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# Supplier Development

## - Moving from a Reactive to a Proactive Approach

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## Abstract

Supplier development was established during and after World War II in Japan. The industry is moving from a traditional approach where low purchasing price were the main focus and supplier switching was common. Today the high price of supplier switching is well known and the importance of supplier development has increased both in research and in the industry. When companies focus more and more on their core competences supplier development is very important to generate competitive advantage. The reason is because the performance of the whole supply chain sets the level of competitiveness.

This project focuses on how to move from a reactive to a proactive approach within supplier development. The reason for this project is ABB Robotics' lack of knowledge within supplier development and their need to take the next step in developing the area. This research analyze supplier development in terms of five factors; Objectives, Activities, Supplier KPI, Success factors and Outcome.

To generate credible results for this research the method chosen is a multiple case study. Five case companies were visited, which resulted in interviews with 25 different people. Both operational and management levels were interviewed at each case company to obtain an objective and in-depth understanding for each individual case. This generated the data collected for the empirical findings, which was used together with the Frame of References as the foundation for the analysis. The analysis begins with a cross-case analysis to find differences and similarities between the cases. These findings are compared to the literature study. Finally supplier development efforts are categorized as reactive or proactive, based on literature and the empirical findings.

The most important result of this study is the importance of having a strategy for supplier development to align the efforts at different departments involved. A dedicated person at management level with a holistic view and responsibility for implementing the strategy and increase focus of this area is recommended. The supplier base should be categorized and each category should be treated differently. Non-critical suppliers need a good contract and competition through multiple sourcing while the relationship with strategic suppliers should aim for partnership. Strategic suppliers should receive most development efforts to achieve partnership. It is also vital to see the supplier development as a mutual work together with the suppliers. The focal company needs to dedicate resources for development and facilitate for the suppliers so that they can perform at their top level. Continuous improvements should be implemented both at the suppliers and for internal processes at the focal company to increase supplier performance.

*Key words: Supplier Development, Purchasing, Proactive and Reactive, Supply Chain Management*

# Sammanfattning

Leverantörsutveckling började under och efter andra världskriget att utvecklas i Japan. Traditionellt sett fokuserade industrin på leverantörer med lågt inköpspris och att byta ut leverantörer som inte presterade tillräckligt bra. Idag är det emellertid känt att byte av leverantörer inte är kostnadseffektivt och därmed har vikten av leverantörsutveckling ökat. Detta är även tydligt då både industrin och forskningen har fått ett ökat intresse för leverantörsutveckling. När företag idag fokuserar på sin kärnverksamhet är leverantörsutveckling en vital del i processen att öka ett företags konkurrenskraft. En starkt fungerande försörjningskedja, från underleverantör till kund, är det som stärker företag konkurrensmässigt.

Fokus för detta projekt har varit att undersöka hur man går från ett reaktivt till ett proaktivt leverantörsutvecklingsarbete. Anledningen till att ABB Robotics önskade ett projekt om leverantörsutveckling var att de ville ha mer och djupare kunskap inom leverantörsutveckling för att kunna ta sig till nästa nivå inom området. Under projektet konstaterades att nästa steg för ABB Robotics är att börja arbeta mer proaktivt. Leverantörsutveckling har i studien analyserats kring fem olika faktorer; mål, aktiviteter, leverantörs nyckeltal, framgångsfaktorer och resultat av utvecklingsarbetet.

Metoden som valdes för att nå ett trovärdigt resultat för studien var en multipel fallstudie. Fem företag besöktes och intervjuer hölls med 25 olika personer för att samla in empirisk data. På varje företag intervjuades både operativa och ledande personer för att generera en objektiv och grundlig förståelse för varje enskilt företag. I analysen användes först insamlad data i en cross-case analys för att hitta likheter och skillnader mellan företagen. Därefter jämfördes dessa med teorin från litteraturstudien och slutligen kategoriserades arbetet i de fem faktorerna som reaktiva respektive proaktiva.

Det viktigaste resultatet från studien är vikten av en strategi för leverantörsutveckling. Strategins syfte är att samordna arbetet och de olika avdelningarna involverade i leverantörsutvecklingen. I och med detta är det mycket fördelaktigt att ha en dedikerad person på ledande nivå, ansvarig för leverantörsutvecklingen och dess strategi. Denna person bör ha ett holistiskt perspektiv och se till att den valda strategin implementeras. Samtidigt ger det ett större fokus på området i hela företaget. Leverantörsbasen bör kategoriseras och olika leverantörskategorier ska behandlas individuellt. Det vill säga, de mindre kritiska leverantörerna kan hanteras med strukturerade kontrakt och konkurrens mellan flera leverantörer, medan strategiska leverantörer ska erhålla det mesta av utvecklingsarbetet och ses som strategiska partners. En viktig faktor är att det köpande företaget förstår att leverantörsutveckling handlar om gemensamt arbete tillsammans med leverantörerna så att de i slutändan når målet, partnerskap. Ett företag måste alltså lägga resurser på att utveckla sina leverantörer och inte bara tvinga dem att utvecklas på egen hand. Det köpande företaget måste dessutom underlätta för leverantören, genom att utveckla sina egna processer så att leverantören får en möjlighet att prestera på topp. Ständiga förbättringar bör implementeras både hos leverantören och för de interna processerna hos det köpande företaget för att öka leverantörsprestandan.

*Nyckelord: Leverantörsutveckling, Inköp, Reaktive och Proaktivt, Logistik, Leverantörsrelationer*

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# Table of Abbreviations

This table's purpose is to serve the reader throughout the report with the abbreviations used.

**Table 1 Table of Abbreviation**

<b>Abbreviation</b>	<b>Meaning</b>
4Q	Quality method at ABB, similar to 8D, DMAIC and PDCA
5S	Quality tool, Sort, Systematize, Sweep, Standardize and Self-discipline in production
8D	Quality tool, eight disciplines for problem solving
ABB LV Motors	ABB Low Voltage Motors
ALPS	Alfa Laval Production System
APQP	Advanced Product Quality Planning
ASCC	Information system at ABB, used as a supplier web
ASQE	Advanced Supplier Quality Engineer
CSR	Corporate Social Responsibility
DMAIC	Quality tool, Define, Measure, Analyze, Improve, Control
DOT	Delivery On Time, KPI at Alfa Laval
FMEA	Failure Model and Effect Analysis
KPI	Key Performance Indicator
LSS	Lean, Six Sigma at Alfa Laval
OTD	On-Time Delivery
PDCA	Quality tool, Plan-Do-Check-Act
PIM	Purchasing Improvement Meeting at Alfa Laval
PPAP	Production Part Approval Process at Volvo Cars
PPM	Parts Per Million, quality defects per million
PQ	Product Quality, KPI at Alfa Laval
QR	Quality Rejection at Volvo Cars
R&D	Research and Development
SCC	Supply Chain Collaboration
SCI	Supply Chain Integration
SD	Supplier Development
SEP	Supplier Engagement Process at Volvo Cars
SQE	Supplier Quality Engineer
SSPP	Strategic Supplier Partnership Process used at ABB LV Motors
TQM	Total Quality Management
TKMS	Tyssen Krupp Marine System, owner of Kockums
VQE	Volvo Quality Excellence, evaluation system



# 1 Introduction

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*The first chapter describes the background of this project and in which context the problem formulation exists. The chapter will also present the purpose of the project as well as problem discussion, focus areas and delimitations and finally who the result is aimed for.*

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## 1.1 Background

In the manufacturing industry it is a visible trend that companies focus their efforts on their core business. To keep competitive advantage, flexibility and reliability are core values in a market with fluctuating demand and smaller margins. When companies downsize and outsource with the aim to focus on their core business, this often leads to increased dependencies on their suppliers in terms of timely delivery, and high quality of the delivered products. Thus the importance of supplier development has increased over the last years. (Kraus, Handfield & Schannell, 1998)

In a time where corporate social responsibility (CSR) has been illuminated the importance of good control and cooperation with suppliers has increased. No customer will buy products from a company not following safety, humanitarian and environmental regulations. The focal company must have visibility and control over a product's whole lifecycle to manage responsibility for it. With this increased interest in the suppliers' business and behavior to assure CSR for the whole supply chain, supplier development arose as an effective tool. It is also the focal company's responsibility to communicate clear requirements for their suppliers and social responsibility is an increasing customer requirement.

Supplier development was established during and after World War II. It started in the automotive industry in Japan with Toyota in front (Wagner 2006). Many publications within the subject have been made after that and the importance of the subject increases. Today there is no recognized program or way of executing supplier development; it is often a new definition for each company. Watts and Hahn (1993) and Wagner and Friedl (2012) agree that there exist some more frequent objectives, which the supplier development programs focuses on. Those are quality, delivery on time, service and cost. All those factors included in supplier development programs are a part of aligning a flexible strategy, which is required in a world with quick shifts in demand.

There are many different definitions for supplier development (SD) in literature in the subject. The definition that many researchers use, which also will be used for this project, is obtainable by Krause and Ellram (1997, pp. 39):

“Any effort of a buying firm working with its supplier(s) to increase the performance and/or capabilities of the supplier and meet the buying firm's short- and/or long-term supply needs. Moreover, promotes on-going improvements that are intended to benefit both buyer and supplier(s)”.

Hence supplier development can be thought of as efforts including monitoring and improving supplier performance.

## 1.2 Company Description

This project has its background in ABB Robotics' need for knowledge within supplier development. To better understand the problem discussion ABB Robotics is described here.

ABB is a world leading company within the power and automation industry. The head office is located in Zurich but has a long history (120 years) in Sweden and operates worldwide. In Sweden the manpower is counted to 9200 employees with the largest amount in Västerås. (ABB Group, 2014)

ABB has five divisions; Power Products, Power system, Discrete Automotive and Motion, Low Voltage Products and Process Automation. This project is located at ABB Robotics, which is one of five business units under Discrete Automotive and Motion. ABB Robotics is manufacturing industrial robots, robot software, attachments and equipment surrounding the robot. Important customers for ABB Robotics are the automotive industry and the food and beverage industry. (ABB Group, 2014)

ABB Robotics has two manufacturing plants, one in Västerås, Sweden and one in Shanghai, China. This project is based at the purchase department at the plant in Västerås. The department contains three sections; operational purchasing, strategic purchasing and supplier quality. The supervisor from ABB Robotics for this master's thesis is the manager for the operational purchasing in Västerås but the thesis will be cross-functional for the entire purchasing department. (Interview 23)



Figure 1 ABB Robotics range of products

ABB Robotics competes in a market with an extremely volatile demand and trends indicate that the volatility will increase the upcoming years. Examples of the volatility for high volume products is that the demand can shift up to 20-30% and for low volume products up to 300% compared to the forecast. This requires high flexibility from the whole supply chain. ABB Robotics is dependent of their suppliers to be able to reach high flexibility; therefore it is their interest to develop their suppliers. (Interview 22)

## 1.3 Problem Discussion

This project has its background in ABB Robotics' need for knowledge within supplier development. After analyzing the purchasing process ABB Robotics noticed a lack of knowledge within this field. Identification of an undesirably low on-time delivery (OTD) of material for the production, one of the key supplier performance measures, revealed a bigger issue and triggered the analysis.

The sources to the problem of low OTD are probably connected with other areas such as information sharing and capacity problems as well as undesirable low suppliers' performance. ABB Robotics has three supplier performance measures defined; OTD, failure rate per million and risk. Risks is only mentioned in their internal documents for the departments of strategic purchasing and not further defined. ABB Robotics continuously works with the measurements to state the situation and goals. The measurements can all be improved by supplier development (Krause, Handfield & Scannell, 1998).

Another challenge ABB Robotics is facing is a strong increase of the demand the upcoming years. To enable this increase and satisfy the market, the whole supply chain needs to increase the capacity. Some suppliers to ABB Robotics are already pushed to their capacity limit and an increase will be difficult. Supplier development is therefore a possible solution for this issue.

ABB Robotics has requested knowledge to manage decisions on how to move into the next step within supplier development. After the pre-study it was defined that the next step for ABB Robotics is to work on supplier development proactively rather than with a reactive approach. In this context, proactive means prevention of future problems by long-term improvements of the supplier base. Reactive supplier development is when "firefighting" is used only when problems with suppliers has occurred (Krause, Handfield & Scannell, 1998). Currently at ABB Robotics the reactive work with urgent problems conquer the proactive work. The "firefighting" takes much time and suppliers are only developed when problems already has occurred. A cross-functional perspective of how to work with supplier development over the three sections; strategic purchasing, operational purchasing and supplier quality will be formed in this project. Today the supplier development efforts are not aligned between the involved departments and no clear objectives are structured.

## **1.4 Research Purpose and Questions**

The purpose of this project is to generate knowledge regarding supplier development and to draw conclusions on how the process of moving from reactive to proactive supplier development is managed. It will help ABB Robotics fill their knowledge gap and advice them how to proceed within the area of supplier development. The purpose is to give ABB Robotics a step-wise action plan, which describes the process of how to move from a reactive to a proactive way of working. Research questions that should be answered through the project are the following ones:

1. What are the most commonly used strategies for supplier development discussed in research?
2. How do companies work differently with supplier development if they use a proactive as compared to a reactive approach?
3. What are, according to the answers above, the next steps for ABB Robotics in the process of integrating proactive supplier development?

It has been identified that different stakeholders has different purposes/incentives in this project. There are three main stakeholders; ABB Robotics, the authors and the university. By communication and clear definitions it will still be possible to meet most of the different objectives in a good way.

The purpose of the project for ABB Robotics is that the generated knowledge should serve as a foundation for top management at ABB Robotics to base further decisions on. It will be examined how other organizations are working with supplier development both at internal divisions at ABB as well as at external companies.

The purpose for the authors is to learn about working in a large project, as it is to write a report from an engineering perspective and use knowledge from previous courses in a practical way. The purpose is also to get a connection to the industry.

The university requests a research perspective of the project. This includes greater focus on academic result, which means examining facts in a critical way to draw valid conclusions.

### 1.5 Project Focus and Delimitation

The focus of this project is to look deeper into the area of supplier development to understand how a proactive approach is achieved. During the literature pre-study two other areas related to supplier development were found; supply chain collaboration and supplier integration. According to Cao and Zhang (2011) supply chain collaboration is defined as not only process integration or transactions, but also the leverage of information sharing and market knowledge for sustainable competitive advantage. They also define supplier integration as follow: “the term integration means the unified control (or ownership) of several successive or similar process formerly carried on independently” (Cao & Zhang, 2011, pp. 163). In other words the focus is on control, ownership or process integration regulated in contracts. This is how the terms will be defined in this project too.

These different areas have been put in relation to each other in Figure 2 Focus areas of this project. The figure shows where the focus area of this project will be and what areas that will be excluded. The x-axis represents the level of suppliers development from low to high, in terms of how dependent the buyer is of the supplier and what capabilities the supplier has. On the y-axis the degree of involvement of the supplier in the focal company is specified. A supplier relation often starts with a supplier development program or support to proceed in a mutual collaboration and the highest level is supplier integration. This project has its focus on the buying company and not the supplier; therefore only departments related to purchasing are included in the case study.

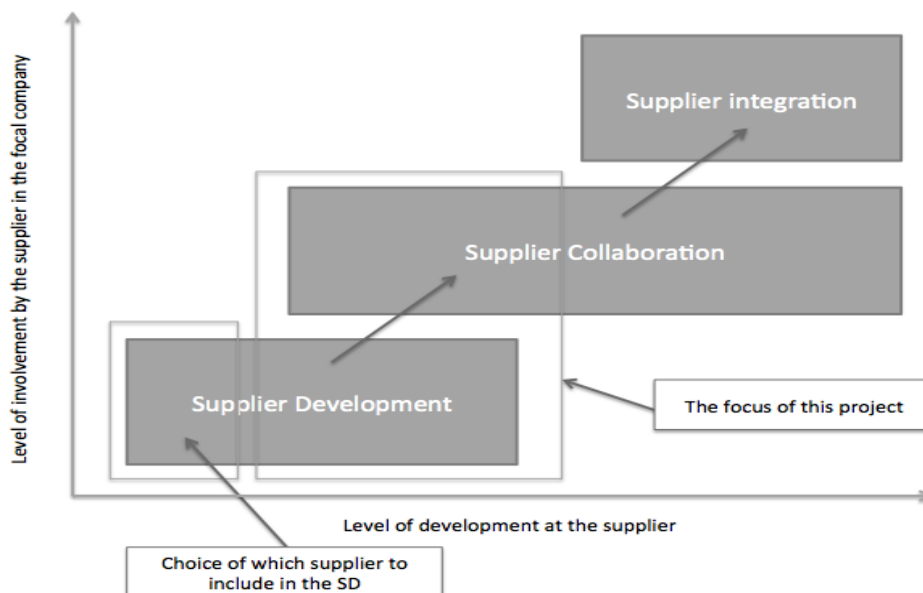


Figure 2 Focus areas of this project

Supplier integration is when a supplier step forward and take over tasks at the focal company, vertical integration. It is only a few suppliers, which have this level of integration at ABB Robotics and thereby it will not be considered in this project. The project will touch upon supply chain collaboration since it is more or less impossible to have supplier development without some collaboration, in the sense of communication. However the focus will be on supplier development.



To choose which specific suppliers to be included in further development will be left for ABB Robotics to examine and implement. It is an important step for successful supplier development, but to include it in this project would make the scope unrealistic within the present time frame. It would be necessary to evaluate all suppliers and categorize them, which is easier for ABB Robotics to do since they already have knowledge about their suppliers. Included in this project is a supplier selection in terms of supplier categorization. It is vital to categorize the suppliers and to have different strategies depending on the importance of the category. Hence to place suppliers in categories will not be done but the categorization will be discussed as well as strategies for them.

Different dimensions or criteria will be included to analyze the concept of supplier development in this project, with an emphasis on comparing and contrasting reactive and proactive supplier development efforts. These factors were found and developed during the literature review and are supposed to cover the whole area of supplier development. The factors are; Objectives, Activities, Supplier KPI, Success factors and Outcome, and they are described in Table 2 Factors for supplier development. A more detailed description why these factors were chosen is found in the third chapter, Frame of References.

**Table 2 Factors for supplier development**

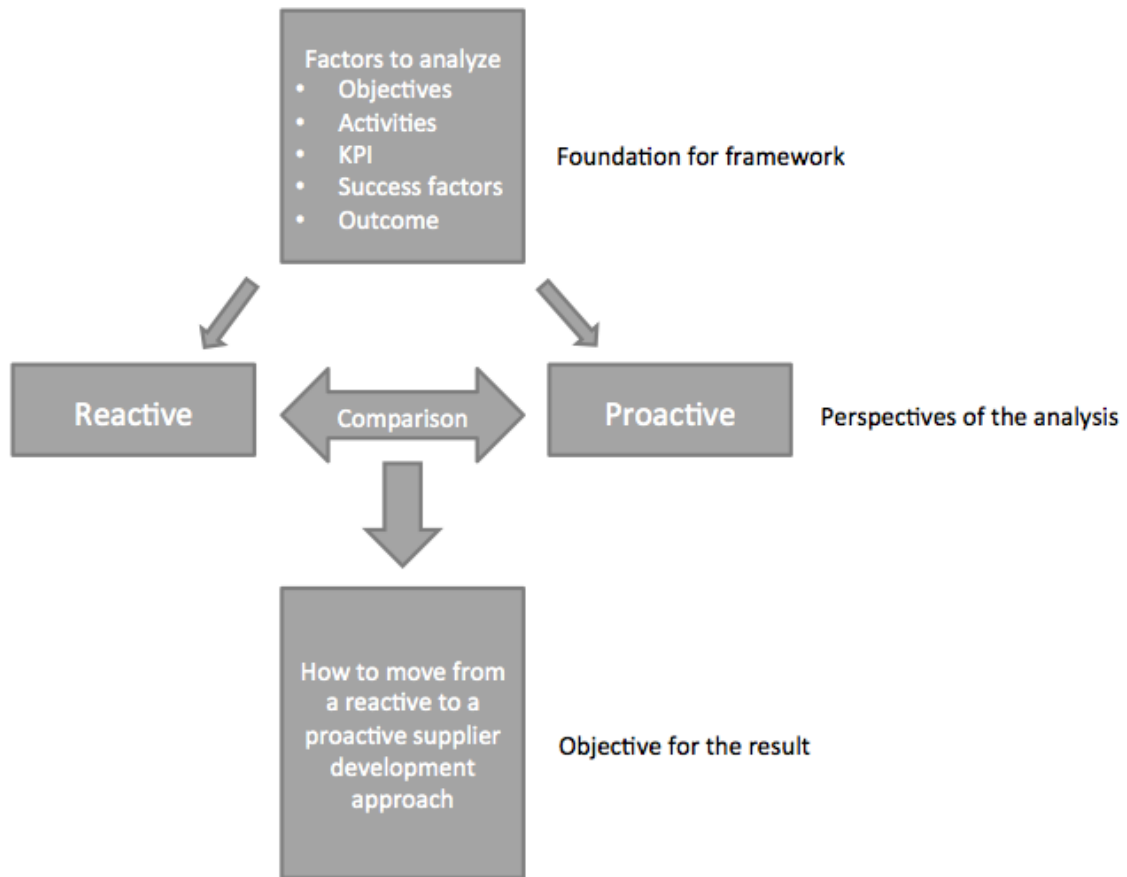
<b>Factors</b>	<b>Supplier Development</b>
<i>Objectives</i>	Common objectives used for supplier development
<i>Activities</i>	Activities included in supplier development
<i>Supplier KPI</i>	Supplier key performance indicators, which measure supplier performance. Measure and improve
<i>Success factors</i>	Existing success factors within different stages of supplier development
<i>Outcome</i>	What outcome can be expected through supplier development

It is obvious that a bullwhip effect exists. A bullwhip effect is when demand volatility increases further down in the supply chain due to lack of correct or transparent information (Holweg et. al, 2005). These issues are of a very complex nature and will not be included in the scope of this project. Even if the problem with bullwhip is solved the market requires increased flexibility, which makes supplier development necessary.

Another area is the risk management perspective, which this project will not focus on. Risk management, in this case, refers to the risk regarding selection of suppliers. Which suppliers are suitable and when should single- or dual sourcing be used?

Supplier development projects should include various functions at the focal company and the suppliers. This project will exclude the supplier related process of product development, R&D, and instead focus on development of operations and purchasing.

This project is focused on the purchasing department in Västerås, Sweden within the division of ABB Robotics. The focus will include case studies both internally at ABB and at external companies within the manufacturing industries to map how they have established supplier development. Focus is on purchasing of direct material to a production site. Figure 3 below summarizes the scope of this project.



**Figure 3 Project structure**

## 1.6 Target Groups

The target group for this project is the management at ABB Robotics who deals with purchasing questions as well as its problems and symptoms. Those people are assumed to have a higher education and be familiar with academic language and terms used within supply chain management and purchasing.

The report is also aimed for researchers and students at university level who want to gain deep knowledge about supplier development and how it differs between reactive and proactive approaches. They are expected to have knowledge in supply chain management and production.

## 1.7 Report Structure

The following table is an outline for the report with a description over the different parts.

**Table 3 Outline for the report**

<b>Part</b>	<b>Chapter</b>	<b>Description</b>
Introduction	1	The chapter will introduce the reader to the background of the environment where the focus area exists. It will also present the purpose, delimitations and what research questions the report will answer. It also presents the context of the project and a description of the company where the project was established.
Methodology	2	This chapter is aimed to describe different methodologies and why certain methods are more suitable than others for this project. This ensures that a scientific approach is used, as well as the validity and reliability of the report. It will also be described how data are gathered and which methods are going to be used to analyze the data.
Frame of References	3	In this chapter the theory within supplier development will be presented. It will serve as a foundation of theory, which the rest of the report will refer to. The theory chapter will help the reader to understand the analysis and conclusion drawn in later chapters. Focus for this chapter is SD within the five factors; Objectives, Activities, Supplier KPI, Success factors and Outcome. Supply Chain Collaboration is also presented.
Empirical Study	4	The empirical study will present the result of the data collection from the cases. It will discuss both the internal and the external cases.
Analyze	5	An important step in research is the analysis, which will be presented in this chapter. The analysis will be based on the chosen methodology, which is presented in chapter 2. It starts with a cross-case analysis to find differences and similarities between the cases after that the findings are compared with theory. Finally a reactive compared to a proactive approach within supplier development is analyzed.
Conclusion	6	The chapter will start with a summary of the analysis, stating the most important findings. After that a recommendation for ABB Robotics will be given on how they can proceed with supplier development. In the end it will discuss the limitations of the project and further areas, which need more research.
References	7	This part is a list of all references in alphabetic order due to the Harvard system. When reading this report it is important to understand the reference system used in the text. When a reference is placed before the punctuation it is a reference to that sentence and if it is outside the sentence it refers to the whole section before.
Appendix 1	8	This appendix is the Case Study Protocol used for the interviews at the cases. It includes a summary of why the interviews are made and an interview guide with the questions used for the interviews.
Appendix 2	9	This is a list of the 29 interviews performed during this project.



## 2 Methodology

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*This chapter aims to describe different methodologies and why certain methods are more suitable than others for this project. The objective is to ensure that a scientific approach is used, as well as the validity and reliability of the project. It will also be described how data are gathered and which methods are going to be used to analyze the data.*

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### 2.1 Scientific Approaches

To increase credibility it is important to select a suitable scientific approach for the research. The different scientific approaches vary in the terms of the view of reality and how they combine the components to create the final result.

#### 2.1.1 The Analytical Approach

The analytical approach is the oldest of the three different approaches considered in this chapter and has deep roots in the Western foundation of science. Arbnor and Bjerke (1996) define this paradigm as “the whole is the sum of its parts” ( $2+2+2=6$ ). This means that you can build a result from putting different pieces together likewise break down an answer to its pieces to get an explanation. The aim with those pieces is to find the cause-effect-relation by testing hypotheses (Gammlegaard, 2004). Due to this paradigm the approach of reality is not dependent on individuals or observers since it is based on the logical fundament. The analytical approach often uses quantitative data to get to the result.



Figure 4 The analytical approach (Arbnor & Bjerke, 1996)

#### 2.1.2 The Systems Approach

Next in the historical development of approaches comes the systems approach. The systems approach is an attempt to see the reality from a holistic point of view. The definition of the systems approach view of reality is “The whole differs from the sum of its parts” ( $2+1+3 \neq 6$ ). Relations between the different components, in this project referred to as factors, is much more essential in this approach. The result is also dependent of synergy effects between components and is trying to give an understanding perspective of the result. (Arbnor & Bjerke, 1996) Since the systems approach is dependent of the relations it is also dependent of the context it operates in compared to the analytical, which has a more universal base (Gamlegaard, 2004). The knowledge created through this approach is dependent of the system, thereby it is important to define both system and components clearly. A system is a set of components and how they interact with each other in relations. The components are described and understood by the characteristics of the whole (Arbnor & Bjerke, 1996).

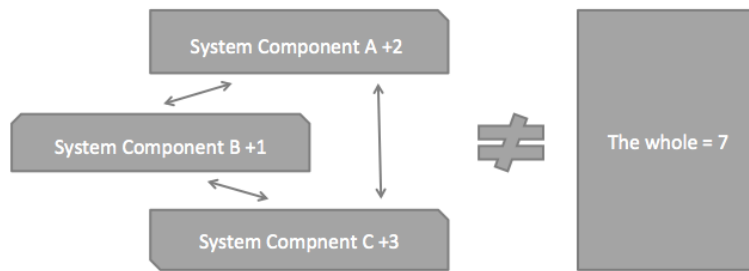


Figure 5 The systems approach (Arbnor & Bjerke, 1996)

### 2.1.3 The Actors Approach

This is the latest contribution to the scientific approaches. The fundamental point of reality is based in the viewpoint: “the whole exists only as meaning structures, which are socially constructed” (Arbnor & Bjerke, 1996). Different meanings build together the meaning structure of the result. The approach aims to understand the different social interactions, which leads to the result. The actors approach is dependent on individuals and wants to find out about the meaning of the actors.

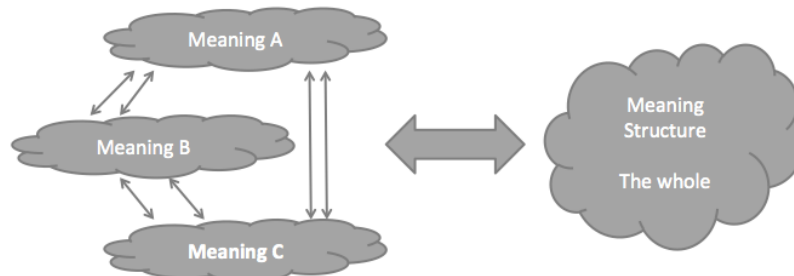


Figure 6 The actors approach (Arbnor & Bjerke, 1996)

There are two kinds of systems, the open ones and the closed. The closed are only considering the environment within the system compared to the open, which consider the context and environment outside the system.

### 2.1.4 The Selected Approach

An analytical approach would have meant, for example that all separate success factors, for supplier development, together would give the most successful result. Since earlier research says, that it is the combination of factors adapted for each specific case is the best solution (Watts & Hahn, 1993), an analytical approach is not suitable.

The purpose of this project is to develop an action plan for supplier development aligned with the company strategy, which means that the human perspective is not of interest as a main approach. The objective for this study is to understand the different components/factors relations to each other and what those relations are. Hence an actors approach is not suitable for this project.

For this project the systems approach has been selected due to the nature of the problem formulation. Since the result is based on different factors, in this case they are activities, objectives, KPI, success factors and outcome. All those factors operate with different synergies between each other. Thus a systems approach is suitable. The importance of how different components relate to each other will be an important factor for the result.

There are two different types of systems, open and closed. The open systems considered the environment where the phenomenon operates and linkage between. The system in this project is

defined as the context of supplier development with the factors shown in Figure 3 Project structure. The environment is in this case defined as factors that influence the system from the outside but is beyond the systems control. The closed system only look in to the system it self. (Arbnor & Bjerke, 1996) Therefore in this project an open system will be analyzed.

## 2.2 Research Methodology

Methodology selection is an important step in creating knowledge. It is a guide of how research and analysis is done and not a step-to-step description of the execution (Höst, Regnell & Runeson, 2006).

### 2.2.1 Inductive and Deductive

There are two ways of relating empirical observations with theory; they are called inductive and deductive. Through the inductive approach the final conclusion has been drawn from assumptions based on empirics. Theory is thereby built on analysis from observations. It is important to know that those types of conclusion to build theory upon are not totally reliable. Even if the research comes from a large population there is always delimitations with the selection of the population. (Ghauri & Grønhaug, 2002)

The deductive approach uses logical reasoning for drawing conclusions. Existing theory is used to explain and make new predictions by looking at observed cases. Thereby the result is not necessarily true, but it has to be logical. In the deductive approach hypotheses built from theory are combined and then rejected or confirmed by empirics. (Ghauri & Grønhaug, 2002)

Figure 7 Relation between induction and deduction, explains the relation between induction, deduction and theory. It can be explained as processes of building theory and explanations of reality through theory.

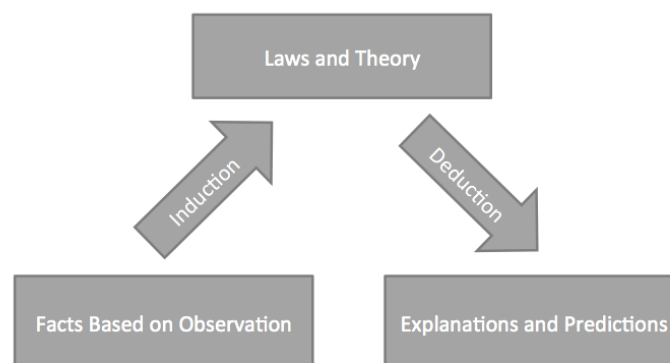


Figure 7 Relation between induction and deduction (Arbnor & Bjerke, 1996)

### 2.2.2 Qualitative and Quantitative Methods

Qualitative and quantitative are two types of data collection methods. When selecting which type that is suitable it is important to study the characteristics of the problem formulation and the objectives with the research.

Qualitative method is based on the aim to understand the situation. The method has been criticized for being a subjective method but has its advantage in the closeness to data. The qualitative method is strongly process oriented and is build upon a holistic view. The qualitative perspective often uses generalizations by comparing different contexts of individuals. (Ghauri & Grønhaug, 2002) Qualitative methods are often associated with unstructured interviews and conversations where the

respondents are able to explain the situation in their own words. Otherwise semi-structured and/or structured interviews are used both in qualitative and quantitative methods.

The quantitative method wants to verify or reject hypotheses. The focus lies within facts, controlled measurements and results. It is more of an objective approach compared to the qualitative but has larger distance to the data source. The quantitative method is often related to surveys, structured observations and facts from databases. (Bryman, 2008)

Even though there is some more distinct difference between the two methods there is no sharp line. A certain data collecting technique can always be argued to be both qualitative and quantitative. The figure below, Figure 8 The relation between qualitative and quantitative, illustrates the relation between qualitative and quantitative methods and the difficulties with categorization of what type a specific method is. (Ghauri & Grønhaug, 2002)

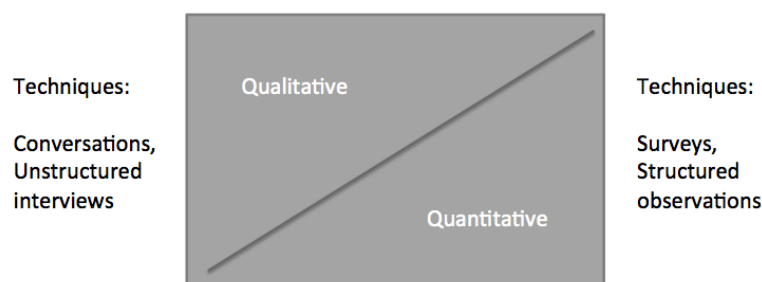


Figure 8 The relation between qualitative and quantitative (Ghauri & Grønhaug, 2002)

### 2.2.3 The Selected Methodology

When it comes to selection of inductive or deductive methodology it is not easy to give a clear answer. Both sets of methodology can be motivated to be both types, inductive and deductive. In this project an inductive method will be used. The project starts with an inductive process where the, case study, is executed and then theory is built with that as a foundation.

When selecting qualitative or quantitative method a good guideline is which scientific approach that will be used. Bryman (2008) says that it is more suitable to have a qualitative approach when relations are an important factor. In the decision of which scientific approach that will be selected it was confirmed that the relations between the components (Figure 3 Project structure) is vital for the result. It is thereby suitable to use a qualitative method. Some researchers argue that it is not scientific enough with a qualitative method but when the objective is to get an in-depth understanding of the problem it is not possible to get this from a quantitative method (Ghauri & Grønhaug, 2002).

## 2.3 Research Strategy

Selection of a research strategy for a scientific project should be based on the expected result and characteristics of the project. Its purpose is to be a tool to reach objectives of the project. (Höst, Regnell & Puneson, 2006)

### 2.3.1 Research Strategies

According to Yin (2003) five different research strategies exists; Experiment, Survey, Archival analysis, History and Case Study. These are shown in, Table 4 Research strategies. The first thing when selecting the research strategy is to consider the research questions.



- Explanatory questions, for example “how” and “why”, are more suited for case studies, history research and experiments.
- Exploratory questions like “what” are suitable for all five research strategies but when questions like “how many” or “how much” are used surveys and archival strategies are more appropriate than the others.

To further separate the strategies to be able to choose one, the extent of control over behavioral events and whether the project focus on contemporary or historical events has to be clear.

**Table 4 Research strategies (Yin, 2003)**

<b>Strategy</b>	<b>Form of Research Question</b>	<b>Requires Control of Behavioral Events?</b>	<b>Focuses on Contemporary Events?</b>
<i>Experiment</i>	how, why?	Yes	Yes
<i>Survey</i>	who, what, where how many, how much?	No	Yes
<i>Archival Analysis</i>	who, what, where how many, how much?	No	Yes/No
<i>History</i>	how, why?	No	No
<i>Case Study</i>	how, why?	No	Yes

### 2.3.2 The Selected Strategy

The strategy for this project will be a case study. The reason for this choice is the purpose of answering questions expressing the meaning of “how”, which makes experiment, history and case study suitable strategies. Furthermore it is not required to have control of behavioral events, which exclude experiments and finally the focus will be on contemporary events. Hence the case study is most appropriate for the expected result and characteristics of this project.

Voss, Tsiriktsis and Frohlich (2002) stress that case study can be used for different types of research purpose fore instance exploration, theory building, theory testing and theory extension/refinement. This project is supposed to be a theory building type of research since its aim is to find the aspects in the process of moving from reactive to proactive supplier development. This is not found in existing theory and it is crucial for businesses. Hence it will be an inductive, explanatory, type of research.

