



# **Sourcing of Development Components**

- Improving efficiency and effectiveness to reduce cost at Volvo 3P

## **MASTER THESIS**

**SELINA LINDQUIST**

**YLVA YHLEN**

Department of Industrial Marketing  
*Master of Supply Chain Management*  
CHALMERS University of Technology  
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## **Foreword**

We are very grateful for having the opportunity to write our master thesis at Vehicle Dynamics at Volvo 3P. There are many persons who deserve a note of gratitude in this foreword. First of all, the employees at Volvo 3P are regarded many thanks for being positive towards us and our subject and did not once hesitate to answer our questions or be in disposal for an interview. Especially, we direct our appreciation to our supervisor Johan Lindqvist for the great responsibility of the thesis and support regarding issues related to the thesis as well as issues related to our upcoming careers.

Second of all, we would like to take this opportunity to thank all the companies that were part of our external research of how components with extensive supplier involvement can be dealt with. The companies were willing to share a substantial amount of material and information which was very helpful for the thesis work and provided a broader perspective of how purchasing functions are organized in different industries.

Thirdly, we would like to thank our supervisor Lars-Erik Gadde at the Department of Industrial Marketing at Chalmers University of Technology for his spot on analysis's and help in writing this thesis.

Sincerely,

Selina Lindquist & Ylva Yhlen

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## **Summary**

This master thesis has the purpose of identifying suggestions of how to improve efficiency and effectiveness to reduce cost when sourcing components where suppliers are involved in product development at the purchasing function Vehicle Dynamics at Volvo 3P. In order to achieve this goal, initial interviews were held to identify the main issues occurring when sourcing these components. The findings were that the greatest problems at Vehicle Dynamics concern the following three problem areas; cross functional collaboration, supplier relationships and efficient contracting. Thereafter, an internal research within 3P was conducted as well as external research where 10 companies within different industries were interviewed concerning the main problem areas that occurred at 3P in order to identify possible improvement suggestions. Solutions to the problems were found internally as well externally and general conclusions of how to improve efficiency and effectiveness when sourcing development parts are presented in the end of the report.



## Key Words

Assigner	Referred to as Johan Lindqvist, Continental Purchasing Manager at Vehicle Dynamics.
Concept Phase	Phase in the global sourcing process where the concept of the component is developed.
Cost Objectives	Internal cost targets which are based upon the project budget.
Development Agreement	Additional agreement needed when having joint product development with suppliers.
Development Component (SIPD part)	Components developed together with suppliers (Supplier Involvement In Product Development).
Development Phase	Phase in the global sourcing process where the component is developed, thus technical specifications are set.
Global Development Process (GDP)	The global product development process followed at Volvo 3P.
Global Sourcing Process (GSP)	The global sourcing process followed at Volvo 3P.
Intellectual Property Rights (IPR)	The right to possess or control the use of intellectual property, such as trademarks, copyrights, patents and trade secrets.
Potential Supplier List (PSL)	List of potential suppliers when sourcing a component.
Product Development (PD)	The product development function at Volvo 3P
Purchasing (PU)	The purchasing function at Volvo 3P.
Request For Information (RFI)	Standard business process to collect written information about the capabilities of various suppliers.

Request For Quotation (RFQ)	Standard process to invite suppliers into a bidding process.
Residential Engineer	Engineer from supplier located at Volvo 3P to work as a technical coordinator and make sure that no misunderstandings are prevailing.
Supplier Involvement in Product Development (SIPD)	Joint product development with suppliers.
SIPD part (development component)	Components developed together with suppliers (Supplier Involvement in Product Development).
Statement Of Work (SOW)	Additional legal document for SIPD parts where for example all responsibilities and working procedures are described.
Supervisor	Referred to as Lars-Erik Gadde, Professor at Chalmers University of Technology.
Teampplace	Shared folders on the intranet that can be used to share documents internally or with suppliers.
Vehicle Dynamics	The purchasing function where the master thesis mainly is conducted.

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# 1. Introduction

Supplier involvement in product development has become increasingly anticipated the last couple of years due a greater trend in outsourcing and focus on core competence within organizations. Outsourcing has originally been used for commodity products within companies where purchasing only had the role of ordering the number and necessary delivery dates for the components. Today however, the outsourced components are to a greater extent development components; meaning that the supplier and company have joint product development. This has changed the role of purchasing from having an operational role to a strategic role. Because of this, purchasing often works in cross functional teams, meaning involvement of for example product development, finance, marketing, manufacturing, logistics and other affected functions, in order to ensure proper specifications. As there has been a shift in purchasing's strategic involvement, it is not always clear how the functions responsibilities are divided within all organizations. The automotive industry is one of the industries where the trend towards focusing on the core competence is increasingly evident during the last decades. (Gadde et al. 2010)

Volvo 3P, part of the Volvo Group, has had a gradual increase of joint product development with suppliers. The process of handling development components is different from the process of handling commodity product as more aspects need to be considered. This has given rise to a number of issues at Volvo 3P. These issues are for example; the projects involving development components are time consuming, leverage towards suppliers is lost, the delivered components do not meet the technical requirements, the development contracts are signed too late, the cost is almost always higher than anticipated and the most suitable sourcing strategy is not always agreed upon in advance. As these problems have been acknowledged, a part of the strategic business plan for the year of 2011 is to increase purchasing flexibility and efficiency and strengthen the supplier delivery assurance. This is where the thesis fits in; looking deeper in the current issues and see what can be done to improve the current situation. The problem will more specifically be investigated in the purchasing department Vehicle Dynamics within Volvo 3P. (Volvo, 2011)

This thesis is conducted for Vehicle Dynamics and investigates the main issues when sourcing development components, identifies key success factors from literature, internal and external research. The thesis is built up by a thorough background analysis followed by purpose and problem analysis. Thereafter, the methodology is described as well as the analytical framework presenting the definitions and concepts from literature that were used to analyze the next section; the collected empirical data. After an analysis of the situation, the section is finished off by the main conclusions of the thesis as well as the recommendations for Vehicle Dynamics.

Below, the background section starts with a short presentation of the Volvo Group and in particular Volvo 3P and its purchasing organization followed by a description of the Vehicle Dynamics department, where this thesis is performed. The section is finalized with a presentation of the master thesis purpose.

## 1.1 Background-The Volvo Group

The Volvo Group is one of the leading suppliers of commercial transport solutions providing products such as trucks, buses, construction equipment, drive-systems for marine and industrial applications as well as aircraft engine components. The Volvo Group consists of nine business areas (horizontal axel) and seven business units (vertical axel) (see Figure 1). The business unit Volvo 3P globally supports the four truck brands within the Volvo Group: Volvo Trucks, Renault Trucks, Mack Trucks and UD Trucks and are focus for this thesis. (Volvo, 2011)



Figure 1: Illustration of the Volvo Group's business areas and business units. As noted in the figure, Volvo 3P is a business unit comprising the four truck brands: Volvo, Renault, Mack and UD (Volvo, 2011)

### 1.1.1 Volvo 3P

Volvo 3P was founded in January 2001 and has about 5000 employees. The organization is responsible for product planning, purchasing, product development and product range management for the four truck organizations mentioned above. In order to guarantee a powerful competitiveness for each brand in each market segment, Volvo 3P works in partnership with the truck companies. Even though all truck brands are based on common vehicle architecture and shared technology, Volvo 3P offers its customers innovative and customized solutions and thus preserves the unique characteristics of each brand. Due to the subject of the report, the focus is hereafter on the purchasing function of Volvo 3P. (Volvo, 2011)

The purchasing organization of Volvo 3P is customer-oriented and supplier integrated and has five driving forces:

- Strongly support the Volvo group truck brands growth objectives
- Focus on supplier performance
- Reducing the supplier base
- Build strong relationships with world class suppliers
- Drive efficiency to operational excellence.

The purchasing organization consists of seven departments; four purchasing segments: Cab, Chassis, Vehicle Dynamics and Electrical and three support departments: Supplier Quality, Global Purchasing and Finance & Business Control. As mentioned above, this thesis is performed at Vehicle Dynamics which is described in more detail below. (Volvo, 2011)

### 1.1.2 Vehicle Dynamics

Vehicle Dynamics is responsible for sourcing of axles, steering suspensions, wheels, tires, pneumatic systems, braking systems, brakes and hubs and the component segments can be seen in Figure 2. The annual purchasing spend, about 1.500 M€, is distributed among about 270 suppliers worldwide. The components sourced by the department are strategic, high value parts with high raw material content. The parts are expensive and have a high level of innovation and Vehicle Dynamics generally has long term agreements with their suppliers. Several components imply joint development processes with suppliers whereby the sourcing decision must take place early on and also implies a high switching cost. Besides this, the supplier market is a low margin market with low transparency where oligopoly or monopoly is rather common. High investments for suppliers constitute an entry barrier to the supplier market which sometimes causes capacity issues for Volvo 3P. The sourcing process of components has thus several hindrances to overcome (Volvo, 2011). As the amount of components with joint product development with suppliers, (hereby referred to as development components), is increasing at Vehicle Dynamics, this also calls for a new working method. Development components are internally handled in cross functional teams but this particular working process is immature, which has led to several issues within the projects. However, no research of how sourcing of development components can be improved has been conducted. Based on this background information, the purpose of this master thesis is presented below.

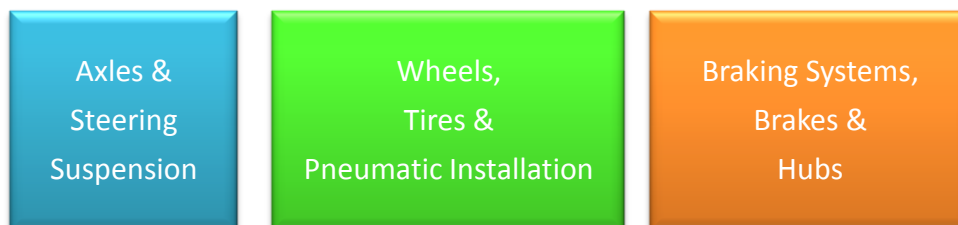


Figure 2: Component segments within Vehicle Dynamics

## 1.2 Purpose

The purpose of this master thesis is to identify the problems when sourcing development components at Vehicle Dynamics and thereafter identify improvement suggestions through internal and external research. Thus, the master thesis renders in possible improvements that could be undertaken concerning how to improve efficiency and effectiveness when sourcing development components to reduce cost.



## 2. Problem Analysis

The aim of the problem analysis is to provide insight in the general issues when sourcing development components at Volvo 3P and compares these issues with purchasing challenges according to literature. This section is comprised by a first part describing the current global sourcing process at Volvo 3P, followed by a problem description derived from interviews within the organization. Thereafter, literature regarding purchasing challenges is presented which later is compared with the stated problem areas at Volvo 3P. Finally, the research questions that will be answered throughout the master thesis are presented.

### 2.1. The Global Sourcing Process at Volvo 3P

Volvo 3P (hereafter referred to as 3P) has developed a Global Sourcing Process (GSP) in order to ensure a selection of premium suppliers and to secure the purchasing segment strategy implementation. The process is valid for the entire range of components but is adjusted for different kinds of components. GSP includes guidelines to be followed globally by purchasing to secure that the supplier selection process is in accordance with the Global Development Process (GDP). The roles and responsibilities of each stakeholder at each step of the process are included as well as the responsibilities of the different decisions concerning segment strategy, Potential Supplier List (PSL) and supplier selection. (Volvo, 2011)

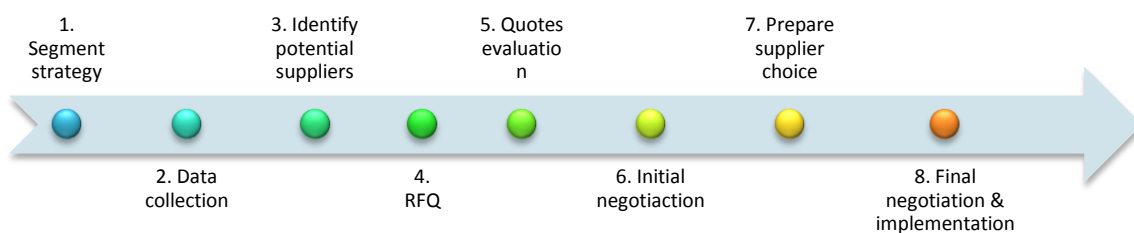


Figure 3: The Global Sourcing Process' eight steps

The process supports the efficiency of the purchasing organization globally and comprises eight steps (see Figure 3). At step 1, a segment sourcing strategy is developed and the future segment supplier base is defined. Step 2 constitutes a collection of required data and a Request For Quotation (RFQ) is set up. At step 3, potential suppliers are identified in order to secure that PSL only consists of premium suppliers. The RFQ is thereafter sent to the supplier at step 4 and feedback from suppliers concerning technical feasibility, economical options, logistics, aftermarket constraints and/or opportunities are received at step 5. The initial negotiation takes place during step 6, aiming to achieve an attractive market price. The final supplier choice is done at step 7 while the final negotiation and implementation take place at the final step. However, this process is slightly adjusted to different component categories even though the steps are similar. To be able to explain the difference and reasons behind the adjustments, the component categories have to be described; the next subchapter will therefore present these categories. (Volvo, 2011)

#### Component categories

3P distinguishes the purchased components into three categories: key-, development- and remaining components (see Figure 4). Key components are the most important parts in projects regarding Quality, Delivery, Cost and Features (QDCF) and risks. Development components on the other hand,



are parts with Supplier Involvement in Product Development (SIPD) where early involvement with suppliers is essential. These parts will hereby be referred to as SIPD parts. The third category, remaining components, consists of all parts that are neither key- nor development parts. Since the focus of this report lies within development parts, different approaches to source these components will be explained below. (Volvo, 2011)



Figure 4: Components categories Development Components, also known as SIPD parts is focus of this master thesis

As mentioned above, the GSP is adjusted for the component categories (see Figure 5) due to diverse prerequisites. When sourcing SIPD parts, the supplier selection takes place earlier and the entire process is generally more time consuming. In this case, the supplier selection is even more critical since it takes place before the product specifications are determined which often implies issues during the final steps of the process. Moreover, each purchasing decision implies contracting, but for SIPD components, a development agreement is also needed. The development agreement includes responsibilities concerning the product development such as development costs, Intellectual Property Rights (IPR) and changes of specifications to reduce the risk of misunderstanding and not fulfilled expectations. The process of each sourcing decision is to a large extent determined by the sourcing strategy. The available strategies regarding SIPD parts are presented in the next section. (Volvo, 2011)

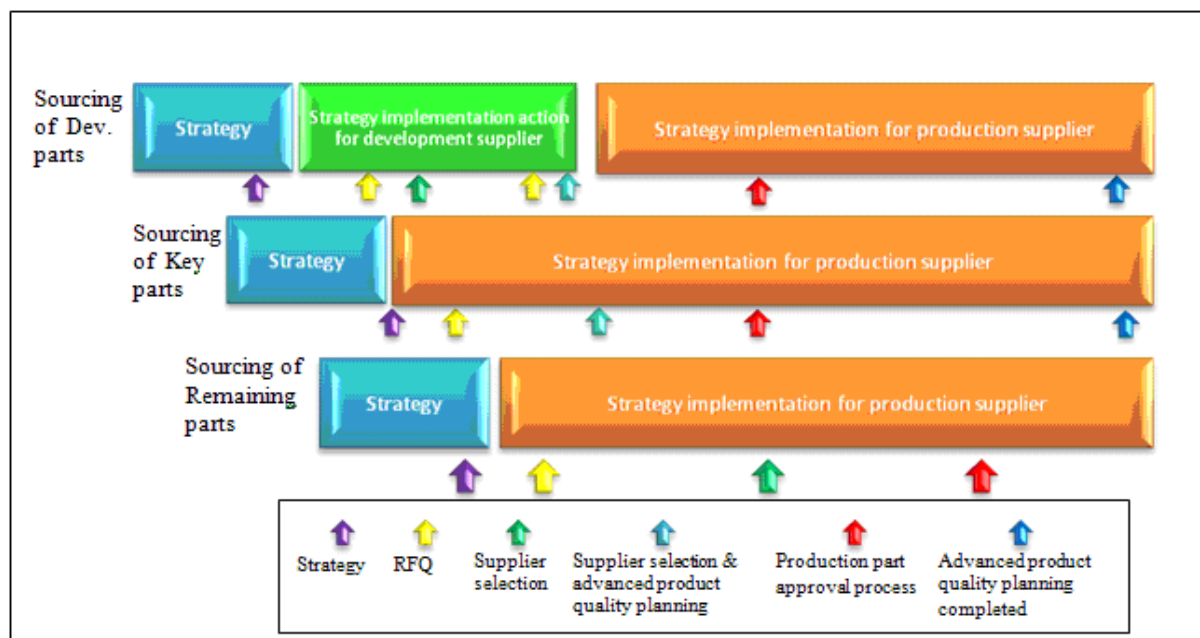


Figure 5: Sourcing process for different components. Note the longer time period for sourcing of SIPD parts

The supplier selection for SIPD parts is of great importance due to close collaboration through joint product development. Different approaches are suitable for different contexts and 3P distinguishes between four sourcing strategies (see Figure 6) where the five phases; pre-study, concept study, detailed development, final development and industrialization are shown:

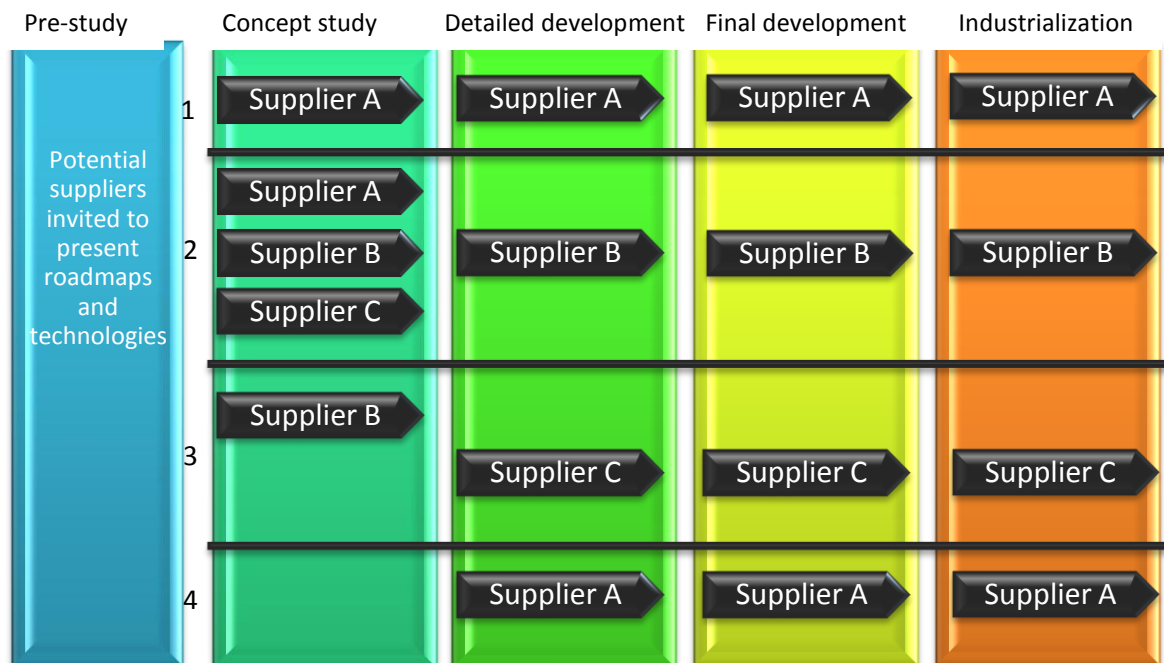


Figure 6: The four sourcing strategies for development parts

1. One supplier is selected from the concept study up to industrialization. This approach is suitable when there is an existent close relationship with a supplier as there is a risk of only relying on a single supplier.
2. Several suppliers are involved during the concept study. Thereafter, one supplier is selected and used through the remaining phases. This strategy reduces the sourcing risk since 3P evaluates several alternatives at the same time as the resource utilization of 3P increases.
3. A single supplier is chosen to develop a concept. Thereafter, a RFQ concerning development of this component is sent to several suppliers and one supplier is selected. This approach provides the flexibility of selecting the best quotation.
4. The concept is developed internally by 3P and is thereafter further developed by the most skilled and competitive supplier.

According to the GSP, the sourcing strategy should be chosen based on the context for each purchasing decision. This is however not always applied in real life. Irrespective of sourcing approach, a development agreement should be signed when sourcing SIPD parts in order to avoid misunderstandings. Unfortunately, these agreements are almost always signed too late. These issues are some of the opinions that have been discovered through internal interviews and these general thoughts of the current sourcing process are presented below. (Volvo, 2011)

## **2.2 Opinions about the Current Sourcing Process**

This section describes the problems with the sourcing process that have been identified in the initial internal interviews (see section 3.4 for a more detailed description). The interviews were held with employees with various positions; however most of them were managers on a strategic level as the persons were renowned for having an overall view. The problems of the sourcing process were most often expressed in context with the following three issues; Relationship between Purchasing and Product Development, Long Term Purchasing Strategy and Development Agreements. The content of these three issues are explained in the following sub-sections.

### **2.2.1 Relationship between Purchasing and Product Development**

The most acknowledged problem is the relationship between purchasing (PU) and product development (PD) as it was mentioned by almost all interviewees. The communication is, according to the interviewees, not working optimally. PD does not always inform PU of the need of a development supplier early enough and does not understand the consequences of a too late involvement of PU. PU on the other hand, does not give enough attention towards the development of new components. It has been expressed that PU could be involved even earlier than today as there is a need for a supplier to satisfy the needs of PD. Before a cross functional team is put together something called advanced engineering takes place where new concepts are created and evaluated. Successful concepts are thereafter leading up to a project where purchasing is involved. Moreover, PD has often already determined what supplier they would like to work with and therefore designed the technical specifications to fit the supplier in mind. In doing this, only one supplier will fulfill the requirements, creating a monopolistic situation with single sourcing, which makes it hard for 3P to create leverage towards the supplier. In addition, PD and PU communicate different things to the supplier without the other internal function's knowledge. This implies that there is no understanding of the benefits of having the same frontage towards the supplier.

One of the goals in the past business plan was to integrate PU and PD. In this sense, some departments have been more successful than others. The changed behavior concerning this subject at Vehicle Dynamics has not been one of the most successful.

### **2.2.2 Long Term Purchasing Strategy**

It has been expressed that not all component segments within Vehicle Dynamics have a clear long term segment strategy. There are existing segment strategies but these do not always apply for SIPD components. One of the long term issues regarding segment strategies is whether multiple- or single sourcing should be used when evaluating suppliers. In this sense, multiple sourcing means that several suppliers are asked to develop a prototype or drawing (see Figure 6) and thereafter one supplier is chosen to develop the component. Single sourcing means that one single supplier develops a conceptual component and thereafter this supplier is evaluated and either approved or declined for further collaboration. See section 2.1 The Global Sourcing Process at Volvo 3P for a more detailed description.

Some interviewees see the possibility of using multiple sourcing as a mean of getting a better end product and component price as the suppliers are competing against each other in getting a deal. Others see that single sourcing is better as it has less development cost for 3P as time and resources for handling several suppliers can be saved. Moreover, it has been said that there is a less hostile environment when working with a single supplier in this case. Another long term strategy issue, strongly related to multiple and single sourcing, is the supplier selection criteria. Supplier selection criterion is hard to set as the demanded final output from the supplier is unknown which also gives rise to an insufficient Potential Supplier List (PSL).

Yet another part of the long term purchasing strategy includes the matter of cost objectives. At the moment, a cost objective is set by cost engineers within 3P. They look at the material cost of the component, the features and make reference to similar existent components in order to get an apprehension of the final component price. This step is done before the development supplier/s communicate their drawings and price approximations in order for purchasing to have a negotiation standpoint. However, the cost objectives are from PU described as somewhat incomplete as they are not further developed when component prerequisites change and since other factors such as prevailing market conditions are not considered. This means that the cost objectives do not really serve the purpose of providing leverage as they are inaccurate.

### **2.2.3 Development Agreements**

Yet another common topic during the interviews is the issue of signing the development agreements. Many mention that the process of involving suppliers works in theory but not in practice. For example, the agreements are not signed when they are supposed to. In other words, the development agreements are not signed before the products are developed. If the development agreements are signed after the products have been developed, it is very hard to negotiate as the supplier knows that 3P is dependent on them and therefore a great deal of leverage is lost.

The reasons for not signing the development agreements in time tend to be many. First of all there is a lack of understanding of how important it is that an agreement is signed and what negative consequences that can occur if not signed properly. Some express that the process is too complex to grasp as it requires involvement of lawyers to a great extent which requires both time and resources from 3P and the supplier. Others believe that there are no sufficient assisting documents that guide buyers in negotiation and legal issues. Moreover, the standard development agreement is often used without any modification depending upon project. This entails the suppliers to change a great deal in the agreements since most projects and development components are unique and require different features each time. It has also been described that the process of handling development agreements with suppliers is quite new at Vehicle Dynamics as the previous components were mostly key or remaining parts that did not require development agreements. With the increasing outsourcing however, the numbers of errands have increased and currently there is no trend towards a decline in this matter.

The three problem areas described in the sections above will be compared with literature; therefore, challenges for the purchasing function according to literature are presented below.

## **2.3 General Challenges for the Purchasing Functions**

Purchasing is increasingly recognized as a key function. This is because the work of buyers directly impacts on the costs of a firm. Moreover, the increasing amount of outsourcing of product development requires a higher competence level of buyers as the components bought are more complex. Another closely linked issue is having efficient and effective relationships with suppliers as this affects the organizations' short term financial position and long term competitiveness (van Weele, 2005). According to Gadde et al. (2010), it is therefore necessary to apply a 'purchasing as supply network management' approach. This new approach implies three main challenges for purchasing:

- Purchasing has to be more involved in efforts to reduce the total cost of the organization rather than focusing on the component price in a specific transaction.
- Purchasing has a major role to play concerning innovation and development which challenges the use of standardized solutions.
- Purchasing needs to have a holistic view of what they are engaged in.

These three challenges are presented in more detail below in order to understand the core issues of efficient and effective purchasing.

### **2.3.1 Total Cost Approach**

In order to reduce costs, the purchasing function has to apply a wider scope. Most purchasing functions focus on reducing the component price in each isolated situation. However, each isolated transaction is only a part of series of transactions over time (Trent & Monczka, 2003). To be cost efficient, a total cost approach should be applied. Cost of design, maintenance and manufacturing should be included as well as hidden costs such as cycle time and cost of pre-work. (Gadde et al., 2010).

By analyzing the total cost and cost drivers together with suppliers, several opportunities for cost reductions might emerge. Knowledge of the supplier's capabilities and competence enables adjustments of the specifications to fit their resources. Communication about the conditions of operations and maintenance provides opportunities for the suppliers to adjust their offerings in terms of design and manufacturing. It is hence possible for purchasing to increase the effectiveness through cooperation with internal functions such as design, product development and productions through awareness of what different suppliers can offer. (Gadde et al., 2010)

### **2.3.2 Involvement in Innovation and Development**

The sourcing decision is of great importance concerning new product development. Due to outsourcing, suppliers are most often involved in product development and innovation for the buying organization. The purchasing function is an important link between the supplier and manufacturing and should thus be involved as early as possible in the internal development processes (Moses & Åhlström, 2008). Early supplier involvement enables use of vendor capabilities in product development which is crucial since up to 80% of the product cost is determined in the design phase. In addition, by involving suppliers early on, the lead time of the development phase can be reduced (Gadde et al., 2010).

### **2.3.3 Holistic View**

Each purchasing decision is related to the past and impacts on decisions as well as procurement of a single item is related to other purchases at the same time. The purchasing decision can be extended to cover other components procured from the supplier to reduce the number of vendors and thus gain economies of scale. An organization might also benefit from encouraging cooperation among its suppliers e.g. joint activities in product development. Furthermore, an efficient supply chain requires involvement with second-tier suppliers to avoid sub-optimization. Every activity is affected and affects other activities, purchasing activities as well as activities of other internal functions. Improvement of one purchase or one relationship might thus enable improvement in others. (Gadde et al., 2010) The challenges of the purchasing function are now compared with the problems identified in Phase 1.

## **2.4 Comparison of Literature and Current Situation at 3P**

In this section, the three challenges for the purchasing function according to Gadde et al. (2010); the Total Cost Approach, Innovation and Product Development and Holistic View are compared to the three current problem areas within 3P; Collaboration between PU & PD, Long Term Purchasing Strategy and Development Agreements. This chapter is structured in accordance with the three problem areas as the purpose of this thesis is to investigate how to improve the situation and thus reduce the current tensions. The comparison is base for the research questions that are presented in the next subchapter.

### **2.4.1 The Collaboration between PD and PU**

All purchasing decisions are interrelated and all functions involved must work closely together in order to be part of an efficient supply chain (Gadde et al., 2010),. Moreover, the choice of today impacts on the choices of tomorrow; an unsuccessful project impacts all other projects as the components of an end product have to be compatible. This means that there is possible to improve the current supply chain at 3P as there is a lack of communication and interest and there have been several unsuccessful projects. It is also worth mentioning that there is insufficient and inconsistent communication to the supplier due to lack of cooperation between internal functions.

Purchasing is supposed to be the link between the supplier and product development. It is vital that purchasing is involved early on in the concept phase in order to use the vendor capabilities to decrease the product cost and reduce the lead time. As there is limited understanding of the importance of early involvement, this suggests that there are longer lead times and higher costs than necessary at 3P.

### **2.4.2 Long Term Purchasing Strategy**

The total cost approach can be applied to long term strategy issues within a department. According to Gadde et al. (2010), the idea of a wider scope of cost means for example that not only the end price is regarded but also the cost of pre-work and cost of failures. If all factors giving rise to cost are not considered, it is hard to be able to reduce cost. This aspect can be illustrated for single and multiple sourcing; there is a higher initial cost associated with having several suppliers developing one component. This might however give rise to substantial cost reductions in the end but this is not identified today as all available information is not taken into consideration. Knowing this, the cost

objective could be improved as it uses a fixed price and has no room for changes in form of risks or opportunities. Moreover, by putting more effort and resources in the beginning of a project, the total cost of the project might decrease even though the initial costs increase.