### 2.3.3 Case Study Approach

Case study is a strategy that will generate deeper knowledge of one or several cases. The strategy is suited to analyze how different components, see Figure 3 Project structure, works in a specific situation, environment or process. Since systems approach is appropriate for this project a case study will align with the paradigm of synergies between components in the system. In a case study interviews, observations and analysis of archives are techniques used to collect data. Thus it is a flexible and qualitative method. (Höst, Regnell & Puneson, 2006)

As mentioned before, qualitative methods including case studies sometimes are judged as subjective strategies. If on the other hand the case study is performed in a correct way for theory building it is a very objective strategy since it has a close adherence to data (Eisenhardt & Graebner, 2007).

Case studies can be accomplished in several different ways depending on what the purpose of the research is. Yin (2003) describes four different types of case studies. He divides them in single or multiple together with holistic or embedded case studies.

A single case study is appropriate when a critical case is tested from well-formulated theory or when an extreme or unique case is studied. It can also be used as a revelatory case or a longitudinal case where the specific case is studied several times to show changes over time. If more than one case is studied it is a multiple case study and the purpose is to contrast or extend the developing theory. Thus every case included should indicate contrast or similarities to the theory. (Yin, 2003)

Single case studies advantage is that a greater depth is gathered compared to a multiple case study. Disadvantages with single case studies are that it is difficult to motivate that conclusions are general together with the ease of overestimating the representativeness of the single case. This makes multiple case studies preferable as well as a protection against bias from the people who observe the cases. (Voss, Tsiriktsis & Frohlich, 2002) According to Yin (2003), a multiple case study is always preferable if it is possible, even though it is just two cases involved instead of one single case. With two cases it is possible to do a direct replication. It is also more likely that the cases differ to some extent and then the result is more generalizable if the conclusion from the two cases corresponds. The disadvantage of the multiple case study is that it requires more resources (Voss, Tsiriktsis & Frohlich, 2002). To summarize, multiple case study is preferable but it require more resources and more cases will lead to less depth in each case.

Both single and multiple case studies can be holistic or embedded. The embedded approach is used when more than one unit of analysis is involved within the case or cases. In the holistic approach no subunits are identified or a holistic approach is more suited for the result. Thus a single unit of analysis is used in the holistic approach. This divides the case study into four different types as shown in (Yin, 2003)

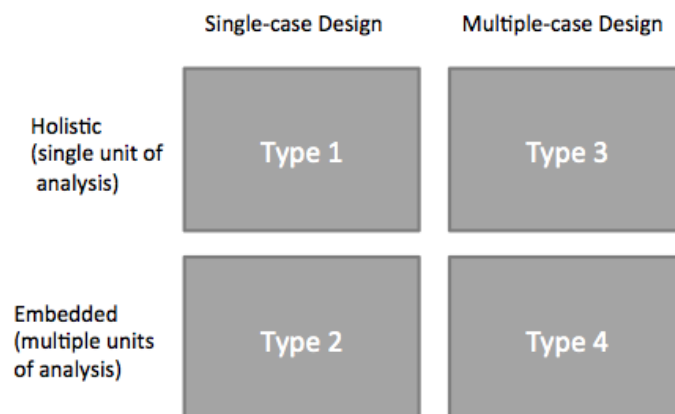


Figure 9 Different types of case study (Yin, 2003)

### 2.3.4 The Selected Case Study Approach

A multiple case study is selected for this project. A single case study is not preferable since it is not a specific case or theory that needs to be observed. The conclusion from the cases is expected to be more general and then the multiple case study has the advantages. Hence, it will be a Type 3 or Type 4 case study according to Figure 9 Different types of case study.

Since the result is expected to be a strategy that covers the whole context of supplier development, within the focus area it will be a holistic case study. The unit of analysis is supplier development and the five factors are used to maintain the holistic view of the subject. This makes the approach of the case study multiple and holistic and therefore it is a Type 3 approach.

### 2.3.5 Case Selection

When cases were selected for this project the research questions and the expected result were two factors to consider. The analysis of the case study should lead to the result of this research and therefore the selection of relevant cases was crucial. A structured approach for selecting cases will increase validity of the result since it increases the probability to collect representative data. To narrow down a broad spectrum of possible cases into a suitable number, different parameters of the cases were discussed. The selected parameter or parameters should generate interesting aspects of the case study and make a few cases cover a broader area. If only similar cases were selected within a case study with a few cases it would generate a one-sided analysis, which would be less generalizable. A more interesting result from a case study would be one with differences between the cases so that conclusions could be made out of one or several different parameters. The main objective of the parameter or parameters was to enable answers for the research questions. Focus will be on research question two:

2. How do companies work differently with supplier development if they use a proactive as compared to a reactive approach?

Research question two will then lead to answers on what the next step for ABB Robotics is, which is research question three.

After a discussion of different parameters to make the case selection from, one parameter was unique because it was closely related to the research question. It was obvious that the cases should be selected with the parameter of reactive and proactive approach towards supplier development. This parameter was expected to generate differences among the cases and interesting results.

Another aspect considered when the cases were selected was if the cases' organization was similar to ABB Robotics in terms of products, complexity of the production and market. It was preferable to have cases from the same kind of industry as ABB Robotics to be able to find a suitable solution for them. Hence, cases with assembly of technical products were highly prioritized. The focus was on purchasing of direct material to the production. This aspect was also requested from ABB Robotics.

### 2.3.6 How the Cases were Selected

Many companies were asked to be a part of the case study for this project. The companies that were positive to participate are shown in Figure 10. The selection of case companies for the case study. Companies that were selected for the case study are circled. It was important to have at least one case from each end of the scale to cover the whole area and enable comparison. An assumption of the placement at the scale was done after a short research on their supplier development efforts. The assumption was made before the companies were visited and interviewed. It was shown later in the project that this figure was not as simple as assumed from the beginning but the whole line has been represented.



Figure 10 The selection of case companies for the case study

### **2.3.7 The Selected Cases for the Case Study**

The automotive industry is well known to be in front within supply chain management (Van Weele, 2010), which includes supplier development. When discussing cases with different people at ABB Robotics, Volvo Cars was the company mentioned most frequently. According to ABB Robotics, Volvo is outstanding within supplier development. The production at Volvo is also quite similar to ABB Robotics production even if it is of much larger scale. Hence Volvo was a desired company for this project.

Tyssen Krupp Marine System AB (TKMS), former Kockums, was the second company chosen on the proactive side of the scale. TKMS also produce highly technical products but since they work differently with long project, far from mass production, they were expected to work closely with their suppliers.

Scania was also desired as one of the cases since they also were expected to be forward in the area of supplier development. A supplier development manager agreed to participate for an interview but problems occurred since he traveled a lot. Unfortunately he was not able to participate during the time reserved for this project.

FMV was also very hard to reach and because of global military unrest a booked meeting was canceled. Unluckily no other time was managed.

Another case mentioned during the interviews at ABB Robotics was ABB LV (low voltage) Motors. ABB LV Motors is another business unit under the same division as ABB Robotics, Discrete Automation and Motion. This case was suggested because it was known that ABB LV Motors works with supplier development in a different way compared to ABB Robotics. At their business unit they have a dedicated function that works only with supplier development and it was an interesting aspect to investigate. From the start of this project it was also desired to analyze another business unit internally at ABB. Since ABB LV Motors started their supplier development efforts only a few years ago it was also interesting to analyze how far in the proactive direction they had come.

IKEA Industry, former Swedwood, and ICA were not selected for this project because their products differ from ABB Robotics. The second reactive company selected was therefore Alfa Laval, which also has production of technical products and is assumed to be reactive.

## **2.4 Research Execution**

### **2.4.1 Data Collection**

There are different ways of collecting data, suitable for different situations and objectives. According to Ghauri and Grønhaug (2002) there are five types of techniques to obtain data; Observation, Communication, Surveys, Interviews and Focus groups. Normally it is the objectives of the answers that decide which type of technique that will be used. This project will mostly use observations and interviews since case study is the selected research strategy.

#### **2.4.1.1 Primary and Secondary Data**

Within data collection two types of sources are defined, primary and secondary sources. A primary source is when new data is collected while secondary sources are described as material or information collected by someone else previously (Arbnor & Bjerke, 1996). A clear advantage for secondary sources is the aspect of saving time and money as well as the utilization of other people's knowledge. The secondary sources can give the researcher a direction of which, research methods

that are suitable. For example if earlier researches, with more knowledge, have used case studies for a specific type of subject, then it is probably the most suited. (Ghauri & Grønhaug, 2002)

In this project both primary and secondary sources will be used with emphasis on secondary. In the phase of pre-study a lot of research articles were read to be able to grasp where the research about supplier development stands today. Already published articles are a good example of secondary source. The chapter Frame of References is based on previous research and originates from secondary sources. But the result from the case study will become a primary source of data.

#### **2.4.1.2 Interviews**

Interviews are used to gather data. To use a correct interview technique is therefore essential to establish validity and reliability. According to Ghauri and Grønhaug (2002) three types of interview techniques exist; structured, unstructured and semi-structured. Structured can be compared to a survey with the difference that it will be communicated by the researcher instead of just being filled out by the interviewed person. Unstructured interviews are more similar to an open conversation and a semi structured is a combination of both. The semi-structured interviews often answer questions of “how” and “why”. It is in those types of answers the strength of this interview technique exists. It gives in-depth understanding.

It is important that the researcher acknowledge the complex situation and the issues around objectivity when using interviews to gather data. The researcher should not influence the people interviewed in neither leading questions nor behavior. To obtain a holistic perspective and interview the relevant people for the current problem it is also important to carefully choose the people to interview. (Ghauri & Grønhaug, 2002)

To ensure the quality of the interviews an “Interview Protocol” will be developed. In this document the objectives for the interviews will be stated as well as an interview guide, see Appendix 1, containing information about the chosen persons, their responsibility areas and titles. This document is a tool to see if the interviews are aligned with the objectives for the whole project. It will also serve as a guidance to remain objective when asking questions, since the questions have been developed carefully for that reason.

#### **2.4.2 Project Execution**

The project execution was founded in Yin’s (2009) model of case study method with some modifications. Five phases have been developed with different steps in each phase. The project started with a pre-study phase where definitions of different relevant concepts were examined as well as a general review over research and theory. A visit at ABB Robotics was also executed during this phase. The purpose of the visit was to map the existing processes and to get a deeper understanding of the content of the problem. Thirteen interviews with people at both top management and operational levels within operational purchasing, strategic purchasing and supplier quality ensured validation of the existing processes. During the project several meetings and visits at ABB Robotics were done to assure the adherence to the company and the problem. The result of the mapping can be seen in the section describing ABB Robotics in the empirical chapter.

“Define and Design” were the next phase, where the Frame of References was developed. The cases were selected and the interview protocol was constructed. The interview protocol was a vital part of the preparations for the cases, Appendix 1

In the execution phase the case study was executed as well as secondary data gathered for the cases. The interviews were held during a visit to the case companies and at least two different persons

were interviewed at each case. During each interview, besides the interviews at ABB LV Motors, both researchers attended to increase the reliability.

Small reports from the cases were written to enable an analysis of the information. To assure the accuracy of the data gathered from the interviews the case companies got the opportunity to read and approve or correct the text written about them in the empirical chapter. A natural next phase was “Analysis”. Here the selected analysis method with pattern matching, explanation building and cross-case synthesis were conducted and conclusions were drawn.

Finally the last phase was the outcome. All the steps and phases will result in a written report, an open seminar and a presentation at ABB Robotics. The report was written parallel with the project activities with different deadlines throughout the phases to ensure the quality of the project and alignment to the research questions.

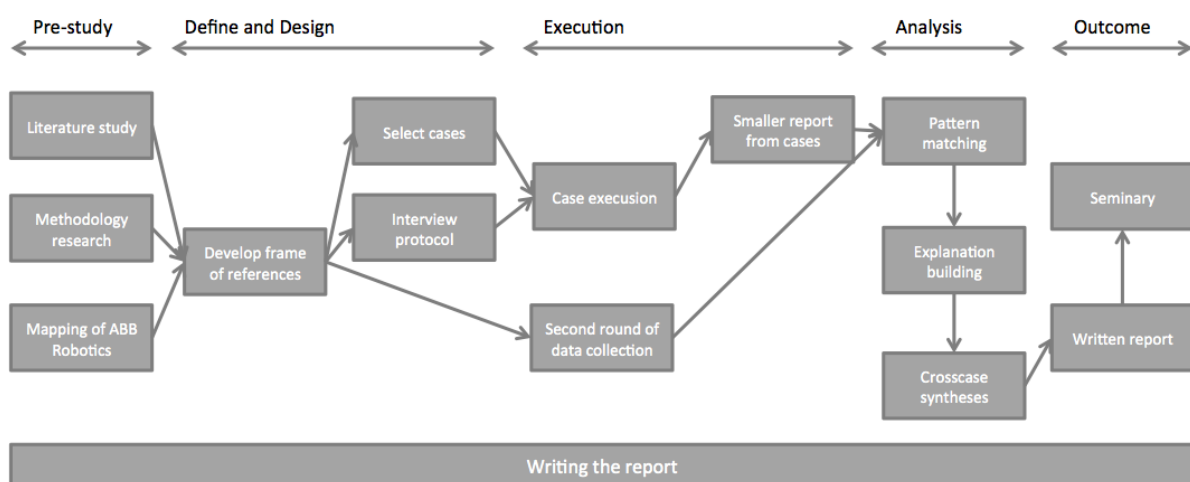


Figure 11 Project execution based on Yin (2003)

## 2.5 Data Analysis

The next phase after collecting data is analysis. It is important to consider the method of analyze when choosing techniques for data gathering. The reason for that is because data gives requirements, which lead to constrains in choice of analysis method. (Ghauri & Grønhaug, 2003)

Due to Yin (2003) some analysis techniques are more common than other and it is important to select suitable ones and work with those in a structured way. Below is a list of the five analyze techniques that Yin (2003) presents.

- *Pattern matching*: This is a method where the researcher looks for patterns within the theory and attempts to find patterns to match with observations. Pattern matching can describe both similarities and differences.
- *Explanation building*: It is similar to pattern matching but explanation building is more complex and more difficult. The objective is to give more of an explanation about the case.
- *Time-series analysis*: The case will be analyzed from the perspective of a timeframe in this analyze method. Conclusions can be drawn from the relation to time.
- *Logical models*: This method corresponds with pattern matching and time-serie analysis. Events are arranged in sequences over time with all cause-effect patterns identified.

- *Cross-case syntheses*: This method is applicable for a multiple case study only. Each case will be examined in the same way to enable comparison between the findings, which will lead to qualified conclusions.

Three of the above methods are selected for this project. Cross-case syntheses, pattern matching and explanation building are suitable and will be used for the analysis. Further details of these methods are described below.

### **2.5.1 Cross-Case Synthesis**

This method is adapted to multiple case studies due to the comparison between different cases. The method gives a robust foundation to enable qualified conclusions. Each individual case is treated as an individual, which means that they are analyzed without considerations to the other cases. All cases are examined in the same way due to the ability to later make comparisons. This is ensured through the interview guide seen in Appendix 1. The strength with this method is that the cases can be examined by different people but still be analyzed since they are treated individually.

Comparing the different cases in several tables enabled the cross-case synthesis in this project. The tables gathered data from the empirics and differences and similarities between the cases were collected from the tables. These findings were also used for the pattern matching and explanation building.

### **2.5.2 Pattern Matching**

Torchim stated this method in 1989 when he found the need for a structured way of relating empirical studies with theory. Pattern matching is a strong tool for building validity in research (Yin 2003). The purpose of the method is to find patterns in theory to formulate prediction of the outcome. The prediction is matched with patterns from observations to confirm or reject the hypotheses. Figure 12 Pattern matching (Torchims, 1998), shows the procedure of Torchims (1998) pattern matching.

In this project pattern matching was executed by using the differences and similarities from the cross-case synthesis to identify patterns. Those patterns were then matched and compared with the theory from the chapter Frame of References.

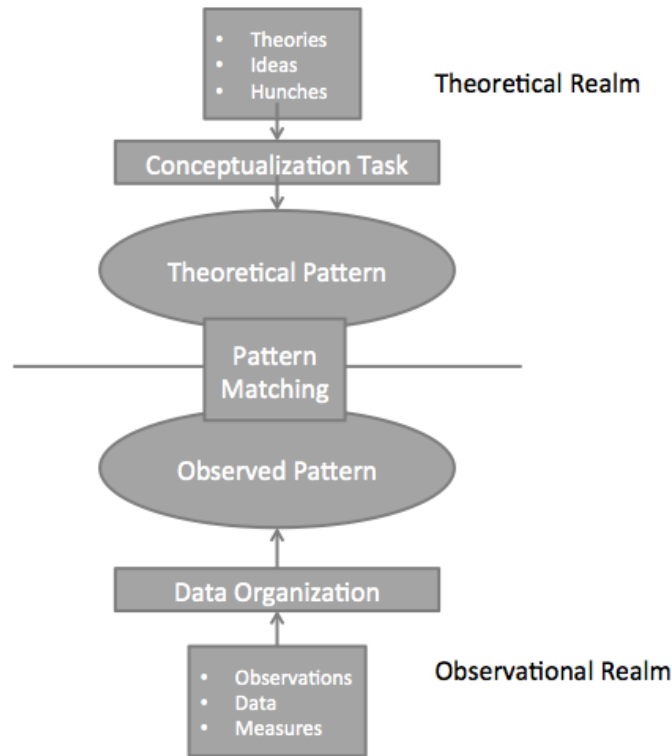


Figure 12 Pattern matching (Torchims, 1998)

### 2.5.3 Explanation Building

This method is an attachment or further development of pattern matching. The purpose is to build explanations surrounding the case, which then will be analyzed. In explanation building, emphasis is relation and links between factors. The process is iterative. It starts with stating an initial proposition from the theory then comparing it with an initial case, continuing by revise it and then compare it with other facts or other cases. When this iterative procedure is performed it starts from the beginning again until an explanation is found. The process is described in Figure 13 The process of explanation building (Yin, 2003).

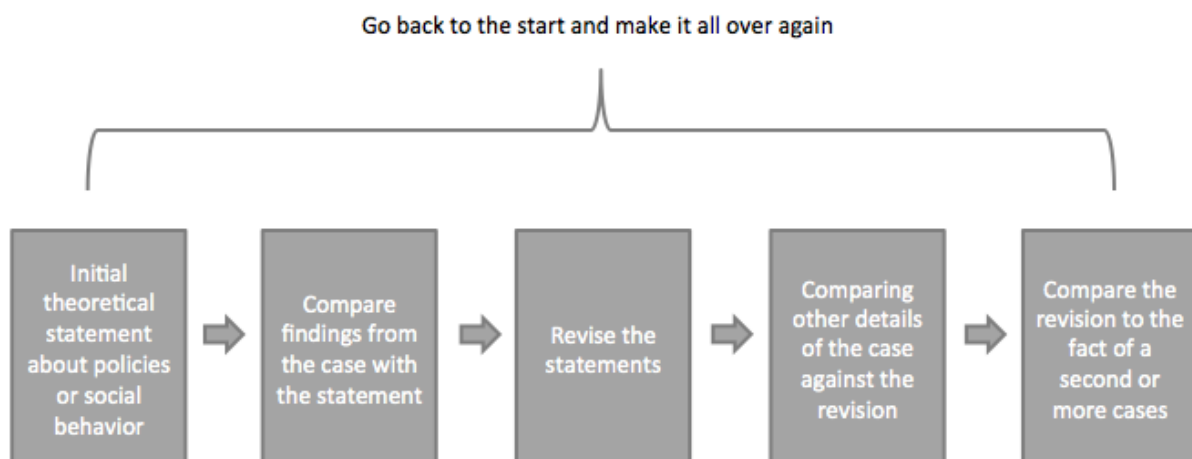


Figure 13 The process of explanation building (Yin, 2003)

In this project the Frame of References has served as the theoretical frame of the subject. The literature has stated policies about how to work with supplier development. Those policies and methods have been compared to the cases to be able to draw conclusion and build understanding of



the cases. A comparison between the different cases is also an important thing in building explanation and understanding.

#### **2.5.4 Execution of Analysis**

During this project cross-case synthesis, pattern matching and explanation building has been used. In the initial phase of the analysis a cross-case synthesis was done to compare the cases and find differences and similarities between them. From the cross-case synthesis patterns were found and these were compared with patterns from the Frame of References in the pattern matching. Cross-case synthesis and pattern matching are a part of giving the empirics a clear structure of the findings. A match was not enough to understanding the holistic perspective, which is the objective in this project. Thus explanation building was used to get a better understanding of the links between the different factors and the theory. The analyses methods lead to definitions of what supplier development efforts are reactive and what efforts are proactive within the five factors analyzed.

### **2.6 Credibility**

Credibility is important in research methods in different aspects. It secure that the conclusions are supported, guarantee that the research address the phenomena that was suppose to be studied and it create more generalizable results. (Höst, Regnell & Runeson, 2006) In case studies credibility assure quality (Yin, 2003).

Within credibility more specific validity and reliability are defined. They are divisible in an analytic perspective but they are also dependent of each other since validity cannot exist without reliability. Validity is, to what extend the measurements of the research are reflecting what the research questions are inquiring. Reliability is, to what extend the research are trustworthy. High reliability means that the result from the research would be the same if it were performed a second time (Bryman, 2008). Yin (2003) describes four tests that are assuring credibility in case studies; Construct Validity, Internal Validity, External Validity and Reliability.

#### **2.6.1.1 Construct Validity**

Construct validity is defined as the traditional meaning of validity, which is how well the studied phenomena, is reflected in the measurements of the research. This validity test is important in a case study in order to keep the research objective and not reflect the researchers possible preconception. There are several ways to ensure construct validity (Yin, 2003). At first multiple source of evidence is a way to ensure construct validity during data collection. Different sources with the same result confirm validity in the study. To create a chain of evidence so that anyone can follow the research and verify if the conclusions are reliable increases the construct validity. Finally to have the report reviewed by key informants increase construct validity. (Yin, 2003)

#### **2.6.1.2 Internal Validity**

This validity test is only applicable for a causal or explanatory case study. It is not suitable for descriptive or exploratory studies. The purpose is to visualize all perspectives of the study. Some findings in a study may not be aligned with the wanted result nevertheless they should be described to increase internal validity. Accurate ways of data analysis support this validity for example pattern matching, explanation building, address rival explanations and use of logic models. (Yin, 2003)

#### **2.6.1.3 External Validity**

External validity means to what extend the result of a study can be generalized for other cases. Case studies are not statistical but analytical generalizable, which means that a particular set of results are general to some broader theory. This covers validity of the research design of the study. For a single case study the alignment to theory is important to increase the external validity while multiple case

studies can use cross-case synthesis. (Yin, 2003) More similar context of the cases in a multiple case study increases the probability to obtain the same result and generalize. Hence a detailed description of the context for each case should be presented in the report (Höst, Regnell & Runeson, 2006).

#### 2.6.1.4 Reliability

The last of the four tests is the reliability. A highly reliable study is one where another researcher can repeat the exact same procedure for the same case and will reach the same conclusions. Hence it is the minimization of errors and bias during the data collection. Documentation is of importance to ensure reliability. Protocol for interviews, as stated before, is one way to do this. Another way is to gather a case study database. (Yin, 2003) Moreover summarize the content from an interview for the interviewed person to make sure it was correctly understood is a way to decrease errors and bias (Höst, Regnell & Runeson, 2006). A solution to eliminate influences from the interviewed persons bias is to interview several persons within the organization with different background (Eisenhardt & Graebner, 2007).

#### 2.6.1.5 Credibility in this Project

As mentioned before this project has both exploratory and explanatory parts. Therefore all four tests are suitable. Table 5 presents the tests for this project as well as the ways to improve validity and reliability and a description on how to perform it.

Table 5 How Credibility is created in this project based on Yin (2003)

Test	Way to improve	Description	Phase of research
<i>Construct Validity</i>	Multiple sources of evidence	Interview different people at each case Use other sources for example webpages and external information	Data collection
	Chain of evidence	Declare interview questions and methods for the research	Data collection
	Report reviewed by key informants	Reviewed by the each case company.	Composition
<i>Internal Validity</i>	Interview different people	To get the full picture not influenced by only one person	Data collection
	Pattern matching	By matching interviews and observations with the theory described in the Frame of References	Data analysis
	Explanation building	Get a deeper understanding from analyzing links between different factors	Data analysis
<i>External Validity</i>	Cross-case synthesis	Comparing the different cases	Research design
	Describe the context of each case	Mapping of the context of each case and the environment they operates in	Research design
<i>Reliability</i>	Case study protocol	Created to be a template for executing the cases in the same way. The protocol includes the interview guide.	Data collection
	List of interviewees	A declaration of all titles of the interviewed people	
	Summarize interviews for the interviewed person	To prevent misunderstandings and assure no confidential material is included in the report	Data collection

### 3 Frame of References

*In this chapter the theory within supplier development will be presented. It will serve as a foundation, which the rest of the report will refer to. The objective is to give the reader an understanding of the subject to be able to follow later conclusions and analysis.*

#### 3.1 Introduction and Guideline of the Frame of References

The articles from this projects pre-study where examined through a brainstorm session to find areas to build a frame of references. The core of the project is supplier development, which links the areas together. The first section in this chapter will therefore give a deeper understanding of supplier development. After that comes an explanation of the different factors and what research says about reactive and proactive supplier development strategies.

#### 3.2 Supplier Development

When shortcomings of supplier performance occur the focal company has four different ways to proceed. They can start manufacturing the components in-house, search for an alternative supplier, invest time and resources to increase the existing supplier performance or use a combination of these alternatives. (Krause, Handfield & Scannell, 1998; Sako, 2004) As explained, in the background of this report, supplier development increases in importance to reach competitive advantages in today's global market. The industry is moving from an old way of treating suppliers where low price was fundamental and suppliers with poor performance were left without business. Today companies understand the high cost of switching suppliers. The companies are dependent of their suppliers when downsizing their own organizations, which lead to supplier development instead of supplier switching. (Krause & Ellram, 1997) Figure 14 Number of papers published by year related to supplier development, shows the increasing interest of supplier development within research by plotting number of articles published each year related to supplier development (Ahmed & Hendry, 2012). The straight line symbolizes the increase of articles within the subjects of supplier development and the fluctuating is the actual amount of articles published.

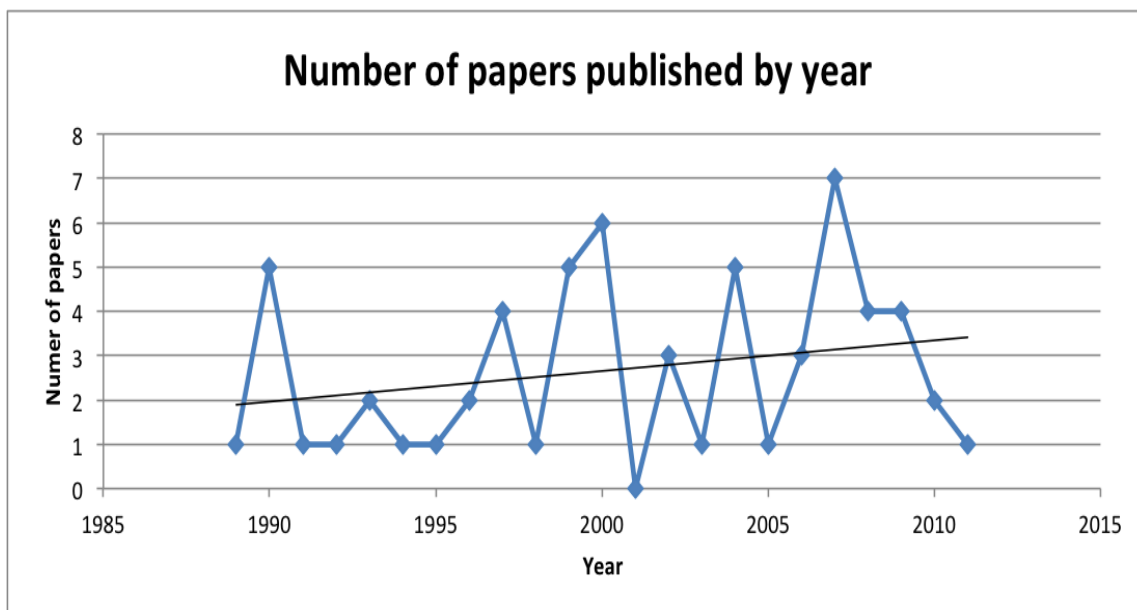


Figure 14 Number of papers published by year related to supplier development (Ahmed & Hendry, 2012)

The general definitions of supplier development differ slightly but many researchers refer to Krause and Ellram's (1997, pp. 39) definition. This definition is also the one used in the project.

“Any effort of a buying firm working with its supplier(s) to increase the performance and/or capabilities of the supplier and meet the buying firm's short- and/or long-term supply needs. Moreover, promotes on-going improvements that are intended to benefit both buyer and supplier(s)”.

### 3.3 Framework for Analysis

To be able to analyze the subject of supplier development areas were selected for the literature study and the research foundation. The common reason for the selection of the factors, which can be seen in Figure 15, is that literature regarding supplier development mentions them frequently.

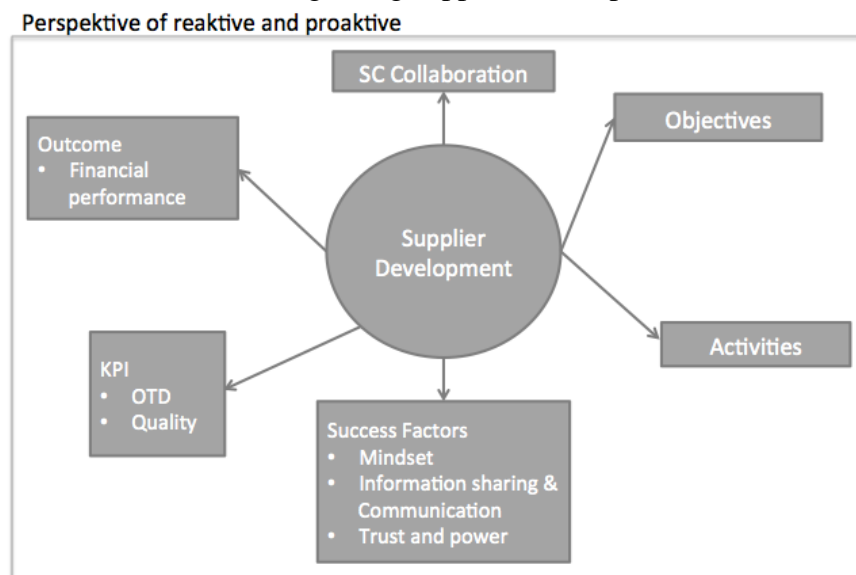


Figure 15 Guideline for Frame of References

The relation and differences between reactive and proactive supplier development is selected with the aim to answer the research question. They will also serve as the foundation when analyzing the different factors from a reactive and proactive point of view.

Supplier development would be inefficient and ineffective without clear objectives. Krause, Handfield and Scannell (1998) states that objectives is an area where reactive and proactive supplier development differs and thereby important for this project. Watts and Hahn (1993) gives objectives large attention, in their empirical analysis of 62 companies. Activities are a factor where different tools, processes and methods are brought up especially in the case study, which made activities interesting for the literature study as well. The reason for that is to be able to compare literature with the case study.

Information sharing and communication where referred to in most of the articles, especially in the context of relationship between two companies (Carr & Kaynak, 2007; Krause & Ellram, 1997; Lambert & Knemeyer, 2004). Trust and power were brought up in literature as a success factors by Cai, Goh, Souza, Li, (2013) and again in the context of relationship building and information sharing. Closely related to this is SC collaboration, which gives a second view of communication and supplier development strategies.

The whole project was initiated because of undesirably low KPI. This gives KPI and supplier KPIs an essential role in the project. ABB Robotics wants to know how supplier development can help

them increase those KPIs. Performance measurement occurs in the context of reactive and proactive working methods. (Krause, Handfield & Scannell, 1998) Under KPI is quality found since it is a frequently used as a KPI. Quality is mentioned in numerous of the factors especially in objectives (Watts and Hahn, 1993), measurements (Bergman & Klefsjö, 2012) and outcome (Carr & Kaynak, 2007).

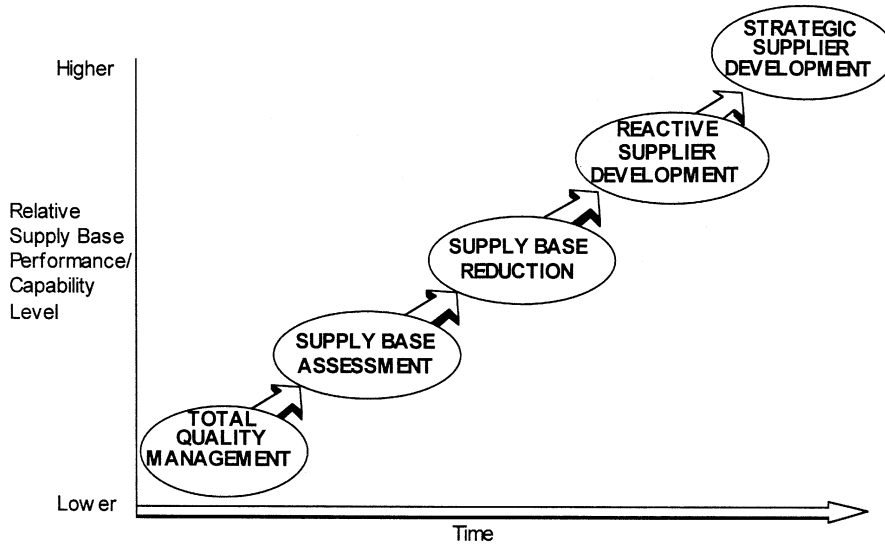
Outcome is mentioned in literature since it is of high interest for all companies. They want to know what can be achieved through supplier development efforts before implementing and invest in them. Carr & Kaynak, (2007) findings are about how supplier development efforts relates to improved financial performance.

### **3.4 Reactive or Proactive Supplier Development**

Supplier development programs are more prevalent in the industry than what could be expected. The firms understand that the interaction can not be limited to the purchaser and the salesperson to receive a successful relationship between the companies. Firms utilizing supplier development are more focused on improving the material they buy rather than improving the supplier's capabilities. Focus is on current costs and quality instead of improving capabilities to generate improvements in future costs and quality. This indicates that most companies work with supplier development in a reactive way. Developing suppliers' capabilities and flexibility will be the key to competitive advantage in the future, because of the market's increasing demand fluctuations and smaller margins. Thus companies should strive towards a more proactive supplier development. (Watts & Hahn, 1993) The differences from the automotive industry in Japan, where supplier development first was established, and companies in the USA and Europe is that they work proactive with long-term improvements. Toyota, Honda and Nissan all started with shop floor improvements of their suppliers and over time extended their activities to product development processes and management systems. (Sako, 2004)

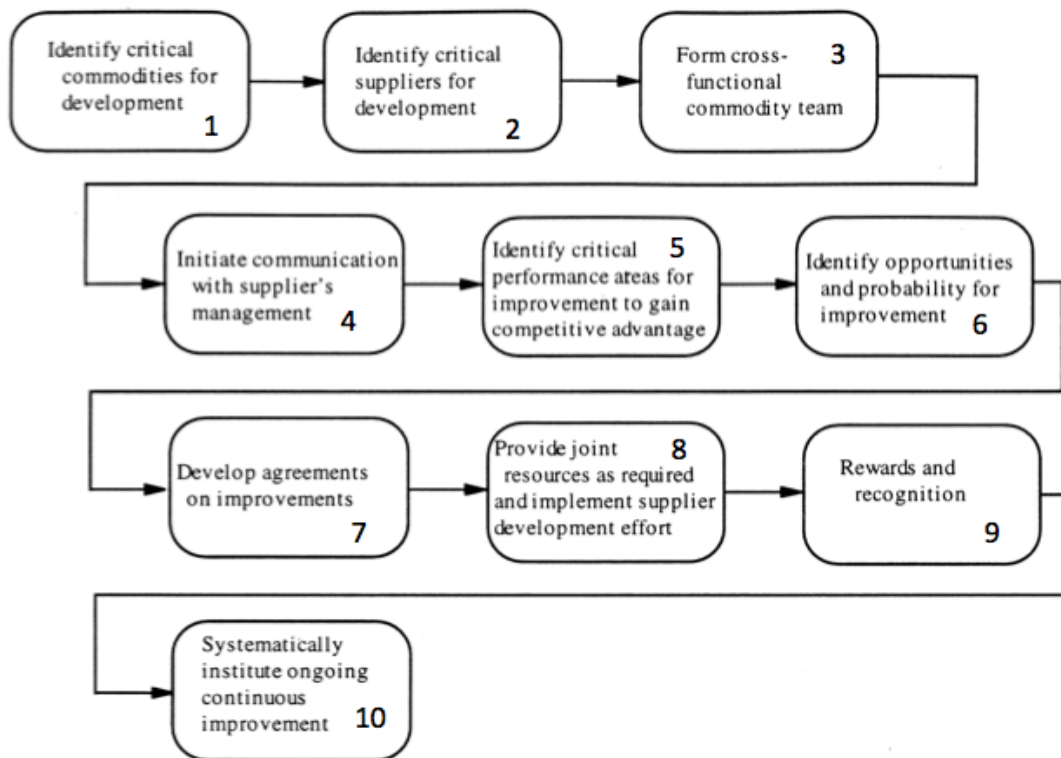
Krause, Handfield and Scannell (1998) have constructed Figure 16. It demonstrates different phases that companies should go through to finally reach a strategic level of supplier development. The strategic level is their name for a proactive supplier development. Total quality management (TQM) is the first phase in the model. Implementation of TQM can be described in five steps. The first step is identification of customer requirements, after that creation of supplier partnership and the third step is to create cross-functional teams to identify and solve problems. Finally the last steps are to measure performance by using scientific methods and improve quality with tools like flowcharts and fishbone diagram. When TQM is implemented the next phases are "supplier assessment" and "supply base reduction". These phases are important to generate knowledge about the suppliers to be able to exclude suppliers that are not good and not worth improvement investments.