#### **2.4.3 Development Agreements**

By having a total cost approach, the wider scope of cost regarding the development agreement is the cost of not signing it, which seems to be a problem at the current state. When not signing, there is an absence of the holistic view, giving rise to misunderstandings concerning intellectual property rights and responsibilities between the two parties which can lead to extensive costs. Moreover, lack of instructions and inefficiency due to standardized agreements affects the total cost because extra time and resources are needed. Thus, the contracting situation when having SIPD sourcing is problematic. The three challenges for the purchasing function and the three problem areas at 3P have given rise to the research questions that are presented below in 2.5 Research Questions.

### **2.5 Research Questions**

The following research questions will be answered throughout the master thesis and have been derived from section 2.4 Comparison of Literature and Current Situation at 3P, where the current situation at 3P is compared to the challenges of the new purchasing organization presented by Gadde et al. (2010). As mentioned earlier, three main issues arise when sourcing development components: lack of collaboration between internal functions, lack of long term purchasing strategy and issues with development agreements. By improving the relationship between product development and purchasing, the long term purchasing strategy as well as the approach to development agreements, the work with SIPD parts can be improved. The research questions are therefore aiming at looking into how the current sourcing process at 3P can be superior. In order to answer this, internal investigations within 3P, literature investigations of the subjects as well as external research with other companies and industries are conducted. In the investigations, the focus was on the three problem areas. With this in mind; the three research questions are the following;

1. How can internal cooperation, supplier relationships and contracting be improved when sourcing SIPD parts according to literature?
2. How can internal cooperation, supplier relationships and contracting be improved according to employees at 3P?
3. How do companies within other industries work with sourcing of SIPD parts?

### **3. Methodology**

This chapter aims at providing the reader with an understanding of how the project was conducted. It starts with describing available research approaches, thereafter data collection methods and quality measures used throughout the study are presented. These theories are the foundation when explaining the specific method developed and used for this project which is presented in the end of this chapter.

#### **3.1 Research Approach: Quantitative and Qualitative Research**

There are two different research approaches; quantitative and qualitative. Quantitative research consists of questionnaires with predefined answers created by the investigator (Seymour, 1992) whereas qualitative research is based on methods that imply collection of more detailed descriptions (Seymour, 1992).

Quantitative research generates numerical data or data that can be converted into numbers. It is often focused on hypothesis testing or claimed relations between phenomena whereby it is preferred to use during latter phases of research projects. The objective is to obtain precise measurement and analysis of target concepts, often by using questionnaires and surveys (Ryen, 2004). Quantitative research explicates the current situation but not the factors generating the development. Generally it does not give any deeper insights on attitudes, motives, contexts or impressions (Seymour, 1992). Qualitative research on the other hand is of another character. Qualitative research methods have the ability to provide a holistic view of a situation (Seymour, 1992). The objective is to get an insight into people's attitudes, behaviors, value systems and concerns through workshops, in-depth interviews and content analysis (Ryen, 2004).

It is of great importance to distinguish between research method and achieved data since a qualitative research might generate both quantitative data and vice versa. Quantitative data consists of data that can be quantified. Qualitative data on the other hand can be composed of detailed descriptions of situations, people, happenings, interaction between people and observations of behavior as well as quotations from people about their experiences, attitudes, convictions and thoughts (Seymour, 1992). Collection of qualitative data is therefore considerably different to quantitative data collection (Seymour, 1992). The majority of the research for this thesis was based on qualitative research since the aim is to provide a holistic view of the current situation. It is therefore of great relevance to take different perspectives into account by interviewing people with different responsibilities, backgrounds and insights in order to identify the main issues that affects the sourcing process. Both qualitative and quantitative data were thus collected. Different qualitative research methods are therefore presented below.

#### **3.2 Data Collection Methods**

There are many kinds of research methods when it comes to collecting data. No standardized method among qualitative researchers exists. However, conducting an interview is the most popular method even though there has been an increased usage of other methods as well (Ryen, 2004). In this thesis, interviews and literature studies have been the main data collection methods.



### **3.2.1 Interview**

As mentioned earlier, an interview is a qualitative data collection method. Using interviews as a data collection method implies that data constitutes of statements from the respondents. These statements were the object of analysis and interpretation and serve as basis for the conclusions which eventually were drawn. (Lantz, 2007)

Several kinds of interviews are available, such as media interview, research interview, diagnostic interview and employment interview (Krag-Jacobsen, 1993). Different kinds of interviews give diverse data, describe dissimilar contexts and can give diverse results and conclusions. It is essential to know what kind of information different types of interviews provide and thus their suitable contexts (Lantz, 2007). Considering the purpose of this thesis, research interviews were used in order to collect data.

The research interview has many characteristics. In comparison to other kinds of interviews it implicates careful preparations and compilation (Krag-Jacobsen, 1993). There are three kinds of research interviews; the informal, the structured, and the standardized. In the context of this study the structured research interview has many advantages and consequently it is the most appropriate. It is less time consuming than the informal interview and it is also not as dependent on the interviewee's qualifications. Using structured interviews provides a certain amount of security regarding the fact that data obtained from interviews can be used and compared. The method also implies the possibility that new and unpredictable aspects can emerge during the interview (Krag-Jacobsen, 1993).

An important feature of the structured research interview is the usage of an interview guide. According to Krag-Jacobsen (1993) an interview guide is a collection of subjects which are explored in a series of interviews with different respondents. The objective with the interview guide is to guarantee that all respondents encounter relevant and similar subjects and it can consist of both open-end and close-end questions. The difference between open-end questions and close-end questions lies in the scope of the answers. The more possible answers, the wider the scope of answers. Hence, an open-end question has a much wider scope of possible answers than a closed-end question (Krag-Jacobsen, 1993) (see Appendices).

### **3.2.2 Literature Study**

Literature studies were used to collect data as a complement to the research interviews. All information is not possible to retrieve through interviews and must therefore be sought for through literature studies. (Krag-Jacobsen, 1993)

## **3.3 Analysis of Data**

Analysis of data consist of three simultaneous phases; data reduction, categorization and drawing conclusions (Ryen, 2004). The phases mentioned are described more thorough in this text and served as guidelines when analyzing data collected for this study.

Data reduction is a systematic way of choosing and eliminating information before continuing with the analysis. Data which is not of relevance to the problem formulation is eliminated. The purpose is

also to abstract and simplify the collected data (Lantz, 2007). The first step when categorizing the data is to divide the raw data into entities. At the second step, the entities are put into different categories. The data collected for this thesis was sorted into different research groups depending upon the information source since the questionnaire and purpose of the interviews differed. Each research group had some major categories based on the purpose of the research. In total, the data was categorized into four research groups;

- *Initial Interviews*: which were conducted to get an overall view of the issues within 3P where most of the interviewees were from the purchasing organization.
- *Opinions from Product Development*; where persons from product development with many years of experience were asked to give a general picture of the situation.
- *Project specific issues*: where several projects were investigated and the interviewees were employees within the cross functional teams.
- *External research*: where companies within different industries were interviewed of how they solve similar issues to the ones at 3P.

The third phase when analyzing is to draw conclusions and is an interpretation process. There are many methods available; compare or contrast, search for patterns, triangulate and looking for deviating cases or letting the respondents from interviews control the results (Ryen, 2004). The method which is considered the most appropriate for this study is triangulation as this method takes several methods into consideration rather than one. The next section observes trustworthiness.

### **Trustworthiness**

The reliance of research results depends on concepts such as reliability and validity. It is of great importance to use the same criteria for both qualitative and quantitative research when evaluating the reliability of research. Lincoln and Guba have developed the concept trustworthiness which is suitable for both kinds of research (Ryen, 2004). Trustworthiness consists of four criteria: credibility, transferability, dependability and confirmability. Hence, trustworthiness is used for this thesis and is therefore described below.

The basic question related to trustworthiness is simple: How can a researcher convince his or her audiences that the findings of an inquiry are of importance? As mentioned above, four issues of trustworthiness exist: credibility, transferability, dependability and confirmability. Credibility is an evaluation of whether or not the research findings represent a credible conceptual interpretation drawn from the interviewees' original data. Transferability is the extent to which the findings of the investigation can apply or transfer beyond the boundaries of the project. Dependability is an estimation of the quality of the integrated processes of data collection, data analysis and theory generation while confirmability is a measure of how well the inquiry's findings are supported by the collected data. (Lincoln & Guba, 1985)

### 3.4 Method used for This Study

The following section is written in order to grasp the methodology used to access a solution to the defined problem of this master thesis. The method eventuated in a planning report, master thesis and a suggestion for improvement at Vehicle Dynamics. The following model has been developed in order to get an overview of the method used to derive a possible solution for Vehicle Dynamics. As can be seen in Figure 7 below it consists of three phases; Phase 1 - Defining the Problem, Phase 2 - Further Investigation and Phase 3 - Analysis, and each of these are described below.

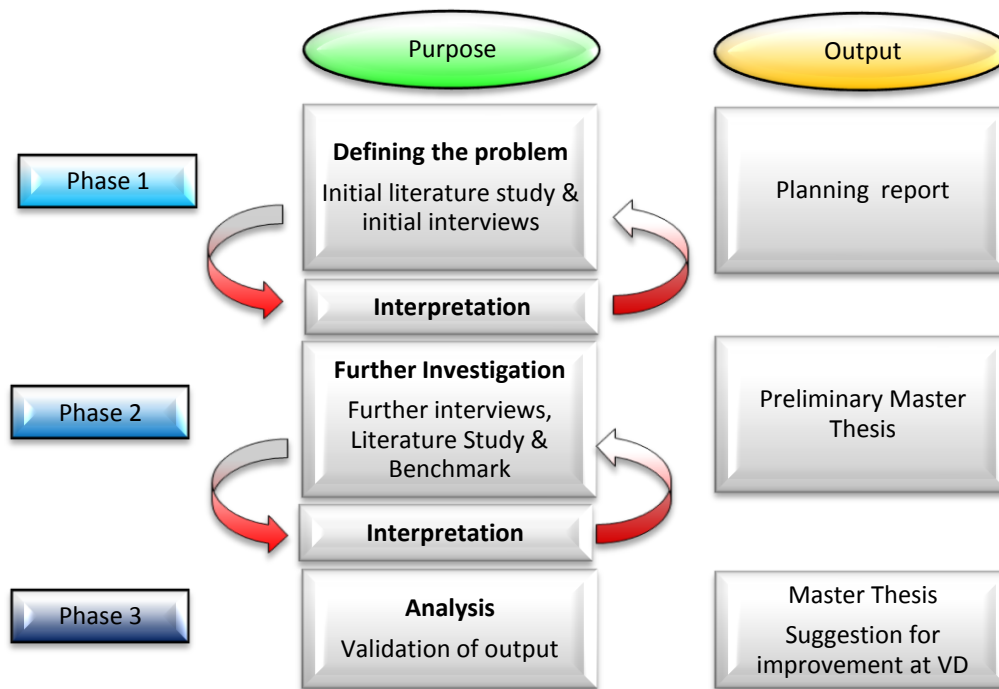


Figure 7: An overview of the method used for this thesis

#### 3.4.1 Phase 1- Defining the Problem

The purpose of phase 1 was to define the problem and this was done through initial literature studies and initial interviews with employees at 3P. Continuous brainstorming was also performed in order to improve the choice of literature and quality of interviews. The initial literature studies and interviews were vital in producing the output, a planning report that was the foundation of the continuous work.

##### Initial Literature Study

An initial literature study was conducted during the ten first weeks in order to get a greater insight in the subject and provide useful information alongside with the internal interviews. The literature in this phase was comprised by internal and external material which is displayed in Figure 8, below. The purpose of having external material was to get a wider spectra of issues that could be related to the subject, understand issues and concepts used within the field of study and might generate questions for the initial interviews. External material in this case includes the topics: research methodology,

interview techniques, contractual management, supply chain management, purchasing, cross functional cooperation, total cost approach as well as literature regarding supplier relationships. Internal material was of more specific sort and was used to understand the current issues within the organization and provides knowledge needed before digging deeper into the issues, also giving rise to questions for the initial interviews. Internal material included: the annual report, the global sourcing process, the process of how suppliers are involved in product development, the business plan, organizational charts, the statement of work and the development agreement. As seen in the list of literature, this phase was constituted by mostly qualitative data.



Figure 1: Material used during phase 1

### Initial Interviews

The purpose of the initial interviews was to get educated of the global purchasing process of development components, to see if the process works the way it is stated in the process document, if employees experience any difficulties with it and if so ask what the cause of the problem is. The initial interviews were conducted during a couple of weeks and the interviewees in this phase have been recommended by the assigner and are all well aware of the process of sourcing SIPD components. Current and former managers at Vehicle Dynamics, project leaders and the 3P process developer were interviewed. For this matter, the structured research interview type has been chosen as it has the benefit of comparing the interview results from the same questions. The coherent interview guide was written before any interviews had taken place and was comprised by a mixture of close-end and open questions. The interview guide can be viewed in Appendix 1.

The very first interviewee was the employee responsible for developing the internal documents at 3P that involves process descriptions and guidance in the field of purchasing. After the interview, a detailed insight of how the processes work according to written documents was given, and initial problem description according to the process manager was acquired as well as causes and possible solutions to it/them. After the first interview, the interview guide was changed due to increased knowledge and insight.

After each interview, the raw data was reduced; analyzed and initial conclusions were drawn. With the latest interview kept in mind, the questionnaire was updated with new arisen questions. The

answers were sorted into different categories to be able to compare answers to previous ones to get an apprehensive view of the situation. Even if the questions were changed, the subjects remained the same in all interviews; the questions had to be adapted due to the interviewee's position, knowledge and interview style preference (open-end/close-end) from recommendation from the assigner. After phase one was conducted three problem areas had evolved; communication between product development and purchasing, lack of long term purchasing strategy and complex development agreements. These areas were the base for further investigation in phase 2.

### **Interpretation**

The purpose of the interpretation sessions was to be able to detect further useful literature, come up with further questions for the interviews as well as grasping the recurring overall problems that have been mentioned. The interpretation sessions were conducted continuously throughout Phase 1. The specific method used is influenced by the method called Deep-Dive™ which has been developed by the company IDEO. The basic idea is that every participant has an open mind and is not discouraged for wild ideas. In this phase, quantity rather than quality is preferred. It is also important that it is possible to build upon others' ideas, being visual, staying focused during the whole session whereby it should not be too long. Therefore, whiteboards are used to a great extent as it enables the participants to write down all ideas and later gives the possibility for the other one to fill in the blank spaces and spin off on some of the ideas.

### **3.4.2 Phase 2 – Further Investigation**

The purpose of Phase 2 was to get into a deeper analysis of the problem through further interviews with employees included in projects, product development, and managers at other departments at 3P. The interview guide can be found in Appendix 2. External research was also made where ten companies within different industries were interviewed concerning the three problem areas that were identified in Phase 1. The interview guide for the external interviews can be found in Appendix 3. Moreover, company documents within purchasing were studied. The output of Phase 2 was a preliminary master thesis including everything but an analysis of collected data and conclusions.

### **Further Interviews**

The purpose of the further interviews was to confirm the problem areas, identify key critical areas as well as key success factors to be able to see possible improvements for sourcing SIPD components. The further interviews were undertaken during seven weeks and the interviewees included buyers, project leaders, product developers, cost engineers, process owners, managers, suppliers and other companies. As for the initial interviews, structured interviews were conducted. Most of the interviewees were suggested as a result from the initial interviews in combination with suggestions from the assigner and supervisor at Chalmers.