**Progression Towards Supplier Development Strategies and  
Improved Supplier Performance**



**Figure 16 Progression towards supplier development strategies and improved supplier performance (Krause, Handfield & Scannell, 1998)**

The last two phases are defined as supplier development with the difference of reactive and strategic supplier development. Within these phases Krause, Handfield and Scannell (1998) suggest a supplier development process model shown in the Figure 17 Supplier Development Process, how to move from reactive to proactive SD.



**Figure 17 Supplier Development Process, how to move from reactive to proactive SD (Krause, Handfield & Scannell, 1998)**

The process model is generally constructed the same way for both reactive and strategic supplier development. However some differences in the execution for the two phases exist, especially in the first steps of the process. The result from Krause, Handfield and Scannell's (1998) study shows that most companies working with supplier development work with the model but in different ways, depending on if they are in the reactive or strategic phase. Most supplier development programs use the same parameters, for example OTD and quality, both to evaluate suppliers, as objectives and as outcome. Those parameters are then the ones controlling the program. The factors are quality, delivery, costs and service (Watts & Hahn, 1993). The differences in reactive and strategic supplier development are summarized in Table 6 Differences Between Reactive and Proactive SD. (Krause, Handfield & Scannell, 1998)

**Table 6 Differences Between Reactive and Proactive SD (Krause, Handfield & Scannell, 1998)**

	<b>Reactive Supplier Development</b>	<b>Strategic (proactive) Supplier Development</b>
<b><i>Objective with supplier development</i></b>	Correction of supplier deficiency. Short-term improvements (firefighting).	Create a world-class supply base capable of providing a sustainable competitive advantage.
<b><i>Identify critical commodities for development</i></b>	It is not the commodities but poor performing suppliers that are chosen for supplier development.	Performed by an executive level team, with the implementation plan being formulated and carried out by a cross-functional commodity team.
<b><i>Identify critical suppliers for development</i></b>	Suppliers where problems have occurred. Motivated by suppliers non-performance identified by the focal company's evaluation system.	Suppliers delivering strategic commodities. Formal supplier performance measurement systems in place to assess suppliers' cost, quality, service, delivery, technology and environmental performance. Then analyze supplier performance data to identify suppliers requiring development.
<b><i>Selection/priority process</i></b>	The suppliers are self-selected for supplier development due to performance or capability deficiencies. Problem-driven.	Pareto analysis and/or portfolio analysis, based on market-driven requirements, are used to identify critical suppliers and commodities for supplier development. Market-driven.
<b><i>Focus</i></b>	Supplier development <u>project</u> for <u>single suppliers</u> .	Supplier development <u>program</u> for <u>the supplier base</u> .
<b><i>Examples of drivers for the supplier development</i></b>	Delivery dates missed Quality Defects Negative customer feedback Competitive threat for buying firm Production disruptions Change in make/buy decision	Supplier integration into the buying firm's operation Supply chain optimization Continuous improvements Value-added collaboration Technology development Seek competitive advantage

The steps in the supplier development process, Figure 17, will now be described with more details and focus on strategic (proactive) supplier development. In other words how proactive supplier development can be accomplished. The description is based on Krause, Handfield and Scannell's (1998) article "An empirical investigation of supplier development: reactive and strategic processes".

*1. Identify critical commodities for development*

Proactive companies had an executive level team to identify critical commodities. Different companies used different methods to do so but many used Pareto analysis and/or portfolio analysis,

based on market-driven requirements. They separated commodities dependent on low and high levels of risk and volume purchased, similar to the matrix, shown in Figure 18, inspired by and similar to the Kraljic's matrix. The strategic commodities were most important in the context of supplier development. The reactive companies usually missed this step.

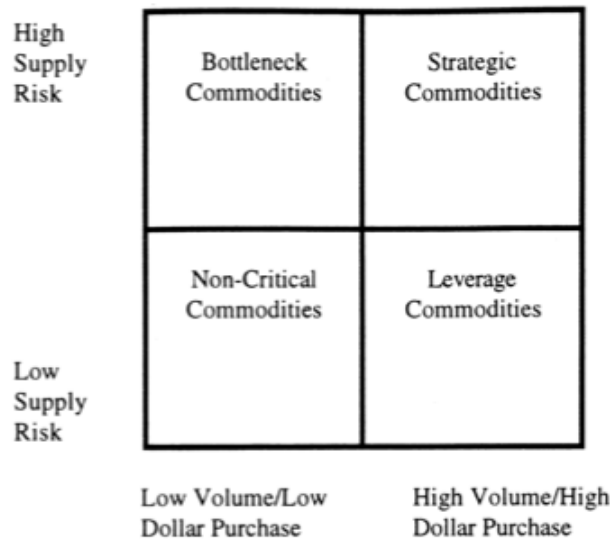


Figure 18 Classification of commodities inspired by the Kraljic matrix

(Krause, Handfield & Scannell, 1998, pp. 48)

### 2. *Identify critical suppliers for development*

The proactive companies had significantly a more formal process to select suppliers requiring development compare to reactive companies. They had formal systems to evaluate suppliers' performance in cost, quality, service, delivery, technology and environment performance. Some companies benchmarked their suppliers' performance to world-class performance to define suppliers to further develop.

### 3. *Form cross-functional commodity/supplier development team*

When executing supplier development efforts the strategic companies used pre-established cross-functional teams to a greater extent than the reactive companies. Core team members were assigned on a long-term or permanent basis to improve the overall performance of the supply base. Included in the strategic companies teams were personnel for quality, procurement, operations and design while the reactive companies used teams on an ad hoc basis. According to Krause, Handfield and Scannell (1998) the use of cross-functional teams may be necessary but not insufficient in strategic supplier development.

### 4. *Initiate communication with supplier's management*

The first step to initiate development with a supplier was to arrange a meeting with the cross-functional team and the top management at the selected supplier. Strategic companies stressed the importance of focus on a jointly effort to improve the flow of material, service and information between the companies rather than a forced performance improvement only executed by the supplier. The objective should be to generate mutual benefits for both companies.

### 5. *Identify critical performance areas for improvements to gain competitive advantage*

Identify critical performance areas for improvements was a key difference between the reactive and strategic companies. Strategic companies defined areas to improve together with the supplier's top management. Very different areas to improve were identified and measurements were established



for each area. Areas for improvements were mutual development of new technologies and procedures, increased standardization of parts and processes, identify quality problems with process mapping, mutual information system development and increased vendor management inventories at the focal company's site.

*6. Identify opportunities and probability for improvement*

The strategic companies evaluated improvements in terms of feasibility, resources and time requirement and return on investment.

"A risk evaluation of the improvement project was a common tool employed by many strategic companies. Strategic companies used one or more of the following evaluative criteria: dollars spent with the supplier, criticality of the product to the buying firm's marketing success, the potential to influence the supplier's product development, the potential for the supplier to become a competitor, the supplier's technical expertise, and the potential of the supplier development effort to support corporate goals."

(Krause, Handfield & Scannell, 1998, pp. 51)

*7. Develop agreement on improvements and performance metrics*

The agreement roles for the buying and supplying company should be specified. Who is responsible for manner and timing for the dedicated resources and who is responsible for the success of the development project? Strategic companies often used percent cost savings, percent quality improvement, percent delivery or cycle time improvement, key product or service performance as their performance metrics.

*8. Provide joint resources as required and implement supplier development efforts*

To work proactive with supplier development means that not just the supplier but also the focal company needs to improve. Both companies should also distribute resources required. Significant for strategic companies were that they deployed a greater amount of resources for the development and so did their suppliers. Resources deployed by the strategic companies were investments in lending engineers to the supplier's site and/or supplier training. Their suppliers invest in resources such as employee training and/or dedicating engineers and other personnel to performance improvements.

*9. Rewards and recognition*

Reactive and strategic companies used rewards and recognition to encourage ongoing commitment. However the strategic companies used programs to encourage the suppliers to continue performance improvements after the supplier development efforts. The programs varied from recognition in the company newsletter to more formal award banquets.

*10. Systematically institute ongoing continuous improvement*

The improvements need to be monitored and tracked over time with adequate information sharing between the buying and supplying company. To make this stage and the whole supplier development successful companies indicated:

"Momentum can be sustained by creating visible mile-stones for objectives, updating goals, open communication, and adopting continuous improvement strategies."

(Krause, Handfield & Scannell, 1998, pp. 54)

### 3.5 Supplier Development Objectives

Table 6, declares the objective with supplier development. The objective is to create a sustainable competitive advantage, at world class, within the supply base. Examples of suitable and common objectives are presented in the parts below due to two different studies.

Watts and Hahn (1993) have investigated different supplier development projects to conclude what are the most important objectives to form companies. They found that improving product quality was the most important objective. The subsequent objectives was improving delivery, improving service and reducing cost. As the less used objectives come consolidating the supplier base. The study shows strong linkage between program objectives and which area that has the best improvement results. Research states a trend in switching from only working with current product quality to future long-term capability improvement.

“What’s in it for us” is a question from Lambert and Knemeyer (2004) to create what the drivers for a partnership relation should be. The drivers refer to the objectives for a supplier development project and are essential for the outcome. Lambert and Knemeyer (2004) has stated four common drivers, asset and cost efficiency, customer service enhancement, marketing advantages and profit growth or stability.

### 3.6 Supplier Development Activities

Specific activities within supplier development, described in research, are listed below. Activities together with success factors are the most common topics within research about supplier development. Even though many activities are listed, literature on supplier development lacks of in-depth frameworks for selection activities to achieve the desired result. (Ahmed & Hendry, 2012) Supplier development activities are not limited to the activities listed below but those are examples of activities (Krause, Handfield & Scannell, 1998; Krause & Ellram, 1997).

Supplier Development Activities:

- Investment in equipment or capital in the supplier’s organization
- Provide competition between existing suppliers through multiple sourcing
- Evaluate suppliers’ performance for example with supplier audits
- Use of supplier certification program
- Increase supplier performance expectations
- Supplier recognition through awards
- Promise increased present and future business if a supplier improve performance
- Site visit to the supplier
- Visit to the focal company by the supplier’s representatives
- Education and training of suppliers’ personnel
- Temporary exchange personal between the supplier and the focal company
- Direct investments in a supplier
- Try to implement a philosophy of continuous improvement at the supplier

#### 3.6.1 Direct and Indirect Supplier Development

Direct and indirect supplier development is a way to divide supplier development activities. Direct activities are the transactional ones with the purpose to transfer knowledge and/or qualifications to the supplier. Examples of direct activities are education and training of suppliers’ personnel and investments in equipment or capital in the suppliers’ organization. Indirect supplier development activities are for example supplier evaluation, increased supplier performance expectations and multiple sources. The two different types of supplier development, indirect and direct, are both

likely to improve competitive advantage of the supply chain and the suppliers' performance. (Ahmed & Hendry, 2012)

### **3.7 Performance Measurement and Improvements**

There have been famous adages about performance measurements “What gets measured gets done” and “You get what you measure”. Implementing the right type of performance measurements is a good way to ensure that the company strategy is aligned with actions taken in the operational work. (Lynch & Cross, 1991)

Key performance indicators (KPI) are key numbers, which serves as an indicator of performance. Carr and Kaynak (2007) have stated some criteria for a good KPI those are:

- Tells you in a split second if you are winning or not
- Can be influenced in short term by adjusting input or output
- Is easy to understand
- Commonly accepted
- Do not have room for different interpretations
- Reflects reality
- Is scarce in number, more than 5 KPIs are not useful

KPIs in the context of supplier development are rarely mentioned in research. Ahmed and Hendry (2012) identified a gap in in theory where it is a lack of operational frameworks on how to measure long-term and short-term supplier development success.

Watts and Hahn (1993) state that quality is one of the most important objective to measure, together with on-time delivery costs and service. They also argue that supplier development “involves a long-term cooperative effort between a buying firm and its supplier to upgrade the suppliers technical, quality, delivery and cost capabilities and to foster ongoing improvements” (Watts & Hahn, 1993, pp.15).

To further strengthen the importance and give examples of performance measurement Krause, Handfield and Scannell's (1998) survey from 82 responding companies (all from the Global Procurement and Supply Chain Electronic Benchmarking Network) concludes some measurements is vital for supplier development. Those are PPM (quality), warranty percentages (quality), OTD (reliability) process capability ratios (flexibility), percent parts rejected (quality) and internal and external customer satisfaction (service).

Even if the importance of performance measurements is stressed, those measurements themselves are not sufficient enough to produce a better performance outcome. Instead, the relationship outcome is influencing the performance measurement. The result of this influence is defined by the extent of the buyer-supplier relationship performance. (Cousins, Lawson, & Squire, 2008)

Quality and on time delivery will get specific attention below and financial performance will be concerned in the section about outcome, since those are stated as some of the most important measurement areas.

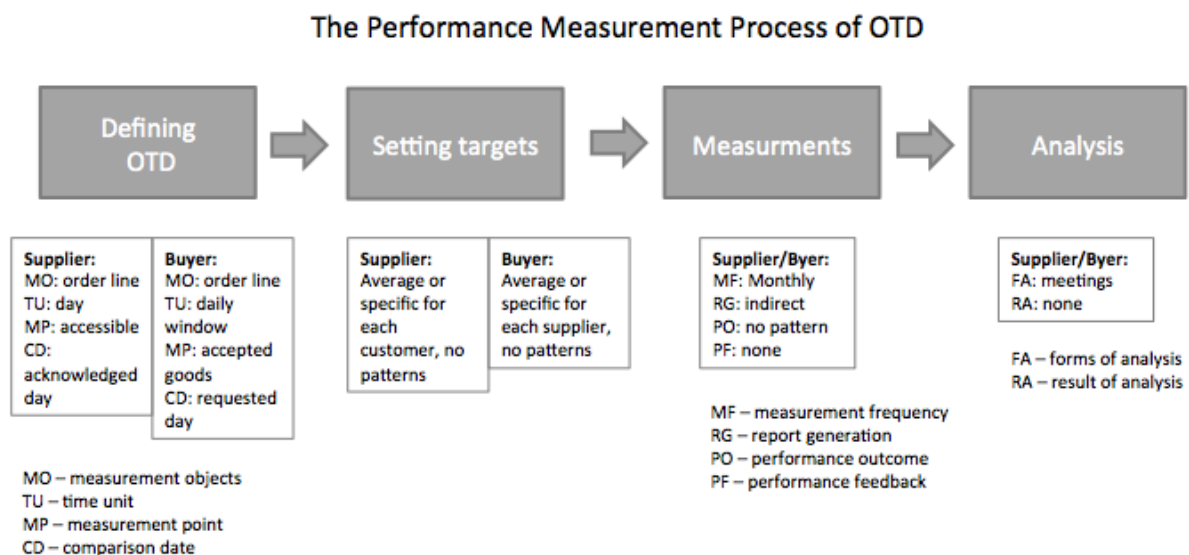
#### **3.7.1 On-Time Delivery**

On-time delivery is a parameter that can be improved through supplier development according to research. (Watts & Hahn, 1993; Wagner & Friedl, 2012; Cao & Zhang, 2011)

On-time delivery is very hard to define. It is complicated in four different aspects (Hofmann, 2008):

- Measurement objectives (MO) – number of late orders, order lines or items
- Time unit (TU) for the order considered as being on time – correct week, day or specific time window for example +1/-2 days
- Measurement point (MP), where the order is considered as delivered – goods packed and ready for delivery, accessible at the buyers site, after the buyer’s goods reception or quality control
- Date for comparison with the actual delivery date (CD) – requested or acknowledged date

According to Hofmann’s (2008) case study, with seven supplier-buyer relations using OTD as a measurement, the OTD process differ significantly between the supplier’s and the buyer’s firm. The companies might think that they are measuring the same thing but without their knowledge it might differ in the four aspects. In Figure 19 Performance measurement process of OTD, the most common used OTD process for supplier and buyer is shown according to Hofmann (2008). The differences make the communication between the firms difficult since they think they talk about the same thing but in reality they do not. Another problem that occurred in Hofmann’s study is that almost no suppliers received feedback from the focal company’s result of the OTD. (Hofmann, 2008)



**Figure 19 Performance measurement process of OTD (Hofmann, 2008)**

Mutually conducted and agreed performance measurement process of OTD between the supplier and buyer would generate positive consequences. When the process is not shared enough, as in Figure 19 Performance measurement process of OTD, above, not only the positive consequences are missed but also the reversed negative consequences occur. It is proved that the buying firm experiences more of the negative consequences than the supplier if they handle the process differently. The negative consequences for the supplier, buyer and the dyads relation are shown in Figure 20 Consequences of not sharing the performance measurement process. (Hofmann, 2008)

### Consequences of not sharing the performance measurement process, OTD

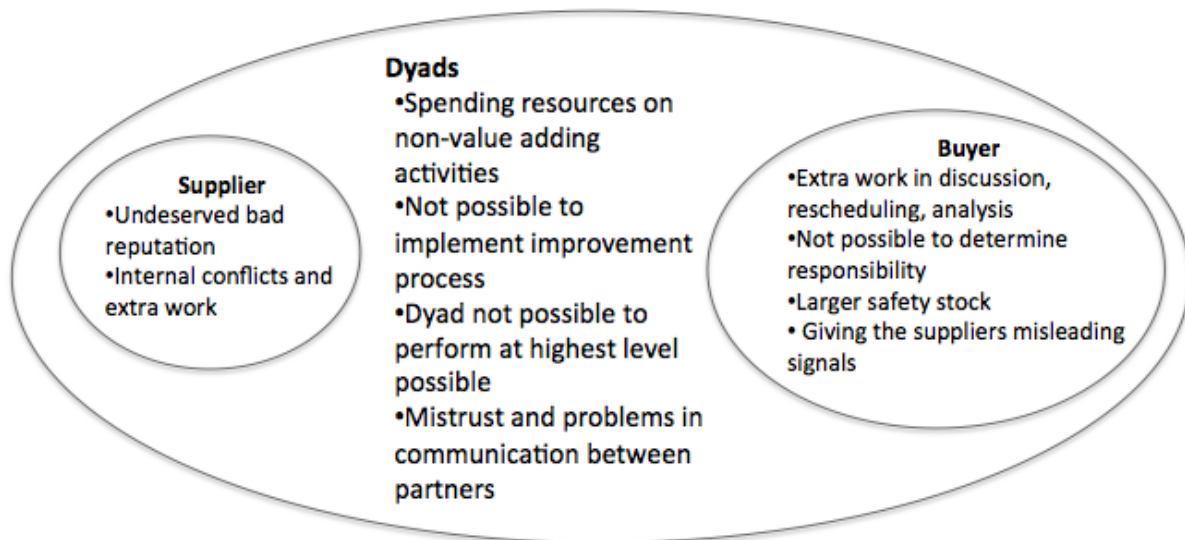


Figure 20 Consequences of not sharing the performance measurement process (Hofmann, 2008)

Da Silveira and Arkader (2007) verified that coordination with suppliers and customers affect different types of delivery performance. For a company to increase its delivery speed or delivery reliability investment in customer coordination is vital while supplier coordination mainly improve manufacturing lead times. Thus supplier needs to invest in customer coordination to improve their delivery speed and OTD. It is important to move from a transactional focused buyer-supplier relationship towards a focus that addresses the overall relationship between the focal company and the suppliers. How this can be done is shown in the Table 7. (William & Wehr, 1999)

**Table 7 Management and motivation techniques to increase OTD (William & Wehr, 1999)**

<b>Management techniques to achieve increased OTD</b>	<b>Motivational techniques to achieve increased OTD</b>
Lead times affecting required delivery date from orders should be developed and continuously updated of the supplier. This decrease changed delivery dates and the need of acknowledgement from the supplier for every order. To identify problems in early stages and assure correct lead times the supplier should perform systematic internal expediting.	Measurements of OTD should be based on and automatically driven by the reception of goods. It should measure both suppliers ability to meet buyers requested date but also the buyers usage of the lead time schedule.
The operational purchaser should contact the supplier and confirm a delivery date before the purchase order is placed if an expedited order is desired.	The focal company should communicate the suppliers' delivery performance every month. A meeting should also be held several times during a year with senior managers as well as other concerned persons from both companies to review performance.
When a late shipment arises it should be handled like a process defect. The operational purchaser should report to the supplier and be open to constructive comments about defects in the buyer's process. This will enable process development for both companies.	
A strategic vision meeting should be periodically held with senior management and middle management representation from the focal company and the supplier. The initial meeting should provide an overview of each party's processes, objectives, and performance concerns. Subsequent meetings should address performance goals and the measurements used to assess performance.	

### **3.7.2 Quality and Continuous Improvements**

Quality is a simple word, which anyone can relate to and has experience of, but at the same time a word with as many definitions as persons defining it. Japan has been the leading country within developing quality and continuous improvements since after the World War II (Bergman & Klefsjö, 2012). It is also the country where supplier development was founded. The two areas, quality and supplier development, are closely related since both of them want to achieve improvements and quality is a part of supplier development. Some definitions of quality made by famous quality icons are gathered to give the picture of diversity:

**Joseph Juran:**

*"Fitness for use"*

**Philip Crosby:**

*"Conformance to requirement"*

**Edward Deming:**

*"Quality should be aimed at the needs of the customer, present and future"*

**Mikel Harry, Six Sigma:**

*"Quality is a state in which value entitlement is realized for the customer and provide in every aspect of the business relationship"*

**ISO 9000:**

*“Den grad till vilken inneboende egenskaper uppfyller krav, dvs behov eller förväntning som är angiven, I allmänhet underförstådd eller obligatorisk”;*  
*“Degree to which a set of inherent characteristics fulfills requirements”*

In this project the definition from ISO will be used. It is of high importance to use the same definitions within the supply chain if improvements are desired. ISO is an independent international institute for standards. The goal is to unite the industry measurement to help the industry to be more efficient and effective. (ISO, 2014-02-14)

As mentioned there are a lot of similarities between quality work and supplier development. The processes often have many common goals and are thereby closely related. Bergman and Klefsjö (2012) state five cornerstones for quality development.

- Put the customer in focus.
- Base decisions on facts
- Work with the processes
- Continuous improvements
- Create conditions for mutual commitment and participation

Those can be related to the phases of supplier development, see Figure 16 Progression towards supplier development strategies and improved supplier performance”. In the first phase TQM is established, which includes customer focus. The second step is supplier assessments to evaluate the suppliers, which enable decision making based on facts. The reactive phase focuses on the processes and what is happening right now, which can be compared to “work with the process”. The continuous improvements mentality is found in the last strategic (proactive) phase. During the whole process commitment and participations is fundamental. (Krause, Handfield & Scannell, 1998)

### **3.7.2.1 Focus on the customer**

Focus on supplier development is often directed to the beginning of the supply chain and the end is easily forgotten. But the end, which is the customer, is the most important component for business. Therefore it is important to align the whole supply chain with the same strategy. As Mahatma Gandhi (1869-1948) said:

“A customer is the most important visitor on our premises. He is not dependent on us. We are dependent on him. He is not an interruption in our work. He is the purpose of it. He is not an outsider in our business. He is part of it. We are not doing him a favor by serving him. He is doing us a favor by giving us an opportunity to do so.”

To stay customer focused is very important in quality management to make the outcome profitable. The customer must contribute the requirements and expectations. Having too narrow tolerances and too high technical specification when it is not required is costly both in time and money. Good customer knowledge is an important success factor in a world where customization and rapid changes in trends is highly attendant. (Bergman & Klefsjö, 2012) Customer focus is also mentioned before the first step in Total Quality Management (TQM), which has to be established in the first phase to develop proactive supplier development (Krause, Handfield & Scannell, 1998).

### 3.7.2.2 Continuous improvements

When the environment on the global market is strongly competitive, continuous improvements and quality is of high importance. Companies are today facing an increasing amount of pressure from their competitors and customers. The customers demand higher product quality and reliable on time delivery to a minimum price. All those factors can be solved through continuous improvements (Shen, Li & Shady, 2008) and supplier development (Watts & Hahn, 1993).

If development in the organization stops the competitive advantages will vanish. Deming (1989) developed the today well-known Plan-Do-Check-Act (PDCA) cycle for continuous improvements. It begins with planning the improvement where the relevant objectives are discussed. The next step is to implement the change or execute the process. When the change is implemented it is important to check and analyze the result to further identify where the reality differs from the planned scenario. Finally action should be taken to improve the operation or strategy. After adjusting actions have been implemented the process of improvements starts all over again. (Bergman & Klefsjö 2012) To work with supplier development in a proactive way continuous improvements have been claimed to be a part of the solution (Krause, Handfield & Scannell, 1998; Bergman & Klefsjö, 2012; Shen, Li & Shady, 2008).

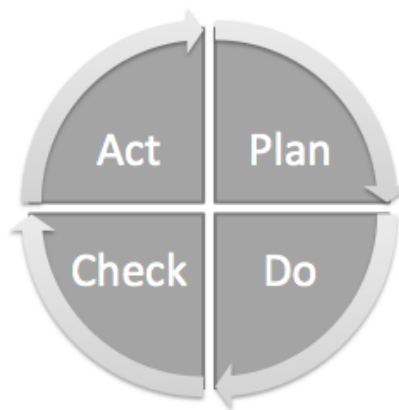


Figure 21 Deming's PDCA-cycle (Deming, 1989)

## 3.8 Success Factors in Supplier Development

The most important success factors within supplier development are support from top management and to work proactive instead of reactive. (Krause & Ellram, 1997; Watts & Hahn, 1993)

“A major challenge facing managers involves deciding when and how to make the transition from transactional relationships to cooperative relationships, and once established, how to deploy these relationships within the supply chain to meet the buying firm's competitive needs.”

(Krause, Handfield & Scannell, 1998, pp. 41)

### 3.8.1 Mindsets within Supplier Development

To move from transactional relationships to cooperative relationships is to work proactive instead of reactive. How a proactive manner is managed will be explained further in this section. The list below shows mindsets that Krause and Ellram (1997) proved in their empirical study, were significantly implemented at firms with successful supplier development compared to firms that did not reach expected result of their supplier development efforts.



- View the suppliers as an extension of the focal company and therefore see suppliers' problems as their own problems.
- Understand that the supplier quality affect the focal company's competitive position.
- Endeavour to build long-term relationships with suppliers and therefore consider suppliers capabilities rather than present product performance.
- Claim higher levels of quality from the supplier and work with them to reach those levels.
- Strong will to help suppliers with the objective of continuous improvements at the supplier's organization.
- Put great effort in supplier development

All these mindsets help the focal company to be successful and proactive.

### 3.8.2 Successful Activities

Not only the mindset but also what activities to perform are important for successful supplier development.

“Firms that were satisfied with their supplier development efforts appeared to communicate more effectively with suppliers, and had the resources and willingness to invest in activities such as formal supplier evaluation, supplier training, and supplier award programs to a greater extent than their less satisfied counterparts.”

(Krause & Ellram, 1997)

Compared to the mindsets, a more concrete way to localize success factors is to look at the supplier development activities. In the section 3.6 Supplier Development Activities, a list of activities were stated. Some of those activities have been stated as success factors. Successful companies had a higher involvement in the activities typed in bold (Krause & Ellram, 1997):

- Investment in equipment or capital in the supplier's organization
- Provide competition between existing suppliers through multiple sourcing
- **Evaluate suppliers' performance for example with supplier audits.** It is important that it is in a formal way and that the suppliers get feedback of the evaluation
- **Use of supplier certification program**
- Increase supplier performance expectations
- **Supplier recognition through awards**
- Promise increased present and future business if a supplier improve performance
- **Site visit to the supplier**
- **Visit to the focal company by the supplier's representatives**
- **Education and training of suppliers' personnel**
- Temporary exchange personal between the supplier and the focal company
- **Direct investments in a supplier.** But the investments should be in the operations.
- **Try to implement a philosophy of continuous improvement at the supplier**

To succeed with supplier development, accurate evaluation of the suppliers, to identify which suppliers and what areas are in most need of improvement, is vital (Watts & Hahn, 1993). Hence step one; two and five in Krause, Handfield and Scannell's (1998) supplier development process model are crucial. It is proved that the most improved areas of supplier development are the ones stated in the objectives of the program. Therefore it is crucial to establish clear objectives before the program starts (Watts & Hahn, 1993). Communication is another success factor, which is further

described, later in this chapter. For the successful companies this was more intense and informal with a greater number of contacts between the focal company and the supplier compare to the less successful companies.

Another interesting finding from Krause and Ellram's (1997) study is that the successful companies average size were larger, gross annual sales of \$100-\$500 million compare to \$50-\$100 million, but they did not buy significant larger percentages of their suppliers' output. Therefore it is suggested that the successful companies only had more resources to devote to supplier development. According to Krause and Ellram's (1997) the result of their study suggest that:

“Buying firms may be able to raise suppliers' performance significantly by expecting more from suppliers, communicating those expectations, and actively participating in the effort.”

### **3.8.3 Information Sharing and Communication**

Information sharing is mentioned in a large amount of articles within the field of supply chain management and supplier development as an important success factor (Holweg et al., 2005). There is no exact and common definition of what information that should be shared and what it should include, but of the most regular information shared are actual demand and inventory levels. Lee, So and Tang (2000) state three situations when it is more suitable to share information between supplier and the buyer.

- When the demand correlation over time is high
- When the demand variance within each time period is high
- When the lead time are long

Lee, So and Tang (2000) argue that the conditions fit the profile of many high-tech products well. Since those products and companies often faces high volatility in the demand and rapid changes in trends on the market. Thus the result of information sharing is even higher benefited for high tech manufactures.

Carr and Kaynak (2007) constructed a model from an empirical study of 231 companies. The model is seen in the Figure 22 Information sharing due to Carr & Kaynak. Solid arrows define relations or links with high correlations and the crosshatched arrows symbolize relation, which are not significant. The marked area represents activities related to information sharing. As seen in the figure they affect the supplier development and in the end the financial performance.

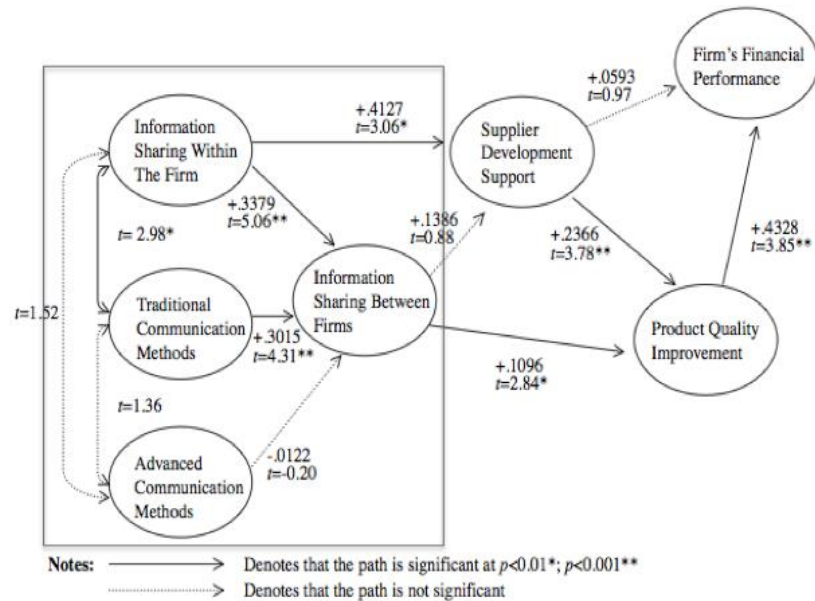


Figure 22 Information sharing due to Carr & Kaynak (2007)

The model shows that information sharing within the firm and traditional communication methods such as telephone calls, emails and face-to-face meetings are the most important factors for establishing information sharing and communication between companies. This research is aligned with what Watts and Hahn (1993) say about communication and the importance of informal contact.

Information sharing within the firm has to be developed and on a mature level to gain advantages from a supplier development support. Both information sharing between firms and supplier development support improve the product quality, which in the end generates increased financial performance. (Carr & Kaynak 2007)

Advanced communication is referred to as computer-to-computer links and electronic data interchange (EDI). Surprisingly it could not be proved that there is a connection between advanced communication methods and information sharing between firms. The conclusion from this was that advanced communication methods can not replace the traditional communication methods like face-to-face communication. Instead the advanced methods are additional opportunities for sharing information. (Carr & Kaynak, 2007) This is also confirmed from the list with success activities where supplier visits can be translated to face-to-face communication (Krause & Ellram, 1997).

### 3.8.4 Trust and Power

As well as in any type of relation trust and power are important for a sustainable relationship. Therefore are they important in several steps of supplier development and collaboration. Trust must be built and power must be managed in a strategic way with respect for all concerned parties for example to establish information and knowledge sharing. "Without trust, neither partner is willing to step out of traditional comfort zones to take on new roles and responsibilities" (Daugherty, Richey, Roath, Min, Chen, Arndt, & Genchev, 2006). Trust is identified as one of the more important success factors but also a barrier when it comes to successful supplier development. Trust needs to be managed and created in every interaction between supplier and buyer. (Daugherty et al., 2006)

"Trust is confidence in an exchange partner's reliability and integrity" (Cai et al., 2013, pp. 2063).

This means that the outcome will be affected direct or indirect by the commitment, indirect the trust, between two partners. With this definition it is easy to understand that trust influence the performance of the supply chain since relations are built on trust. Trust is therefore something that needs to be in order to gain advantages from supplier development. A supplier would not invest time and money in a relationship with a buyer that can not be trusted. One finding from Sako's (2004, pp. 301) research of supplier development at Honda, Nissan and Toyota was: "Suppliers' trust of customer companies lay in the latter's competence as teachers, but also in devising a clear set of rules for sharing specific gains from short-term intervention, and for letting suppliers appropriate wider gains from long-term capability enhancement." Suppliers with buying firms from the US and Europe distrusted their buyers intentions of short-term assistance, short-term supplier development. They believed that it would only be followed by an instant price renegotiation. The Japanese companies on the other hand built trust by separating short-term price pressure from long-term supplier development. (Sako, 2004)

Cai et al. (2013) make references to resource-dependence theory for explaining the relation of power and dependence. The definition of this is that inter-organization dependence is created during the situation when one firm "does not entirely control all of the conditions necessary for the achievement of an action for obtaining the outcome desired from the action". The buying firm can use the power in order to put pressure on the supplier. Looking at the stated success activities and mindsets both claiming higher quality standards and audits are factors of success related to power.

The findings done by Cai et al. (2013) state that trust is a key factor for knowledge sharing. It takes expression in a proactive way in the content of enhancing information sharing. Power on the other hand is a more passive link to information sharing. One partner in a supply chain might be forced to share information due to a more powerful player in the supply chain but will eventually benefit from the over all increased supply chain performance. It is important to manage power in the right way and not examine leadership by fear.

### **3.9 Supply Chain Collaboration**

There is no consistent definition of supply chain collaboration (SCC) in current research. Some researchers claim that SCC is a way to obtain supplier integration and others describe it more like supplier development. One thing all researchers have in common is the importance of the subject. (Praxmarer-Carus, Sucky & Durts, 2013) The overall performance of the supply chain is what sets the ability for success.

In section 1.5 Project Focus and Delimitations the scope for this project is illustrated in Figure 2 Focus areas of this project. This figure shows how supplier development goes hand in hand with supply chain collaboration.

Lamber and Knemeyer (2004) state SCC as a type of partnership. They also address the importance of making careful selection of which suppliers that should be developed. They describe three types of partnership and that it is important to have supplier in all different types.

- The type 1 group can be maintained only by a really good contract. They only have coordination between the companies on a limited basis. Lamber and Knemeyer (2004) stress the importance of having good contract and that it is not possible to have a partnership relation with a suppliers, the simple relations are also important.
- Type 2 has a more comprehend collaboration with cross-functional teams.
- Type 3 is the partnership with strategic supplier, which is a very close collaboration between the buyer and supplier. The companies see each other as an extent of the own company.

Lamber and Knemeyer (2004) developed a model with two corner stones, drivers and facilitators. Drivers are aspects, which gives the company incentives for the partnership and facilitators are factors that help and eases the collaboration. Examples of drivers are assets and cost efficiency, customer service, marketing advantages and profit growth or stability. Facilitators are key factors that need to be in order to be able to support the risk it is to go into a partnership relation. The four most vital are s strong sense of mutuality, compatibility of management philosophy and techniques, compatibility of corporate culture and symmetry between the two parties.

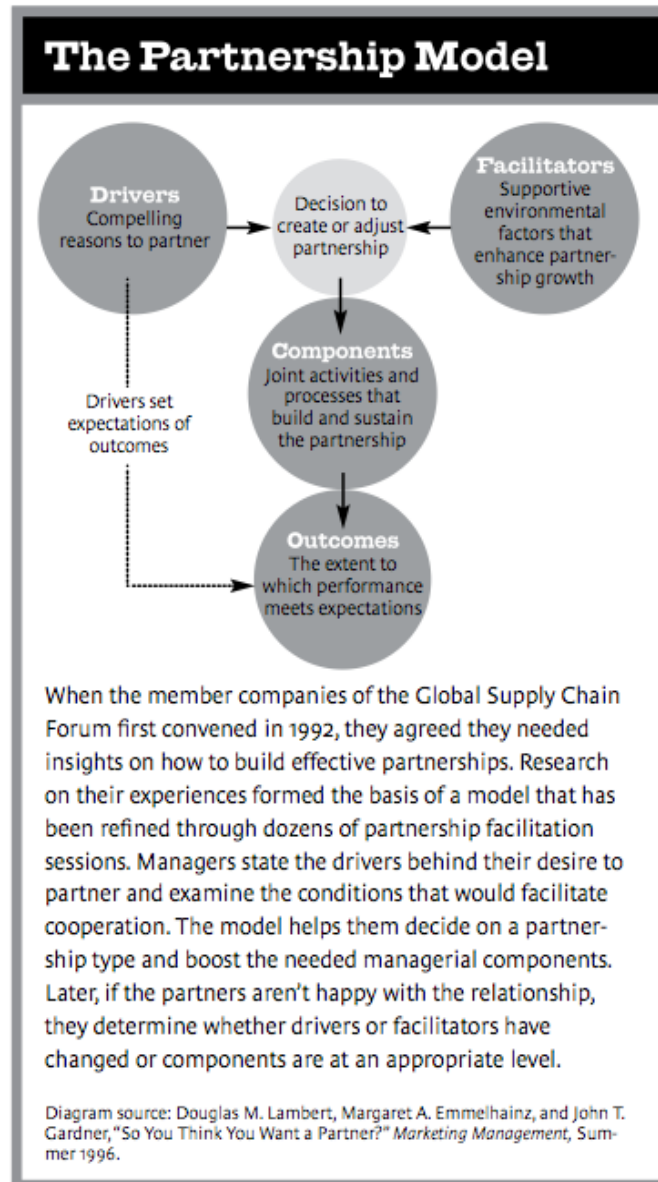


Figure 23 The partner ship model by Lambert and Knemeyer (2004)

Other common denominators are trust and risk sharing. Without trust no one is willing to share risks. A quote from a business leader explains the aimed sense of the collaboration “Now the decision’s been made. You’re a supplier. Your business isn’t at risk. What we’re trying to do here is to structure the relationship so we get the most out of it for the least amount of effort.” (Lambert & Knemeyer, 2004, pp. 3) It clearly shows that the business management trusts the supplier since he, the business leader, trusts the people choosing that supplier.

### 3.10 Outcome

#### 3.10.1 The Connection Between Quality and Financial Performance

Carr and Kaynak (2007) discuss the financial impact from supplier support, which can be compared to supplier development, and product quality. In their study they ensure that there is a significant impact on the firm's financial performance from the improved product quality. It could not be proved that there is a direct link between financial improvement and supplier development. However product quality is improved by supplier development, which means that it indirectly improves financial performance. Figure 24 The link between Quality and Financial performance, illustrates the linkages. Solid arrows define relations or links with high correlations and the crosshatched arrows symbolize relation, which are not significant.

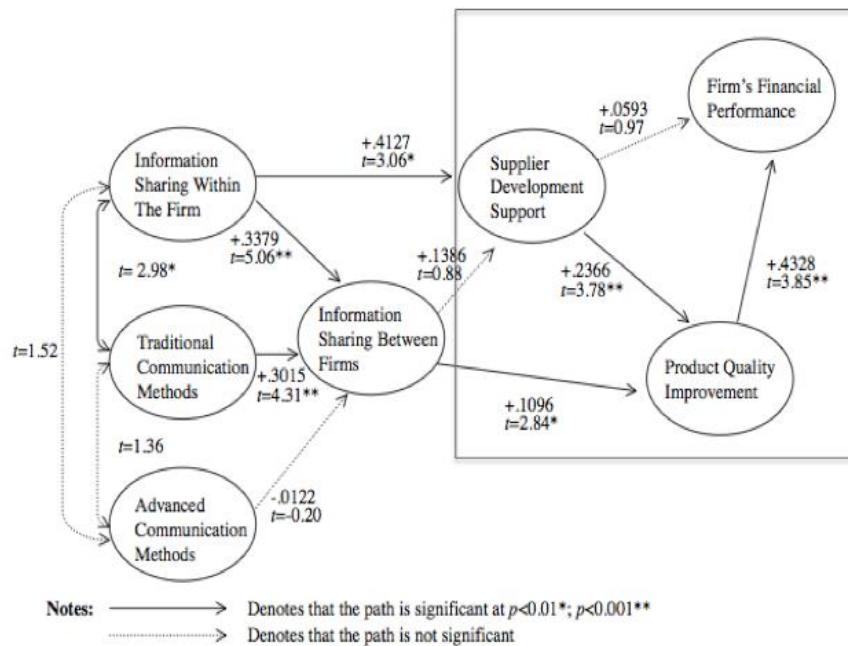


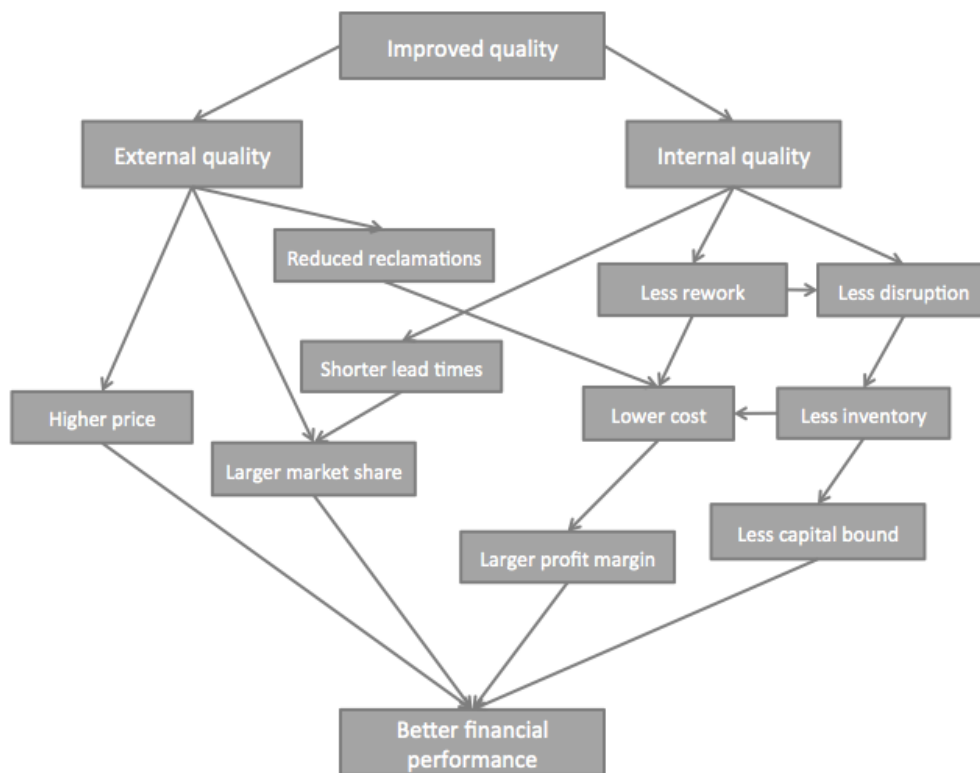
Figure 24 The link between Quality and Financial performance (Carr & Kaynak, 2007)

Carr and Kaynak (2007) also state four factors of how improved quality makes positive impact on the firm's financial performance.

- The reputation of high quality product and services makes it possible to take a higher price and thereby increase profit
- Less waste and improved efficiency increases the return of assets
- Less rework, less scrap is equal to lower costs
- Enhanced product and/or service quality promotes loyalty among satisfied customer which can be translated into increased sales

#### 3.10.2 Why Quality Improve Financial Performance

Higher quality can contribute to the financial performance directly but also through synergies and indirect effects. Quality can be divided into two different groups external and internal quality. External is the quality the customer receives and the internal refers to quality of internal processes. Figure 25 Relation between improved quality and better financial performance, illustrates different connections and relations between improved quality and better financial performance. (Bergman & Klefsjö, 2012)



**Figure 25 Relation between improved quality and better financial performance (Bergman & Klefsjö, 2012)**

The figure shows that it is a lot of factors related to quality improvements, which contributes to the financial performance. For example less rework due to improved quality will lower the costs and thereby enables larger profit, which leads to better financial performance. Another example is when the customer experiences higher quality, the good reputation lead to larger market shares and competitive advantage.

Juran is another quality guru who has driven the development of the subject. In his handbook about quality he states most of the factors above for improved financial performance. He also says “quality does not cost it is a way to increase profit”. (Juran & Godfrey, 1998)





## 4 Empirical Study

*This chapter summarizes the data gathered during the empirical case study. Initially it is explained how the data is presented for the cases. After that the data from the different cases is presented in one section for each company.*

The purpose of the empirical study was to gather data to build an understanding of how different companies work with supplier development. The data was expected to generate an answer to the second research question, which will enable answers for research question three:

1. What are the most commonly used strategies for supplier development discussed in research?
- 2. How do companies work differently with supplier development if they use a proactive as compared to a reactive approach?**
3. What are, due to the answers above, the next steps for ABB Robotics in the process of integrating proactive supplier development?

To enable comparison of supplier development efforts between the cases the five factors included in supplier development; activities, objectives, KPI, success factors and outcome, were used. The aim was to compare how supplier development efforts vary between proactive and reactive cases in the different factors. This is illustrated in the figure below.

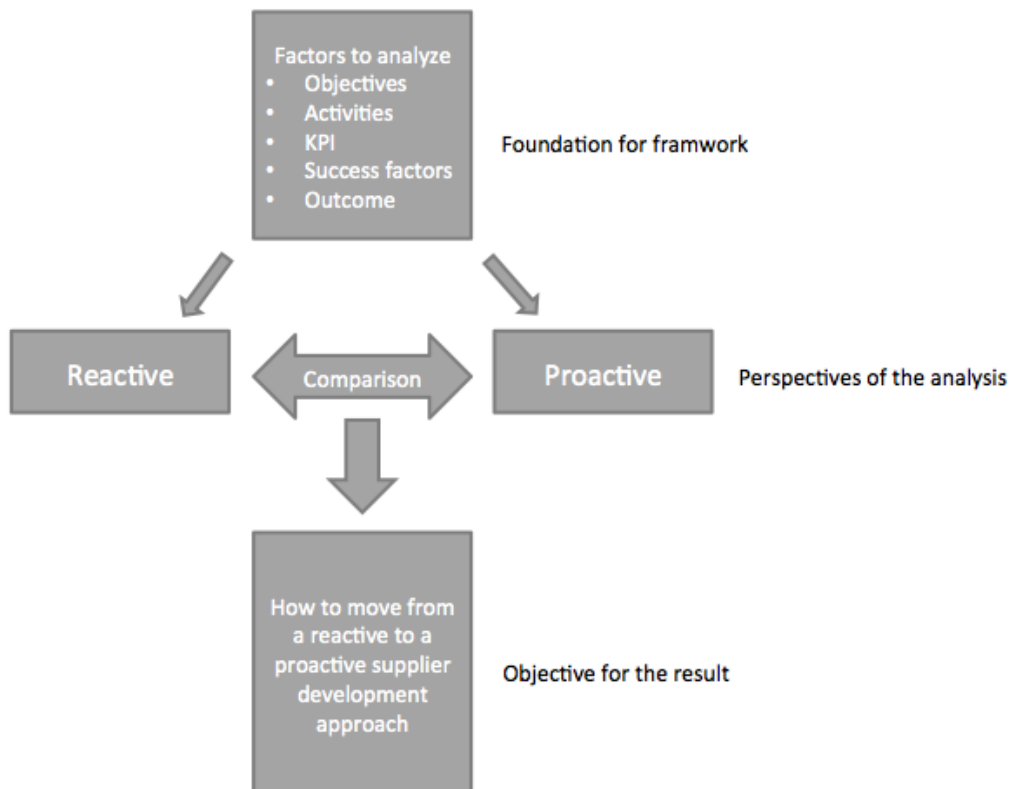


Figure 26 Project structure

The factors were the foundation of the data gathering and form the outline of the case description. All cases are presented with a short introduction to the specific company to understand the context of each case.

As described in the methodology chapter the data was mainly gathered from several interviews at the case companies. The interview questions were generated to reflect the most important topics found in the literature study in the chapter Frame of References. The questions should also fill in gaps found in the literature studied. To get in-depth data from each case, semi-structured interviews were executed with the interview questions as support. Therefore the different cases vary and do not necessarily answer all interview questions. Almost all interviews were conducted with both researchers attendant to verify the data.

Table 8 Form filled in independently by each case after the interview, was handed to at least one of the interviewees at each case, after the interview. Every case received the same table and independently answered what supplier development activities they perform at their company. Some case companies wrote additional sentences to explain their answers in the table; those are described below the table for those cases. The questions in the form are created from the part about activities in the Frame of References.

**Table 8 Form filled in independently by each case after the interview**

<b>Supplier development activities</b>	<b>Yes</b>	<b>No</b>
Investment in equipment or capital in the supplier's organization		
Provide competition between existing suppliers through multiple sourcing		
Evaluate suppliers' performance for example with supplier audits		
Use of supplier certification program		
Increase supplier performance expectations		
Supplier recognition through awards		
Any type of "black list"/"flop list" of suppliers with undesired performance		
Promise increased present and future business if a supplier improve performance		
Site visit to the supplier		
Visit to the focal company by the supplier's representatives		
Education and training of suppliers' personnel		
Temporary exchange personal between the supplier and the focal company		
Direct investments in a supplier		
Investments in supplier's operations		
Try to implement a philosophy of continuous improvement at the supplier		

## 4.1 ABB Robotics

ABB Robotics has one manufacturing plant in Västerås, Sweden and one in Shanghai, China. The products are distributed to customers in Sweden and internationally. The demand has a high volatility and is expected to increase further.

ABB Robotics' supplier base consists of 300-350 suppliers. The purchasing department includes strategic purchasing, operational purchasing and supplier quality. They are together managing the suppliers and the existing supplier development efforts. There are 10 operational purchasers, 11 strategic purchasers and 21 employees at global and local supplier quality. Currently ABB Robotics does not have a strategy for supplier development but they want to increase their knowledge in the area to develop a strategy. The data presented in this section is based interviews with thirteen different people, Interviewee 12-29, at the purchasing department in Västerås, observations after a week at the department and documentation for the department and their procedures.

### 4.1.1 Form

ABB Robotics filled in this form after the case interviews.

**Table 9** Answers to the form by ABB Robotics

Supplier development activities	Yes	No
Investment in equipment or capital in the supplier's organization	x	
Provide competition between existing suppliers through multiple sourcing	x	
Evaluate suppliers' performance for example with supplier audits	x	
Use of supplier certification program	x	
Increase supplier performance expectations	x	
Supplier recognition through awards		x
Any type of "black list" / "flop list" of suppliers with undesired performance	x	
Promise increased present and future business if a supplier improve performance		x
Site visit to the supplier	x	
Visit to the focal company by the supplier's representatives	x	
Education and training of suppliers' personnel		x
Temporary exchange personal between the supplier and the focal company		x
Direct investments in a supplier		x
Investments in supplier's operations		x
Try to implement a philosophy of continuous improvement at the supplier		x

ABB Robotics does evaluate suppliers but not to a large enough extent according to them. Visits to the suppliers and by supplier representatives to ABB Robotics are done frequently. But there is no clear guideline, for the whole supplier base, of how often this should occur. Previously ABB Robotics educated suppliers in Robotics' requirements and processes. They are currently thinking about reintroducing that education.

### 4.1.2 Objectives

ABB Robotics objectives with supplier development are to increase OTD to 97% and decrease quality issues to a maximum of 500. The intention with future supplier development efforts is to work in a proactive way to prevent the issues before they make an impact on ABB Robotics production and finance. Issues with quality of incoming goods can for example generate production stops or in worst case reach ABB Robotics' customers and create problems for them. Low OTD could also delay ABB Robotics' production or force them to increase their stock levels, which will

increase their tied capital. The only time the suppliers receive clear objectives is when they are at the Flop 10 list. Flop 10 is a list where the ten suppliers causing greatest impact on cost of poor quality are listed. Cost of poor quality includes both undesired quality and delayed deliveries. At the Flop 10 list the supplier receives conditions, which need to be fulfilled to get off the list.

The long-term objectives stated in ABB Robotics purchasing document is that the supplier base should ensure material without quality defects to the lowest total cost.

#### **4.1.3 Activities and Tools**

Even though ABB Robotics does not have any strategy for supplier development they perform some supplier development activities. Suppliers at the Flop 10 list first receive a letter with notification of their placement and that ABB Robotics expects an action plan for improvements from the supplier. If the supplier does not improve or use recourses and efforts for improvements another letter is sent to them and resourcing can be done. The last step is a meeting at the headquarter of ABB in Zurich where pressure is put on the supplier and an action plan is discussed.

ABB Robotics recently restarted to work with Flop 10 and it is a bit controversial at the department. Some interviewees are positive to the list because it forces the suppliers to develop their business and because everyone internally knows whom the ten worst suppliers are. Hence it improves the internal communication at ABB Robotics. The criticism towards the list is that the process takes too much time and sometimes the suppliers have already improved before they receive the letter. It is a good way to manage large suppliers but for the smaller suppliers it is too much administrative work. If a supplier is on the list, no new articles should be placed at that supplier. But since ABB Robotics has a lot of single source suppliers this is not fully implemented.

According to a document from the purchasing department, with the three sections responsibilities, strategic purchasing is responsible to frequently provide suppliers with feedback of their performance. It is the responsibility of operational purchasing to lead action programs for suppliers who do not reach the desired objectives for delivery. Supplier quality has the same responsibility for suppliers with insufficient quality. Thus the suppliers who do not perform at the desirably levels are the once ABB Robotics put efforts to develop. The impression is that the supplier quality section is mature in their supplier development efforts but the other two sections only refer to Flop 10.

When developing a supplier ABB Robotics prefer to use a tool called 4Q. It is a way to work with continuous improvements. It is developed by ABB and can be compared to other quality tools. It is similar to quality methods like 8D, DMAIC (Define, Measure, Analyze, Improve and Control) and PDCA-cycle (explained in Frame of References) in many ways. The four different quadrants, which have given the method its name, are representing four stages and are shown in the picture from ABB, Figure 27 ABB Group's 4Q model – Quality tool. (ABB Group, 2011)

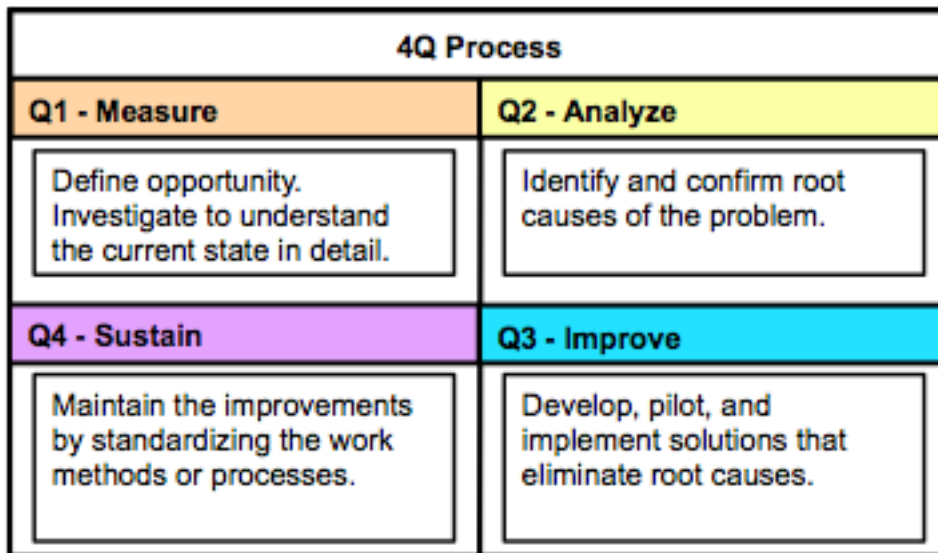


Figure 27 ABB Group's 4Q model – Quality tool

When major issues occur with a supplier, ABB Robotics enjoins the supplier to do a 4Q or 8D analysis. Issues leading to this analysis are for example quality defects and the suppliers having most delayed orders during a month and carrying the responsibility for the gap between current OTD value and the desirable value.

#### 4.1.4 KPI

The KPIs used at ABB Robotics is OTD and Parts Per Million, PPM. OTD is measured by dividing the number of order lines on time with the total number of orders delivered by a supplier. ABB Robotics defines on time as an order being delivered not more than one day after the requested order date. They have no limit of how early the order can be delivered compared to the order date. An order being late because of transportation issues or such problem that is not caused by the supplier is manually adjusted in the metrics afterwards. The suppliers obtain updated feedback of their performance on OTD and PPM in a web-based system called ASCC. All KPIs are reviewed on a yearly basis and budget goals are also revised yearly. Last year the goal was 97% on OTD.

#### 4.1.5 Success Factors

##### 4.1.5.1 Mindset

ABB Robotics tries to move from a mindset within purchasing where a low product price is the main focus. They try to focus more on suppliers with the lowest total cost, which include quality and processes in a broader perspective.

##### 4.1.5.2 Information Sharing

There is high potential for good information sharing internally at ABB Robotics. The operational purchasers and local strategic purchasers are placed in an open plan office, which simplify communication. There are purchasing teams for each supplier including the three sections with one operational purchaser, one strategic purchaser and one person from supplier quality. The potential is good but the employees from the different sections express that they often work in different directions because they focus on different factors in the supplier work. Issues around definitions of words were also mentioned. Operational purchasers express that they have to mediate between the supplier quality and the suppliers. Another issue discussed was that strategic purchasing focus on decreasing the purchasing price, which is not aligned with quality of the articles or delivery of the orders.

Internally ABB Robotics has an escalation process for supplier issues. This process has a defined order of where to bring up the issue. The problem mentioned for this escalation process is lack of responsibility definitions at each stage in the process.

External information sharing with suppliers is updated daily in the supplier web, ASCC. Suppliers can find information regarding OTD, PPM, stock levels and forecasts. It is the operational purchasers responsibility to make sure the suppliers follow up forecasts in ASCC and notify ABB Robotics early if there is a risk that the forecast can not be fulfilled.

An issue raised during the first interviews at ABB Robotics was the communication with the Chinese suppliers. The problem is based on culture and language differences. The way of doing business and different perspective results in misunderstandings and frustration.

#### 4.1.5.3 Trust and Power

Many of the interviewees express that the suppliers do not trust ABB Robotics because the forecasts are deceptive. The forecast often shows an increase in the demand in the near future but there is often no increase of demand. This is explained in Figure 28 The deceptive forecast at ABB Robotics. The unsecure future irritates many of the suppliers.



Figure 28 The deceptive forecast at ABB Robotics

The power ABB Robotics has is due to the fact that it is a big company and a well-known brand. Many companies want to have ABB Robotics as a customer since it proves that their products are qualified for high-tech robots. According to the interviewees the suppliers can use that as advertising to attract other customers.

#### 4.1.6 Outcome

Under the section 4.1.2 Objectives the expectations on outcome for future supplier development efforts were stated. The current outcome is hard to define since no specific supplier development strategy is used. Even though ABB Robotics has no supplier development strategy they have achieved outcomes related to supplier development. They have good structure of responsibilities between the different sections within purchasing. This improves the internal communication especially because of their work with cross-functional purchasing teams. When the interviews were conducted the OTD had just reached the highest score of OTD (still lower than the final goals), which was celebrated. But the level will be increased and supplier development is expected to enable new, increasing objectives.

#### 4.1.7 Reactive or Proactive Supplier Development

ABB Robotics has the impression that they are very reactive in their work with suppliers, but that they have some areas where they believe they are proactive. They want to increase knowledge so that they can start to work structured with supplier development and with a strategy, which is more proactive.

## 4.2 ABB LV Motors

ABB LV Motors is another unit at ABB. This ABB unit is producing advanced technical products on a global market. They have production sites in Sweden, Finland, Poland, India and China but the units are mainly independent. This section therefore only concerns the Swedish site. The demand of the products is fluctuating because of increasing customization.

ABB LV Motors is currently restructuring because of recent supplier development efforts. At the moment one person is dedicated to supplier development and mainly the department operational purchasing is involved in the efforts. Purchase planning, supplier quality and strategic purchasing are collaborative departments but they focus more on other areas. There are 4 different operational purchasers at the site in Sweden who are responsible for 270 suppliers. At this case two interviews were performed one with the Supplier Developer (Interviewee 3) and one Operational Purchaser (Interviewee 4).

### 4.2.1 Form

ABB LV Motors filled in this form after the case interviews.

**Table 10** Answers to the form by ABB LV Motors

Supplier development activities	Yes	No
Investment in equipment or capital in the supplier's organization	x	
Provide competition between existing suppliers through multiple sourcing	x	
Evaluate suppliers' performance for example with supplier audits	x	
Use of supplier certification program	x	
Increase supplier performance expectations	x	
Supplier recognition through awards		x
Any type of "black list" / "flop list" of suppliers with undesired performance	x	
Promise increased present and future business if a supplier improve performance	x	
Site visit to the supplier	x	
Visit to the focal company by the supplier's representatives	x	
Education and training of suppliers' personnel	x	
Temporary exchange personal between the supplier and the focal company		x
Direct investments in a supplier		x
Investments in supplier's operations		x
Try to implement a philosophy of continuous improvements at the supplier	x	

### 4.2.2 Objectives

The main objective is to create efficient, effective and reliable purchasing procedures. An OTD from suppliers of 98% and defect-free product of 99,5% is what ABB LV Motors aim for and 100% OTD to their customers. During the three years that ABB LV Motors has worked with supplier development, different short-term objectives have been used over time. The first year was mainly to structure how to manage supplier development, after that the objective was to develop the internal purchasing processes and now the objective is to minimize the supply base.

### 4.2.3 Activities and Tools

The last three years major modifications have been made within supplier development at the ABB unit. A new function called Supplier Developer was hired and started to focus on the subject. The first year this person mainly developed the supplier developer role and how the supplier development efforts should be executed at ABB LV Motors. This generated the pyramid in Figure

29 Strategic Supplier Partnership, SSPP, at ABB LV Motors, which is the principal for the supplier development efforts at ABB LV Motors, called Strategic Supplier Partnership Process (SSPP). The pyramid is based on a model for supplier development published at Harvard Business Review (Liker & Choi, 2004).



**Figure 29 Strategic Supplier Partnership, SSPP, at ABB LV Motors**

To understand the supplier is the first step in the pyramid and that is what ABB LV Motors started with in their supplier development process. They visited the production sites of the strategic important suppliers to see and understand their processes and how they work. In this step it was also crucial to commit to co-prosperity for both ABB LV Motors and the supplier. ABB LV Motors had to explain how the suppliers business will grow if their business grow and that depends on how well they meet customers expectations. To meet customers' expectations ABB LV Motors express that they need to have good processes throughout the supply chain and the quality of the supplying commodities has to be high to ensure a high quality end product. Thus ABB LV Motors and the suppliers have to work together to increase their performance.

An essential change ABB LV Motors did in the beginning of their new supplier development efforts was to be clear with the requirements for each supplier. Some suppliers were surprised with what ABB LV Motors expected from them because they had never received that information before. Hence many problems were solved only because the supplier received information about requirements. A supplier guide with requirements was developed and provided to all suppliers. An example of requirements included in the guide was packaging instructions to simplify the process of receiving goods at ABB LV Motors' production site. This supplier guide should also be distributed when initiating new suppliers to the supplier base.

The latest restructuring made because of the new supplier development efforts is to separate operational purchasing from purchase planning. Operational purchasing was a part of purchase planning, which reduced the focus on suppliers. With operational purchasers responsible for different suppliers, supplier development is highlighted in the daily work.



Even though competition between different suppliers is one step in the pyramid, ABB LV Motors tries to reduce their supplier base. They want to keep dual sourcing to minimize risks but reduce the number of suppliers where it is possible. Some years ago production of some products was relocated from another site, adding new suppliers to the supplier base. Some of these new suppliers will be replaced by already existing suppliers.

When a problem occurs related to a supplier ABB LV Motors starts with analyzing the issue internally. If the problem seems to be caused by the supplier, ABB LV Motors executes a 4Q analysis (explained in the section ABB Robotics) before the supplier is informed. When initiating the process with the supplier they are asked to analyze the situation with their own 4Q analysis. Afterwards the two 4Qs are compared and together with the supplier a solution is found.

#### **4.2.4 KPI**

ABB LV Motors measures their suppliers on on-time delivery (OTD) and quality. However the quality metric is claimed to be unfair by the supplier developer, because it measures the number of defected articles per order line. This sometimes gives a great negative indication even though the impact on ABB LV Motors' production is insignificant.

ASCC, the supplier web, is used so that suppliers can receive daily updated feedback of the metrics for OTD and quality. Strategic suppliers are required to check ASCC daily and use it to understand how they perform. If a problem occur and it is revealed that it was caused because the strategic supplier did not control the numbers in ASCC they will be responsible for the effect. In ASCC the suppliers can also see stock levels for their articles at ABB LV Motors. One time a strategic supplier noticed that the stock levels at ABB LV Motors was low and called ABB LV Motors to ask if they wanted a new order. That is how ABB LV Motors wants the partnership to work. They also desire that more suppliers, not only the strategic, use ASCC more often.

#### **4.2.5 Success Factors**

##### **4.2.5.1 Mindset**

Partnership with strategic suppliers is the new mindset for the supplier development efforts at ABB LV Motors. Their suppliers are an extension of the focal company and their performance reflect on ABB LV Motors' performance, therefore they have to work together to develop competitive advantages. SSPP, the process pyramid, is how ABB LV Motors wants to move from conservative supplier treatment to supplier development through partnership and long-term relations. The conservative treatment is when the suppliers perform what is required or the focal company starts business with another supplier.

##### **4.2.5.2 Information Sharing**

Historical it has been some barriers between different functions internally at ABB LV Motors. Strategic purchasing, operational purchasing and supplier quality have different focus and are measured on incompatible metrics, which complicates the work. Strategic purchasing's objective is to decrease cost for incoming goods, which most often gives lower quality and not reliable suppliers. Operational purchasing wants reliable suppliers with good OTD and communication, which often increase the purchasing price. The function of supplier quality desire high quality commodities even though the supplier is not reliable. High quality often cost more as well. The culture at the department was that the functions blamed each other for problems instead of taking responsibility for them. A new project to form commodity teams between strategic and operational purchasing has been initiated to generate cross-functional work. The functions are placed close to each other, which enable internal information sharing and even though the historical collaboration issue still exists the functions are talking to each other frequently.

External information sharing is something ABB LV Motors has worked a lot with. Clear requirements for the suppliers are fundamental now with for example the supplier guide. They also analyze the suppliers and give feedback so that the suppliers know what ABB LV Motors thinks about them. The supplier web, ASCC, is used for daily performance feedback. At the moment the ABB unit do not share a forecast with their suppliers but they are trying to enable that for the future. How frequently ABB LV Motors have meetings with a supplier depends on what supplier it is and how the supplier perform. For example one strategic supplier had an undesirable low performance and initial ABB LV Motors had meetings with them several times a week. When the situation became better the meetings were monthly and now, when the supplier has increased performance, they have meetings before and during new developing projects.

The ABB unit has divided their suppliers into different groups depending on how important they are. To divide them they have used the Kraljic's matrix for the commodities the suppliers deliver. One operational purchaser is responsible for each supplier group. Thus one operational purchaser is responsible for twenty-five strategic suppliers while another is responsible for hundred non-critical suppliers. Because of this the work vary a lot between the different operational purchasers. Strategic suppliers automatically get more focus and have a closer partnership with daily contact.

ABB LV Motors has many suppliers in Asia and they do not experience any issues with culture and communication. They have good processes that manage the Asian suppliers, which enable high performance. In Asia they have local sourcing employees who can visit the suppliers and understand them. The only issue they experience is because of long lead times. ABB LV Motors need to be very flexible toward their customers and that is harder to accomplish with long lead times.

#### **4.2.5.3 Trust and Power**

ABB LV Motors does not want to use power to push the suppliers to better performance instead they work on partnership and build long-term relationships. Hence the supplier development efforts mainly are focusing on the strategic suppliers. They create trust through understanding of how ABB LV Motors' and the supplier's businesses connect and depend on each other. Trust is also built through collaborative efforts to develop the supplier and clear requirements so that the suppliers know what is expected.

Even though trust is the stronger factor, multiple sourcing is used to increase some power and to reduce risk. Renegotiation on price is not connected to supplier development since strategic purchasing is negotiating price with the supplier and they are not completely involved in the development efforts.

#### **4.2.6 Outcome**

During these three years that ABB LV Motors has been working with supplier development they have seen improvements. They have increased their OTD from 85% to 95% only because they have been clear with requirements for the suppliers and created conditions for the supplier to perform well. One very important strategic supplier has after intense supplier development efforts with ABB LV Motors increased their OTD from 12% to 96%. When making an operational purchaser responsible for specific suppliers and the stock levels for those suppliers, the inventory cost decreased with 49%.

The internal processes have also improved significantly. According to ABB LV Motors it is necessary to improve the processes in-house to enable well performing suppliers. For example it is much easier for the supplier to have one single person for the daily contact with ABB LV Motors

instead of having contact with different people for different things. The responsible purchasers argue that it makes the process more bureaucratic since everyone needs to go through them in order to contact the supplier. On the other hand, it simplifies the communication and makes it possible for them to see the whole picture of each supplier. Someone has the holistic view for each supplier. The communication with the supplier is easier now and they get response faster from the supplier. The positive outcome dominates over the little extra time spent on internal communication.

Another internal process that has been developed is how deviations related to suppliers and purchasing processes are managed. Now different deviations are gathered in a database, which makes the process more structured when something different occur.

#### **4.2.7 Reactive or Proactive Supplier Development**

ABB LV Motors still sees many improvement areas in their supplier development efforts and therefore they believe that they are still reactive. They have done many changes since starting their supplier development work three years ago and are more proactive now than before.

### 4.3 Alfa Laval

Alfa Laval is an international company operating in a global market. It is a manufacturing company with production located in different areas of the world as well as the customers of Alfa Laval's products. All products, for example heat transfers and separators are of high technical standard. Due to growth through acquisitions and heritage the supplier base has grown over the years and are today close to 5000, of these, 250 are strategic suppliers. Alfa Laval's products are both sold directly to end customers for "stand alone use" as well as components to be integrated in larger systems as first tier supplier for other industries. The demand has become more fluctuating compared to historical demand. At Alfa Laval many different departments and divisions are engaged in supplier development, for example R&D, production and purchasing. The role of each department differs between different supplier development projects. 10-15 persons are employed at the purchasing department at the visited site in Sweden.

The data about Alfa Laval is collected from interviewee 1 and 2; one Supplier Developer and one Black Belt Performer within the production.

#### 4.3.1 Form

Alfa Laval filled in this form after the case interviews.

**Table 11** Answers to the form by from Alfa Laval

Supplier development activities	Yes	No
Investment in equipment or capital in the supplier's organization	X	
Provide competition between existing suppliers through multiple sourcing	X	
Evaluate suppliers' performance for example with supplier audits	X	
Use of supplier certification program		X
Increase supplier performance expectations	X	
Supplier recognition through awards	X	
Any type of "black list" / "flop list" of suppliers with undesired performance	X	
Promise increased present and future business if a supplier improve performance		X
Site visit to the supplier	X	
Visit to the focal company by the supplier's representatives	X	
Education and training of suppliers' personnel		X
Temporary exchange personal between the supplier and the focal company		X
Direct investments in a supplier		X
Investments in supplier's operations		X
Try to implement a philosophy of continuous improvement at the supplier	X	

When it comes to supplier awards program Alfa Laval does not work with it in Europe but to some extent in Asia, where suppliers are rewarded if they have good business principals. They have a recognition list with the top 10 best performing suppliers. The list is based on DOT and quality. The same goes for education of supplier personnel. It has occurred but not as a norm. Alfa Laval believes that education is an important part of developing the supplier and building trust and understanding.