### **Company Documents**

Additional company documents were read after the initial literature study in order to enable a deeper understanding of the problem. The company documents were read after hints from interviewees and from assigner's recommendations. These more explicitly included legal documents, segment strategies and material that were used in specific projects.

## **External Research**

External research was performed in order to compare the situation at 3P with companies in other industries in order to see where possible improvements could be made within the three problem areas that were identified at Vehicle Dynamics. The purpose was to investigate if companies that use functional specifications and have product development together with suppliers handle the issues considerably different compared to the automotive industry. In total ten companies were included in the external research of this thesis. The companies were selected based on industry and product range to receive information from organizations that face similar sourcing challenges within other industries. Companies within healthcare-, engineering-, robotic-, space-, mining & construction-, defense-, transportation- and medical industry were included in the study. For the interviews, face-to-face, structured interviews were conducted in order to generate as much data as possible.

## **Interpretation**

A second session of interpretation was also done continuously after Phase 2 Further Investigation. The purpose was to be able to detect further useful literature, come up with further questions for the external research as well as to obtain a deeper understanding of the identified problem areas. For this phase, the Deep-Dive™ method, described above, was once again used.

### **3.4.3 Phase 3 – Analysis**

In this final phase, the results derived from phase 1 and 2 were analyzed. The findings from the internal research were compared with literature and findings from the external research. In phase 1 12 employees were interviewed, in phase 2 34 internal interviews and 15 external interviews were conducted while 20 interviewees were involved in phase 3 (see Table 1). Moreover, the trustworthiness of the collected data was confirmed by interviewing employees at different functions and positions and by looking into several projects. The issues occurring in projects at Vehicle Dynamics were occurring both at other departments at 3P and external companies which supported our findings. In addition, different project experienced similar issues but sometimes team members mentioned dissimilar reasons for why the issues occurred. Therefore, we see our findings as trustworthy and valid for other companies within other industries. The analysis eventuated into several improvement suggestions that were discussed together with several employees to evaluate the suggestions and improve them based on the employees' feedback. Except from evaluating the improvement suggestions, this master thesis was revised to its current state. The next chapter presents the analytical framework that has been used to analyze that data that has been collected throughout the thesis work.

Phase	Interviewees
<b>Phase 1: Defining the problem</b>	<b>12 internal interviewees</b> (Current & former managers at Vehicle Dynamics, project leaders and the 3P process developer)
<b>Phase 2: Further Investigation</b>	<b>32 internal interviewees</b> (buyers, project leaders, product developers, cost engineers, process owners, managers) 17 external interviewees (suppliers & 10 employees from 10 external companies)
<b>Phase 3: Analysis</b>	<b>20 internal interviewees</b> (buyers, project leaders, product developers, cost engineers, process owners, managers)

**Table 1: Interviewees in the three phases of the master thesis**

## **4. Analytical Framework**

The analytical framework aims to present definitions and concepts from literature studies related to the sourcing process of SIPD parts at 3P. The chapter is structured after the three main issues identified in Phase 1. First, main problems and key success factors of cross functional teams are described. Thereafter, high involvement and low involvement relationships and the total cost approach are presented. Finally, key success factors of contracting for projects are described. The analytical framework is used to analyze the empirical data in order to evaluate how to improve the current working process at 3P.

### **4.1 Cross Functional Teams**

Outsourcing, supplier development, strategic alliances and partnerships have attained huge focus within purchasing functions at the expense of organizational design. It is however of great importance for managers to understand how an effective design might enhance supply management performance (Trent 2004). Organizational design determines, according to Hamel & Prahalad (1994), the process of assessing and selecting the structure and formal system of communication, division of labor, coordination, control, authority and responsibility required to achieve an organization's targets. Collaboration and interaction between internal functions such as purchasing and product development have recently become a top priority. As outsourcing increases, the demand of technical knowledge within the purchasing function increases and the need for cross functional teams arises.

Cross functional teams can be viewed in terms of their physical composition or their psychological characteristics (Sethi et al., 2001). In this thesis, we focus on functional diversity within the team, hence the team consists of employees from internal functions such as purchasing, product development, marketing, supplier quality assurance and manufacturing. The possibility to continuously interact and increase the knowledge amongst the team members is a great advantage (Gadde et al., 2010). Cross functional teams are implemented in order to reduce the time spent on product development and at the same time improve performance. The teams entail decentralized decision-making and more accurate decisions through increased collaboration and transparency between internal functions. Hence, the functions that are affected by the decisions are represented in the decision-making process (Henke et al., 1993). Thus, cross functional teams often entail more successful product development projects (McDonough III, 2000). However, not all cross functional teams are successful. This subchapter presents common problems in cross functional teams and thereafter factors that can improve the performance of cross functional teams. Due to the scope of this thesis, the focus lies within the cooperation between the purchasing- and product development function even though all involved functions have to collaborate in order to be successful.

#### **4.1.1 Common Issues in Cross Functional Teams**

Cross functional teams might experience problematic issues during the working process. Moses & Åhlström (2008) have identified three main problem areas of cross functional teams: functional interdependency, strategy complications and misaligned functional goals. It is however of great importance to bear in mind that these issues could have been even greater without cross functional



teams since the interaction would have been lower. This section presents common issues in cross functional teams.

### **Functional Interdependency**

Functional interdependency can occur when organizational functions are integrated. Thompson (1967) distinguishes between three kinds of interdependency; pooled, sequential and reciprocal. Pooled interdependency occurs when each function contributes equally to the entire organization. Sequential interdependency means that all functions are connected in a serial flow that when combined support the organization while reciprocal interdependency represents closely connected functions where the output of one function is the input for the next in line and vice versa. Issues occur when one function's work generates unforeseen happenings that affect other functions. Also, knowledge from past projects that might be useful for new projects might get lost due to reciprocal interdependency if all functions do not build on the same experiences (Moses & Åhlström, 2008).

Interdependency between internal functions is a main issue in sourcing decision processes. Involved functions are highly dependent on other functions' work; their time management and information adequacy affects the functions' mobility and may cause several problems (Henke et al., 1993). A common issue is lack of a holistic view, meaning that important aspects are not taken into consideration when taking a decision, which might impact the outcome negatively. Another issue is lack of common IT-systems which gives rise to information sharing issues within and between projects. Hence, useful experiences and important information from one function or project are not always shared to other members. In addition, decisions are often based on earlier experiences and tacit knowledge without having follow-ups on the outcome and impact (Moses & Åhlström, 2008).

### **Strategy Complications**

Strategy complications often occur due to disagreements across functions because of diverse priorities. It is important that the new product development strategy is clear to all functions in order to make the best decision for the entire organization. A well working business strategy has to be supported by various functional strategies that are internally consistent. The business strategy should be a guide for sourcing decisions. If there is a lack of clear strategies this leads to issues concerning long term strategic decisions since there is no strategy to support the decisions made (Henke et al., 1993). Besides that, the decisions are often made on incomparable information; hence it is always an uncertainty whether the most suitable supplier is chosen (Moses & Åhlström, 2008).

### **Misaligned Functional Goals**

Misaligned functional goals often arise in cross functional teams. Internal functions might have diverse targets which often influence the new product development process negatively due to conflicts and complications (Henke et al., 1993). Three main issues may arise due to misaligned functional goals; functional imbalance, forced path dependency and diverse functional needs. Functional imbalances occur when some functions have fewer representatives than other functions. This might harm the decision process since this implies that some functions will have more authority than others. Forced path dependency arises when some functions are forced to start early to meet deadlines and functional goals. This might lead to designing for one supplier to save time which has

the consequence of having single sourcing instead of strategically weighing different sourcing options. Hence, it is easier and be more convenient to stay with one supplier than switching even though other alternatives might more suitable. The third issue, diverse functional needs might happen when the need of information during a project is different for involved functions. For example: purchasing wants to select the suppliers as late as possible to have more leverage while product development wants to choose one supplier as early as possible to develop a customized product (Moses & Åhlström, 2008). Above, the three main problems occurring in cross functional teams are presented. Below, key success factors for cross functional teams are presented.

#### 4.1.2. Key Success Factors for Cross Functional Teams

A collaborative cross functional team efficiently delivers new products to the market while reducing cost as well as lead time through a high level of creativity and collaborative team members. Well working cross functional teams have, according to Jassawalla & Sashittal (1999), high level of at-stakeness, transparency, mindfulness and synergy as well as improved coordination, information sharing and joint planning of involved functions (see Figure 9). The figure describes how the degree of cross functional interaction and integration is achieved by several factors. In the next coming sections at-stakeness, transparency, mindfulness and synergy are more thoroughly described and suggestions how to improve these factors are given.

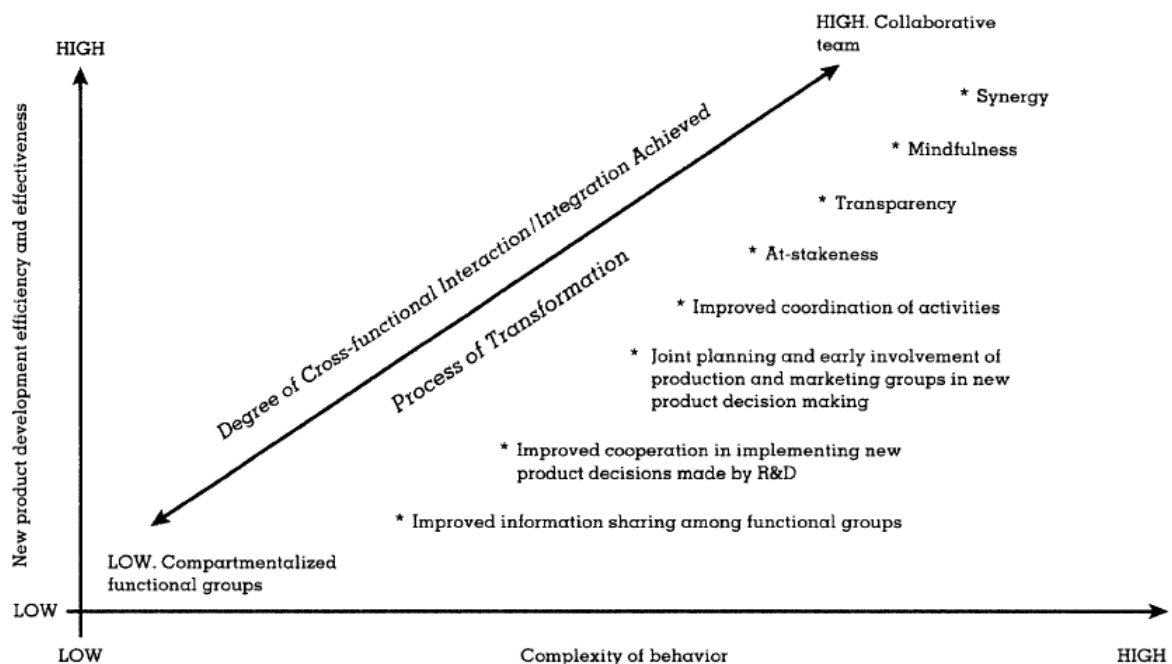


Figure 9: How efficiency and effectiveness is enabled by behavioral transformation

#### At-Stakeness

At-stakeness occurs when all participants equally commit to the team's decisions due to equal concerns of the outcome. The members involve other functions to share their tasks and burdens and are well aware of the connection between their inputs and the decisions of the team as well as the link between their investment in task performance and the team's targets (Jassawalla & Sashittal, 1999). In addition, everyone enjoys being part of a team. To increase the at-stakeness in a team, the team leader should be relatively free of functional connections and be skilled at managing

interpersonal relationships and interactions and ensure that all participants are jointly involved from the beginning, which can be seen in Figure 10 (McDonough III, 2000).

### **Transparency**

Transparency implies that all participants understand each other's targets and interests. Hence, the participants have high level of awareness, clarity and understanding of multiple orientations, motivations and agendas within the team. Conflicting interest are explicitly discussed and the members are open for suggestions. Transparency is often derived from participants' efforts to define their own boundaries in order to increase others awareness of their constraints and interests (Jassawalla & Sashittal, 1999). This is achieved by conscious communication to ensure that others are making decisions based on this understanding. This can be done by an encouraging team leader or formal processes and forums where participants can explain the reasons for their actions supported by hard data. In addition, early involvement, education of other functions work and cross functional experiences of managers contributes to transparency (McDonough III, 2000).

### **Mindfulness**

Mindfulness is the integrated awareness of diverse interests within a team which creates a shared cognitive, emotional and social context from which mindful decisions and actions can emerge. High level of mindfulness hence implies a high level of transparency. Mindfulness entails effective implementation of new product decisions since the decisions receive support from involved functions. Mindfulness origins in the concern of doing it right from start in order to avoid error, rework or associated cost escalations (Jassawalla & Sashittal, 1999). In a team with mindfulness, the participants continually have a high degree of concern for others. The level of mindfulness can be improved by arranging team activities that build trust and by promoting the view that every contribution to team decisions is valid and important (McDonough III, 2000).

### **Synergy**

Synergy occurs when there is a high degree of comfort among the participants. This means that participants have the courage to raise divergent opinions and challenge each other's ideas which is important as constructive conflicts are essential for identifying creative alternatives. Synergistic interactions are triggered by the conviction that new product activities have to be better and less expensive, and that new product introductions have to have a shorter time to market in order to pre-empt competitors (Jassawalla & Sashittal, 1999). Synergy in teams can be improved by having multiple perspectives in decision making and ensure that the team includes a wide range of interests and emphasize that the team benefits from the diverse orientations (McDonough III, 2000).

### **4.1.3 Summary**

As mentioned above, collaborative cross functional teams deliver competitive new products to the market while reducing cost as well as lead time through high level of creativity and well connected team members. The performance of a team is improved by involving all participants from start, by having a skilled team leader, by having high level of transparency and trust (see Figure 10). By improving the performance of the cross functional teams the sourcing process of SIPD parts would be improved. Hence, this master thesis evaluates how to increase at-stakeness, transparency, mindfulness and synergies in cross functional teams. Below, the second area of literature, Long Term Purchasing Strategy is presented.

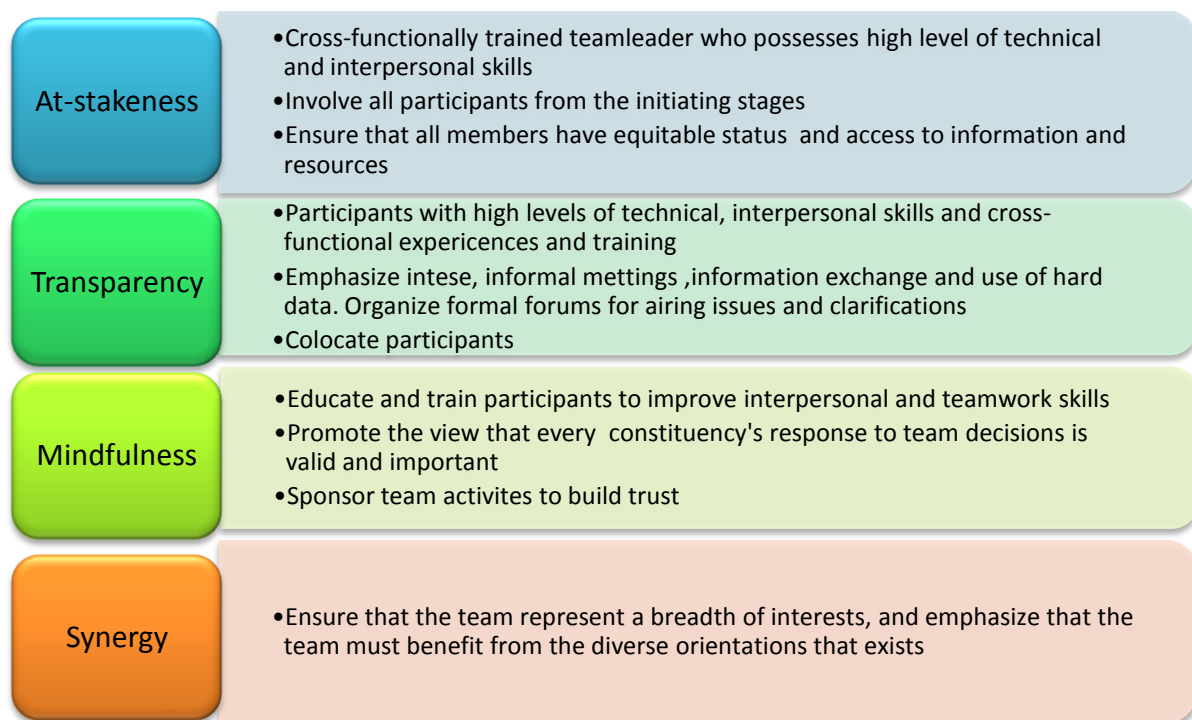


Figure 10: How to increase At-stakeness, transparency, mindfulness and synergy in cross functional teams

## 4.2 Long Term Purchasing Strategy

One of the main problems identified with the SIPD sourcing process is the lack of long term purchasing strategy. The following section has the purpose of weighing the pros and cons of one long term purchasing strategy; single- or multiple sourcing. In this report, single- and multiple sourcing refer to the sourcing strategy used before the development gate; meaning that the technical specifications are set and a prototype might be taken forth by the supplier. A valuation tool for sourcing strategy is the total cost approach which is also described in the section below as this gives deeper knowledge of the pros and cons of each sourcing alternative. The section finishes off with a summary of which type of sourcing is most suitable for which situation.

According to Gadde et al (2010), each purchasing decision is related to the past and impacts future purchases. In order to use the capabilities of the supplier to the greatest extent, a long term strategy can be used and the benefits of having this cannot be seen immediately but after a longer period of time. Kirytopoulos et al. ( 2010), claim that the question whether to have single or multiple sourcing is an important decision for any company. The customer-supplier relationship that arises from the sourcing strategy has two strategic gains; cost rationalization and the benefit of using the supplier resources and competencies to create innovations and improve current practices (Skjott-Larsen et al, 2007). The decision also has impact upon to what extent uncertainty of supply disruption can be reduced (Christopher et al, 2011). In order to understand which sourcing strategy is the most beneficial and in which situation, an organization should choose which of the two strategies have to be evaluated as the degree of involvement can impact the component outcome. Multiple sourcing usually equals short term relationships with low involvement and single sourcing usually equals long

term relationships with high involvement. The evaluation of the two strategies in terms of pros and cons are described below; multiple and single sourcing.

#### **4.2.1 Multiple Sourcing**

Multiple sourcing is most suitable if commodity type products are sourced as it is possible to achieve a competitive component price by playing off suppliers against each other. Multiple sourcing most often entails several low involvement relationships as high involvement relationships are costly in terms of time and resources. Low involvement relationship can be short term or long term as the transactions can take place during a long or a short period of time (Gadde et al., 2010 & Skjott-Larsen et al, 2007). Common advantages of multiple sourcing are; reduced transaction uncertainty, enhanced technological flexibility and seized opportunities for component price pressure (Gadde et al., 2010). The transaction uncertainty due to the risk of failure can be reduced by having several suppliers since the others can pitch in case one does not manage to fulfill the obligations (Tullos & Utecht, 1992). Technology flexibility is achieved by decreasing the likelihood of being locked into one supplier's specific technical solution which might not be the most suitable for the situation. The motive of component price pressure has traditionally been the strongest reason for choosing multiple sourcing; by letting several suppliers compete against each other, a lower component price is often achieved.

However, there are also disadvantages with multiple sourcing. Because multiple sourcing usually entails low supplier involvement, supplier commitment and loyalty is usually not easy to achieve. The suppliers are also less likely to invest in new processes benefitting the focal company and it is hard to take advantage of supplier know-how. As the supplier is not sure of granting the business, all possible efforts might not be used (Skjott-Larsen et al, 2007). Low involvement relationships also decrease the probability of developing an effective supplier quality assessment as there is not enough information about the supplier to base it upon. The number of suppliers also increases the effort needed when it comes to communication since there are more actors to communicate with. (Skjott-Larsen et al, 2007).

Multiple sourcing does not ensure that the three advantages of multiple sourcing occur simultaneously and apply to the situation (reducing transaction uncertainty, price pressure and avoid technology lock-in). For example; having several suppliers competing against each other to reduce uncertainty does not always secure a lower component price (Gadde et al., 2010). Instead collaboration with one supplier could be achieved instead. More of this collaborating with one supplier is described in the section below.

#### **4.2.2 Single Sourcing**

Single sourcing is usually most suitable for customized specialized products rather than commodity products. This often entails establishing high involvement relationships for single sourcing and these build on having mutual dependency and trust with the supplier. High involvement relationships are time and resource demanding and because of this, a company can only hold a few high involvement relationships. Single sourcing with low commitment relationships could for example be one supplier having delivered the same component to the focal company for several years without any making any major adaptations to the supplier more than the set-up for transactions.

The products and services when holding high involvement relationships are usually linked directly to the buying firms' core competencies (Skjott-Larsen et al, 2007). Because of the linkage, dependency and trust is needed for increased commitment which in turn reduces the probability of supply disruption. High involvement relationships might enable the focal company to benefit from the supplier skills and capabilities to improve quality of the own products and services. It is not uncommon that the two parties have joint product development in order to take advantage of both parties' resources. Other benefits of high involvement relationships are the possible cost reductions through improving the production processes, physical flows, improved service levels and flexibility (Gadde et al., 2010). Another benefit is that a better bargaining power is achieved when it comes to price negotiation because of the consolidated volumes which reduces the supplier base.

The disadvantages of a high involvement relationship are the substantial investments both parties have to make in order to be able to reap the benefits. If there is no cooperation from the supplier, it is like having multiple sourcing without the ability to achieve a competitive component price. Gadde et al (2010), state that the investments come in form of adaptation; which typically is not a standardized solution that could be used in other relationships as well. Even though there is only one relationship to handle, it requires a lot of attention, for example; there are substantial coordination, adaptation and handling costs. Kirytopoulos et al (2010) state that there is a risk if the supplier is aware of being the only supplier of the category and knows that there is a high switching cost, as it increases the possibility that the supplier takes advantage of the situation and charges the focal company a higher component price. They also state that the focal company also holds a great vulnerability to disruption if the supplier were to fail. In order to get to the root of which sourcing strategy that would be more beneficial for a certain situation, the next section describes the two strategies out of a total cost perspective.

#### **4.2.3 The Total Cost Approach**

The total cost approach is a purchasing tool with the purpose of displaying the true cost rather than component price that traditionally has been the target for buyers. However, in order to be profitable and competitive in the long run, the total costs have to be taken into consideration. Total cost usually implies; component price, costs from delay, administration, downtime, maintenance, waste in form of scrap and rework, service, warranty costs, logistic costs, development costs, productions costs and cost of having a bad reputation. Many companies are not aware of their total costs breakdown; for example the supplier's production cost and handling costs as these are not directly visible. Therefore, the one thing that is visible is targeted; the component price. The economic consequences of the two sourcing strategies are difficult to track down and measure as there are both hard and soft factors influencing. The two sub-sections below link the total cost approach to multiple sourcing and single sourcing in order to get a comprehensive view (Batson, 2011 & Gadde et al, 2010).

#### **The Total Cost Perspective and Multiple Sourcing**

When it comes to multiple sourcing, the direct component price is often lowered because of the competition between suppliers. On the other hand, direct procurement costs to some extent increase as the orders are split between different entities implying several transaction costs. Moreover, several suppliers in the concept phase imply higher development costs and the cost of

more working hours. On the other hand, other costs that might not be seen directly are the cost of communication with the suppliers as well as the frustration and risk of spreading bad publicity when it comes to the supplier that is not chosen for further collaboration.

Other factors that increase the total cost that should not be neglected are the hidden costs such as; adaptation costs of internal resources that to some extent have to be done even though it initially was not intended. The total cost is reduced for another reason as well; because the probability of choosing the most suitable supplier with the best fitted technical solution and other abilities increases. It is hard to quantify this cost as the alternative costs of for example development, rework and logistics never can be foreseen.

### Single Sourcing and the Total Cost Perspective

According to Atkinson et al. (1990), it is necessary to achieve a high involvement relationship in sourcing in order to reduce the total cost and this is possible to do within single sourcing. In order for a high involvement relationship to be efficient, commitment and trust must be included. If there is substantial commitment and trust, the buying firm can take advantage of the supplier capabilities in order to improve quality and services, reduced cost in production processes; and all these factors decrease cost. However, the cost of having single sourcing with high involvement is substantial as it implies a great deal of handling costs which requires adaptation, coordination and interaction. A cost that is not easy to estimate is the opportunity cost; i.e. not choosing the most suitable supplier from start. There might be technical failures, higher component price than planned, reduced leverage and it is very difficult to estimate what a different supplier might have achieved.

Håkansson & Wootz (1984) mention that single sourcing can lead to extensive collaboration between the supplier and customer and has a lower total cost than multiple sourcing in two situations. The first situation is when indirect costs associated with purchasing are greater than the supplier's actual price of the component including for example production costs, material costs. In this situation, the total cost is reduced by having deeper involvement with one of the suppliers (see Figure 11). The other situation is when the supplier costs are high and the indirect costs are low and can be improved. In this case the company can affect the indirect costs in order to reduce the total costs (see Figure 12). Here two suppliers or more are played off against each other in order to create an as low component price as possible. This usually works for a non-standardized item where features and physical distribution still can be changed (Gadde et al, 2010).



Figure 11: The figure illustrates how total cost can be reduced when the indirect costs are high.



Figure 12: The figure illustrates how the total cost can be reduced when the component price is greater than the indirect costs.

#### 4.2.4 Summary

The two sourcing strategies; multiple and single sourcing are suitable for different situations depending on whether a high involvement or low involvement relationship is established. Having several low involvement relationships have the benefit of not locking the focal company into a specific technical solution and offers reduction in component price due to competition. It also provides a higher probability of choosing the most appropriate solution but at the same time there is a risk of the supplier not being committed enough to share its know-how. Single sourcing has the benefit of reducing total cost through close collaboration and provides great knowledge transfer if both parties commit to the relationship. However, there is a greater risk of not choosing the most suitable solution and there is the possibility of a technical lock-in as well as lost leverage towards the supplier. With this said, it can be concluded that there is no general optimal solution, every sourcing strategy decision must be taken under the prerequisites for the specific situation. Hence, this master thesis evaluates how to increase the base of information needed for taking the correct decision by identifying critical factors and determining how to compare the two sourcing strategies. Below, the third area of literature, Contracting is presented.

### 4.3 Contracting

The main reason for writing a contract is to reduce uncertainties of a business deal. However, according to Williamson (1979) contracts are always to some extent incomplete since it is impossible to predict every single unforeseen incident that may occur. Williamson (1979) distinguishes between external and internal uncertainty: external uncertainty is defined as market uncertainty while internal uncertainty arises when an organization has unclear specifications or when there is an uncertainty of whether the contracting parties will fulfill their obligations. To reduce uncertainties, organizations are aiming at improving their agreements.

Different kinds of contracts are suitable for different situations. Due to the scope of this master thesis, the focus is on contracts suitable when having joint product development with suppliers. Thus, this subchapter presents key factors of contracts. First, contracting in projects is described before presenting key success factors of these contracts.

#### 4.3.1 Contracting in Projects

Product development projects have distant time horizons and require significant up-front commitment while posing large potential downside losses (Florice & Miller, 2001). The complex situation and the risks call for detailed and carefully written contracts defining the legal, financial and technical aspects of the outcome and working process (Bubshait & Almohawis, 1994). According to De Meyer et al. (2002), the benefits of contracts decrease as the uncertainties of projects increase



since a contract requires observations of the process or of the output. The higher the uncertainty, the more difficult it is to define the business deal in detail. Contracts for product development projects where the technical specifications are not fully determined therefore tend to be less useful.

According to Branconi & Loch (2004) eight key levers determine the business deal (see Figure 13) and by covering these in the contract, the most critical aspects of a project are generally covered. Besides the eight key business drivers that determine the fundamental logic of the business deal, there are additional hierarchical contract components managing the relationship and interaction during the project (Stinchcombe & Heimer, 1985).

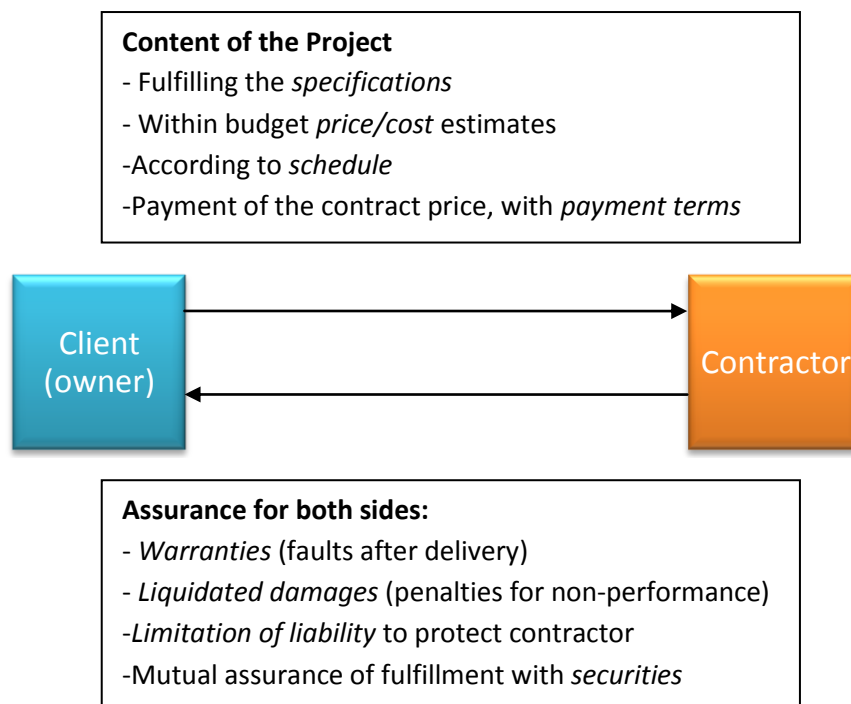


Figure 13: The eight key business levers in the contract

Due to the scope of this master thesis, the focus is on the levers concerning the content of the project (see Figure 13). Each of these is described below in order to understand how to contract wisely. First, technical specifications are presented, thereafter the levers price and cost, payment terms and schedule are described before finalizing this subchapter with a summary.