#### 4.3.2 Objectives

Alfa Laval set their objectives in quantitative measurements to simplify comparison. They measure product quality, PQ, and delivery on time, DOT. They aim for a PQ of 98% and a DOT of 96%,

both measured per order line. The targets have been stable for some time, but the expectation to meet them has increased.

The sourcing strategy, explained further below, sets the direction for how the sourcing to the production should proceed. It has a horizon of three years. Each supplier development project included in this strategy has specific objectives depending on the problem that triggered the project. For example it can be capacity problems or a quality problem.

### 4.3.3 Activities and Tools

Historically, different purchasing organizations and product groups at Alfa Laval were striving for different goals regarding the sourcing of incoming products. Some were only price oriented while others were quality oriented. When this diversity was identified the need for a sourcing strategy was clear. The objective was to unify the goals. Alfa Laval installed a program manager on high management level to drive a sourcing program with the objective to take Alfa Laval's purchasing/sourcing to a higher level. This plan is illustrated in Figure 30 Alfa Laval's Sourcing Strategy. The Sourcing strategy gives direction for the coming three years and is reviewed yearly. The strategy is broken down to a more operational level, the handshake process, where selection of which projects Alfa Laval should proceed with. The projects from the handshake process should align with the sourcing strategy and targets. A yearly project plan is created every year that is reviewed monthly. The selected projects are executed in the purchasing process. In a purchasing project a supplier may be selected that does not meet the requirements but that have very strong potential. For each of those cases a supplier development project will be defined and executed. This purchasing process follows each team and is thereby a continuous process with over 100 of projects every year.

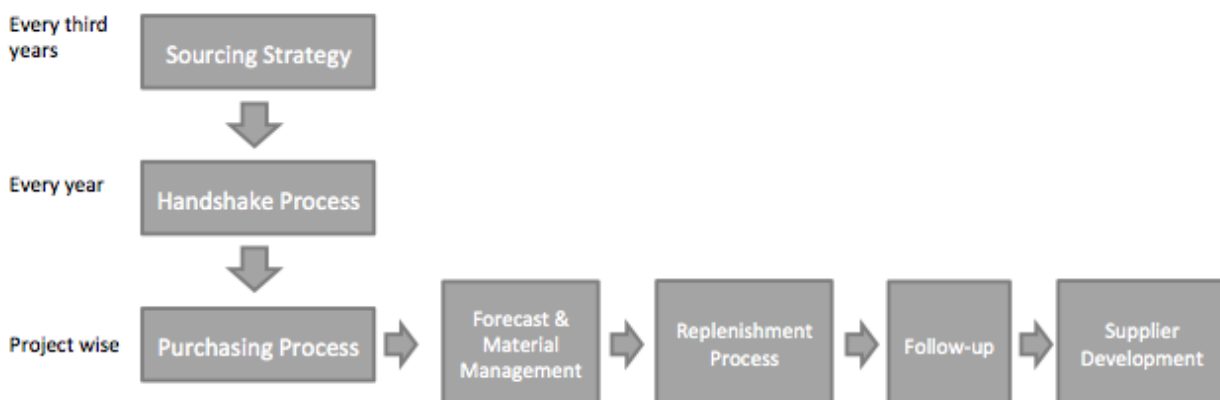


Figure 30 Alfa Laval's Sourcing Strategy

Because of issues with an enormous supplier base Alfa Laval has an ongoing process of optimizing the number of suppliers (increase for some areas and decrease for others) to a more manageable number. Reasons for the huge number of suppliers is the large product portfolio and long lasting products, often decades, which need supply of spare parts. Some suppliers are only delivering spare parts a couple of times per year but it is hard and costly to move those items to other suppliers.

Alfa Laval works a lot with Lean and Six Sigma (LSS) within supplier development. Greenbelt education, second level certificate in Six Sigma, is now standard for everyone working with supplier development and continuous improvements. Alfa Laval also has a number of black belt employees, which is the highest level of the Six Sigma education. Many projects tied to supplier development and continuous improvements are executed as Six Sigma projects focusing on process and product quality. The project method for Lean and Six Sigma projects is DMAIC, which stands for Define, Measure, Analyze, Improve and Control. When a development project is started a

project leader is elected either from Alfa Laval or the supplier. The project leader has a coordinating responsibility, ensures the collaboration and that goals are stated and fulfilled. The team is cross-functional both from Alfa Laval and the supplier. Someone from the production at Alfa Laval is often involved in the project to generate a customer perspective. It is often poor material quality or the signing of a new supplier that initiate a supplier development project.

Alfa Laval uses Lean-tools as value stream mapping and 5S (Sort, Systematize, Sweep, Standardize and Self-discipline) when developing their suppliers. Value stream mapping enables waste cuts and streamline processes. Just by visualizing the different problems or issue areas a lot of problems can be solved or eliminated. When people actually can see where the waste goes or where the bottlenecks are in for example a production line, the employees know where to put the effort.

Within Global Purchasing, two persons are dedicated to supplier development and responsible for the holistic view and coordinating the work. Alfa Laval also has six supplier quality engineers (SQE), employed to ensure the quality. Educations in the processes and the structure developed by the sourcing program, supplier development being one part, are held within the company to increase the knowledge and understanding of the importance with a good supplier relationship. The education contains a six-day course of green belt education, which focuses on continuous improvements and a 2 day course focused on LSS applied on supplier development with special attention on Lean, total cost and inventory management. After that the education proceeds with a two-day of sourcing strategy and supplier development program.

Alfa Laval does not use penalties, because they believe it damages the long-term relationship and it is often hard to say whose fault it is. They prefer to have a price model with room for a premium price when the supplier improving the capabilities or quality. The premium price is then the highest level of the price Alfa Laval is willing to pay for the product. Even though Alfa Laval does not use penalties for their suppliers they express that it could be good to implement for some crucial commodities.

#### **4.3.4 KPI**

The objectives are aligned with the KPIs at Alfa Laval. The KPIs are PQ and DOT.

The time window for DOT has recently been changed to -10 days to 0 days compared to the agreed delivery date. Before the time window was -5/0 days. The reason for the change was the long lead times for long-distance sea transports where it is difficult to tell if Alfa Laval or the supplier is responsible for the problem. The supplier should not be accountable for issues they do not control, for instance delivery issues. The change is a criticized solution for this problem at Alfa Laval. They want to measure the PQ in a way that reflects the impact on their production. That is not how the metrics is measured today since a critical commodity gets the same impact on PQ as a not so important commodity.

The requirements on the KPIs are evaluated and changed on a yearly basis in the handshake process. All KPIs are discussed at monthly meetings with the supplier where forecasts and open claims also are discussed. During these meetings issues are escalated to a higher level both at Alfa Laval and the supplier if needed.

#### **4.3.5 Success Factors**

##### **4.3.5.1 Mindset**

Alfa Laval has a clear mindset of openness and humbleness toward their suppliers.

The mindset is relationship-based, for example a healthy relationship with trust, good communication and commitment is emphasized. Of course different goals are established for

different suppliers but the overall mindset is focused on the relationship. Supplier development is seen as an opportunity for education and knowledge for both parties. Alfa Laval sees a competitive advantage in starting business with suppliers that are not so developed. In this way they can negotiate a low price and the supplier receive help with development as a part of the arrangement. They believe that quality and improvements are the best long-term solution. Alfa Laval wants the supplier to feel that being a supplier for Alfa Laval is an opportunity for education and development.

#### **4.3.5.2 Information Sharing and Communication**

Alfa Laval has a company structure suitable for good external communication with their suppliers. They have local units at their global markets that have the main responsibility to talk to the local suppliers both for face-to-face contact and in passive communications. How often and close the communication with the suppliers is depends on if it is a strategic supplier or not. Alfa Laval wants to develop the categorization of their suppliers further using for example the Kraljic's matrix. At the moment they only have two categories; key suppliers and others. Alfa Laval uses the regional purchasing offices to decrease the impact of cultural differences with for example Chinese and Indian suppliers. The distance and time zones is the only problem with suppliers in Asia for the manufacturing in Europe. The lead times increases, which is a problem when Alfa Laval needs to be more flexible toward their customers. The same is of course valid for the manufacturing sites in Asia when the buy from European or US suppliers.

Alfa Laval has different types of internal meetings at different management levels. The meetings are a vital part in the escalation process of supplier related issues. Alfa Laval has implemented Alfa Laval Production System (ALPS) where one important ingredient is the daily performance meeting that takes place at the start of each shift. Problems are raised in the performance meeting and they try to solve the problems immediately. If the problems can not be solved at this level they are escalated to the Improvement meeting, which is a longer weekly meeting (one hour) where the group solves larger problems using a problem resolution method based on DMAIC. If the problem is related to a supplier and they cannot solve it in the improvement meeting the problem will be escalated to a higher level, which is a meeting called Purchasing Improvement Meeting, PIM. PIM involves the global purchasing department, sourcing managers for the product groups and local purchasing from the production. At PIM supplier development projects are defined.

Once a month a quality meeting is held with all plant managers and quality personnel. Those meetings are more specifically focused on quality, and deviations and issues are discussed in cross-functional teams.

The company understands that their internal information flow still has a lot of improvements areas. Large improvement has been made between the purchasing department and R&D. The purchasing department has improved their communication about incorrect drawings, and is working with R&D to secure correct drawings for and improve product capability for new products. They also have good communication between the departments during supplier development projects. The project teams are always cross-functional but they are not permanent. Depending on the project characteristics different teams are assembled. Meetings are held face-to-face with strategic suppliers monthly. The objective with the meetings is to discuss new forecasts, open claims and an opportunity to escalate problems and give feedback to the supplier. The supplier also has the ability to log in at a supplier web to see different goals and current state of their performance.

#### **4.3.5.3 Trust and Power**

The easiest way of building trust according to Alfa Laval is during various projects involving both supplier and themselves. By showing the supplier that Alfa Laval put effort, trust and recourses into

the supplier, the supplier is willing to collaborate and commit to Alfa Laval. The importance of trust is crucial for Alfa Laval and a reason why they are reluctant to use power in their relationships. But they admit that the brand itself is inevitable power in the way that many suppliers want to have Alfa Laval as their customer.

At a local level there is only minor usage of power, but at global level Alfa Laval are more powerful because of the large volumes. Alfa Laval believes that there is more powerful ways than using power to generate improvements at their suppliers. Instead of historical harsh price negotiation focus is now on the relationship with the supplier (of course depending on type of supplier, supply situation and desired relation with the supplier). Because of this Alfa Laval does not aim for renegotiating the price with the supplier as soon as an improvement at the supplier side is visible. Instead they are valuing the improvement as a long-term advantage, which is of higher value than a low product price. The process of renegotiating the price after a successful supplier development has a different paradigm in parts of Asia where the supplier wants to take a higher price after the development. This is handled by contracts to equally share the risk and benefits. What the contract state is that the price will not be changed. The win-win situation is that Alfa Laval gets higher quality and reliability and the suppliers can decrease their costs.

#### **4.3.6 Outcome**

Alfa Laval has achieved both better communication and collaboration with the suppliers as a direct result from supplier development projects. Naturally the quality has increased and waste has been decreased, many times just by introducing 5S or other basic tools at the supplier site. Financial performance has not been measured. One reason for that are difficulties in valuing soft values, such as better communication, relationship and improved quality.

Better DOT and PQ is the result for Alfa Laval's customer, which goes hand in hand with credibility for the company. An internal result is the closer connection between the different commodities such as the purchasing department and R&D.

#### **4.3.7 Reactive or Proactive Supplier Development**

Alfa Laval identifies themselves as a reactive company in the context of supplier development. When an urgent problem occurs the escalation process starts to see which level of management need to be involved to solve the problem. After that an internal mapping is done to be able to start discussions with the supplier. Alfa Laval is open to feedback from their suppliers on their internal processes to ensure that Alfa Laval not causes the problem. The feedback is the first step and after this a discussion about the supplier can take place.



## 4.4 Volvo Cars

Volvo Cars is a manufacturing company within the automotive industry operating on a global market. Both customers and production is located in different parts of the world. The customer for Volvo Cars is the end user. The demand is fluctuating and unstable because the product is sensitive for trends and the economical situation in the global market.

Volvo Cars currently has 1700 suppliers worldwide. They have experienced ownership shifts that brought new suppliers to the supplier base. Volvo Cars has a separate purchasing department and one supplier quality management department (SQM) under the logistics department. At SQM 230 people are employed and located both in Sweden, Belgium, Czech Republic and China. The supplier development work is executed and handled by the SQM department, but it is the purchasing department that identifies, together with SQM, which suppliers to develop or where problems occur. (Interviewee 7, 8)

The data from Volvo Cars is collected from Interviewee 5-8, with the titles Director Resource and Competence, Sourcing Specialist, Director of Supplier Quality Management and Operative Supplier Quality Manager. Since interviews were made both at the department for purchasing of direct material (Interviewee 7, 8) and the department for purchasing of services (Interviewee 5, 6) these are referred to after each section.

### 4.4.1 Form

Volvo Cars filled in this form after the case interviews.

**Table 12** Answers to the form by Volvo Cars

Supplier development activities	Yes	No
Investment in equipment or capital in the supplier's organization		x
Provide competition between existing suppliers through multiple sourcing	x	
Evaluate suppliers' performance for example with supplier audits	x	
Use of supplier certification program	x	
Increase supplier performance expectations	x	
Supplier recognition through awards	x	
Any type of "black list"/"flop list" of suppliers with undesired performance	x	
Promise increased present and future business if a supplier improve performance		x
Site visit to the supplier	x	
Visit to the focal company by the supplier's representatives	x	
Education and training of suppliers' personnel	x	
Temporary exchange personal between the supplier and the focal company		x
Direct investments in a supplier		x
Investments in supplier's operations		x
Try to implement a philosophy of continuous improvement at the supplier	x	

Temporary exchange of personnel is only executed when large problems occur. Volvo Cars express that investments can be done in special cases for example if a supplier is close to bankruptcy. It also exists exceptional cases regarding temporary exchange personnel when a major problem has occurred at the supplier site.

#### 4.4.2 Objectives

At Volvo Cars the long-term objective is to get as many suppliers as possible with Volvo Quality Excellence, VQE. This is Volvo’s award system explained deeper later and it implies self-driven suppliers. The objective for the twelve VQE-factors is increased manually each year except PPM, which is increased with 10 % each year. The most important short-term objective is to decrease the time it takes to solve a problem, time to resolution. (Interviewee 7,8)

All departments within the organization of Volvo Cars have different objectives and goals but in the end it is the head of SQM and top management of Volvo Cars who are responsible to achieve the objectives. The objectives are aligned with the VQE for different departments. (Interviewee 7,8)

#### 4.4.3 Activities and Tools

Volvo Cars has a clear structure for their supplier development process. It is based on a total quality management approach. The process has three main steps symbolized as the pillar in Figure 31 Volvo Cars’ House of Quality, illustrates. The first step is to select suppliers, which is outside the scope of this project and therefore not further discussed. The second step is how to develop a supplier development program through Advanced Product Quality Planning, establishing a Supplier Engagement Process and Production Part Approval Process. Finally the third step is executing the plan through various tools for example 8D, DMAIC and escalation processes for the supplier. This last step is for already existing suppliers. (Interviewee 7,8)

## House of Quality



Issuer: Hans Pettersson ; Supplier Quality Management (SQM) ; Security Class: Proprietary

Figure 31 Volvo Cars’ House of Quality

*APQP*: Advanced Product Quality Planning is a structured method for defining and establishing the steps necessary to achieve PPAP.

*SEP*: The Supplier Engagement Process defines a set of activities performed throughout a program to ensure that critical parts delivered by suppliers achieve the desired quality and capacity levels.

*PPAP*: The Production Part Approval Process is designed to demonstrate that the component the supplier has developed their design and production process to meet the client's requirements.

The House of Quality's foundation is based on lessons learned and continuous improvements. The foundation also includes their recognition and reward system, Volvo Quality Excellence, VQE. All lessons from previous programs and projects have been documented in a lesson-learned base and are searchable for the staff at Volvo Cars. The overall goal, which builds the roof of the house, is customer satisfaction. Hence everything should be aligned with Volvo Cars' customer requirements. Customer focus is important for Volvo Cars, which is reflected in the strategic mindset. The columns in the House of Quality are filled with specific tools and processes suitable for each step in the process. (Interviewee 7,8)

The VQE rewards system is very essential for the whole supplier development process and a useful way of managing the supplier development. It is a reward system built on twelve different factors, which each supplier is measured on. (Interviewee 7,8)



Figure 32 Volvo Cars' VQE, Volvo Quality Excellence

The numbers after each factor symbolizes the amount of points a particular factor generates up to the maximum of 300 points. Volvo Cars also has a color code system for the factors to easily visualize suppliers' performance within the different factors. The colors are red, yellow and green and represent bad, moderate and good performance. (Interviewee 7,8) The list below describes the twelve factors. The VQE measures how well each supplier works or prevents problems related to each area.

- **Certificates** (60/300): Which and how many, ISO standards and other customer commodity specific certificates the supplier has.
- **Manufacturing Site Assessment, MSA** (60/300): Process planning and capability of the supplier. If they have consumer driven Six Sigma projects, efficiency and customer satisfaction.
- **Lean Assessment, LDA** (30/300): how well the supplier works with 7 waste, re-work, over production, movement, inventory, rejects, 5S.
- **Logistic Evaluation, MMOGLE** (30/300): global standard for material process that reduces the workload for suppliers and customers.

- **Parts Per Million, PPM (60/300):** number of rejected parts per million numbers of parts.
- **Logistics (10/300):** Delivery performance, on-time shipment, meeting customer requirements.
- **CPI (10/300):** number of quality rejections (QR) incidents. Number of technical deviation reports sent to the supplier.
- **Escalation (10/300):** how problems, which need to be escalated are managed at the supplier.
- **Stop shipmen (10/300):** if a quality defects causes stop in shipment of already finished vehicles but not in hands of the dealers.
- **Field Actions (10/300):** quality defects caused by delivered parts built into the vehicle.
- **Trust (10/300):** delays in various contexts, rejected approval, if the suppliers do not accomplish their part of the contract.
- **Endorsement (yes or no):** achieve the VQE award and certificate.

Even if the award system is emphasized in Volvo Cars’ supplier development efforts, Volvo Cars also has a strict penalty system. Suppliers are punished with penalties in forms of fees for administrative rejects, wrong labels, quality rejects (QR), warranty chargeback and line stops at Volvo Cars’ production with an increased fee if the stop lasts for more than twenty minutes. (Interviewee 7,8)

Volvo Cars IT department has a strategy of reducing their supplier base and give the selected suppliers a larger share of their spend. This is done to enable a more efficient supplier base and a joint strategy. It will also give Volvo Cars the optimal contracts and supplier environment. The strategy is visualized in Figure 33 Strategy for supply base at Volvo Cars. (Interviewee 5,6)

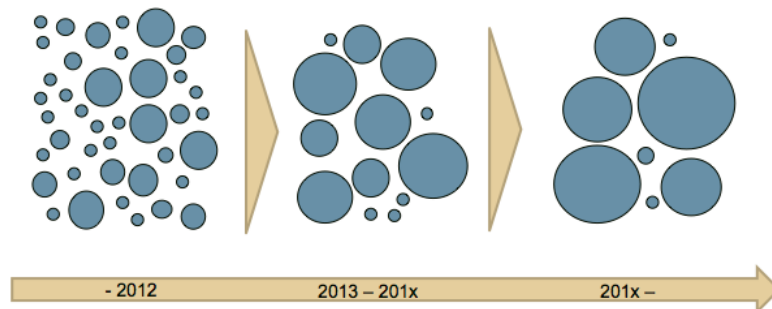


Figure 33 Strategy for supply base at Volvo Cars

#### 4.4.4 KPI

VQE is what is essential in the KPIs as well. Since twelve KPIs, one from each factor, is not a preferable number, some KPIs are more important than others. The three most important from the VQE is certificates, PPM and manufacturing site assessments. Time for solving problem is also an important factor. All suppliers can log into a supplier web to see their merits and goals, which updates daily. (Interviewee 7,8)

#### 4.4.5 Success Factors

##### 4.4.5.1 Mindset

Volvo Cars has 5 important factors and one point of view stated in their SQM, which is the department managing supplier development at Volvo Cars. Those are stated in the list below. The holistic perspective is to put customer expectation in focus and to emphasize rewards and preventing problems in their supplier development. All efforts should contribute to increase the customer satisfaction. One conclusion Volvo Cars has made is that the customer expectations increase constantly. (Interviewee 7,8)

- *The importance of quality:* quality and profitability is equal. Poor quality costs in terms of bad will, time, money, recalls and scrap.
- *The importance of healthy working conditions:* consequences of non-healthy working conditions are for example bad-will and brand reputation, employment injuries and absent employees.
- *The importance of environmental responsibility:* risk for the business if not following rules and laws, bad will and environmental accidents.
- *The importance of resolution speed:* when an issue occurs time is one of the most costly factors and regarding that, the speed for getting a solution is important.
- *The importance of Failure Models and Effect Analysis, FMEA:* this is a process designed to make continuous improvements. The model is illustrated in Figure 34 Volvo Cars' process for reducing quality rejections

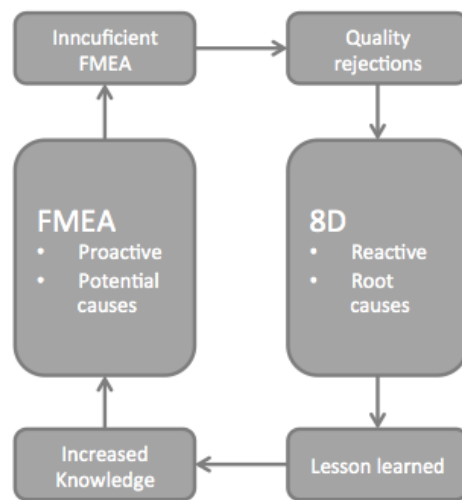


Figure 34 Volvo Cars' process for reducing quality rejections

#### 4.4.5.2 Information Sharing and Communication

The supplier quality department at Volvo Cars has a lot of smaller functions spread over the world, which collaborates in various ways. For example they have specific workshop teams, Lean Deployment teams, who travel to different suppliers and arrange workshops. In the second phase in The House of Quality, cross-functional teams are established at Volvo Cars to get a full view and input from Volvo as the customer. The cross-functional teams have great importance in the planning process and engagement process (second step in The House of Quality).

All suppliers can see the forecasts and their score in all twelve categories of VQE, through a supplier website. The information updates daily but are complemented with face-to-face meetings. Which level of management the supplier meets is selected based on how strategic the supplier are. To illustrate this the IT division at Volvo Cars has established a pyramid model. (Interviewee 5, 6) A supplier 3 only meets the service owner comparing to a supplier 1 who is involved at an executive level and meet all levels at Volvo Cars. Hence this method automatically generates more frequently meetings with strategic suppliers (supplier 1) compared to non-critical suppliers (supplier 3).

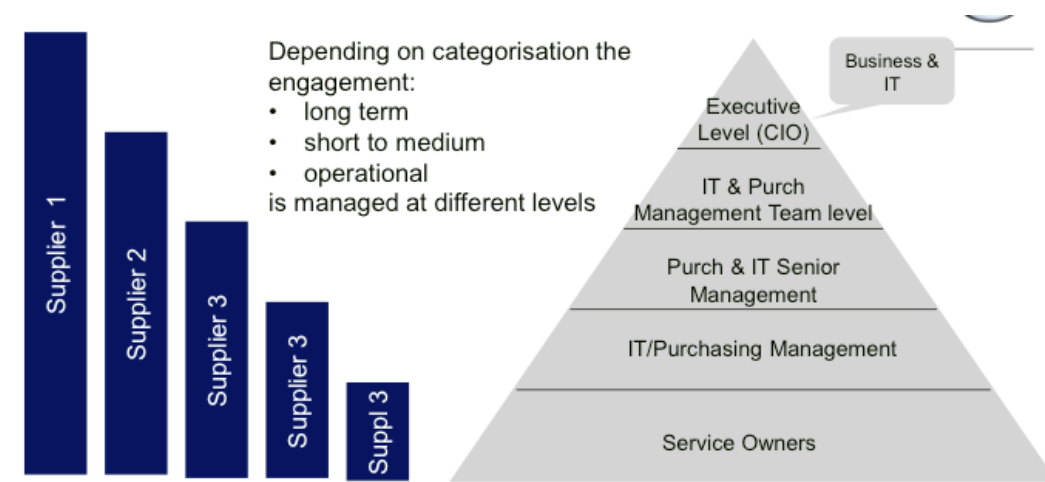
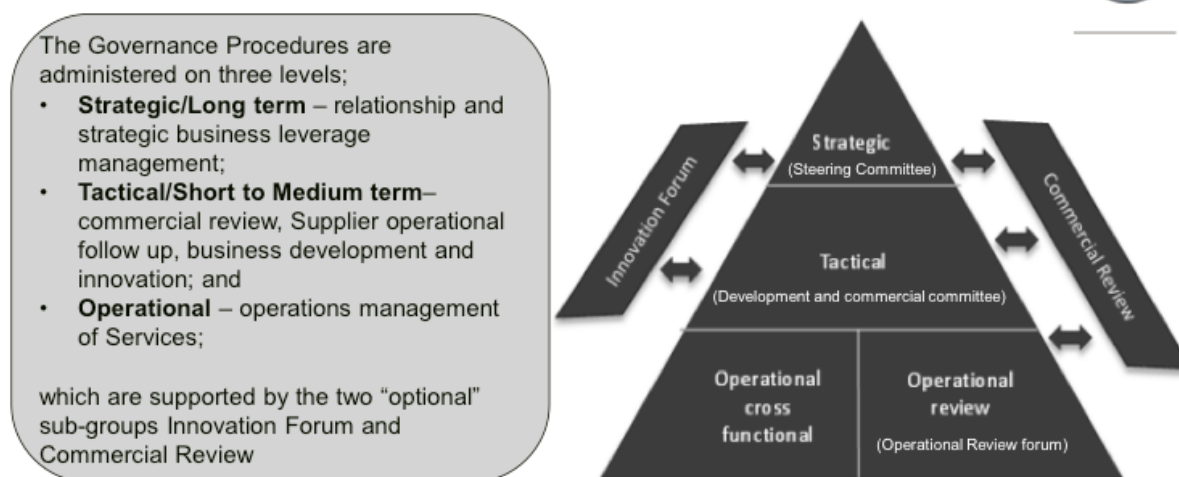


Figure 35 Volvo Cars' strategy for different suppliers

Regarding the alignment of the strategy Volvo Cars has identified a problem related to the Swedish culture. People do not always follow decisions even though they are made at official meetings and everyone has agreed upon them. In Sweden there is a high acceptance for questioning management decision. But they have no cultural issues with Asian suppliers. (Interviewee 7, 8)

Volvo Cars has a clear process of how to align their strategy throughout the different management levels. At the strategic level decisions are made for long-term relationships and which direction Volvo Cars should move in. The tactical level contains the decision about development and short-term objectives. The last level is the operational, where the strategy is executed by cross-functional teams and evaluated. The alignment strategy is illustrated in Figure 36 Volvo Cars' strategy alignment, and should be aligned in all supplier contracts and relationships. (Interviewee 5, 6)



The model may vary depending on agreement

Figure 36 Volvo Cars' strategy alignment

#### 4.4.5.3 Trust and Power

Volvo Cars values trust highly and that is the reason why it has become one of the twelve categories for the VQE. They are dependent on their suppliers because a stop in the production is extremely costly. One new car is produced every 16 seconds. Volvo Cars emphasizes two-way confidence in a relationship, both sides must trust each other.

Power is used frequently when buying items for production. Because of the mass production, that they buy many articles and the power in the brand they have power to put pressure on their suppliers. An example of this is the penalties. Volvo Cars has a zero tolerance to failures and poor quality and fees are issued immediately. This can be hard to handle for a small supplier but also a useful tool for Volvo Cars to communicate a clear message of a zero vision. The brand of Volvo Cars also implies good quality for the supplier to have in their customer portfolio. (Interviewee 7, 8)

#### **4.4.6 Outcome**

Volvo Cars has achieved a lot through supplier development, foremost a better relationship between them and the suppliers through clear communication and distinct requirements. The right contact at the right level has developed the alignment of Volvo Cars' cooperate strategy. The most interesting is the increased financial result. The IT department has, only after a couple of months, seen financial gains but they are hard to measure in exact numbers. Through dedicated persons working and having the responsibility on a higher management level a holistic perspective has been established. This holistic perspective has given Volvo Cars a better negotiation position and by that saved a lot of money. (Interviewee 5, 6) Quality is another good source to decrease costs.

The incentives for a supplier to have Volvo Cars as a customer is the ability to development. They help their supplier with for example, mapping their processes and improvement areas. Internally at Volvo Cars the supplier development work has structured the internal processes, foremost the escalation process.

#### **4.4.7 Reactive or Proactive Supplier Development**

Volvo Cars answer that they are reactive when the question was asked direct to them. The reason why they do not see their supplier development efforts as proactive is because they still have a lot more they can improve to become more proactive.

## 4.5 TKMS AB

TKMS is a global company with production in Sweden. TKMS' production is very different compared to other companies in the industry, and in this project, since they have a project-based production. A project, from development to production, of one product takes approximately fifteen years. Another thing that distinguish TKMS from others is that they operate in the military industry.

The supplier base includes 4700 suppliers. The number is misleading since many of the suppliers are not active. Approximately 1500 suppliers are active and the remaining suppliers are needed for spare parts. The products last for 20-30 years, which is the reason why the supplier base is large. 100 of the active suppliers are strategic suppliers. The purchasing department, which includes four sections, is responsible for the suppliers. The sections are supplier quality engineering, SQE, strategic purchasing, project management and a section for transport, import and export.

### 4.5.1 Form

TKMS filled in this form after the case interviews.

**Table 13 Answers to the form by TKMS**

<b>Supplier development activities</b>	Yes	No
Investment in equipment or capital in the supplier's organization	X	
Provide competition between existing suppliers through multiple sourcing	X	
Evaluate suppliers' performance for example with supplier audits	X	
Use of supplier certification program	X	
Increase supplier performance expectations	X	
Supplier recognition through awards		X
Any type of "black list"/"flop list" of suppliers with undesired performance	X	
Promise increased present and future business if a supplier improve performance		X
Site visit to the supplier	X	
Visit to the focal company by the supplier's representatives	X	
Education and training of suppliers' personnel	X	
Temporary exchange personal between the supplier and the focal company		X
Direct investments in a supplier		X
Investments in supplier's operations		X
Try to implement a philosophy of continuous improvement at the supplier	X	

### 4.5.2 Objectives

TKMS' objective with supplier development is to decrease costs at the supplier so that they can increase their profit and together with TKMS last through the project. TKMS aims for mutual prosperity where both parties get their share from the increased performance. To do this TKMS need to understand their suppliers. Specific objectives are to increase quality of incoming goods and increase delivery accuracy.

TKMS has a close collaboration with strategic suppliers even before they deliver a commodity. Short-term objectives for this process are decided along the way. The purchasing department is responsible for the supplier relationship. Hence they should assure that the objectives are reached. The largest achievements have been seen between two projects.



### 4.5.3 Activities and Tools

TKMS works cross-functional over different projects visualized in Figure 37 Organization chart for projects at TKMS. For example the purchasing department is one function that works with different projects at the same time and they also have project management as one section in their department. One project is constructed around one product.

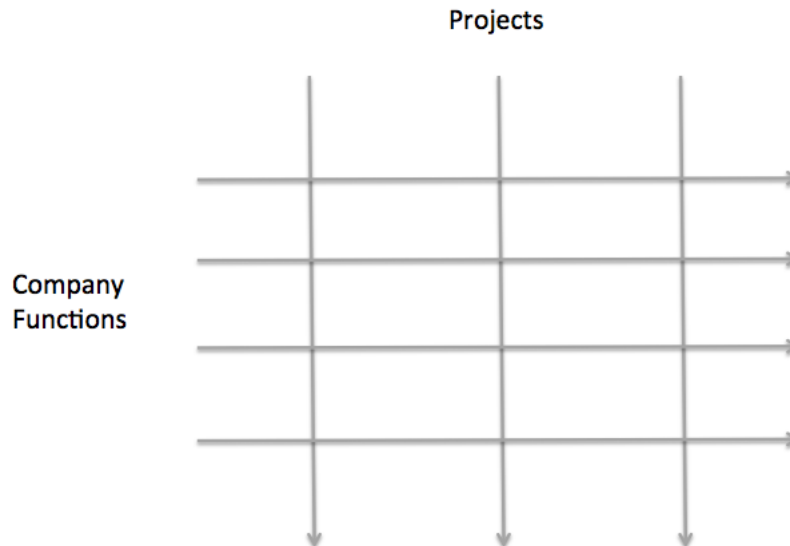


Figure 37 Organization chart for projects at TKMS

If problems occur with a supplier a person from TKMS visits the supplier to analyze and identify the problem. The person visiting the supplier varies from different cases depending on the problem. It can for example be a technician or a supplier quality engineer. Problems that lead to this development activity is for example quality problems, low OTD, legislative requirements or CSR that are not fulfilled. After the analysis at the supplier, strategic purchasing investigates if it is worth to dedicate resources to develop the supplier.

TKMS works close with their strategic suppliers even before they have delivered the commodities. They have meetings several times during the suppliers manufacturing process and generate milestones along the way for the supplier and mutual collaboration. They can also pay the supplier a partial sum of their payment during the manufacturing process when they reach the milestones. This is because it is very important for TKMS to facilitate, economically, for the supplier so that they can continue their business. Other things TKMS does to facilitate is to place smaller orders several times instead of one big order in the end, even though the commodities are needed in the end. For example if TKMS needs five motors to assemble in their product at the same time they order one at a time during a longer period so that the supplier can handle the big order.

TKMS simplifies the work for their suppliers but sometimes they are dependent on help from their suppliers as well. For example if a propeller breaks at a customer to TKMS they need their supplier to replace or repair this urgently. Thus TKMS needs to have mature relationships with their suppliers and stable contracts. Contracts are something TKMS works a lot with in supplier relations. Every employee needs to be aware of laws and contracts. Because of the long project lead times good contracts are essential for a good relationships and progress in the project.

Self-assessment for suppliers is a project TKMS recently initiated. The assessment forms are at TKMS webpage (TKMS AB, 2014). They have not started to use it yet but they are developing it. Suppliers are supposed to evaluate themselves at TKMS webpage with questions TKMS has elaborated. The purpose with the questions is to discover issues early so they can be solved before

they make an impact. Suppliers are expected to answer the questions frequently so that new issues can be detected.

#### **4.5.4 KPI**

TKMS measures their suppliers on the quality of the commodities delivered, delivery accuracy, correct material delivered and confirmed orders. The quality metrics are affected by the impact on TKMS' business.

Regarding quality TKMS has a specific system required from their customer. It is a quality system and guarantee from USA called Sub Safe. Everything connected to the product's ability to float and not leak, together with the ability to go up to the surface is included in Sub Safe. Special requirements are stated especially for traceability down to structure, composition and quality in handcraft of every component. If a supplier is going to install something in the boat concerning this they have to go TKMS' education.

#### **4.5.5 Success Factors**

##### **4.5.5.1 Mindset**

Because of the extremely long lead times in TKMS' production they need suppliers who last for the whole project and do not risk going bankruptcy during the period. Thus it is very important for TKMS to make sure both they and their suppliers are making profit on their business. Therefore TKMS has a distinct mindset of creating a win-win situation for both suppliers and TKMS. This enables a sustainable development process and the companies can grow together. They focus on enabling high performance from their suppliers by facilitating their processes for the suppliers.

##### **4.5.5.2 Information Sharing**

The internal communication has improved lately at TKMS. The employees are more open and talk about the suppliers internally and elucidate which of the suppliers are good and which are below the desired level. TKMS also works with information from earlier projects and try to learn from them.

It is important for TKMS to provide their suppliers with forecasts. Initially in a project the forecasts are unstable and unsure but while the project precedes the forecasts get more certain. Another factor TKMS needs to consider is to share information of future business with their suppliers so they do not forget TKMS while the collaboration is passive. This is hard to predict but TKMS needs to work with it. TKMS also needs to have much information about the supplier's business. For example they need to know when the suppliers have other customers' demand to fulfill so that TKMS can place their orders when it is suitable, which facilitate the suppliers operations.

The technical specification is very important because it affects the outcome of the product. TKMS is clear with their suppliers of what they require in the technical aspect. Feedback on the suppliers' performance is given at frequently meetings. TKMS divide their suppliers into groups according to the Kraljic's matrix. The strategic suppliers have meetings at least every quarter, but sometimes every week, depending on where in the process they are. The non-strategic suppliers also receive feedback from TKMS when a meeting is held but this is not as frequently as for strategic suppliers.

##### **4.5.5.3 Trust and Power**

Trust is something TKMS works a lot with in their supplier relationships. They build commitment through trust by working with long-term relationships. Both the supplier and TKMS need to gain profit in the business. One of the most fundamental ways of creating trust is, according to TKMS, that they pay their suppliers on time. If TKMS is not contributing with their part of the contract why should the supplier do so? They also increase trust by being open and honest about their forecasts.