### Technical Specifications

Technical specifications should be consistent between the technical- and commercial function. Well defined specifications and clear deadlines and deliverables reduce the risk of the project since it decreases the amount of future changes (Branconi & Loch, 2004). Yet, well defined specifications might be harmful for joint product development with suppliers since the possibility to take the supplier's knowledge into consideration is limited. It is then essential to have well defined accurate tolerances of the specifications in order to be successful (Florice & Miller, 2001).

The supplier has to fulfill the technical specifications. To measure performance explicitly, requirements have to be stated whereby problems often arise due to irrelevant tolerances and lack of performance guarantees. Tolerances might be irrelevant for several reasons; either they are comprised by irrelevant factors or the tolerance span is inaccurate. It is therefore of great importance to have accurate tolerances and to contract upon how to proceed if the technical requirements are not met and how the customer shall be compensated for deviations. (Branconi & Loch, 2004)

### **Price and Cost**

Even though most buyers are aiming at achieving the lowest possible component price it is essential to have credible cost targets. Deviations from the true cost in either direction during the project pose large risks. If the component price is too low, the supplier might get out of the deal since the customer will not allow compromising on quality to reduce costs in complex product development projects. If the component price is too high, the supplier might realize that customer's lack of knowledge and use it against the customer in later phases or projects (Genus, 1997). According to Branconi & Loch (2004), the client should avoid to always aiming for the lowest bid since it may reflect that the supplier has not understood the requirements or is applying less compatible equipment or has the intention of creating a technology lock-in for the customer to earn money by filing change orders. Hence, the supplier must be verified by the customer through a third party. Ideally, the component price and quality should be consistent with the technical specifications. It is therefore of great importance to understand the reasons for differences in component prices between suppliers in order to choose the best one. In addition, the later the contract is signed, the greater the risk of increased component price due to the supplier's awareness of the customer's high switching cost.

### **Payment Terms**

Scheduled partial payments determine to what extent cash receipts by the contractor covers the cash expenses of the project. The supplier should seek contractual terms to protect themselves and thereby their customer since their existence may be at stake. Thus, when having product development together with a supplier it is vital to have a supply chain approach due to the dependency upon each other. The cooperation has to be beneficial for both parties to be successful. Therefore, partial payments should be contracted upon but the size and frequency of these depend upon the circumstances. (Branconi & Loch, 2004)

### **Schedule**

By having consistent and shared understanding of key milestones of the project, the uncertainties and risks of failure with a project decrease since the involved actors are united. Therefore frequency of meetings and communication should be included in the contract. It is especially important to determine what the deliveries at each milestone should be. Recent trends to reduce project's lead time to improve organization's project return might affect projects negatively since the supplier has to spend money on acceleration in order to meet final due dates. However, by applying long term planning and thus reducing waste by doing it right from start, the output of the project will not be affected. (Branconi & Loch, 2004)

#### **4.3.2 Summary**

As mentioned above, eight key business levers for project contracts exist: technical specifications, price, payment terms, schedule, performance guarantees, warranties, limitations of liability and securities. Each factor should be contracted upon to reduce the uncertainties of a project. The earlier the contract is signed, the more the uncertainties are reduced due to a united approach from start. However, the higher uncertainty of a project, the less useful the contract is since it is difficult to define the business in detail. This master thesis evaluates how to increase efficiency and effectiveness of contracting in SIPD projects.

## **5. Empirical Data**

This chapter presents data collected for this master thesis. The chapter is divided into two sections; internal research and external research that were collected during Phase 2. The Internal research section is structured according to the three problem areas identified in Phase 1; cross functional teams, supplier relationships and contracting. External research covers data collected from interviews with ten different companies within different industries regarding SIPD sourcing. In the external research chapter, first general findings from other companies are presented followed by successful examples of how other companies source SIPD parts concerning the three problem areas. The empirical data is analyzed with help from the analytical framework to come up with improvement suggestions that could improve efficiency and effectiveness at 3P.

### **5.1 Internal Research**

After identifying the main problem areas at Vehicle Dynamics and linking these to relevant literature, an internal research study was performed. The internal research included interviewing and analyzing input from participants within various projects where the supplier was involved in product development. Six different projects, both completed and ongoing projects, within Vehicle Dynamics as well as at one other purchasing department were investigated. The purpose was to find key success factors as well as identifying what gives rise to problematic situations within 3P. Moreover, by looking into an additional purchasing department besides Vehicle Dynamics, other types of best practices were identified. Within the projects, the buyer, product developer, project leader and in some cases the supplier and cost engineer were interviewed in order to ensure a comprehensive view of the project situation. Of the six projects, two projects were successful; project A and B, while the four other projects were not as successful. Due to the purpose of the internal research, this subchapter is structured based on the three main problem areas identified in Phase 1 in order to map how the performance within each area can be improved.

#### **5.1.1 Cross Functional Teams**

One of the most important aspects in cross functional teams is internal cooperation. Internal cooperation in the context of projects is in this thesis defined as united project members that work together and have understanding for each other's work and constraints which adds to great success of the project. Moreover, this implies clear responsibilities amongst the participants. Early internal cooperation in cross functional teams can lead to greater performance as it reduces the probability of rework and thereby lead time which creates leverage towards the supplier in for example component price negotiation. Moreover, better decisions can be taken if all parties have a holistic view of the situation. The sections below describe how the degree of internal cooperation in cross functional teams has impacted the outcome of projects.

An issue that occurred within all SIPD investigated projects is purchasing involvement. As soon as a project group has been formed, all participants are invited to a project kickoff to introduce the project. This is generally the first time purchasing is involved in the project discussion. However, a few matters such as which supplier to use or whether to use single- or multiple sourcing is discussed even before a formal project cross functional team exists. The discussion of supplier choice really

starts at something called advanced engineering where possible concepts are developed and evaluated together with a few elected suppliers. The suppliers are not chosen for serial production as they participate in advanced engineering but they are well aware of the path in technology that 3P might take on. Since one supplier has been given the opportunity to adjust its processes towards the new technology, this gives the supplier an advantage. In addition, if the advanced engineering team has set their mind upon one technical solution from start it has proven difficult to evaluate several suppliers after the project kickoff.

All projects, both successful and less successful, use something called cost targets. These cost targets are developed for buyers at a department at 3P known as Product Finance. Cost targets are set based on the budget of the project. The purpose of the cost objectives is to better approximate the appropriate cost of a component with consideration to the technical features and material. Throughout the interviews, it has been acknowledged that buyers sometimes use the cost targets in the request for quotation which is sent out to suppliers. Because of this, the purchasing department has expressed a concern regarding the validity of the cost targets as the supplier offers deviate substantially from the cost targets. Moreover, the cost targets do not include prevailing market conditions such as if there is a monopolistic situation. Product Finance on the other hand state that the cost targets only should be used internally.

Another issue that has been raised within the investigated projects is that project members use different systems for storing information. Within projects, there is something called a teamplace where all information vital for a project should be stored. It is up to the participant to upload documents here and many employees see the process as non value adding extra work whereby not all documents are uploaded. Yet another concern was the system for storing drawings. Product developers use one system to upload drawings where the old drawing and article numbers are stored. However, because of lack of time and knowledge, buyers often outsource the process of locating the drawings to administrative workers. As the operation is outsourced, there is an increase in lead time, and by the time the buyers have gotten hold of the drawing, a new one might have been released. This has led to that the latest drawings are not forwarded to the supplier implying longer lead time and cost or rework. The factors previously described hold for all projects. The next section presents findings from the less successful investigated SIPD projects.

### **Findings from the Less Successful Projects**

In almost all less successful projects included in this master thesis, almost none had previous experience of working with SIPD and the internal cooperation was initially not well functioning. In one of the projects, the two functions did not work together as frequently as necessary as the parties were involved in too many other projects. In all four projects, it was the project leaders' first SIPD case and the SIPD process was not clear for the leaders. Moreover, there was generally no agreement upon whether single- or multiple sourcing strategies should be utilized.

In one project, the lack of internal communication concerned how technical changes should be communicated and documented. The newly appointed project leader was not quite aware of the SIPD process to start with and was not aware of all responsibilities included when appointed. The

leader did not always inform the project group of all changes that had been discussed with management and suppliers. This resulted in internal confusion as well as confusion towards the supplier. Moreover, this also had the consequence of rework and increased lead time resulting in high end costs. The changes also resulted in risk of affecting other components technical specifications. One of the other projects had a change of project leader and the responsibilities of the new leader were unclear which left all participants in a state of confusion. Moreover, the new SIPD project leader had a hard time understanding what was asked of the SIPD leader.

In one of the less successful projects, there were quite a lot of arguments of whether to use single- or multiple sourcing. A solution from a known supplier was used but no satisfactory results arose. A great amount of rework and elongated lead time was the result. As the component was not in any kind of state to be used, this resulted in opening the possibility of switching supplier.

### **Findings from the Successful Projects**

For the most successful projects, key was the relationship between purchasing and product development. The two most successful projects showed that a greater leverage against the supplier can be created as both parties communicate the same thing towards the supplier. Project A had a shared understanding about whether to use single- or multiple sourcing. From start it was decided to use one specific supplier as this one had been used before. However, no evaluation of having several suppliers in the concept phase was under discussion.

Moreover, in project A, communication was enabled to a great extent as purchasing and product development are located very close to each other. This made it easy to ask quick questions in person instead of writing an e-mail or calling. But this was not the only factor enabling frequent communication, several project participants also stated that the chemistry between the persons involved in the project was very good, enabling a smooth working climate. Before meeting the supplier, purchasing and product development were united as there was informal communication as well as internal meetings twice a week. Through the interviews, it was understood that the participants had great respect for the project leader.

Project B had similar qualities as project A; the two functions were geographically close and there was extensive communication. The communication was urged by purchasing with the goal of creating greater leverage against the supplier. In this case, purchasing fought for being part of discussions from advanced engineering and urged the importance of being involved as cost benefits could benefit all parties. This was enabled by the two functions delivering the same message at different occasions when various persons were meeting the supplier. In project B there was evaluation of whether to use single- or multiple sourcing in the concept phase within the project. The project members all agreed upon using one single supplier that had been used in a different occasion in the past. However, another supplier was also requested in order to challenge the supplier and create greater leverage.

### **5.1.2 Supplier Relationships**

In this thesis, an efficient and effective supplier relationship is defined as a relationship working in an environment with well functioning communication resulting in an optimal component. A prerequisite

for a well working supplier relationship is a win-win situation and often comprises early supplier involvement. A well functioning relationship entails reduced component price and the possibility of reducing project lead time. A well functioning relationship in most cases requires efficient communication. Efficient communication can be enabled by frequent contact by phone, e-mail, audio or face-to-face meetings. In this section, the findings from the less successful projects and the successful projects in terms of supplier relationships are presented.

### **Findings from Less Successful Projects**

When it comes to the projects that did not function well, a couple of factors were in common. First of all, there were great deals of misunderstandings due to lack of communication which elongated the project lead time. None of the less successful projects shared and used teamplaces with the suppliers. Moreover, there was friction when it came to signing development agreements as the suppliers were big players on the market. In one of the projects, there were great deals of misunderstandings; from technical specifications to communication of development agreements though the latter are described in the section below. The chosen supplier and 3P did not have an open dialogue to vent all issues. There were misconceptions regarding the technical specifications which caused several prototypes not meeting the technical standards. Because of the insufficient communication, the supplier did not initially understand that they were development suppliers; meaning that they were chosen for development, not being chosen for serial production. When the supplier realized that they had not gotten the full business, there was a lack of commitment and as no contract was written regarding validation and testing of the components, the suppliers required compensation. All of these issues resulted in postponed deadlines and 3P considering turning to other options.

In another project there was also a communication issue. The product development had severe problems when communicating with the supplier as there was a substantial language barrier that was not solved until the project had been running for quite some time. Moreover, the technical specifications from 3P were at times not clear enough. The changes that were made to the component during the project were not well documented as there was no well functioning system between the supplier and 3P. Many changes also occurred in the end right before serial production. The time-plan was however held as the supplier made effort to perform the late changes.

### **Findings from the Successful Projects**

For the cases with the greatest success, the relationship with the supplier was efficient. In project A, one success factor was the continuous meetings held with the supplier twice a week and were organized by the project leader. The supplier in this project had a residential engineer positioned at 3P to work as a technical coordinator and make sure that no misunderstandings were prevailing. The residential engineer for example, had the responsibility of releasing all drawings in the system. Residential engineers are existent within various departments at 3P but not at Vehicle Dynamics. By having residential engineers, and frequent meetings, the relationships between the two parties were close whereby commitment and trust was built. However, commercial issues are not part of the residential engineers work responsibilities. Thus, there were additional meetings with the commercial parties of the supplier.

The chosen supplier for the project was known and was working with 3P in several projects. This made cooperation easier as the relationships already were established and both parties were aware of the necessary processes. It is worth mentioning that the supplier was a small actor compared to 3P.

The supplier in project B was a large actor compared to 3P. This project also had residential engineers, frequent meetings and an established teamplace with the supplier. The greatest difference between project A and project B was the approach towards the supplier. The initial technical solution had some constraints because the specifications from 3P would imply too much cost for the supplier. Because of this, the project participants had a dialogue with the supplier of what they could deliver instead of limiting the mindset to complete specifications from 3P. This resulted in a satisfactory technical solution which also had an end component price fulfilling the expectations.

### **5.1.3 Contracting**

Most organizations use contracts as soon as there is anything outsourced to an external partner. In order to not waste time in signing a contract, the signing process has to be conducted in an efficient and effective matter as it is possible to spend an endless amount of hours on contract signing. This is because the product development process usually is postponed until all parties have agreed upon all terms. Important sections in the contract include responsibilities of each party, Intellectual Property Rights (IPR) and the procedure if infringement occurs. When to use a contract varies from situation to situation. At 3P there are two additional legal binding documents for SIPD components, the development agreement and the Statement of Work (SOW), where for example all responsibilities and working procedures are described. At 3P a standardized legal document is used, this goes for both the development agreement as well as the SOW. For the SOW, some modifications can be made as some sections can be removed. Below, the performance of the contracting within the six projects is elaborated.

### **Findings from Less Successful Projects**

In less successful projects, a common issue was resistance from the suppliers regarding the development agreements. These initial agreements stated most IPR to 3P which was not granted by the suppliers that in most of the projects were of greater size compared to 3P. For the projects, a standardized agreement was at first used which received substantial changes from the supplier side. Because of the issues of not getting the development agreement signed, the project deadlines had to be moved and leverage was lost as product development continued working on the project. Most of the projects started with the development work even though the development agreement had not been signed. All projects also had difficulties in proceeding with the SOW as it was used for the first time. Several employees explained concerns of the format of the SOW they saw it as complex and difficult to read. The participants in the less well working projects were not aware that all sections in the SOW are not mandatory and that some sections can be removed depending upon the situation.

In one of the less successful projects, 3P was negotiating with a supplier of a considerably larger size than 3P and used the standardized development agreements. As there were considerable comments



from the supplier side, the responsible buyer took the initiative to create a shorter agreement with less “legal language” to save time. Even so, the development agreement was not signed on time. The development work continued but the end result was not satisfactory. Moreover, in one of the projects, a hostile environment with the supplier evolved due to lack of misunderstanding and poor communication. The parties had agreed that the party that developed the component should stand for testing and validation costs. However, as conflict occurred and none of this was stated in the development agreement, the supplier refused to stick to this commitment which added to the hostility that had evolved.

### **Finding from Successful Projects**

In project A, in cooperation with a small supplier compared to 3P, the development agreement was signed without further discussion and the supplier only had some minor comments. The process of signing development agreements and SOW was improved because the assigned buyer for the specific case had previous knowledge of both development agreements and SOW. The project leader hired a consultant to fill in all needed information in the SOW due to time limitations.

In project B, 3P worked with an in comparison bigger supplier and the development agreement was not signed for a long period of time due to changes. The IPR in the first version were according to the 3P standard agreement, where most IPR rights accrued 3P and there was a shift in this throughout the negotiation process. Even if the agreement was under negotiation, the supplier and 3P were well aware of each party’s responsibilities as 3P previously had been working with the supplier in several projects. Therefore, the work kept on going even though the development agreement had not been signed. A special part of the contract was a section of risks and opportunities. This stated that changes were allowed up until a certain point without adding extra expenses for 3P.

### **5.1.4 Summary**

In summary, key success factors in cross functional teams are communication, understanding and transparency between product development and purchasing in order to create leverage against suppliers and reduce misunderstandings. In order to enable these success factors, frequent project meetings, geographical closeness and a devoted and experienced project leader have proven to improve the situation. Where these factors were not undertaken, leverage towards supplier was lost, a greater amount of rework was conducted which most often resulted in a higher component price. When enabling an efficient and effective supplier relationship, the key success factor is communication. The successful projects proved that this can be achieved by having residential engineers, shared teamplace and frequent meetings with the suppliers and presupposing what the supplier can offer. When communication was poor, the result was misunderstanding resulting in rework and postponed deadlines. Key success factors in writing a contract include having the development agreement signed on time. Projects that did not have the agreements signed in time had project members that were inexperienced in developing legal documents and used a standardized development agreement. The most successful project cases had experience of development agreements and statement of work on both 3P and supplier side. It has also been experienced that the smaller the supplier, the easier to have the development agreements signed on time.

In order to visualize the findings from SIPD projects at 3P in the internal empirical data, Figure 14 has been developed. Here, key success factors of the three areas Cross Functional Teams, Supplier Relationships and Contracting are stated. These findings are used in finding possible improvement areas at Vehicle Dynamics in order to increase efficiency and effectiveness when sourcing SIPD components in order to reduce cost.

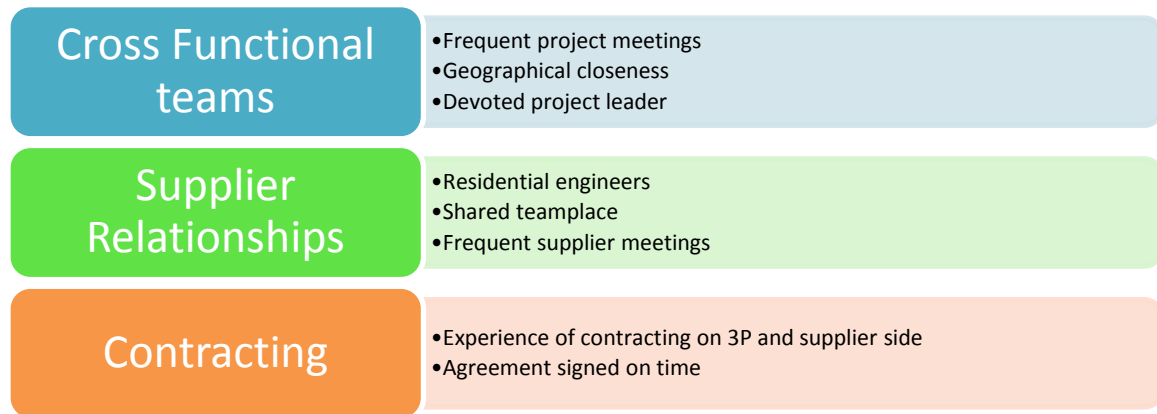


Figure 14: The figure illustrates key success factors for SIPD projects at 3P regarding the three problem areas

## 5.2 External Research

During the second phase of the master thesis, an external research study was performed. The intention was to investigate how companies in other industries cope with similar issues when sourcing development components. The purpose was hence to compare 3P with other organization to be able to map trends, critical factors as well as key success factors for similar sourcing situations. The three main problem areas identified during the initial phase of the thesis were the base for the scope of the external research. Thus, the focus was on the sourcing process, cross functional teams and contracting. The study comprises ten companies which were chosen based on their product range and operating industry e.g. healthcare-, robotic-, IT- and engineering industry. Eight of the companies were visited in person to increase the output and quality of data collected and presented in this chapter.

In general, single sourcing is used during the concept and development phase for the interviewed companies. This is due to the apprehension that multiple sourcing is too costly and the opinion that few suppliers will agree on having one competitor when using resources to develop a concept. Moreover, several companies lack a sourcing process meaning that no specific process for development parts exists which affects the performance of projects negatively. However, all companies stated the importance of directing more resources and effort in the beginning of project in order to reduce the probability of rework. Thus, there is a need for early supplier involvement to make use of the supplier's knowledge in product development. In addition, this requires openness towards the supplier in order to increase the level of transparency and in order to take advantage of available competence when having joint product development. Concerning internal cooperation; frustration and misaligned goals are common and it appears that the purchasing function has to convince the product development function of their importance. Hence, integration and early involvement of purchasing in projects are of great importance for organizations. The external

research confirms that specific agreements when having joint product development with suppliers exist within other industries. Moreover, the process is immature for most of the organizations included in the research. It has been shown that signing a contract is time consuming and that it generally takes about six months to get it signed. However, due to different situations and requirements most of the organizations write specific agreements for each occasion based on a list of contents.

Besides mapping general trends, the purpose of the research was to identify critical factors as well as key success factors. Therefore, the visited companies were ranked based on the efficiency and effectiveness concerning the three main problem areas mapped internally. By doing so, three high performing companies were identified, company A, B and C. Successful solutions identified in the external research concerning cross functional teams, supplier relationships and contracting are described below, aiming to present how efficiency and effectiveness at 3P can be improved. First, a general description of the concept and how it affects the performance of the organization is described. Thereafter, solutions from the three high performing companies are presented as well as successful examples from the remaining companies.

### **5.2.1 Cross Functional Teams**

The scope of this section differs from the scope of the subchapter cross functional teams concerning the internal research. This is because the focus of internal research was on a project level while the focus of the external research was on an organizational level. Hence, this section describes how other companies are improving internal cooperation between functions instead of how they are improving the performance of cross functional project teams. However, by improving internal cooperation, the collaboration within cross functional teams are improved and thus its performance. Internal cooperation represents well working internal functions with high understanding of other functions' work and constraints. In addition, responsibilities of each function are clear and the acceptance of other functions is high which lead to a united organization. Well functioning cross functional teams affect the performance of an organization to a great extent since this implies less waste and thereby reduced lead time by doing it right from start. Thus, the base of decision is improved since several insights are taken into consideration. However, high performing cross functional teams can be reached in several ways.

All the three top performing companies have managed to achieve high level of internal cooperation by adjusting the structure of the purchasing department and at the same time convincing other functions of the importance of purchasing. Company A has implemented a technical buyer at each commodity group located at the product development department. The technical buyer takes part in product development's daily work and progress in order to enable direct action from purchasing when needed. Moreover, he/she is responsible for involving purchasing from the very beginning and report changes and needs to the buyers to ensure that the functions are on the same page. At first, the technical buyer is responsible for initial communication with the supplier but when a supplier is selected, the buyers become responsible. By having technical buyers, the purchasing function is involved from the beginning and the amount of rework decreases to a great extent. Hence, the company manages to have clear responsibilities of each position and reduces the amount of misunderstandings. Moreover, by introducing technical buyers, the reliance of the purchasing

function was improved as they were involved early and were able to impact the process in an appropriate manner.

Company B distinguishes between buyers and project buyers. The project buyer takes part in cross functional teams to represent the entire purchasing function instead of having several buyers involved in each project. The project buyers are responsible for the time plan and the Request For Quotation (RFQ) and contact the buyers to get hold of potential suppliers. By having project buyers, the involved functions cooperate better and the amount of frustration has decreased since all project members are equally committed to the projects. Thus, transparency has increased and decisions are taken together which reduces the risk of not taking the most appropriate decision. The internal cooperation has also increased because of increased internal reliance of purchasing. This has been done by making the purchasing organization responsible for cut-cost projects. Hence, resources are not taken from product development projects and this decreases the frustration of product developers. In addition, the reorganization has entailed clear responsibilities of each employee which has reduced the amount of misunderstanding and thereby improved the internal cooperation.

Company C also has a purchasing organization with project buyers but their main responsibility is to connect the purchasing function with the product development function. The project buyers are therefore situated at the purchasing department but are responsible for the technical aspects of purchasing such as securing that features and quality requirements are fulfilled while the buyers are responsible for the supplier relationship and cost targets. Moreover, the project buyers are responsible for arranging projects meeting in order to secure that purchasing is involved at early stages. By doing this, the functions are united internally as well as toward the suppliers. In addition, lists of responsibilities of each employee at the purchasing function are available at the intranet in order to improve internal cooperation. During recent years, the purchasing function has increased its responsibilities gradually to assure that it will fulfil or exceed the expectations of other functions and thereby improve its reputation. Actually, due to the internal marketing, the purchasing function is now expected to be the driving force in projects. Hence, the performance of cross functional teams can be increased in several ways; below, some general actions to increase the performance summarize this subchapter.

The three companies mentioned above have restructured their purchasing organizations in order to increase the internal cooperation through increased transparency and understanding of other functions' issues. However, understanding and transparency at other organizations included in the external research are improved by internal education of other functions daily work, geographical closeness of team members, continuous communication, shared folders on the intranet. A prerequisite for high level of internal cooperation is high acceptance of other functions. Thus, purchasing has to convince the entire organization of their importance if not involved at early stages in projects. This can be done through internal marketing and active participating in project meetings and by gradually increasing the responsibilities and thereby the integration of purchasing. Therefore, the skills of managers and project leaders are essential since they have to put lot of effort in these changes and push the change forward.

### **5.2.2 Supplier Relationships**

A well functioning supplier relationship for joint product development implies early supplier involvement and continuous well working communication as well as high commitment and trust towards each other. However, a prerequisite for a well functioning relationship is that the cooperation is gainful for both parts. Well functioning supplier relationships affect the performance of an organization to a great extent since it entails usage of supplier knowledge. In general, this entails reduced costs and lead time while improving the performance of the component developed. In addition, through continuous communication, the risk of misunderstandings is reduced and thereby the amount of rework. Moreover, by high commitment and trust, the openness towards each other increases. Below, the top-performing companies in the external research approach concerning supplier relationships for joint product development are described.

The three high performing companies have different strategies to improve their supplier relationships. Each of them utilize specific strategies to improve the relationships; for example by involving their supplier early in the product development process. Company A works continuously to discover new suppliers and focuses on function rather than product when looking for new solutions. For example; the company evaluates suppliers of entirely different industries and investigate if some specific components can be adjusted to fit their demand. Moreover, company A is aiming at having the manufacturing company as supplier instead of distributors to reduce costs. Company A believed that it is essential to involve suppliers in product development to take their knowledge into consideration whereby the specification should not be set when selecting supplier.

Company B improves its supplier relationship by involving several suppliers when developing the concept of a new component. The reason for involving several suppliers is to reduce the risk of not selecting the most suitable supplier. Thus, the suppliers' knowledge is taken into consideration and the company can evaluate the suppliers' competence as they see their ability to specify and design the component asked for. The suppliers only sign confidential agreements during the concept phase to speed up the process and a development agreement is signed after selecting one development supplier. Before selecting supplier, the company investigates the suppliers' references to assure that the suppliers have preferred experience. Moreover, Company B is reducing their supplier base to improve the relationship with fewer suppliers. This is because earlier collaboration is beneficial when having joint product development due to knowledge of each other's business and processes. Instead of focusing on single cost, the company focus on the life-time cost of one relationship.

Company C is a small organization compared to their suppliers; hence they have to offer their supplier something more than volumes in order to be a preferred prioritized customer. Therefore, they let their suppliers evaluate its performance within three areas: price, quality and logistics. The area with largest improvement potential is thereafter investigated whereby company C gives the supplier up to five recommendations how to reduce costs. By helping the supplier to evaluate the cost drivers, the company gives the supplier a strategic gain and becomes a prioritized customer. When the supplier's cost is reduced, company C e.g. receives reduced component prices. This approach is suitable when having openness towards the supplier and by admitting strengths and weaknesses; the company receives information of the supplier's situation. Company C is thus

marketing themselves towards the supplier and believes that openness improves the performance of the cooperation. The approach has improved the company's supplier relationships to a great extent. For example, by helping one supplier where the company accounted for less than five percent of the supplier's revenues, three out of ten top prioritized parts of the supplier were given to company C. Moreover, by helping the supplier to become more efficient, the company received reduced component prices while other customers did not. Besides this, company C performs a risk analysis to evaluate the cost of switching supplier to evaluate current supplier relationships.

Beside the solutions given above, other organizations included in the study improve their supplier relationships differently. For example, one company gives the supplier exclusiveness when they require exclusiveness from the supplier to have reasonable requirements. Moreover, one organization evaluates the supplier's employees' competence by sending a questionnaire together with the Request For Information (RFI). In addition, the company sometimes has a joint cost target with their supplier, if the costs exceeds the target the supplier is responsible for the additional cost, if the costs are lower, the company and supplier split the profit. However, a prerequisite for a well functioning supplier relationship is thus that the cooperation is gainful for both actors. A supply chain approach is therefore necessary to not deplete the supplier since both parties are dependent on each other. This calls for openness and high level of integration to make use of available competence. However, different situations call for different relationships. It is not suitable to have close relationships with all suppliers but it should be considered for joint product development.

### **5.2.3 Contracting**

Efficient contracting in organizations implies usage of contracts when necessary and to sign the contracts on time. Responsibilities of each actor have to be stated as well as ownership rights. Efficient contracting might affect the lead time and increases the leverage while reducing risks since critical parts are covered. Hence, unexpected cost might be reduced while the customer reduces the risk of paying more than necessary due to overpricing. Different situations and relationships call for different contracts; hence it is important to know which contracts to use in each situation. Below, efficient contracting solutions of the companies included in the external research are presented.

Company A uses standardized agreements to shorten the time spent on writing them. For example, the company has long term strategic contracts where the company has one year exclusivity of all new components developed by the supplier. The company gets the Intellectual Property Rights (IPR) if it's seen as within their core business, otherwise the IPR:s belong to the supplier. In general, the company that pays the development costs gets the IPR and in order to get the contracts signed they have less extensive agreements. The company believes that suppliers that sign a too extensive contract do not know what they are signing. Hence, all agreements have their limits, what is of importance is to have a well functioning relationship based on trust and commitment if something unexpected were to happen. Thus, company A has efficient contracting by simplifying their contracts to get them signed on time. Consequently, the most important areas are covered and the lead time is reduced.

At company B, the purchasing manager for each commodity department is responsible for signing all development agreements of the department. A specific agreement is written for each occasion and

covers e.g. IPR, specifications of technologies, testing and cooperation. However, each commodity has one agreement based on the requirements for its commodity. Lawyers are involved in the process and the process is still immature. Since the agreements are not always signed on time, the product development function continues their development work which might affect the company's leverage position negatively. However, when discussing with several suppliers in the concept phase only confidentiality agreements are signed. Hence, company B has efficient contracting by having one experienced person at each department responsible for all development agreements. In addition, by adjusting the contract for each project, the company contracts upon the right things which reduce the lead time.