TKMS expresses that they have to manage their power wisely. If they push their suppliers too much it will eventually be negative for TKMS. The brand is powerful which can be an advantage both for TKMS and their suppliers. A supplier who is chosen for a new project has also secured demand from a customer for many years.

To work with the military industry can both be an advantage for a supplier since it is a lucrative and a tough business, which requires reliable products. Other customers understand that a supplier to these kinds of products needs to have quality commodities. On the other hand it is an ethical aspect to work with military products, which not every company prefers.

When a supplier has developed successfully with help from TKMS they expect to renegotiate the price of the commodities. The reason for this is that TKMS needs to gain something since they have invested in the development process. Not only the supplier but also TKMS should gain from the collaboration and cut their costs.

#### **4.5.6 Outcome**

When the suppliers understand TKMS' requirements they have improved the quality and on-time delivery. Clear objectives from TKMS also generate better performance from the suppliers and TKMS have saved time on administrative work when the correct commodities are delivered at the accurate time. These improvements also reflect on external quality for TKMS' customers. They receive better products at the correct time and to the right price.

#### **4.5.7 Reactive or Proactive Supplier Development**

TKMS claims that they are more reactive than proactive in their supplier development efforts. They explain that they can improve a lot within the area. For example they express that they could have more specific supplier development programs and benchmark suppliers. However they also express that it is different and more difficult for them since they do not have mass production but work in projects. The self-assessment for suppliers is something they think would make them more proactive in their supplier development efforts but it still awaits implementation.

## **4.6 Summary of the Empirical Study**

Even though the empirical study is based on the literature review there are some subjects that was mentioned during the case study, which is not stated in the literature. An example is the issue ABB Robotics brought up with cultural barriers between them and their Asian suppliers. This was therefore discussed with the other cases to understand if they have the same issues or how they solve that. Quality tools was not included in the Frame of References but was also discussed during the interviews. The quality tools are used to develop suppliers.

Another major subject, which was discussed with each case, was trust and power. This subject is not discussed a lot in theory related to supplier development but the importance of the subject increased during the case study.

## 5 Analysis

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*First in this chapter is a cross-case analysis made based on the data gathered in the empirics. The cases have been compared to each other to find differences and similarities. The findings are then compared with theory from the chapter Frame of References combined with a general analysis. The chapter continues with an in-depth analysis of what a reactive compared to a proactive approach is in the different factors and the case companies are evaluated. A specific analysis of ABB Robotics is executed in the aspect of being reactive or proactive within supplier development as well as a holistic summary. All case companies are also compared to each other in the perspective of being proactive in supplier development.*

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The analysis is based on the factors stated in the first introduction chapter, Objectives, Activities, KPI, Success Factors and Outcome, stated in the first introduction chapter. They are repeated and reinforced in the Frame of References because of their importance in supplier development.

In the sections below a table has been established for each factor to enable a cross-case analysis. The similarities and differences were found through systematic pattern matching between the cases and are presented below the table.

The sub factors, each row in the tables, have been based on the interview protocol, which can be found in the frame of reference chapter. Some sub factors comes from findings during the interviews. The cases, and data gathered during the case study vary which is normal for a qualitative study. Some findings were only discussed with one or a few cases but are still valuable for the subject, thereby added to the table. The comparison with the frame of reference is connected with the findings from the cross-case analysis. Analysis of each factor is also used for building explanations.

After each interview the interviewees were asked to answer a short form about their supplier development activities. The summarized result from this form is presented before the factors.

This chapter has three different parts:

- Cross-case analysis of each factor
- Findings from the cross-case analysis compared to the Frame of References
- Reactive and proactive comparison of approaches
  - What is stated as reactive compared to proactive efforts in respectively factor and how is ABB Robotics performing in those
  - Benchmark of ABB Robotics amongst other case companies

## 5.1 Cross-Case Analysis: Form

Table 14 Summary of the answers to the form handed to each case company

Supplier development activities	Yes	No
Investment in equipment or capital in the supplier's organization	R, M, A, T	V
Provide competition between existing suppliers through multiple sourcing	R, M, A, V, T	
Evaluate suppliers' performance for example with supplier audits	R, M, A, V, T	
Use of supplier certification program	R, M, V, T	A
Increase supplier performance expectations	R, M, A, V, T	
Supplier recognition through awards	A, V	R, M, T
Any type of "black list"/"flop list" of suppliers with undesired performance	R, M, V, T, A	
Promise increased present and future business if a supplier improve performance	M	R, A, V, T
Site visit to the supplier	R, M, A, V, T	
Visit to the focal company by the supplier's representatives	R, M, A, V, T	
Education and training of suppliers' personnel	M, V, T	R, A
Temporary exchange personal between the supplier and the focal company		R, M, A, V, T
Direct investments in a supplier		R, M, A, V, T
Investments in supplier's operations		R, M, A, V, T
Try to implement a philosophy of continuous improvement at the supplier	M, A, V, T	R

R = ABB Robotics
M = LV Motors
A = Alfa Laval
T = TKMS
V = Volvo Cars

As shown in the summarized Table 14, the case companies answers do not differ much, which gives a solid picture of how companies work with supplier development. They all foster competition between existing suppliers through multiple sourcing and evaluate suppliers' performance. Though ABB Robotics comment that they should evaluate suppliers to a greater extent. Each company also increases supplier performance expectations, have site visits to the suppliers and arrange visits for suppliers' representatives to their company. However ABB Robotics comment on the visits that they occur frequently but there is no clear guideline, for the whole supplier base, of how often this should be done. The companies do not temporally exchange personal between the supplier and them self; they neither invest direct in the supplier or in their operations.

The two activities that vary most between the case companies are "Supplier recognition through awards " and "Education and training of suppliers' personnel". Alfa Laval and Volvo Cars are the only companies using recognition through awards for their suppliers. However Alfa Laval comments that they only have awards for their Asian suppliers and for Europe Alfa Laval has a top 10 list. Education is an activity all companies but ABB Robotics and Alfa Laval perform. ABB Robotics has had education for suppliers in ABB Robotics' requirements and processes. A reintroduction of this education has been discussed. Alfa Laval also comments on education. It has

occurred but it is not a norm. They believe that education is an important part of developing the supplier and build trust and understanding.

There are other activities where one company differs from the others. Volvo Cars is the only company that does not invest in equipment or capital in the suppliers' organization. Alfa Laval was the only company that crossed no for supplier certification programs but they comment that they have it to some extent in Asia. They are also the only company not using a black or flop list. A reason for that could be that they prioritize the relationship with the suppliers and that it is not a way to solve problems. ABB LV Motors is the only case company that promises increased business if a supplier improves their performance. Finally ABB Robotics is the only one that does not try to implement a philosophy of continuous improvement at their suppliers according to their answers in the form. But at the interviews it was mentioned that ABB Robotics tries to implement 4Q or 8D at their suppliers. This indicates that they try to implement continuous improvements.

## 5.2 Cross-Case Analysis: Objectives

Table 15 is a table of the five case companies comments about their objective regarding supplier development.

**Table 15** Cross-case analysis: objectives

OBJECTIVES	ABB Robotics	ABB LV Motors	Alfa Laval	Volvo Cars	TKMS
<b>Type of objectives</b>	Increased OTD and PPM.	OTD 98%, 99,5 % defect free products.	DOT 96%, PQ 98%.	The factors in VQE.	Quality and timely delivery.
<b>Long-term</b>	The supplier base should ensure material without quality defects to the lowest total cost.	The main objective is to create efficient, effective and reliable purchasing procedures.	Different goal depending on time horizon. Also shifting within each project i.e. quality or capacity.	Get as many VQE awarded suppliers as possible.	Decrease costs at the supplier so that they can increase their profit and last together with TKMS through the project and for future business.
<b>Short-term</b>	Firefighting.	Minimize the supplier base. Fire fighting.	Different in each SD project. Fire fighting.	Decrease the amount of time it takes to solve a problem.	Decided during the project, related to the payment plan
<b>Frequency of increasing objectives</b>	Yearly.	Not discussed.	Yearly.	PPM increased yearly with 10%, rest manually.	For each new project.

A similarity found between the case companies is which type of objectives they use. They all had goals related to their KPIs and all of them measured on-time delivery and quality. The answers about objectives look similar to the answers regarding measurements, supplier KPI. This is because the interview protocol is based on literature and the expected answers for questions regarding objectives differed from the real result.

Regarding long-term objectives all companies have defined goals. To summarize them the overall objective is to improve the supplier base, which means ensure material in right time with right quality to a correct price. Volvo Cars differ from the others because they aim for as many self-driven suppliers as possible, which they will create by increasing the number of VQE awarded

suppliers. Since Volvo Cars requires a high level of 12 parameters in the VQE it results in very self-driven suppliers compared to the other companies that only have two parameters.

An interesting finding is that only Volvo Cars has defined a specific short-term objective. The objective is to shorten the time for solving problems. The other case companies only have different types of firefighting as short-term objective. Firefighting objectives are often not outspoken and means that the most severe problems get most attention at the time. Focus is on managing crises and urgent problems.

ABB Robotics, Alfa Laval and Volvo Cars all increase the objectives on a yearly basis. TKMS' operation is different from the others therefore a yearly automatic increase is not possible. They set new objectives for every new project with experience from previous projects instead.



### 5.3 Cross-Case Analysis: Activities

Table 16 represents the finding about some activities, related to supplier development, that are conducted at each company. The four first sub factors were discussed in theory and the two last were discussed during the interviews and were relevant for the subject.

**Table 16 Cross-case analysis: activities**

ACTIVITIES	ABB Robotics	ABB LV Motors	Alfa Laval	Volvo Cars	TKMS
<b>Suppliers selected for development (drivers)</b>	Suppliers who do not reach desirable performance levels are developed.	Strategic Supplier Partnership Process, they pyramid, Figure 29	Poor material quality or new suppliers often initiate a supplier development project.	Suppliers who perform below desired level in VQE.	Quality problems, low OTD, legislative requirements or CSR that are not fulfilled.
<b>Initiate phase of the development process</b>	No clear strategy yet.	Ensure internally that the supplier causes the problem. ABB LV Motors makes a 4Q analysis of the supplier. The supplier is required to do their own 4Q and then they are compared.	Decision about development made at the handshake process then a cross-functional project team is constructed together with the supplier.	Not discussed.	Analyze and identify problems by a visit at the supplier. Then strategic purchasing investigates if it is worth to develop the supplier.
<b>Decision of what area to improve</b>	After a 4Q or 8D.	Dependent on the result of the two 4Q analyses.	Cross-functional team, PIM	VQE, (described in section 4.4.3)	Not discussed.
<b>Dividing suppliers</b>	Use Kraljic's matrix and other evaluation tools to categorize suppliers.	Kraljic's matrix is used and the supplier groups are distributed on the four operational purchasers.	Only separates key strategic suppliers from others but want to use Kraljic's matrix to get more categorize.	Not discussed. However some distribution is used to separate suppliers depending on how important they are.	Use Kraljic's matrix.
<b>Supplier reduction</b>	Yes.	Reduce the number of suppliers but keep dual sourcing.	Reducing the number of suppliers to a more manageable number.	Reduce to fewer suppliers with more orders.	Not discussed.
<b>Tools and methods used</b>	4Q, 8D, APQP and Flop 10.	SSPP pyramid, 4Q, supplier guide, lessons learned.	Lean, Six Sigma, DMAIC, value stream mapping, 5S.	House of Quality, TQM, 8D, DMAIC, APQP, SEP, PPAP, VQE, penalties, lessons learned and continuous improvements.	Not discussed.

Drivers to initiate supplier development with a supplier where undesirable low performance from important suppliers. Typical driver could be quality and OTD.

In the initiate phase of supplier development all companies execute some kind of analysis of the supplier. It differs if they involve the supplier immediately in the analysis or if they do their own analysis first. ABB LV Motors and Alfa Laval distinguish from the others because they mentioned an internal analysis, which they perform to identify if they or the supplier is the cause to the problem. This is executed before the analysis of the supplier. At all the companies the supplier analysis is what leads to the decision regarding what area to improve. They use tools like 4Q, 8D, DMAIC and VQE for this.

All companies, besides TKMS where no tools were discussed, use quality tools and methods for their supplier development work. They all use 4Q, 8D or DMAIC, which are very similar methods. Volvo Cars and ABB LV Motors both have a database for lessons learned. Volvo Cars is the company that mentions most different tools and methods they use. Alfa Laval is the only case company mentioning value stream mapping and 5S and ABB LV Motors is unique with their SSPP-pyramid and their supplier guide for requirements.

When it comes to dividing suppliers into groups, the Kraljic's matrix (Kraljic, 1983) was mentioned frequently during the case study. ABB Robotics, ABB LV Motors and TKMS use the matrix to divide their suppliers. Volvo Cars did not mention Kraljic but they divide their suppliers dependent on how important they are. Alfa Laval only separates their key strategic suppliers from the rest but they want to introduce the Kraljic's matrix for their whole supplier base. Four of the case companies; ABB Robotics, ABB LV Motors, Alfa Laval and Volvo Cars, mention that they want to reduce their supplier base.

TKMS differ a lot from the other companies since they are working in a very different way with lead times of 15 years for one product. Therefore they also work differently with supplier development. They have to collaborate with their supplier before they deliver the products to assure quality and on-time delivery. They also try to facilitate for the supplier so that they can manage high performance. Hence they need to understand the supplier and their business. This is something ABB LV Motors also works with. Another thing that distinguish TKMS is that they are the only company that mentions contracts, which is very important for them. Supplier self-assessment is also something TKMS is unique with. The supplier can do a self-assessment through filling in forms TKMS has established to see how well they perform or if they fulfill TKMS requirements.

## 5.4 Cross-Case Analysis: KPIs

Table 17 contains answers from the case companies regarding the performance measurements. All of the companies had additional information to share regarding this factor, which has been presented in the last sub factor.

**Table 17 Cross-case analysis: KPIs**

SUPPLIER KPIs	ABB Robotics	ABB LV Motors	Alfa Laval	Volvo Cars	TKMS
<b>What metrics are used</b>	OTD, PPM and risk.	OTD and quality. The quality measures claims to be unfair.	PQ =Product Quality. DOT=Delivery On Time, with a window of - 10/0 days.	Twelve metrics from VQE. The most crucial is PPM, manufacturing assessment and time for solving problems.	Quality of the products. Delivery accuracy.
<b>Feedback</b>	Through ASCC, the supplier web. Meetings with the supplier.	ASCC supplier web. Meetings with the supplier.	At monthly meetings. Not mentioned any supplier web.	Supplier Web where they can monitor VQE and other data. Updated daily. Meetings.	A supplier web under construction. Meetings with the supplier.
<b>Alignment with the company's KPI</b>	Yes, they are aligned and the same.	Yes, they are aligned and the same.	Yes, they are aligned and the same.	Not discussed.	Quality is aligned and crucial for the product.
<b>Specific comments about KPI</b>	Would like to have measure related to how they affect the production. Unfair measurement process for the KPIs.	Unfair quality measures and because of that not so high emphasis on this KPI.	Would like to have measure related to how they affect the production.	Some KPIs need to be more important than others of the twelve in VQE. Measures soft values like trust.	Individual measures depending on the product.

As mentioned in the section about objectives all case companies measure some quality and on time delivery somehow. Today the companies use their KPIs as objectives. Volvo Cars were the only one with more than three KPIs and the major difference is that they also measure soft values like trust. Volvo Cars also had an interesting KPI, time for solving a problem, which they were alone with.

ABB Robotics has according to internal documents a KPI called risk, due to delimitation is this not further investigated. Risk is also something not mentioned by the operational level.

Supplier webs were the most common way, except for TKMS, for suppliers to get feedback on their performance. The supplier webs were complemented with meetings at all case companies. All companies also use the same supplier performance measures as they measured their internal performance on.

A desire to introduce a measurement, which gave a picture of how a problem effected production were brought up by most of the companies. A majority of the companies expressed that the quality measures were unfair and did not give the right picture. The unfairness, especially regarding PPM, is because it often gives the wrong impression of which supplier that is not performing on a desired level and how much the production is affected. For example a supplier providing the production with five crucial items per year this has a huge impact on the production if there is a quality defect. A supplier selling thousands of standard screws, which easily can be replaced, does not affect the production as much.

## 5.5 Cross-Case Analysis For Success Factors

In this section the three different factors regarding success for supplier development is presented. Those are mindset regarding the supplier development, information sharing (divided in to internal and external information sharing) and finally trust and power.

### 5.5.1 Cross-Case Analysis: Mindset

Mindset in this project is defined as the company's holistic perspective regarding supplier development. Table 18 presents the different companies mindsets regarding supplier development.

**Table 18 Cross-casse analysis: mindset**

MINDSET	ABB Robotics	ABB LV Motors	Alfa Laval	Volvo Cars	TKMS
<b>Mindset</b>	It is not clear since there is no structured way of managing supplier development. The expectations for SD are to increase supplier performance in OTD and PPM.	Partnership through long-term relationships with strategic suppliers. Their suppliers are an extension of their own company, which is why they work together to develop them.	Alfa Laval want suppliers who need to develop so they can negotiate a low price and the supplier receive help with development as a part of the arrangement. Trust, good communication and commitment are what they build relationships on.	Customer expectations in focus. <ul style="list-style-type: none"> <li>• Quality</li> <li>• Healthy working conditions</li> <li>• Environmental responsibility</li> <li>• Resolution speed <ul style="list-style-type: none"> <li>• FMEA</li> </ul> </li> </ul>	Creating a win-win situation for both supplier and TKMS. Facilitate their processes for the suppliers to enable high performance.

The mindset and focus for the supplier development efforts vary much between the companies. One similarity between ABB LV Motors, Alfa Laval and TKMS is that they all discuss a relationship and focus on both them and their suppliers. ABB Robotics only focus on internal benefits while Volvo Cars goes one step further and focus on the real customer and their expectations.

### 5.5.2 Cross-Case Analysis: Information Sharing

Information sharing is divided into two parts; internal and external. Internal in this context is information sharing and communication within the buying company. External information sharing is the information exchanged between the buying and the supplying company. Table 19 contains internal information sharing and Table 20, contains external table and finding.

### 5.5.2.1 Cross-Case Analysis: Internal Information Sharing

Table 19 Cross-Case Analysis: Internal information Sharing

INTERNAL INFO SHARING	ABB Robotics	ABB LV Motors	Alfa Laval	Volvo Cars	TKMS
<b>Cross-functional teams</b>	Purchasing teams for each supplier, including one person from each section; strategic purchasing, operational purchasing and supplier quality.	Have initiated cross-functional commodity teams including strategic and operational purchasing.	Always cross-functional teams for supplier development projects. Not permanent teams. They include for example production, quality and purchasing.	Permanent workshop teams who travel to different suppliers and arrange workshops. Cross-functional teams are important in the planning process and engagement process for supplier development.	They work cross-functional over the projects.
<b>Internal communication</b>	Open landscape and easy to talk to others at the purchasing department.	The purchasing departments are located closely and communicate frequently.	Meetings have simplified communication. Good communication during projects. But they still see improvement areas.	Not discussed.	Increased. More open about suppliers' performance.
<b>Aligned internal objectives</b>	Not aligned objectives between the sections at the purchasing department.	Historically the purchasing departments have different objectives, which lead to misalignment within the company. The commodity teams are a way to align the departments.	Historically not aligned, which led to the sourcing strategy plan and internal education after help from an expert in supplier development and continuous improvements.	Not discussed.	Not discussed.
<b>Escalation process</b>	A clear structure but not defined responsibilities at each level.	Not discussed.	Internal process for escalation of supplier issues through meetings at different management levels.	Clear escalation process internally.	Not discussed.
<b>Dedicated supplier developer</b>	No aligned opinion about introducing a dedicated supplier developer.	One dedicated person for supplier development.	Two dedicate persons for the holistic view and to coordinate the supplier development work.	Have many functions dedicated to supplier development. 230 employees at supplier quality management.	None.

Shown in Table 19 all companies work in cross-functional teams but in different ways. ABB Robotics and ABB LV Motors arrange their teams according to commodities and suppliers while Alfa Laval and TKMS arrange teams for each new development project. For TKMS this means more permanent teams since their projects last for long periods (typically more than 15 years). Volvo Cars have their permanent workshop teams and cross-functional teams for planning the supplier development work. ABB LV Motors only includes purchasing in their teams while ABB Robotics also includes quality and Alfa Laval often includes the production as well. R&D is excluded in this research project and therefore not discussed with the case companies. Hence it is not known if design is included in the cross-functional teams.

All the case companies besides Volvo Cars, where this was not discussed, have simplified their internal communication. At ABB Robotics and ABB LV Motors the daily communication is simplified by close location of the involved departments and at Alfa Laval this was done by frequently structured meetings.

The complexity of the internal alignment of objectives for the involved department has been brought up at three of the companies. Examples of the misalignment is that strategic purchasing wants lowest possible purchasing price while supplier quality wants high quality and operational purchasing wants reliable delivery and good service, which often increase the purchasing price. ABB Robotics, ABB LV Motors and Alfa Laval argue that it complicates the work. ABB LV Motors has initiated cross-functional work between operational and strategic purchasing to minimize this issue. ABB Robotics already has these teams but still complain about the misalignment. Alfa Laval developed their new sourcing strategy to encounter this problem.

ABB Robotics has an escalation process for supplier issues but it does not work desirably because of the poor definition of responsibilities at each level. A clear structure is something Alfa Laval and Volvo Cars have developed during their supplier development efforts.

To have a dedicated person for supplier development or not was discussed with the case companies. Alfa Laval and ABB Motors established their supplier development strategy most recently, less than five years ago. One of the first things they did was to hire a dedicated person to structure the whole sourcing strategy from a supplier development perspective. This has given the subject a large focus and also great outcomes. TKMS has no dedicated person but they have the supplier development more integrated in all functions. This is needed because they work in timely projects. At Volvo Cars they have several functions working only with supplier development, for example their Lean Deployment team, which is a workshop team for suppliers. The Supplier Quality Management department at Volvo Cars, which are responsible for all supplier development activities, are 230 employees.

### 5.5.2.2 Cross-Case Analysis: External Information Sharing

This table contains the external information sharing and communication between buying and supplying companies.

**Table 20** Cross-case analysis external info sharing

<b>EXTERNAL INFO SHARING</b>	<b>ABB Robotics</b>	<b>ABB LV Motors</b>	<b>Alfa Laval</b>	<b>Volvo Cars</b>	<b>TKMS</b>
<b>Information shared with the suppliers</b>	OTD, PPM, stock levels and forecasts at the supplier web, ASCC. And feedback is also given at meetings with the suppliers.	OTD, PPM and stock levels at the supplier web, ASCC. And feedback is also given at meetings with the suppliers. Clear requirements in the supplier guide.	Goals and current state of the supplier's performance at the supplier web. At supplier meetings they discuss new forecasts, open claims and it is an opportunity to escalate problems. Feedback to the suppliers is also given.	Forecasts and the performance in all the twelve categories of VQE, through a supplier website. And feedback at meetings.	The forecast and technical requirements are very important. Feedback on the suppliers' performance is given at frequently meetings. Need to have much information about the supplier's business to facilitate for them.
<b>Frequency of information sharing</b>	ASCC is updated daily. Operational purchasers responsibility that the suppliers check ASCC at least once a week and inform if there are any issues. Meetings are held often but frequency ad hoc.	ASCC is updated daily. Feedback is given at meetings with suppliers. Frequency depends on what supplier and their performance level (weekly, monthly or for new projects).	Dependent on what supplier it is, a strategic or not. Current performance state available at the supplier web. More information shared during the monthly meetings with strategic suppliers.	The supplier web is updated daily. Dependent on what supplier it is meetings are held. Strategic suppliers have meetings with all levels at Volvo Cars, which makes it more frequently. Non-critical suppliers do only meet the lowest levels, which make it less frequently. Showed in the pyramid in Figure 35.	The strategic suppliers have meetings at least every quarter, but sometimes every week, depending on where in the process they are.
<b>Culture barriers</b>	Culture and language differences, which generate problems with Chinese suppliers.	No cultural or communication issues with Asia. They have local units visiting the supplier and generate suitable processes. The only issue is long lead times.	Only problem with Asian suppliers is the lead times. Local units simplify the relationships.	No issues with Asian supplier because of culture. Issues with the Swedish culture because people do not always do what is decided.	Not discussed.

Each company except TKMS has a supplier web with current performance parameters for the suppliers. They give more feedback to their suppliers during meetings with them. ABB LV Motors differ a bit from the other case companies by being the only company that does not share their forecast with their suppliers yet. They also differ because they share their supplier requirements clearly in the supplier guide. TKMS is also different from the others; they emphasize that they need to have much information about the supplier's business to facilitate for them. Volvo distinguishes from the other companies because they share much more information with their suppliers through the supplier web. They have current information on supplier performance for the twelve categories of the VQE.

Similarities when it comes to frequency of information shared with the suppliers, is that all companies update their supplier web daily. They also have frequent meetings with their suppliers and how often this occurs depends on how important the supplier is and how they perform. ABB Robotics does not have any formal guideline for how often they should have meetings with the supplier in their supplier base. ABB LV Motors has meetings when new projects are started and if the performance is very low they can have monthly or even weekly meetings. They have one category of suppliers for each operational purchaser. This means that the operational purchaser for the few strategic suppliers has more time for them than the operational purchaser who manages non-critical suppliers. Hence strategic suppliers automatically get more attention. Alfa Laval has monthly meetings with strategic suppliers and TKMS has meetings at least every quarter. Volvo Cars' suppliers meet different management levels dependent on how important the supplier is. A non-critical supplier only meets the lowest level which makes meetings less frequent while strategic suppliers get to meet all the levels and therefore the meetings are more frequent.

Asian cultural barriers were discussed with all companies except TKMS. Only ABB Robotics mentioned issues regarding cultural and language differences. ABB LV Motors and Alfa Laval only have significant issues with long lead times and time zones and Volvo Cars express that the Swedish culture is more of an issue.



### 5.5.3 Cross-Case Analysis: Trust and Power

In this table the findings regarding trust and power in the content of supplier development and the relation between the buying and supplying company is presented.

**Table 21 Cross-case analysis: trust and power**

<b>TRUST &amp; POWER</b>	<b>ABB Robotics</b>	<b>ABB LV Motors</b>	<b>Alfa Laval</b>	<b>Volvo Cars</b>	<b>TKMS</b>
<b>Trust</b>	Some suppliers have lack of trust in ABB Robotics because of incorrect forecasts and late payments.	Want to build long-term relationships with trust. Promises future business if supplier performance improves.	Relationship based SD. Trust is highly valued in a long-term relationship.	Highly valued and one of the 12 factors in the VQE.	Highly dependent on their suppliers and thereby trust is vital. It is essential that both the supplier and TKMS make profit on the business to be able to have a sustainable future.
<b>How to create trust</b>	Good communication both internally and externally.	Creates trust through understanding of both ABB LV Motors' and the supplier's business and interface. Also through joint development and clear requirements.	Common development projects are the most efficient way. Deeper understandings between the companies are achieved through this. Humbleness is also important.	Both sides must have faith and trust in each other.	Pay the suppliers in time. Working in long-term relationship.
<b>Power</b>	Uses power of the brand in price negotiation.	Not using power to force development but in some cases in multiple sourcing to increase competition.	No strategy of using power since Alfa Laval believes it damages the trust. But in some situations are the brand an inevitable power source.	Frequently used. The large volumes Volvo purchases mean a lot to the suppliers as well as having customer in the automotive industry. The penalty system is also a type of power statement.	Must be handled wisely. The military industries can be seen as both a high quality standard but also stand in conflict with ethics in the supplier company.
<b>Renegotiation of price after SD</b>	Yes that is something they expect.	Not connected to their SD strategy. Strategic purchasing are the ones negotiation the price but those are not involved in the SD.	No aim to renegotiate the prices. Often contract of equally sharing the risk and profit. Some countries want a higher price after SD.	Not discussed.	Yes, this is the incentive of starting a development program and put effort in the supplier.

All of the case companies expressed that trust is more important than power. Trust is a vital factor when working with strategic suppliers or single source suppliers where a dependency relation exists.

Trust can according to ABB Robotics, ABB LV Motors and Alfa Laval be created through clear communication and common projects where understanding for each other's business can grow. TKMS mentioned a simple factor essential in creating trust; pay the supplier in time.

All companies use multiple sourcing in some way, which indicates that power is used. In this context power is defined as the negotiation power occurring when several alternatives are similar in the bidding. The power of the brand was a factor used more or less by all of the companies. Volvo is the one company using power most frequently. The power of the brand is an inevitable factor for all the case companies since they are considered good brands and stand for high quality and technical expertise.

When discussing renegotiation after successful supplier development, TKMS and ABB Robotics were the only companies expecting this. Alfa Laval mentioned that in some parts of Asia where the renegotiation process reverse. The supplier wanted to increase the purchase price after improved supplier development but this did not Alfa Laval agree on.

## 5.6 Cross-Case Analysis: Outcome

With outcome this project refers to the result of supplier development efforts. Table 22 Cross-case analysis: outcome, summarize the outcomes from supplier development efforts at the case companies. Experience by the supplier is a sub factor covering how the buying company believes the supplier experiences the outcome of the development efforts. With internal processes it means if there have been other positive synergy effects internally at the buying company due to supplier development.

**Table 22 Cross-case analysis: outcome**

<b>OUTCOME</b>	<b>ABB Robotics</b>	<b>ABB LV Motors</b>	<b>Alfa Laval</b>	<b>Volvo Cars</b>	<b>TKMS</b>
<b>Achievements</b>	Since ABB Robotic does not have any explicit SD, achievements has not been identified.	Large improvements in OTD and quality. OTD increased from 85% to 95%.	Better communication and relationships with the suppliers.	Improved relationships have been achieved through clear requirements and communication.	Better on-time delivery and quality.
<b>Financial performance</b>	Same reason as above.	Inventory cost decreased with 49% and less capital tied.	Has not measured this, but improved quality gives positive financial performance.	Clear financial performance but hard to define a specific number because of delimitation problems. Better quality is equal to better financial performance.	Possibilities to decrease purchasing prices.
<b>Experience by the suppliers</b>	Same reason as above.	Much easier communication through one dedicated person.	Better processes and communication.	Better and more efficient escalation processes.	Efforts in and investments in long-term relationships.
<b>Internal processes</b>	Same reason as above.	Improvements in communication and responsibility but also in how they manage different deviations.	Better communication between different commodities especially purchasing and R&D.	Better escalation processes and holistic perspectives.	Not discussed.

There have been two clear outcomes from the different supplier development efforts; improved quality and better relationship with the suppliers. Since ABB Robotics does not have an announced supplier development strategy it is impossible to state outcomes. The other case companies have experienced better financial performance because of their supplier development efforts. None of the companies has been able to put an exact number on savings since many factors are included, which together builds synergies and the result. Quality is mentioned as a factor for cost reductions.

ABB LV Motors, Alfa Laval, and Volvo Cars believe that improvements, which the supplier experience, are better communication and escalation processes. Through a dedicated person, working with supplier development, the efforts has been more structured and responsibilities clarified. Internal improvement areas expressed by the companies are increased communication, better internal processes and responsibility distribution.

## 5.7 Findings Compared to Frame of References

Below are all the findings from the different factors in the cross case analysis compared with Frame of References. The analysis is based on both research theory and the empirical findings in this study.

### 5.7.1 Form

This table represents the form given to the cases after each interview. The darker gray fields are the activities literature stated as proactive (Krause & Ellram, 1997).

**Table 23 Comparison of the answers from the case companies and theory**

Supplier development activities	Yes	No
Investment in equipment or capital in the supplier's organization	R, M, A, T	V
Provide competition between existing suppliers through multiple sourcing	R, M, A, V, T	
Evaluate suppliers' performance for example with supplier audits	R, M, A, V, T	
Use of supplier certification program	R, M, V, T	A
Increase supplier performance expectations	R, M, A, V, T	
Supplier recognition through awards	A, V	R, M, T
Any type of "black list" / "flop list" of suppliers with undesired performance	R, M, V, T	A
Promise increased present and future business if a supplier improve performance	M	R, A, V, T
Site visit to the supplier	R, M, A, V, T	
Visit to the focal company by the supplier's representatives	R, M, A, V, T	
Education and training of suppliers' personnel	M, V, T	R, A
Temporary exchange personal between the supplier and the focal company		R, M, A, V, T
Direct investments in a supplier		R, M, A, V, T
Investments in supplier's operations		R, M, A, V, T
Try to implement a philosophy of continuous improvement at the supplier	M, A, V, T	R

Literature on supplier development lacks of in-depth frameworks for selection activities to achieve the desired result, in terms of different improvements (Ahmed & Hendry, 2012). But it has been significant proved that companies that are successful with their supplier development had a higher involvement than the less successful companies in some activities. These activities are marked with the grey color in Table 23 Comparison of the answers from the case companies and theory. (Krause

& Ellram, 1997) There are three activities literature defines as successful, which all of the case companies perform. Those activities are supplier evaluation, visits to the supplier and supplier visits to the focal company. Alfa Laval is the only company that does not use certification programs and ABB Robotics is the only company that does not try to implement continuous improvements at the suppliers. These two activities are successful according to Krause and Ellram (1997). Continuous improvements are, according to literature, a good way to work with supplier development with a proactive approach (Krause, Handfield & Scannell, 1998; Bergman & Klefsjö, 2012; Shen, Li & Shady, 2008).

Volvo Cars and Alfa Laval are the only case companies performing supplier recognition through awards even though literature states the activity as successful. However Alfa Laval only performs awards for some Asian suppliers and in Europe is a top 10 list applied. Thus award is something that the case companies can use more of in order to improve the performance of their supplier base. Proactive companies use recognition through awards to encourage the suppliers to continue performance improvements after the supplier development efforts (Krause & Ellram, 1997). Education and training of suppliers' personnel is the other activity where ABB Robotics and Alfa Laval differ from the other companies and literatures suggestion. But both these companies are positive to education and will start with that activity.

Direct investments in suppliers are something none of the case companies do. But literature argues that direct investments in suppliers operations are something most companies successful in supplier development do (Krause & Ellram, 1997). Krause and Ellram (1997) also suggest that the successful companies had more resources to devote to supplier development. These companies were larger with greater gross annual sales but did not buy significant larger percentages of their suppliers' output compare to less successful companies.

### **5.7.2 Objectives**

It is proved that the most improved areas of supplier development are the ones stated in the objectives of the program. Therefore it is crucial to establish clear objectives from the beginning (Watts & Hahn, 1993).

The findings from the cases showed that quality and OTD were the most frequently used objectives, which is verified by chapter 3, Frame of References. Watts and Hahn (1993) stated that quality is the most important objective and that service and cost reductions are secondary. This study has not focused on services. OTD can be seen as a type of service but other types has not been discussed. Volvo Cars has a couple of measurements related to service for example the measurement of how fast problems are being solved.

Theory states a trend in switching from only looking at current product quality to future long-term capabilities improvements (Watts & Hahn, 1993). Volvo and TKMS are the strongest of the case companies in having sustainable objectives where the aim includes the supplier and their capabilities. Volvo wants their supplier to be as self-driven as possible and TKMS wants the supplier to grow and develop together with them. The other three case companies only have internal objectives.

Krause, Handfield and Scannell's (1998) discuss differences in objectives between a reactive and a proactive company within supplier development. The conclusion is that in reactive companies there is focus on firefighting compared to proactive companies where long-term goals are more

important. This is probably because a proactive company has reduced or eliminated the urgent problems that need firefighting. Hence it is possible to focus on a long-term perspective.

TKMS again differ from the other companies because their project methodology is not comparable with mass production. TKMS works project oriented which gives a natural reason for using milestones. In Krause, Handfield and Scannell's (1998) supplier development process, step 10 milestones are discussed which is something TKMS works a lot with. Theory emphasizes the importance of milestones in supplier development projects. At TKMS the milestones are often connected to payments to give the supplier a good incentive. Milestones have also been discussed during ABB Robotics Flop 10 program.

Increasing the objective on a yearly basis goes in line with the mentality of continuous improvements. To strive for new improvements and increase the performance level to new heights is the essence of continuous improvements (Bergman & Klefsjö, 2012).

### 5.7.3 Activities

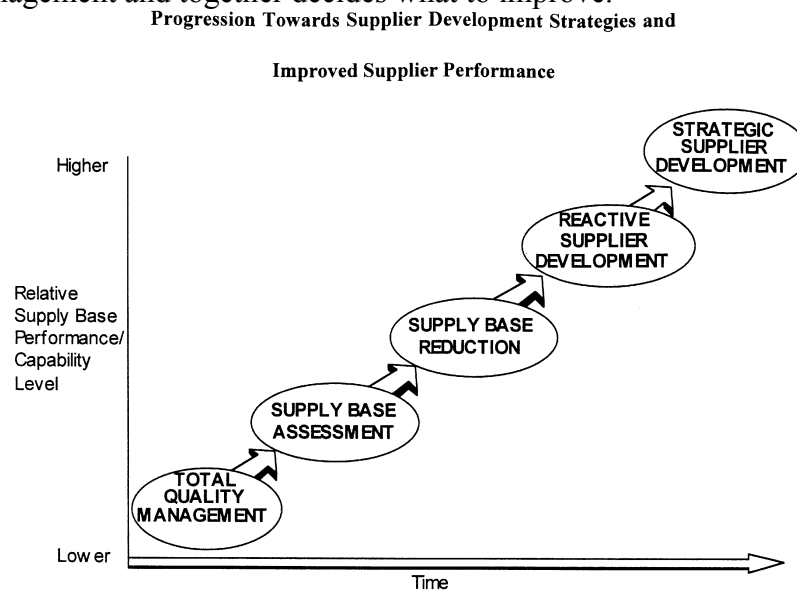
According to the Frame of References it is very important that the drivers to define suppliers for supplier development is not only poor performance. The major difference between proactive and reactive companies is the identification of critical commodities, which should be executed by a management team. Strategic suppliers should receive most of the development efforts. (Krause, Handfield & Scannell, 1998) All of the case companies have divided their suppliers into groups dependent on how critical the commodities are. In this aspect they are all proactive. The Kraljic's matrix is mentioned in literature as a useful tool to divide suppliers in this context (Krause, Handfield & Scannell, 1998). It is also something ABB Robotics, ABB LV Motors and TKMS do and Alfa Laval want to introduce.

Another important factor when selecting suppliers to develop in a proactive way is to have a formal and accurate system to measure suppliers' performance. (Watts & Hahn, 1993) (Krause, Handfield & Scannell, 1998) This seems to be in place at all the case companies.

Krause, Handfield and Scannell (1998) express that drivers for proactive supplier development should be supplier integration into the buying firm's operation, supply chain optimization, continuous improvements, value-added collaboration, technology development or seeking competitive advantage. Compared to the more reactive drivers like missed delivery dates, quality defects, negative customer feedback, competitive threat for buying firm or production disruptions. These proactive drivers are not main drivers for the studied companies. The reactive drivers are still what they use and it seems complicated to stop using them and switch to the proactive drivers. It might not be possible to only use the proactive drivers but the companies should see the proactive drivers as a long-term objective and move in that direction.

When a supplier is selected for development the decision of what area to improve is vital (Watts & Hahn, 1993). The last step of total quality management, which is the first phase to reach strategic supplier development, is to use scientific methods and tools to measure performance and improve quality (Krause, Handfield & Scannell, 1998). This is shown in Figure 38 Progression towards supplier development strategies and improved supplier performance. This emphasizes that the case companies' efforts with quality tools and methods to analyze improvement areas are aligned with literature. The literature does not mention what part should execute the analysis, which differs between the companies. But Krause, Handfield and Scannell (1998) express that proactive companies define areas to improve together with the supplier's top management. This is not

discussed with the case companies directly but a couple of them mentioned that they meet the suppliers' top management and together decides what to improve.



**Figure 38 Progression towards supplier development strategies and improved supplier performance**

**(Krause, Handfield & Scannell, 1998)**

As seen in Figure 38, reduction of the supplier base is a phase to reach strategic/proactive supplier development (Krause, Handfield & Scannell, 1998). Several of the companies mentioned that this is something they strive for but according to the figure it should be done even before reaching reactive supplier development.

TKMS is the only case company expressing the importance of contracts. According to Lamber and Knemeyer (2004) contracts are very important for non-critical suppliers.

Finally the supplier development process, Figure 17 Supplier Development Process, how to move from reactive to proactive SD, that Krause, Handfield and Scannell (1998) have developed through their empirical study of supplier development is very useful. It is clear, concrete and easy to understand. The studied companies execute some of the steps but not all companies perform all steps. It is also important that the steps should be executed in a proactive way.

#### **5.7.4 KPI**

The findings about KPIs are aligned with theory. Quality and on time delivery is the most important and common ones in both theory and among the case companies (Krause, Handfield & Scannell's, 1998).

When analyzing OTD and quality compared to Carr and Kaynak's (2007) definition of good performance measurements it is clear that they are easy to understand, can be influenced on a short period of time and are commonly accepted. The issues occur with the possibility for different interpretations and do not always reflect the reality. Hofmann (2008) discusses the problem that OTD can be interpreted in different ways because of different definitions. This is probably why a majority expresses a desire to have a measurement more related to how it effects the production in a fair way. Fair in this context means that the performance measurements should reflect the deviations impact on the production. Not all deviations are critical, for example if a standard screw is defected it is easy to replace but if it is on a vital special designed product it is harder and it makes a greater impact on the production. But all KPIs fulfill the requirements of being scares in number.

The adage “what gets measured gets done” stands in conflict with Cousins, Lawson and Squire’s (2008) conclusion that not the measurement itself is the way to improvements. Instead, the relationship is influencing the performance measurement not the measurement itself. This could be done to the extent of the buyer-supplier social performance. Volvo Cars is the case company who has taken this one step further and also attempts to measure the soft values in the relationship.

When evaluating performance it is important to have accurate measurement methods and to do all measurements in a correct way. This is important because the result is the foundation for many decisions. A scientific way should be used. (Bergman & Klefsjö, 2012)

## **5.7.5 Success Factors**

### **5.7.5.1 Mindset**

Krause and Ellram (1997) expressed that the industry is moving from an approach where low purchasing price were the main focus and supplier switching was common towards supplier development. The high price of supplier switching is well known and the importance of supplier development has increased (Krause & Ellram, 1997). This is exactly what the case companies express too. Supplier development seems to be highly interesting for the industry.

Krause and Ellram (1997) and Krause, Handfield and Scannell (1998) emphasis the fact that both the supplier and the buying company have to make efforts for successful supplier development. The buying firm needs to understand the advantage of a strong supplier base and see the suppliers as an extension of their own business. Hence they need to build long-term relationships and put great efforts in helping the supplier to reach continuous improvements. (Krause & Ellram, 1997) Focus should be on joint efforts to improve material flow, service and information between the companies instead of only forcing the supplier to improve (Krause, Handfield & Scannell, 1998).

This seems to be aligned with the mindset of most of the companies except for ABB Robotics, since their focus is too internal. However Volvo Cars has a greater involvement of customer focus in their mindset. According to Bergman and Klefsjö (2012) customer focus is very important for quality management to make the outcome profitable. Carr and Kaynak (2007) also prove that quality is what is increased with supplier development and improved quality is significant for financial performance. Without total quality management, where customer focus is fundamental, it is not possible to reach proactive supplier development (Krause, Handfield & Scannell, 1998). Hence customer focus is very important in supplier development.

Another factor that literature emphasis as a success factor within supplier development is support from top management (Krause & Ellram, 1997) (Watts & Hahn, 1993). Thus a mindset at the company where supplier development is expressed as an important subject increase the success of the efforts. Top managements involvement was only mentioned at Volvo Cars. They have a very clear strategy where the executive level even has frequently meetings with the strategic suppliers.

### **5.7.5.2 Information Sharing and Communication**

Information sharing is according to theory an important success factor for supplier development and collaboration. (Holweg et al. 2005; Carr & Kaynak, 2007; Krause & Ellram, 1997)

#### **5.7.5.2.1 Internal Information Sharing**

The internal information sharing within the focal company is significant for results in information shared with suppliers and supplier development support, which are significant for product quality improvements. The product quality improvements are resulting in financial performance. (Carr &



Kaynak, 2007) Therefore it is good that the companies simplify their internal communication. They have done this with close location of the departments and frequently structured meetings.

Cross-functional team is another way to increase the internal communication which each case company do. According to Krause, Handfield and Scannell (1998) cross-functional teams should execute the supplier development efforts and the teams should be permanent if a company works proactive with supplier development. Some of the cases use permanent teams according to theory while others assemble new teams when a new project is started. One finding from the cross-case analysis was that some companies arrange their teams according to commodities and suppliers while others arrange teams for a new project or to plan the supplier development work. This is not mentioned in theory but it appears that the teams are more permanent if they are arranged for commodities or suppliers. Members of the team should be assigned on a long-term basis and it should include personnel from quality, purchasing, operations and design (Krause, Handfield & Scannell, 1998). None of the companies mentioned that design is included in their cross-functional teams but this is outside the scope of this project and therefore not asked. ABB LV Motors only includes purchasing, ABB Robotics also includes quality and Alfa Laval often includes the operations/production as well.

Even though cross-functional teams are necessary, they are not sufficient, in proactive supplier development (Krause, Handfield & Scannell, 1998). This might be the reason why ABB Robotics, that has cross-functional teams, still expresses a complication with misalignment in objectives between the different departments. ABB LV Motors tries to solve their misalignment with cross-functional teams, however Alfa Laval's way with structuring a new sourcing strategy might be a better solution.

Internal escalation process is not mentioned in the chapter Frame of References but was brought up several times at the case companies. If a company has a clear escalation process for supplier problems this could increase the internal communication and simplify for the suppliers if they understand how this process work.

Whether to have dedicated persons for supplier development or not is not discussed in literature. But with all activities and efforts suggested in literature it seems reasonable to have a role that coordinates the work, which three of the case companies have. Literature also addresses the importance in involving top management (Pradhan & Routroy, 2013) and to do so a dedicated person is a good idea. Volvo Cars, Alfa Laval and ABB Motors all have dedicated persons. Both Alfa Laval and ABB LV Motors hired a person in the initial phase to be able to implement the processes of supplier development and educate the employees with good result. According to this study supplier development is a complex subject, which requires high competence. All of the companies had dedicated persons with at least a master degree. Volvo Cars has a large organization for only managing supplier development and supplier quality management. It is easy to see that the case companies prioritize supplier development and invests a lot of resources to be able to keep their competitive advantage on the market.

#### **5.7.5.2.2 External Information Sharing**

When it comes to information shared with suppliers there is no exact and common definition of what information that should be shared and what it should include. One of the most regular information shared is actual demand and inventory levels. (Lee, So & Tang, 2000) Lee, So and Tang (2000) also express that the result of information sharing is even higher benefited for high tech manufactures because of demand variance and long lead times. Most case companies share

demand and inventory levels with their suppliers together with performance levels of the suppliers' KPIs and feedback at meetings.

Advanced communication with computer-to-computer links and electronic data interchange (EDI) is not proved to improve communication between firms, shown in Figure 22 Information sharing due to Carr & Kaynak. These communication methods can only be used as additional opportunities for sharing information together with traditional communication like phone calls, e-mails and meetings. However traditional communication is proved to improve communication between firms, which improve product quality and therefore influence the financial performance. (Carr & Kaynak, 2007) The supplier web that the case companies use is hence only a compliment and the meetings are more important as well as regular phone calls and e-mails.

Krause and Ellram (1997) also agree that communication is very important for successful supplier development. The result from their study show that companies that were satisfied with their supplier development efforts seemed to communicate more frequently and used more time for communication with suppliers. Frequently meetings, that all the case companies have, are hence good for supplier development and should be executed often. According to Krause and Ellram's (1997, pp. 51) the result of their study suggest that:

“Buying firms may be able to raise suppliers' performance significantly by expecting more from suppliers, communicating those expectations, and actively participating in the effort.”

ABB LV Motors experienced this improvement when they started to be clear with their requirements in the supplier guide. Volvo Cars nevertheless is the company that has most expectations on their suppliers with the twelve categorize in VQE.

Cultural barriers are not declared in the Frame of References but in the case findings the solution seems to be good communication with suppliers through local units. It is interesting that Volvo Cars mentions the problem with the Swedish culture. This shows a mature attitude to internal issues and enables improvements in-house.

### **5.7.5.3 Trust and Power**

Trust has been a subject spoken of frequent by the case companies. They all seem to put a lot of emphasis on trust in their supplier relation. According to theory trust will, direct or indirect, affect the commitment and relation between a supplier and a buyer (Cai et al., 2013). In the extension it will influence the outcome of supplier development and the success of it. Thus the case companies should continue to emphasis trust from suppliers.

Understanding for each other's business is brought up in this study as an important factor for creating trust together with communication and joint development projects. It is important to remember that it is always humans behind the companies. Humans have basic need based on feelings, which has to be considered. Esteem, trust and safety are some of them according to Maslow's (1943) hierarchy of motivation. It is thereby crucial to have a good sense for people and how to interact with them.

When analyzing communication and information sharing an important factor is face-to-face meetings, traditional communication (Carr & Kaynak, 2007). This factor helps buyer and suppliers to gain trust in each other. Therefore the case companies express that joint work in projects with suppliers increases the suppliers' trust.

TKMS mentioned payments as an important factor for trust. As the adage says “money talks” and “walk the talk”. Why should suppliers put effort in improving themselves if the buying firm does not perform their part of the agreement and pay the supplier on time? Not paying on time can challenge trust in the relationship.

Watts and Hahn (1993) express the importance on focusing on improving the supplier’s capabilities to be more proactive in supplier development. The reactive approach is to focus on current cost and quality. Renegotiation on purchasing price directly after development efforts have increased the supplier’s performance is therefore a reactive approach. To build trust it is important to separate short-term price pressure from long-term supplier development. (Sako, 2004) TKMS and ABB Robotics are the companies expecting renegotiation on price after improvements while ABB LV Motors and Alfa Laval separate renegotiation and supplier development.

Power can be used in both a positive and a negative way. Sometimes it can be good to force the supplier to develop and sometimes it only destroys a good relationship (Cai et al., 2013). A good way to manage trust and power is to use more power towards non-critical suppliers. For strategic supplier trust is the important factor.

### **5.7.6 Outcome**

The outcome has been hard to measure in numbers. This can be explained by the complexity of measuring what is related to development effort and to a specific relationship. Many of the outcomes are not observable immediately instead they give long-term benefits. Numerous reasons for successful achievements are based on the trust built between the buyer and supplier, which are hard to define.

Carr and Kaynak’s (2007) could not find a significant direct link between financial performance and supplier development. It is instead an indirect achievement, which comes from improved product quality. Alfa Laval and Volvo Cars confirm this indirect relation. ABB Motors mentions another indirect factor, lower inventory, as a reason for better financial performance. TKMS work with more direct factors as renegotiation of price.

A difference in this case study compared with the theory regarding outcome is that the case companies focused a lot on the improved relations and the theory more on product quality (Carr and Kaynak’s, 2007). All of the companies expressed that they have improved quality both internally and externally according to Bergman and Klefsjö’s (2012) definition Figure 25 Relation between improved quality and better financial performance. In the internal processes were communication, escalation processes and lower inventory most emphasized and in the external process the product quality and communication with the supplier.

## **5.8 Reactive Compared to a Proactive Supplier Development Approach**

In this section different supplier development efforts will be analyzed and categorized as reactive or proactive. This will be done for each factor. The classification is done based on the Frame of References and the Empirical Study. First a figure with three columns is established for each factor, Figure 40-48. The reactive supplier development efforts are placed in the left column and proactive efforts escalate to the right. The middle column is activities, which are in the right direction for a proactive work. In these figures some efforts are typed in bold, these are efforts ABB Robotics perform. These efforts are then summarized to evaluate ABB Robotics in a reactive or proactive perspective.

The last part of this section is a holistic summary of ABB Robotics within the factors and a benchmark amongst the different case companies. This is done to compare how reactive or proactive the companies are compared to each other.

### 5.8.1 Objectives

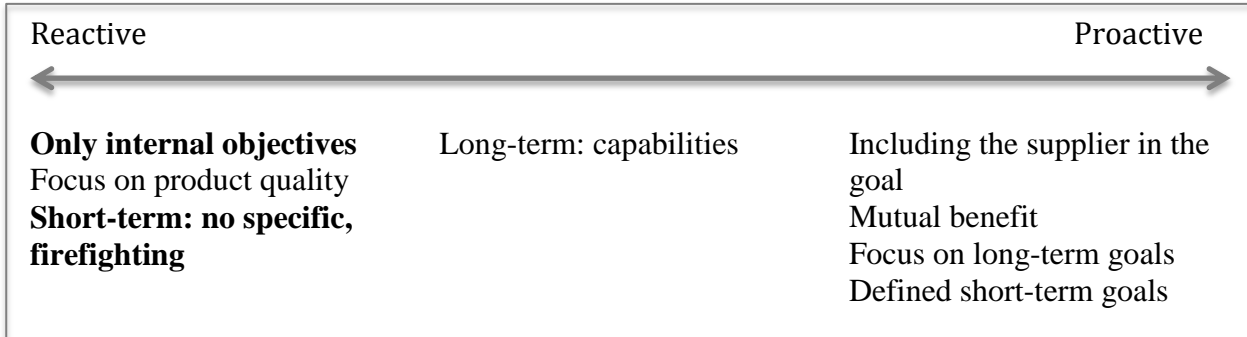


Figure 39 Reactive and proactive objectives

Regarding objectives this project has found that the difference between a reactive and a proactive approach is that reactive companies has no possibility to raise their horizon and state long-term objectives. Instead focus is on fighting the most urgent problems.

Stating long-term improvements of the capabilities in the supply chain is to take the development one step further. When working proactive the objectives for supplier development include the supplier's wellbeing, and have defined short-term goals. Mutual benefit should be included in the objectives. (Watts & Hahn, 1993)

#### 5.8.1.1 ABB Robotics

When it comes to objectives for supplier development ABB Robotics has a more reactive approach. They focus on internal objectives with benefits for them. They have no short-term objectives more than their KPIs and are caught in firefight urgent problems with suppliers. A reason for this is also that ABB Robotics has no implemented supplier development strategy.

### 5.8.2 Activities

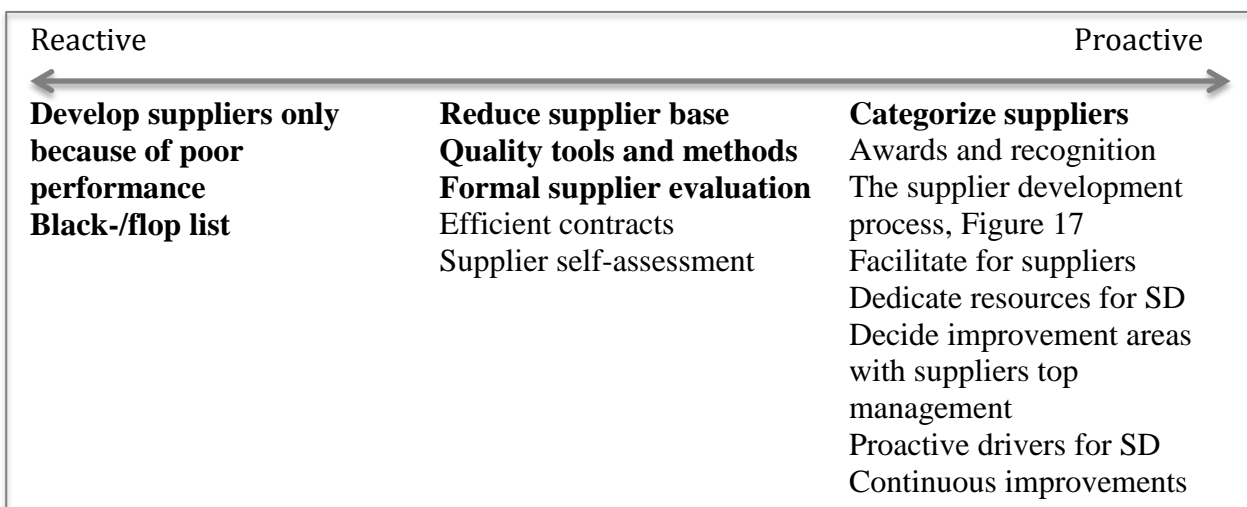


Figure 40 Reactive and proactive activities

A reactive effort within supplier development is to select suppliers for development only based on poor performance and independent of what type of supplier it is. Compared to that a more proactive approach is to categorize suppliers dependent on how critical commodities they deliver. (Krause, Handfield & Scannell, 1998) The different categorize should be treated differently and development efforts should mainly be performed with strategic suppliers.

Usage of black-/flop lists for low performing suppliers is a reactive activity. Nevertheless all case companies use this list, which indicates that it is a useful tool. The advantage with the list is that it communicates both internal and external, which suppliers are the worst. Nevertheless it is important that efforts with suppliers at the list are not the main focus and that more proactive efforts to prevent suppliers from entering the list is prioritized. To be proactive it is more important to use awards and recognition to give suppliers incentives to increase their performance (Krause & Ellram, 1997; Krause, Handfield & Scannell, 1998).

Reduction of the supplier base is a step to become more proactive but it should be done in an early stage (Krause, Handfield & Scannell, 1998). To facilitate a proactive supplier development approach it is important to have established quality tools and methods to analyze suppliers (Krause, Handfield & Scannell, 1998) and introduce continuous improvements (Krause, Handfield & Scannell, 1998; Bergman & Klefsjö, 2012; Shen, Li & Shady, 2008). A formal and accurate supplier performance measurement system is also important to assure correct evaluations. Other factors to enable a proactive approach are efficient contracts (Lamber & Knemeyer, 2004) and supplier self-assessment (Interview 9 & 10).

The supplier development process developed by Krause, Handfield and Scannell's (1998), Figure 17, should be used to manage proactive activities for supplier development. It is also important to facilitate for the suppliers with processes that enable high performance from them (Interview 1, 2, 3, 9 & 10) and that the buying firm dedicate resources for development (Krause, Handfield & Scannell, 1998).

### 5.8.2.1 ABB Robotics

Within activities ABB Robotics are partial proactive. They use a Flop 10 list, which is reactive but that activity is still performed at more proactive companies. ABB Robotics uses the Flop 10 list to identify which suppliers to develop and that is a reactive selection to only develop the worst suppliers. At the second step to become more proactive they perform several of the activities mentioned as a step towards proactive supplier development. They have a reduced supplier base, use quality tools and methods for example 4Q, 8D and have a formal supplier evaluation with audits and measurements at the supplier web. ABB Robotics is only partial proactive since they have many of the really proactive activities left to introduce. To become more proactive ABB Robotics needs to facilitate for the suppliers and dedicate resources to develop them.

### 5.8.3 KPI

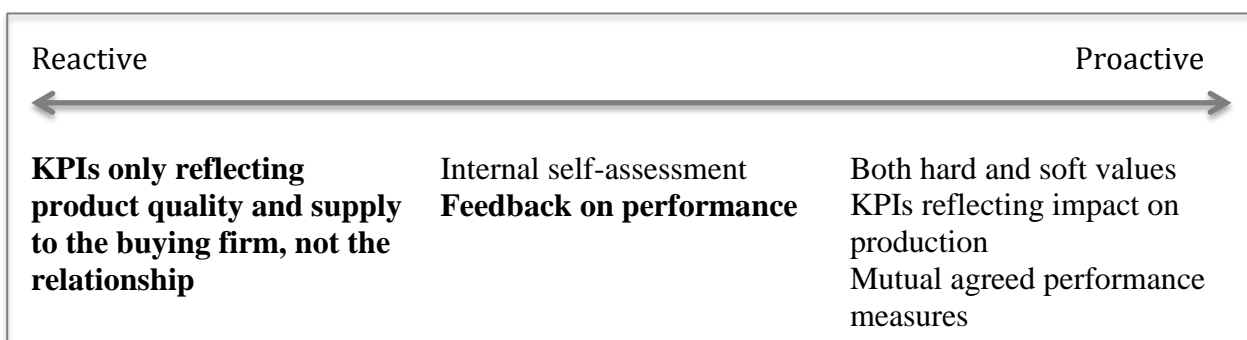


Figure 41 Reactive and proactive KPI

The largest difference in working reactive versus proactive is to measure soft values. In the context of supplier development, soft values means measurements of the relationship between the two companies, which in many cases is built through trust (Lamber & Knemeyer, 2004). It is very difficult to find suitable performance measurements for this (Pradhan & Routroy) but Volvo Cars have several in their VQE-factors, for example trust.

Internal self-assessment is a good way when working with continuous improvements. It is a part of the quality work. This includes the buying company to evaluate and improve internal processes to facilitate for the suppliers. Together with constructive feedback on the supplier’s performance this is a step towards proactive supplier development (Bergman & Klefsjö, 2012).

In the last step to become proactive within KPIs, mutual agreed performance measurements are important as well as measuring soft values (Krause, Handfield & Scannell, 1998). Finding KPIs reflecting the impact on the production is hard but it makes the KPIs fair and relevant in a proactive supplier development (Interview 25 at ABB Robotics).

#### 5.8.3.1 ABB Robotics

ABB Robotics uses PPM and OTD as supplier KPIs. These KPIs only reflect product quality and supply and not the supplier relationship. Thus they are reactive KPIs within the subject of supplier development. ABB Robotics’ suppliers receive feedback on their performance through the supplier web, ASCC, and at meetings. This is important for a more proactive approach.

#### 5.8.4 Mindset

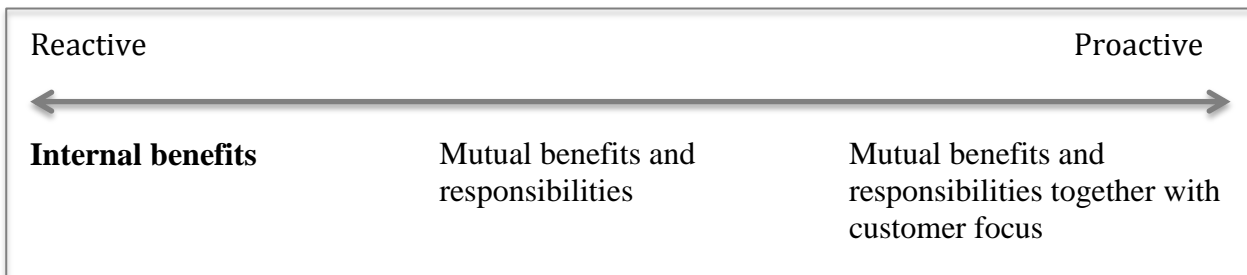


Figure 42 Reactive and proactive mindset

If the mindset for supplier development only focuses on internal benefits for the focal company it is a reactive approach according to this project. A step further to become more proactive in supplier development is to have a mindset based on long-term relationships. Focus should be on mutual benefits and shared responsibilities between the supplier and the focal company. The suppliers should be seen as a part of the buying company and their problems are the buyer’s problems. (Krause & Ellram, 1997; Krause, Handfield & Scannell, 1998) The last step to become even more proactive within the mindset is to complement the mutual benefits between the two companies with a strong customer focus (Bergman & Klefsjö, 2012; Krause, Handfield & Scannell, 1998). The customer is the reason for both companies business and therefore the most important part and should be included in the supplier development strategy.

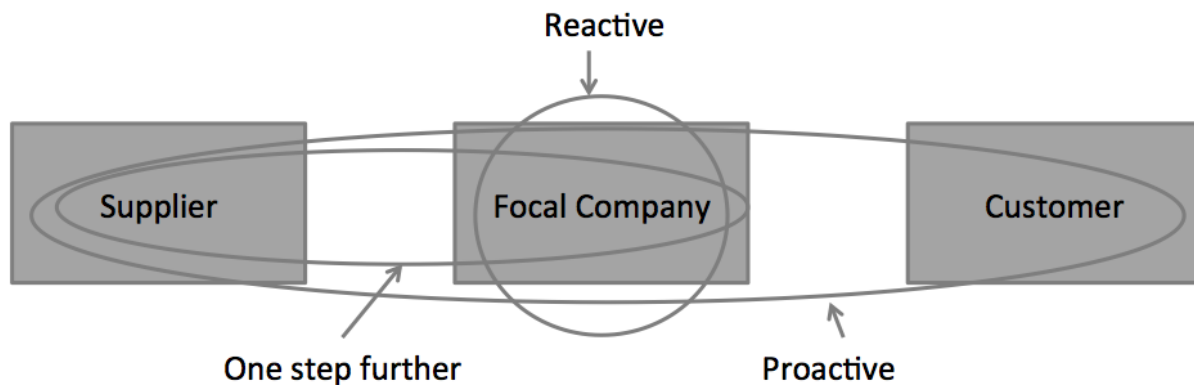


Figure 43 Different supplier development mindsets

#### 5.8.4.1 ABB Robotics

ABB Robotics mindset is focused on internal benefits for them. This is a very reactive mindset. They are in the circle of reactive, shown in Figure 43 Different supplier development mindsets. A reason for this is that ABB Robotics has no strategy for their supplier development. Even if they have customer focus as a holistic perspective they need to focus on mutual benefits and responsibilities for their supplier development first. After including the suppliers in the mindset the customer focus can be emphasized in supplier development.

### 5.8.5 Information Sharing

Information sharing is again divided into internal and external efforts.

#### 5.8.5.1 Internal Information Sharing

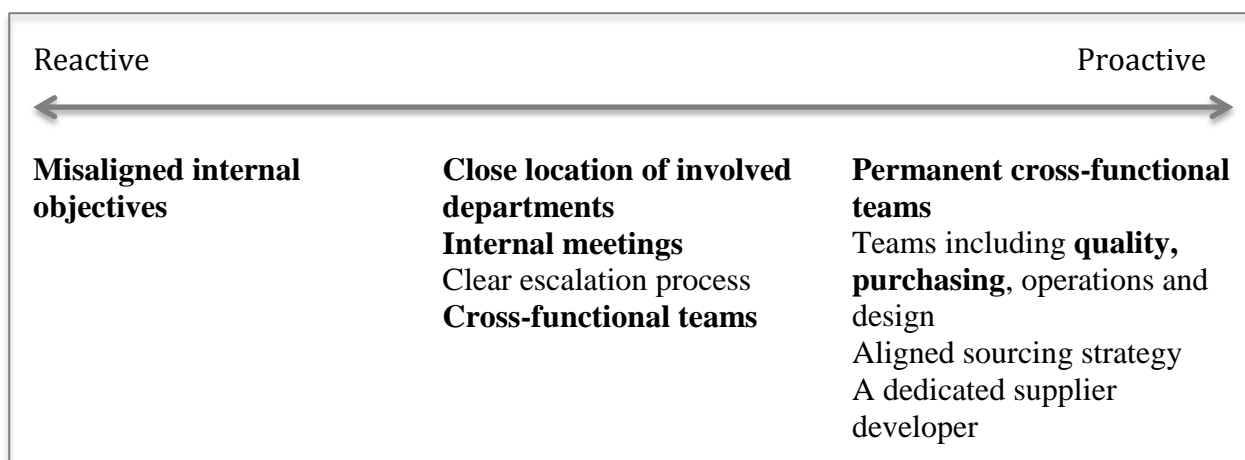


Figure 44 Reactive and proactive internal information sharing

Misalignment in internal objectives is not reactive in itself but it implies an immature internal procedure. This research shows that it complicates the processes of supplier development. Misalignment within objectives of departments involved in supplier development is a complex issue and hard to manage. Knowledge about the existence of the issue internally helps to decrease the impact.

Improved internal communication can reduce the impact of misaligned internal objectives. For example close location of the departments involved in supplier development, internal meetings and clear escalation processes helps to improve according to this study. Cross-functional teams are also a way to handle the problem and it might ease the issue but it is not a solution that eliminates the problem (Krause, Handfield & Scannell, 1998; Interview 3; Interviews at ABB Robotics).

To be more proactive companies should have permanent cross-functional teams (Krause, Handfield & Scannell, 1998). It appears that an easy way to achieve that is to build teams divided on commodities and suppliers. The teams should include quality, purchasing, operations and design (Krause, Handfield & Scannell, 1998). A more proactive way to reduce internal misalignment, according to this study, is to have a clear sourcing strategy with a vision, objectives and an action plan.

#### 5.8.5.1.1 ABB Robotics

Within internal information sharing ABB Robotics is more proactive in their approach. They still suffer from misaligned internal objectives between strategic purchasing, operational purchasing and supplier quality. But they have permanent cross-functional teams, purchasing teams, which minimize the impact. Both purchasing and quality is included in the teams, this indicates a proactive approach.

Internal meeting in the purchasing teams and the fact that the departments involved in supplier development are placed close to each other also facilitate a closer internal communication.

ABB Robotics also has an internal escalation process for supplier issues. The problem with this process is that the responsibility for each level is not clearly defined and therefore it does not work properly. ABB Robotics has no dedicated person for supplier development and that results in unclear responsibilities and misaligned objectives.

#### 5.8.5.2 External Information Sharing



Figure 45 Reactive and proactive external information sharing

Sharing information with suppliers is a very important factor to become more proactive within supplier development especially for high-tech manufacturing companies (Lee, So & Tang, 2000; Carr & Kaynak, 2007). If the suppliers have no knowledge of how they perform and what the focal company requires it is very hard for them to improve. First steps in becoming more proactive are to have a supplier web with updated performance measurements for the suppliers, increase and communicate expectations (Krause & Ellram, 1997; Interview 3) and use local units in global markets. All this facilitate for the suppliers according to this study. More proactive is to have intense traditional communication with strategic suppliers. The communication should be frequent and timely and include information sharing and feedback on the suppliers' performance. E-mails, phone calls and face-to-face meetings should be used for the communication. (Carr & Kaynak, 2007) Another proactive approach is to have a clear plan for how often meeting should be held for the different suppliers in the supplier base.

#### 5.8.5.2.1 ABB Robotics

External information sharing is another area where ABB Robotics is more proactive. They have a daily updated supplier web for supplier KPIs where the supplier can view their performance. They



also give feedback to suppliers through traditional communication like face-to-face meetings. But a clear plan for how often these meeting should be held for different suppliers is missing.

ABB Robotics increase expectations of suppliers' performance each year, for example increased expected OTD. They also have local units in Asia but still express issues with cultural and language differences.

### 5.8.6 Trust and Power



Figure 46 Reactive and proactive trust and power

Trust is a very elementary factor in a relationship between two companies. Many of the other factors in supplier development are important but if trust and good communication not exist those factors are ineffective (Lambert & Knemeyer, 2004). In a reactive company the relationship and trust has a minor focus. It is reactive to use power to renegotiate the purchasing price after successful supplier development efforts.

To build trust, both internal and external efforts must be made (Cai et al, 2013). A good way to accomplish this, according to this study, is if both the supplier and the buyer put effort and resources into mutual projects. Keeping promises in terms of contract and payments is together with joint efforts a step to become more proactive in supplier development (Interview 9 &10).

Sustainable trust with reciprocal understanding is fundamental in proactive supplier development (Liker & Choi, 2004). Power should always, according to this study, be considered carefully otherwise there is a risk to damaging the relationship. Power is something more important in the management of non-critical suppliers compared to strategic suppliers where trust is more important.

#### 5.8.6.1 ABB Robotics

Trust and power is an area where ABB Robotics is more reactive compared to proactive within supplier development. They perform joint efforts in development projects with the supplier but they could increase these efforts. For example they only coaches the development efforts and projects at the supplier. Generally they do not participate in them more than supervision. ABB Robotics also has very long payment terms, up to 120 days, to their suppliers, which also decrease the trust. ABB Robotics expects to renegotiate the purchasing price after successful development with a supplier. This is a reactive way to handle their power.

Another thing that destroy trust from ABB Robotics suppliers is that they not always keep their promises to the suppliers. The forecast often differ a lot. An example of this is a contract with a supplier where ABB Robotics states that the forecast should not vary more than +/- 25% between month six to month three before the order and that they have a frozen period of three months for their forecasts. By experience ABB Robotics knows that this is not correct. The deviations are much

larger. Sometimes it is an increase of several hundred percent within these six months. Thus ABB Robotics has contracts they know they can not manage.

### 5.8.7 Outcome

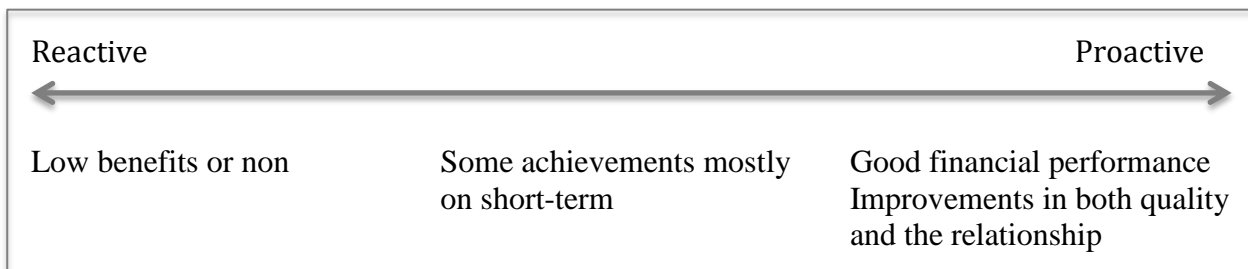


Figure 47 Reactive and proactive outcome

The outcome from proactive supplier development can vary but the most visual, according to this study and literature, is quality, which leads to different positive achievements. The production can proceed without interruptions (Bergman & Klefsjö, 2012). Often short-term outcomes are visual after a short period of time but the larger outcomes, especially financial, comes with long-term supplier development. The total cost of ownership, which includes parameters as cost for bad quality and rework, has a longer penetration time (Interview 28). Long-term is here referred to efforts over more than a year, where the relationship can grow. In proactive supplier development are the outcomes both improved quality and good financial performance, examples are fewer rejections, less rework, lower inventory, less customer claims and good reputation (Bergman & Klefsjö, 2012; Carr & Kaynak, 2007). According to this study improved relationship both internally and externally are also accomplished.

Increased on-time delivery and a smoother purchasing process have also been proved as an outcome through this study. This also leads to an increased financial performance with less time spent on solving urgent problems.

Another less positive outcome is that it is inevitable with cost increases in the initial phases of a supplier development project and efforts. To hire expertise and devote resources is costly before the outcome is visible.

#### 5.8.7.1 ABB Robotics

Outcome is an area where it is hard to evaluate ABB Robotics. The reason for this is because they do not have an outspoken strategy for supplier development and hence no outcome is received. Their efforts within solving problems at a supplier site have led to improvements, however it is no directly related to supplier development.

Generally is supplier development a relatively young within the industry when talking about implemented strategies. The subject has even though existed in research for a long time but it is not so extensive in the industry yet.

### 5.8.8 Evaluation of ABB Robotics within the Factors

To visualize how reactive and proactive ABB Robotics is within the different factors, Figure 48 Evaluation of ABB Robotics (reactive or proactive) in the factors was established. The scale goes from reactive to proactive and is a qualitative result from the analysis of the factors in previous section 5.8. The evaluation was made depending on how many parameters and in which category they were. A parameter to consider when reading the, Figure 47 is that ABB Robotic not yet has an implemented supplier development strategy.

Grade	← Reactive		Some Efforts		Proactive →
Objectives	=====				
Activities	=====	=====			
KPI	=====				
Mindset	=====	=====			
Internal information sharing				=====	
External information sharing			=====		
Trust & Power	=====				
Outcome	Not applicable				

Figure 48 Evaluation of ABB Robotics (reactive or proactive) in the factors

### 5.8.9 Benchmarking of ABB Robotics Amongst Other Case Companies

To give a wider and more holistic view all companies are analyzed with the aim to place them in an order, corresponding to how proactive they are. All factors from the previous section, 5.8, have been summarized and resulted in Figure 49 Benchmark of all case companies. The scale goes from reactive to proactive but has no quantification. The focus is on the order the companies are placed compared to each other. An interesting finding from the interviews was that all companies, but ABB Robotics, thought they were reactive within their supplier development when the question was asked directly. ABB Robotics was the only company expressing that they are partly proactive. The analysis in this project does not correspond. Each of the case companies had some factor where they work proactive and a couple of them even had many proactive factors implemented. ABB Robotics is the most reactive company according to this study. Their answer, that they are partly proactive, shows that they do not have enough knowledge about supplier development, which is why this project was started. An explanation for this attitude amongst the other case companies, that answered that they are reactive, could be the mentality of continuous improvements and how the companies always see new challenges and possibilities for improvements. The Swedish culture, where it is not permitted to praise the own efforts, could be another factor included. It is difficult to become very proactive. Even companies that are mostly proactive will probably have some reactive parts. Volvo Cars is a good example of that.

Volvo Cars was the most proactive company in the case study. The reason for this is their coherent focus on the end customer. The House of Quality, see Figure 31 Volvo Cars' House of Quality, indicates that customer focus is fundamental. They have proactive objectives with self-driven suppliers and defined long- and short-term goals. To summarize, Volvo Cars includes the suppliers in their objectives. Their measurement and award system both includes hard and soft values and is the focus in Volvo Cars supplier development efforts. But even though they are very proactive they still have reactive parts for example a flop list and they have to manage urgent problems.

Alfa Laval has a structured sourcing plan with two dedicated persons responsible for internal education and the entire supplier development strategy. Like Volvo Cars Alfa Laval have a top 10 list for recognition of the best performing suppliers. The escalation process has improved a lot since the introduction. The new strategy has only been established a couple of years, which reflects the industry. Hence they still have some things to improve, which place them in a less proactive

position than Volvo Cars. They have great potential to grow into proactive supplier development since the sourcing strategy is facilitating this and align a supplier development strategy.

TKMS closely follows Alfa Laval regarding including the suppliers in their objectives. They aim for mutual benefits for supplier and buyer. Main focus is also in facilitating for the suppliers and their production. They have a lot of supplier development projects and efforts. TKMS is, as mentioned before, very different compared to the others due to their long project times. This has forced them to be more proactive since everything has to be correct from the beginning.

ABB LV Motors has a lot of similarities with Alfa Laval however they were at a lower level when they started their efforts in supplier development. For example similar activities, with a structured supplier development method, Figure 17 Supplier Development Process, how to move from reactive to proactive SD, and a dedicated person for supplier development. An effort, which has proved to be very efficient, is the supplier guidelines where all their requirements are stated. ABB LV Motors' supplier development strategy is even more recently established compared to Alfa Laval's but has the same future potential.

Compared to the other companies ABB Robotics is the most reactive. This does not mean that they do not execute some proactive factors and efforts but in comparison with the others they are less proactive. The major reason for this is because they do not have an outspoken supplier development strategy.

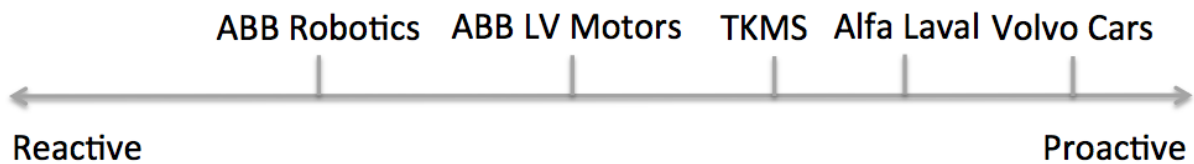


Figure 49 Benchmark of all case companies

## 6 Conclusion

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*This chapter consists of the answers to the research questions stated in the introduction chapter. The questions result in a summary of commonly used strategies for supplier development, identification of differences between reactive and proactive approaches at different companies and finally a recommendation for ABB Robotics. The chapter ends with research implications, limitations and further research.*

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### 6.1 Answers to the Research Questions

Below are the three research questions from the introduction answered. The third question will contain the recommendations for ABB Robotics.

#### 6.1.1 What are the most commonly used strategies for supplier development discussed in research?

Supplier development programs are more prevalent than what could be expected. Firms understand that the interaction can not be limited to the purchaser and the salesperson to receive a successful relationship between the companies. Firms utilizing supplier development are more focused on improving the material they buy rather than improving the supplier's capabilities. Focus is on current costs and quality instead of improving capabilities to generate improvements in future costs and quality. This indicates that most companies work with supplier development in a reactive way. Developing suppliers' capabilities and flexibility will be the key to competitive advantage in the future because of the market's increasing demand fluctuations and smaller margins. Thus companies should strive towards a more proactive supplier development. (Watts & Hahn, 1993)

Before a proactive approach to supplier development can be implemented a company needs to go through some phases. First total quality management needs to be established at the company. After that the supply base should be evaluated and reduced. Finally the supplier development phases can be started and it initiates with a reactive approach before the company can move into a strategic approach. (Krause, Handfield & Scannell, 1998)

The result from Krause, Handfield and Scannell's (1998) study shows that most companies working with supplier development work with the process in Figure 50 Supplier Development Process. Depending on if they are in the reactive or strategic phase they work with the process in different ways.

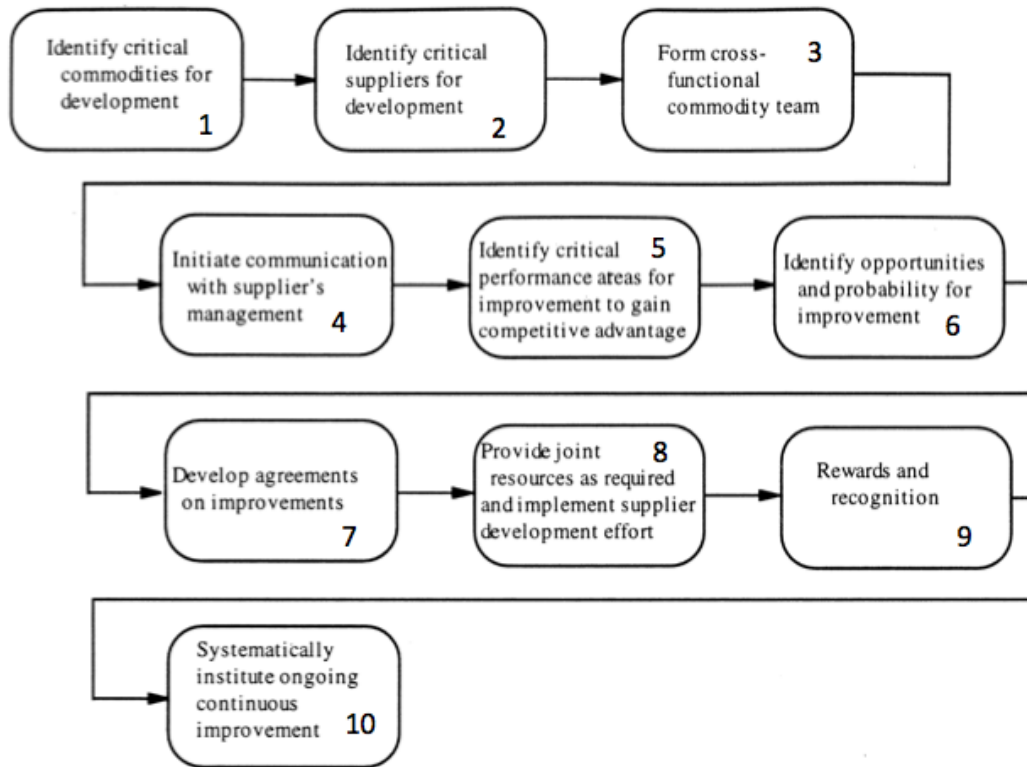


Figure 50 Supplier Development Process (Krause, Handfield & Scannell, 1998)

The major difference between the reactive and the proactive phase in the supplier development process is the first two steps, “Identify critical commodities for development” and “Identify critical suppliers for development”. Reactive companies do not focus on the commodities but only on poor performing suppliers, which are chosen for supplier development. Strategic companies focus their development efforts on suppliers delivering strategic commodities. These suppliers are analyzed on supplier performance data together with soft values to identify suppliers requiring development. (Krause, Handfield & Scannell, 1998)

### 6.1.2 How do companies work differently with supplier development if they use a proactive as compared to a reactive approach?

Five factors were considered to enable meaningful comparison between reactive and proactive approach to supplier development. Those factors serve as the foundation for supplier development and give the analysis a focus. The five factors are presented in Table 24 Factors for supplier development.

Table 24 Factors for supplier development

Factors	Supplier Development
<i>Objectives</i>	Common objectives used for supplier development
<i>Activities</i>	Activities included in supplier development
<i>Supplier KPI</i>	Supplier key performance indicators, which measure supplier performance
<i>Success factors</i>	Existing success factors within different stages of supplier development. Including mindset, information sharing and trust and power
<i>Outcome</i>	What outcome can be expected through supplier development

The answers to this question come from the case study where five companies were visited and interviews were conducted. When this research began it was expected that companies were either reactive or proactive but this was proved to be incorrect after the analysis of the case companies. Each case had some factors where they work reactive and some, where the work was proactive. Because of this the importance of literature increased to enable definition of reactive and proactive efforts. The five factors and the questions for the case interviews are based on chapter 3, the Frame of References. Hence theory is integrated in the answers to research question two. The data from each case is gathered in chapter 4, Empirical Study and the cross-case analysis and a comparison of the findings from the case study and theory is analyzed in chapter 5, Analysis. For a better understanding it is suggested to read chapter 5.

Objectives have been a factor differentiating the case companies. Some has been reactive with only internal objectives and no specific short-term objectives. While others have been more proactive with objectives including the supplier and mutual benefit. The proactive companies had both long- and short-term goals for their supplier development efforts.

Reactive activities are black-/flop lists together with only developing the supplier because of poor performance. A step in the right direction to become more proactive is to reduce the supply base, use different quality tools and to have a formal supplier evaluation system. To have efficient contracts and supplier self-assessment are also steps to become more proactive. Categorizing the suppliers and treating the categories differently is a typical proactive activity. Development efforts should mainly be performed with strategic suppliers to reach partnership while non-critical suppliers should be managed with good contracts and competition between multiple suppliers. Recognition through awards is another activity stated as proactive, which helps to implement continuous improvements. Improvements of the internal processes to facilitate for the supplier are also a proactive activity as well as to dedicate resources for supplier development efforts.

All of the companies measure OTD and quality and use them as KPIs. However a desire of a quality measurement considering the impact on the production was mentioned. Internal self-assessment and feedback to the suppliers on their performance is a step to become more proactive. To include evaluation of soft values for the relationship between the companies, for example trust, is very proactive. Mutually agreed measurement is also stated as proactive.

The mindset of reactive companies is directly related to the internal benefits. Companies having a more proactive approach have the mindset of creating mutual responsibilities and benefits between the suppliers and themselves. To have a very proactive mindset within supplier development the mutual benefit and responsibilities needs to be accomplished with a customer focus.

In this project information sharing was divided into internal and external information sharing, internal at the buying company and external between the supplier and the buyer. Reactive companies had issues with misaligned objectives internally. Establishing cross-functional teams is a good start for a proactive approach, and working in those permanently is even more proactive. The internal escalation process had been improved through the structure and the dedicated resources for supplier development. In proactive supplier development an aligned sourcing and SD strategy is very important. To establish and implement a supplier development strategy a dedicated person is essential. An improvement in external information sharing is a supplier web where the supplier can see their performance and goals. Having local units at the global market has been helpful for limiting cultural barriers. Traditional communication with suppliers is vital for the proactive approach and therefore a clear structure for meetings with the entire supplier base should be established. It is important to ensure that the strategic suppliers meet all level of management.

Trust was a factor which the case companies emphasized. Trust is very important to reach partnership with strategic suppliers since relationships are built on trust. The best way to create trust is through joint projects and reciprocal understanding, which is proactive, approaches. To keep promises is another important factor to build trust. Power should be used carefully and mainly for non-critical suppliers.

A positive effect of supplier development is the outcome of improved quality and better financial performance. Quality improvements have been the most defined outcome, which has a positive effect on the financial performance in many ways, examples are fewer rejections, less rework, lower inventory, less customer claims and good reputation. The relationship has also improved between the buying company and the supplier through supplier development. An expected outcome mentioned by several case companies where the improved escalation process.

### ***6.1.3 What are, according to the answers above, the next steps for ABB Robotics in the process of integrating proactive supplier development?***

The following section states what actions the researchers recommend ABB Robotics to take, and in which order to establish a more proactive approach of supplier development. The recommendations are hence based on both literature and the empirical study in this project.

#### ***6.1.3.1 Recommendation One – Implementing a Clear Strategy for Supplier Development with a Dedicated Supplier Development Manager***

The most important thing, which ABB Robotics needs to start with, is to establish a clear strategy for their supplier development efforts. The classification of the suppliers, for example the Kraljic's matrix, should be used and the efforts should vary between the categories of suppliers. The focus for non-critical suppliers should be on good contracts and competition between different suppliers while strategic suppliers should receive most development efforts. The goal for the relationship with strategic suppliers is to achieve partnership, which means mutual development efforts and benefits with clear objectives.

To enable implementation of a strategy for supplier development and work in an efficient way a dedicated person is needed. Supplier development is complex and need focus and competence to align the different departments at ABB Robotics. Therefore a supplier development manager should be hired. All case companies in this project have had at least one dedicated person working with and having the responsibility for supplier development. To be able to follow the development of the market and the increased demand over the coming years it is vital for ABB Robotics to start this work immediately.

The dedicated supplier development manager should start with the mindset and objectives of the efforts. To be able to work proactively ABB Robotics need to include their suppliers in their mindset. The suppliers should be seen as an extension of the focal company. Both ABB Robotics and their suppliers need to understand the co-prosperity of their business, which means that both companies get benefits from increased performance. The mindset should also be reflected in the objectives. The recommendation is to establish goals including the supplier and not only using the KPIs. It is important to have both defined long and short-term goals. Volvo Cars have good examples with a short-term goal to reduce time to solve problem when they occur and a long-term objective to get as many self-driven and independent suppliers as possible.



### ***6.1.3.2 Recommendation Two – Establish Clear Requirements and Communication of them with the Suppliers***

The KPIs ABB Robotics uses today, OTD and PPM, are frequently used in the industry and are therefore useful. To increase supplier performance it is very important to increase requirements and communicate these requirements. ABB Robotics could increase the amount of KPIs and add factors reflecting the relationship between them and the supplier in their evaluation of the suppliers.

The most important is however to be clear in the communication with the suppliers so they know what is required from them and how ABB Robotics measures their KPIs. ABB LV Motors give their suppliers a guidebook with requirements, which has increased the performance (Chapter 4.2). This is a simple way to increase the supplier performance. Communication is very important for supplier development. The permanent cross-functional purchasing teams should be used in the supplier development efforts to align the different departments at ABB Robotics. Frequently, traditional communication with suppliers by phone calls, e-mails and meetings are proved to be important and affect the outcome, which gives the operational purchasers a central role. What ABB Robotics needs is a plan for how often they should have meetings with suppliers from different categories and what level they should meet. It is important that the strategic suppliers not only meet the higher levels of management but more like the pyramid Volvo Cars (chapter 4.4) uses, where they have more meetings because they have meetings with all levels. ABB Robotics can also improve their escalation process by stating what responsibility each level in the process has.

### ***6.1.3.3 Recommendation Three – Devote Resources for Supplier Development***

The process to move from reactive to proactive supplier development is costly. The reason is because there will be a period when the company needs to keep the reactive efforts while implementing the more proactive efforts. A very important factor to succeed with a proactive supplier development is that the focal company needs to dedicate resources for development of the suppliers. Hence ABB Robotics needs to help the strategic suppliers to develop with mutual efforts. Development can not only be forced on the supplier. Education and training of suppliers personal is another example, which according to this study is an important effort for strategic supplier development. The mutual efforts, together with keeping promises, are also the easiest way to build trust from suppliers. ABB Robotics needs to stop promising suppliers things that they know will not occur, for example that the demand will only differ with 25% six months before an order. Trust is also important to build partnership.

### ***6.1.3.4 Recommendation Four – Facilitate for the Supplier in Internal Processes***

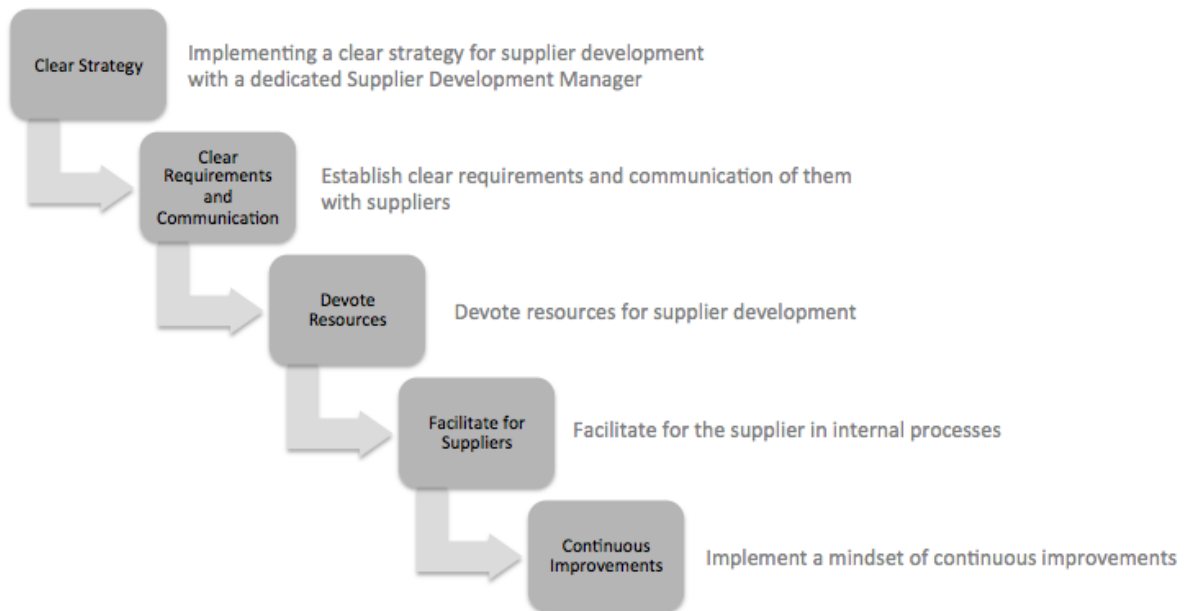
It is also important that ABB Robotics respect the suppliers. To increase the supply base performance ABB Robotics needs to facilitate for the suppliers so that they can manage to perform at their highest level. An example is that ABB Robotics can facilitate for the supplier in the purchasing processes and how they manage timeframes for payments to the suppliers. This means that ABB Robotics might have to improve their internal processes to enable improved performance from the suppliers. Both the suppliers and ABB Robotics needs to improve and develop with continuous improvements.

### ***6.1.3.5 Recommendation Five – Implement a Mindset of Continuous Improvements***

When helping the supplier to develop ABB Robotics should try to implement the mindset of continuous improvements at the supplier. 4Q is a good tool, which the suppliers can learn to use in all their processes. The 4Q, or 8D, method is used today but mostly when problems already have occurred. The method of continuous improvement should be implemented as a permanent solution and especially in terms of supplier development. Suppliers succeeding with continuous improvements and increasing their performance without or after ABB Robotics efforts should be rewarded with awards. This is a way to implement this mindset and increase the performance of the

whole supplier base. Two of the case companies interviewed for this study have a database with lessons learned. When new problems occur they collect the lessons from that and if it happens again they know how to handle the problem. This is a good way to work with continuous improvements since old problems are used and new solutions are built on experience.

Figure 51 summarizes the recommendations for ABB Robotics in a visual way. It also gives a clear picture of which order that is recommended to examine the recommendations in.



**Figure 51 Recommendation to supplier development efforts for ABB Robotics**

## 6.2 Limitations

Time has been a limiting factor for this project, especially for the data gathering. With more time more companies, both buying and supplying, could have been included in the case study and thereby increased the credibility of the results. It would also be possible to make more than one visit to the companies, which would give higher quality of the data.

The generalization of the result from this study can be questioned since it is a case study with only five companies. However each company is a global, high-tech, manufacturing company with production in Sweden and direct material for their production has been studied. Therefore the result is more generalizable for these kinds of companies.

A major focus on supplier development with a clear strategy is something companies recently started to implement. Therefore the amount of historical data collected at the companies is scarce.

No quantitative comparison between the cases has been possible. This reason of this is the differences in how the numbers are measured at each company and the scope they represents. A comparison would not contribute without a larger investigation of the numbers.

Regarding outcome it has been difficult to get exact numbers of the results. The reason is the many synergies existing in this type of complex relation between two companies. It is hard to locate costs.

### **6.3 Future Research**

Something that would be very interesting for future research within supplier development is to analyze from the suppliers point of view. To investigate what suppliers think about supplier development and what help they prefer from the buying company to be able to increase their performance.

Another aspect, outside of this scope, is to include the product development, R&D, in supplier development. The development of new products is important for what suppliers will be used for future business and therefore this is important for supplier development.

Research about what specific supplier development activities that should be used to reach a desired outcome for specific objectives would be value adding for the subject. This would be a step in making the supplier development efforts even more efficient.

### **6.4 Research Implications**

The research discusses objectives in terms of KPIs, such as quality, OTD, service and cost (Watts & Hahn, 1993). However objectives with a more holistic perspective has been found throughout this project. At proactive companies both long- and short-term goals has been essential for the supplier development strategies and their success. A good example of this is Volvo Cars who has a long-term objective to create self-driven suppliers through fulfilling the requirements of their VQE evaluation system. Reducing the time for solving problems is Volvo Cars' short-term objective.

This report is the only one discussing the process of moving from a reactive to a proactive approach within published articles about the subject. Kraus and Ellram 1997 states that reactive and proactive supplier development exists.

This project can also contribute to research with a way of visualizing the different mindsets, see Figure 43 Different supplier development mindsets, within supplier development. The figure explains the scope and focuses of the mindset. The reactive companies only focuses on internal benefits compared to a company including the supplier in the mindset, which then has come one step further to become proactive. Finally a proactive company is adding focus of the customer in their supplier development actions. The mutual responsibilities and benefits must be established to fulfill the proactive approach and complete with customer focus.



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## 8 Appendix 1 – Case Study Protocol

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*This protocol was established for the researchers to summarize why the case study should be executed and what the expected result was. The “Interview Guide” includes the questions used at the semi-structured interviews.*

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### Interview Protocol

*What every investigator needs to know:*

- *Why the study is being done*
- *What evidence is being sought*
- *What variations can be anticipated (and what should be done if such variations occur?)*
- *What would constitute supportive or contrary evidence for any given proposition*

### Research Questions

4. What are the most commonly used strategies for supplier development discussed in research?
- 5. How do companies work differently with supplier development if they use a proactive as compared to a reactive approach?**
6. What are, due to the answers above, the next steps for ABB Robotics in the process of integrating proactive supplier development?

### Methodological Reminders

- The system in this project is defined as the context of supplier development with the factors; Objectives, Activities, KPI, Success factors and Outcome
- It is an inductive research; the final conclusion has been drawn from assumptions based on empirics (theory is built on analysis from observations)
- Multiple holistic case study
- Semi structured interviews
- Pattern matching – is theory matching the empirical findings
- Explanation building – build explanations surrounding the case, links between factors
- Cross case analysis – compare the different cases

## Credibility

The bold text is what is relevant for this part of the project

Test	Way to improve	Description	Phase of research
<i>Construct Validity</i>	Multiple sources of evidence	<b>Interview different people at each case</b> <b>Use other sources for example webpages and external information</b>	Data collection
	Chain of evidence	Declare interview questions and methods for the research	Data collection
	Report reviewed by key informants	Reviewed by the supervisor at the University	Composition
<i>Internal Validity</i>	Pattern matching	By matching interviews and observations with the theory described in Frame of References	Data analysis
	Explanation building	Get a deeper understanding from analyzing links between different factors	Data analysis
<i>External Validity</i>	Cross-case synthesis	Comparing the different cases	Research design
	Describe the context of each case	<b>Mapping of the context of each case and the environment they operates in</b>	Research design
<i>Reliability</i>	<b>Case study protocol</b>	<b>Created to be a template for executing the cases in the same way</b>	Data collection
	<b>Summarize interviews for the interviewed person</b>	<b>To prevent misunderstandings and assure no confidential material is included in the report</b>	Data collection
	<b>Interview different people</b>	<b>To get the full picture not influenced by only one person</b>	Data collection

## Data Collection Procedure

Interviews and research for each case (research at company webpages and for articles about them).

## Review of Case Study Nomination

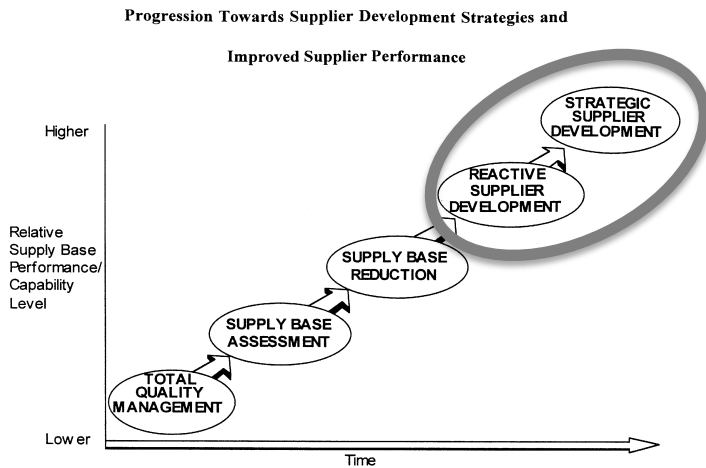


## Schedule for Doing Case Studies

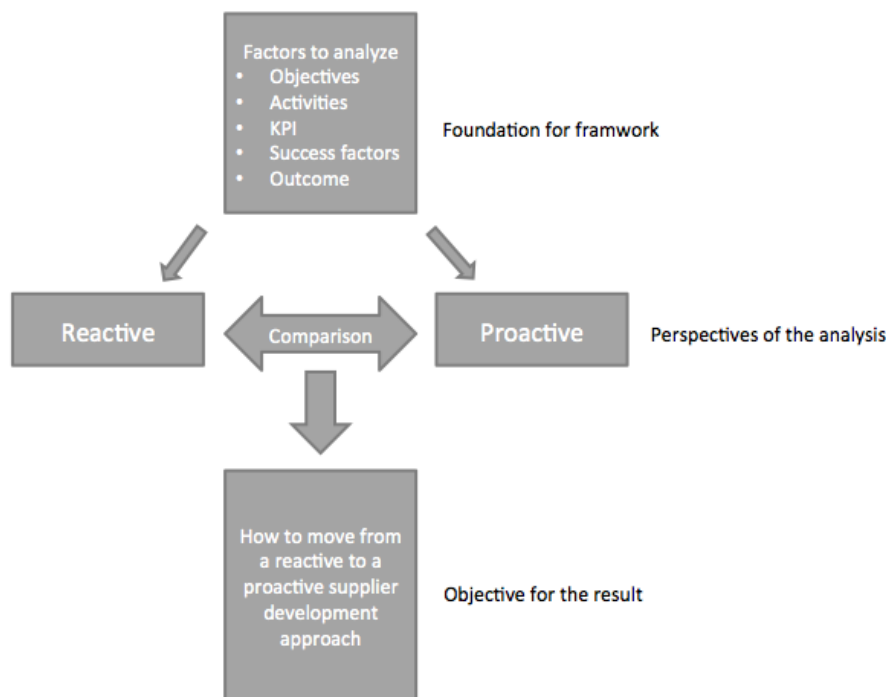
See the document "Case Companies" in dropbox.

## Expected Findings

How to move from reactive to proactive supplier development.



Are there any differences in supplier development (the factors) between companies working reactive or proactive? The purpose is to find how a company should work with the different areas in the picture below to work proactive?



## Outline of Case Study Report

### Empirical Study

What information is gathered from the cases and how is that relevant?

- Introduction of the company to understand the context of each case
  - Short presentation
  - Define if they work reactive or proactive (shortly and explain more later)
- Activities
  - Continuous improvements?
- Objectives
- KPI/SPM

- What metrics are used (OTD, Quality)
  - How are they measured
- Success factors
  - Information sharing
    - Information sharing within the firm
    - Information sharing between the buyer and suppliers
  - Trust and Power
    - How are trust and/or power used in the context of SD?
  - Strategic fit
    - What supply chain strategy exists and how does suppliers align with this?
- Outcome
  - What is gained from the SD activities (improved quality, OTD, other improvements)
  - Improved financial performance for the focal company? Which parameters and how much?
- Reactive or proactive supplier development (what indicates that)

5.2 Findings for each case – the headings explained in chapter 5.1!

## Analysis

Pattern matching. Match the result/findings with theory

Explanation building – build explanations surrounding the case, links between factors

Cross-case analysis of the cases for each heading:

- The context of the different case companies
- Reactive or proactive supplier development
- Activities
- Objectives
- KPI/SPM
- Success factors
  - Information sharing
  - Trust and Power
  - Strategic fit
- Outcome
  - What is gained from the SD activities (improved quality, OTD, other improvements)
  - Improved financial performance for the focal company? Which parameters and how much?

## Interview Guide

**Research Question:** *How do companies work differently with supplier development if they use a proactive as compared to a reactive approach?*

- Introduction of the company to understand the context of each case

- How do you define SD?
  - Do you have a fluctuating or stable demand?
  - What functions/departments are involved in SD?
  - Number of purchasing employees?
  - Number of suppliers in current supplier base?
- Objectives
  - What objectives do you have for SD?
  - What do you require from your suppliers and how often do you increase those requirements?
- Activities
  - If you define your SD as a program, what steps do you perform?
  - How do you select what supplier to develop? (Drivers: KPI or improved relation to supplier?)
  - How do you initiate (the first step) a development program with a supplier?
  - Who decide what areas that should be improved at the supplier and what is that based on?
  - (What recourses do you and your suppliers dedicate for a SD program?)
  - Specific questions on activities we find during the case research (for example the black list at Alfa Laval)
- KPI/SPM
  - What metrics are used? (OTD, Quality)
  - Do your suppliers get feedback from your measurements/requirements?
- Success factors
  - Information sharing/communication
    - Do you work in cross-functional teams with SD and in that case which functions are involved? Are those teams permanent?(Information sharing within the firm?)
    - What information do you share with your suppliers and how frequently?
    - (Do your supplier see the end customer demand?)
    - How often/and how many of your suppliers do you meet face-to-face?
  - Trust and Power
    - How do you build commitment through trust with your suppliers?
    - How do you use/manage power in your relation with your suppliers?
    - Do you expect to renegotiate the price in connection to SD improvements? If not, why?
- Outcome
  - What is gained from the SD effort (improved quality, OTD, other improvements)
  - What improved financial performance do you experience? Which parameters and how much?
  - How does your costumer experience your SD efforts? (external quality)
  - Have your SD efforts lead to improved internal processes? (internal quality)
- Reactive or proactive supplier development (what indicates that)

- How do you manage urgent supplier problems?
- Are your SD efforts focusing more on improving the material you buy or the supplier's capabilities?
- Do you work reactive or proactive with SD? Explain!
- How do you define reactive and proactive SD work?

To be handed to the interviewee:

Supplier development activities	Yes	No
Investment in equipment or capital in the supplier's organization		
Provide competition between existing suppliers through multiple sourcing		
Evaluate suppliers' performance for example with supplier audits		
Use of supplier certification program		
Increase supplier performance expectations		
Supplier recognition through awards		
Any type of "black list"/"flop list" of suppliers with undesired performance		
Promise increased present and future business if a supplier improve performance		
Site visit to the supplier		
Visit to the focal company by the supplier's representatives		
Education and training of suppliers' personnel		
Temporary exchange personal between the supplier and the focal company		
Direct investments in a supplier		
Investments in supplier's operations		
Try to implement a philosophy of continuous improvement at the supplier		

## 9 Appendix 2 – List of Interviews

Table 25 Interviewees at all companies

Company	Interviewee	Title	Date
Alfa Laval	Interviewee 1	Senior Project Manager, Supplier Developer	March 20, 2014
Alfa Laval	Interviewee 2	Production Manager, Black Belt	March 20, 2014
ABB LV Motors	Interviewee 3	Supplier Developer	March 19, 2014
ABB LV Motors	Interviewee 4	Operational Purchaser	March 19, 2014
Volvo Cars	Interviewee 5	Director, Resource and Competence	March 18, 2014
Volvo Cars	Interviewee 6	Sourcing Specialist	March 18, 2014
Volvo Cars	Interviewee 7	Director Supplier Quality Manager	March 18, 2014
Volvo Cars	Interviewee 8	Operative Supplier Quality Manager	March 18, 2014
TKMS AB	Interviewee 9	Strategic Sourcing Manager	March 31, 2014
TKMS AB	Interviewee 10	Project Manager Purchasing	March 31, 2014
TKMS AB	Interviewee 11	Project Director Noli	April 5, 2014
ABB Robotics	First visit	Title	Date
ABB Robotics	Interviewee 12	Global Supplier Quality Manager	February 3, 2014
ABB Robotics	Interviewee 13	Strategic Purchaser	February 3, 2014
ABB Robotics	Interviewee 14	Supply Chain Manager	February 3, 2014
ABB Robotics	Interviewee 15	Operational Purchaser	February 4, 2014
ABB Robotics	Interviewee 16	SQE-Supplier Quality Engineer	February 4, 2014
ABB Robotics	Interviewee 17	Production & Logistics Manager	February 4, 2014
ABB Robotics	Interviewee 18	Global Supplier Quality	February 4, 2014
ABB Robotics	Interviewee 19	Operational Purchaser	February 5, 2014
ABB Robotics	Interviewee 20	Operational Purchaser	February 5, 2014
ABB Robotics	Interviewee 21	Strategic Purchaser	February 5, 2014
ABB Robotics	Interviewee 22	Production Planning Manager	February 5, 2014
ABB Robotics	Interviewee 23	Operational Purchasing Manager	February 6, 2014
ABB Robotics	Interviewee 24	Local Supplier Quality Manager	February 6, 2014
ABB Robotics	Interviewee 25	ASQE-Advanced Supplier Quality Engineer	February 6, 2014
ABB Robotics	Second visit	Title	Date
ABB Robotics	Interviewee 26	Global Supplier Quality	May 7, 2014
ABB Robotics	Interviewee 27	SQE-Supplier Quality Engineer	May 7, 2014
ABB Robotics	Interviewee 28	Strategic Purchaser	May 8, 2014
ABB Robotics	Interviewee 23	Operational Purchasing Manager	May 8, 2014
ABB Robotics	Interviewee 29	Operational Purchaser	May 9, 2014