Company C uses a Statement of Work (SOW) when having joint product development with suppliers. The process is mature due to industry requirements. The SOW is necessary to have as it states clear responsibilities and includes technical, commercial and legal aspects such as Intellectual Property Rights (IPR) and testing. However, all issues are never eliminated by a well written SOW. By having a SOW, the company does not use a development agreement since the IPRs are covered in the SOW and responsibilities are stated in the Request for Quotation (RFQ). The SOW is filled in by each function based on internal responsibilities, e.g. buyers are responsible for the commercial aspect. Thus, company C has efficient contracting by having a mature process and thereby a well working process and contracting upon the right things which reduce lead time.

Besides the solutions of the three top performing companies, one company forces the supplier to sign the agreement within five days as long as the supplier does not have any further questions or wanted changes. Moreover, one organization agrees upon how to solve upcoming conflicts while another makes the supplier responsible for increased cost due to changes if not reporting changes of the component. However, professional lawyers will always find ways around agreements. Hence, a well working relationship based on trust and commitment reduces risks more than any contracts. By having one shared target, the supplier and customer might be more united and cooperate to a further extent. For example, a target price can be determined by the two actors and if the final costs are lower than the target the supplier and customer share the profit. By having a target price model, both actors are aiming at helping each other to reduce cost and have an efficient and effective relationship. Since all relationship has to be gainful for both parties, a wider perspective has to be applied, with or without development agreements, since both actors are dependent of each other. Almost all organizations included in the external research uses some kind of development agreement. Yet, to benefit from a development agreement it has to be signed.

#### **5.2.4 Summary**

Several approaches to increase the performance in the three main problem areas were identified in the external research. Successful solutions of other organizations were described and a summary of them is seen in Figure 15. The findings are used when evaluating possible improvements to increase efficiency and effectiveness to reduce cost when sourcing SIPD components.



Figure 15: Successful solutions of other organizations concerning: Cross Functional Teams, Supplier Relationships and Contracting





## **6. Analysis**

The section below analyzes the situation at 3P by comparing the findings from the internal research with the analytical framework and external findings. The analysis is built up by three sections, analysis of cross functional teams, supplier relationships and contracting and is finished off by a summary of the chapter. Each section starts off with describing the problem occurring at 3P, thereafter the problem is compared to the literature included in the analytical framework. Finally, examples of how to improve the situation according to literature and findings from the internal and external research are presented.

### **6.1 Cross Functional Teams**

3P works in cross functional teams when having joint product development with suppliers. Three main factors cause issues in cross functional teams when sourcing development components: involvement of purchasing, internal communication and cost targets. The three factors are analyzed below.

#### **6.1.1 Involvement of Purchasing**

One issue in cross functional teams at 3P occurs since buyers experience that they are involved too late in the product development process. Even though purchasing is involved from the beginning of a project, the development of a concept starts ahead of the projects leading to less influence for purchasing. In addition, product development and purchasing often have different opinions of whether to involve one or several suppliers in the concept phase. Thus, it is important that purchasing is involved earlier.

According to literature, late involvement of one function happens due to functional imbalances and forced path dependency (see section 4.1.2 Key Success Factors for Cross Functional Teams). A cross functional team is set together when there is a component to be sourced. Forced path dependency happens since all concepts being evaluated in advanced engineering do not end up becoming a project. Hence, product development is forced to start developing a concept before projects start in order to have something to source. However, not all advanced engineering projects are successful, thus some of them do not render into a suitable concept meaning that purchasing involvement is not needed since the concept is scrapped after advanced engineering. It might thus be difficult to decide when to involve purchasing since it is impossible to know which concepts that will call for sourcing. Thus, late involvement happens due to reciprocal interdependency (see section 4.1.2 Key Success Factors for Cross Functional Teams) since the output from advanced engineering is the input for purchasing and the fact that the work performed during advanced engineering generates unforeseen happenings that affects purchasing. Since buyers are not involved from start in concept development, functional imbalances occur which implies less authority for purchasing in the decision process.

Issues arising due to late involvement of purchasing in the product development phase can be reduced by increasing at-stakeness (see definition in 4.1.2 Key Success Factors for Cross Functional Teams). All participants have to have equal concern of the outcome of the project and thus buyers have to show their interest of active during advanced engineering as well as the product developers have to invite the buyers to take part before a cross functional team is put together. Thus,

transparency before a cross functional team is put together has to be increased to assure that the functions understand each other's targets and interests. In addition, higher level of mindfulness (see definition in 4.1.2 Key Success Factors for Cross Functional Teams) can according to literature be achieved by putting more effort and resources in the beginning of a project, to avoid errors, rework or cost escalations. In one project included in the internal research, the buyer fought for being part of discussion from advanced engineering and urged the importance of being involved as cost reductions could benefit all parties. By being involved early on, the two functions delivered the same messages when meeting the supplier and took joint decisions. Moreover, several of the organizations included in the external research have managed to involve purchasing from start by restructuring their purchasing organization and through convincing other functions of the importance of early involvement of purchasing. By implementing either technical buyers at the product development department, or commercial product developers at the purchasing department, the transparency between the functions has increased while the internal cooperation and leverage towards the suppliers was improved. A restructured purchasing organization at 3P calls for substantial changes and it might be difficult to motivate by proving cost reductions as additional resources needed. Moreover, employees might not cooperate to an as great extent as planned and it might be difficult to find employees with appropriate knowledge. However, to improve the efficiency and effectiveness when sourcing development parts at 3P, purchasing has to be involved earlier in the concept development phase. This can for example be done by having active buyers in advanced engineering or by restructuring the purchasing department to increase at-stakeness, transparency and mindfulness in cross functional teams.

### **6.1.2 Internal Communication**

There is a lack of information sharing in cross functional teams. Functions do not meet as frequently as necessary and are not always committed to the team as the participants are involved in too many projects. In general, there is a lack of communication in the beginning of projects causing problems in latter phases due to not aligned targets and misunderstandings. Moreover, the fact that almost no employees have previous experience of working with SIPD cause issues in projects due to lack of communication between cross functional teams. All employees might not be aware of what information that might be useful to other parties.

According to literature, lack of communication arises due to diverse functional needs since the need for information during a project is different for different functions. Thus, functions are not aware of what to communicate at what point in time which leads to some information not being shared and some being shared too late. Literature states that the lack of communication between projects constitutes a problem because of functional interdependency since knowledge from past projects that might be useful for new projects gets lost. One reason for not sharing knowledge and experience in and between cross functional teams is lack of well functioning IT-systems as well as lack of follow-ups on the outcome and impact.

According to literature, the amount of communication can be increased by having a cross functional trained team leader who possesses high level of technical and interpersonal skills to ensure well functioning communication. Moreover, the problem can be reduced by increasing transparency in and between projects through co-located participants and emphasize the importance informal

meetings and information exchange. By organizing formal forums for airing issues and experiences from projects, the ease of communication can be increased. In addition, by educating and training participants and sponsor team activities to build trust, the level of mindfulness and thus the degree of concern for other project members can be improved leading to increased communication. Also, team leaders that emphasize that the team must benefit from existing diverse orientations when taking decisions can reduce the amount of issues due to increased synergy.

Some of the successful projects included in the internal research managed to have well functioning internal communication. By being aware of other functions' constraints and daily work they managed to be united and take joint decisions at early stages. This was enabled when product development and purchasing easily could ask questions face-to-face and when the participants respected each other and their opinions. Organizations included in the external research improve the internal communication by having internal education of other functions daily work, shared folders as well as list of responsibilities of each employee at the purchasing department at the intranet. Moreover, at one company, the buyers are responsible for arranging project meetings to secure that purchasing is involved when necessary. Hence, to improve internal communication the at-stakeness, transparency, mindfulness and synergy in cross functional teams can be improved. Continuous communication through face-to-face meetings as well as well functioning IT-systems and educations are examples of how to improve performance when sourcing development parts at 3P.

### **6.1.3 Cost Targets**

Another factor causing problems in cross functional teams are the internal cost targets since they are set based on the budget of the SIPD project and thus not taking the market situation into account since it has been acknowledged that buyers use them in the request for quotation sent to suppliers. While buyers require more valid cost objectives, the cost engineers developing the cost objectives state that the buyers use the targets incorrectly. In addition, the costs of different sourcing strategies are often not compared for SIPD parts.

According to literature, this issue arises due to strategy complications and not aligned functional goals. While cost engineers have the project budget as point of reference, the buyers take the market situation into consideration. Thus, there are conflicting targets since they are based on incomparable information, what is demanded from the focal company might not be possible to achieve at that price level. Thus, either the component price must be increased, or some features have to be removed to match the cost targets based on the project budget. According to literature, deviations from the true cost in either direction during a project pose large risks. If the component price is too low, the supplier might get out of the deal since the focal company will not allow compromising on quality to reduce costs in complex product development projects. If the component price is too high, the supplier might perceive that the customer has lack of knowledge regarding the component and use it against the customer in latter phases or projects. Concerning whether to have one or several suppliers in the concept phase, the decision is often taken on incomparable data due to strategy complications.

The issues arising due to the cost objectives can, according to literature, be reduced by increasing the level of transparency. This can be achieved by having an encouraging team leader with cross

functional experiences or formal processes where participants can explain the reason for their actions supported by hard data and how to use and adjust the cost objectives. According to employees interviewed during the internal research, the core is to make sure that the cost objectives are accurate in order to not lose leverage towards the suppliers. It is therefore of great importance to understand the reasons for differences in component prices between suppliers in order to be able to choose the best one. In addition, there is a demand of determining when to have several suppliers involved in the concept phase to avoid technical lock-in and lost leverage towards suppliers due to diverse opinions of functions. Hence, to improve efficiency and effectiveness when sourcing development parts at 3P, the cost targets have to be market oriented and aligned with the strategies of all functions.

#### **6.1.4 Summary**

Three main factors cause issues in cross functional teams when sourcing development components: involvement of purchasing, internal communication and cost targets. The issues due to late involvement of purchasing can be reduced by involving buyers in advanced engineering or by restructuring the purchasing department. Concerning issues caused by lack of communication, the situation can be improved by education of other functions and of how to work with SIPD as well as through well functioning IT-systems, continuous communication and collaboration workshops in projects. The issues happening due to misaligned cost target can be decreased by having market oriented cost objectives that are aligned with all functions' strategies.

### **6.2 Supplier Relationships**

SIPD components at 3P require extensive collaboration together with suppliers. As shown in chapter 5. Empirical Data, two main factors cause supplier relationship issues when having joint product development: lack of commitment and trust and lack of communication. These three factors are analyzed below.

#### **6.2.1 Commitment and Trust**

Many factors at 3P result in lack of commitment and trust from the supplier side. Many of these arise as there are internal disagreements which is illustrated in section 6.1 Cross Functional Teams. One of these questions is whether to have single or multiple sourcing in the concept phase. Most projects have used single sourcing, without evaluating the possibility to have several suppliers in the concept phase. Moreover, the decisions are often made before involvement of purchasing which left degrees of frustration amongst the parties. Another factor that impacts the commitment and trust is the size of the supplier, which is illustrated in chapter 5 Empirical Data, the smaller the supplier, the higher the commitment and the greater the probability of the supplier signing the development agreement.

Literature states that single sourcing often equals high involvement relationships and especially for specialized and complex components. In order to gain from such relationship, a long term purchasing strategy must be used, for example choosing whether to have single or multiple sourcing. If a long term purchasing strategy is not used, the two strategic gains; cost rationalization and usage of supplier resources and benefits to improve current practices and create innovations can be lost. Without dependency and trust in such a high involvement relationship, the situation could be

compared to having multiple sourcing without the benefit of cost reduction and without reducing the probability of a supply disruption.

With the information above, it can be said that 3P has high involvement relationships that do not function flawlessly due to a lack of long term strategy regarding how to decide upon sourcing strategy. Internally, no specific observed measures have been identified that could be used to solve this situation. In the external research however, several suggestions of how to increase commitment and trust were observed. One company uses joint target cost for the project together with their supplier. A joint target cost creates both commitment and trust which leads to increased cooperation. The joint target cost can moreover be applied for both small and big suppliers compared to 3P. Another organization in the external research study applies a best partner approach by letting their suppliers evaluate their performance concerning price, quality and cost. Thereafter, the company gives up to five recommendation of how to improve the performance of the lowest ranked area. By doing this, the company gives the supplier a strategic gain by working for them which creates commitment and trust due to the gains given. Moreover, the company becomes a prioritized customer and receives a reduction of total cost as the supplier operations are improved. The best partner approach is suitable when trying to avoid supplier bankruptcy, when aiming at increasing the number of potential suppliers and for components where quality and lead time are critical. However, the best partner approach is most beneficial for small suppliers and cannot solve the situation of commitment from large suppliers.

### **6.2.2 Communication**

The other issue concerning supplier relationships at 3P is lack of communication. The lack of communication arises as there is not an open dialogue between the two parties as both strive towards creating leverage. Another reason is because there is not always a formalized way of communicating and because there at times are existent language barriers. The process of changing technical characteristics from supplier side and Volvo is also not consistent in all SIPD projects. The communication issues above have led to substantial rework within projects.

According to literature, communication is a vital essence for having joint product development due to high involvement of the supplier. Literature states that it is necessary to create a close relationship with substantial communication in order to be able to reduce the total cost. If there is lack of communication, both direct and indirect costs increase. Direct cost increases as there is a great amount of rework and adaptation costs. Indirect costs also increase as rework lead to more coordination of resources and change of planning.

Several successful projects at 3P have managed to improve the communication with the supplier. Some projects at other departments use residential engineers. This enables better communication as well as less rework and misunderstandings as the residential engineers are in close cooperation with employees at 3P:s product development department. The disadvantage of having residential engineers is that it requires time and resources from the product developers responsible for the residential engineers and there is a risk of the supplier getting hold of confidential information. However, having a residential engineer is resource demanding whereby it is not economically defendable for all projects. Moreover, in one project, the communication between 3P and the

supplier was improved by establishing a joint teamplace as well as frequent meetings with the supplier which reduces the misunderstandings. By having a teamplace, the risk of not using the latest drawings decreases. The work of both parties is also more transparent. These communication benefits apply to both the direct and indirect aspects of total cost. The teamplace offers an easy setup and could be applied for all suppliers. The greatest risk of using a joint teamplace with supplier is that confidential material could be uploaded or that it is used in an incorrect matter.

The external research showed that early supplier involvement is of great importance for joint development with supplier. By early involvement and being open towards several suppliers in what direction the company might go concerning a new concept development, it is possible to get hold of several suppliers' knowledge and to a greater extent later specify what is wanted.

### **6.2.3 Summary**

Supplier relationships are not working desirably due to lack of commitment and trust as well as lack of communication. The issues regarding commitment and trust can be solved by applying a long term sourcing strategy, establishing joint cost targets for 3P and the supplier and by applying a best partner approach. Communication can be improved by established teamplaces with suppliers, having residential engineers as well as involving the suppliers as early as possible.

## **6.3 Contracting**

3P uses additional agreements when sourcing development components since a supplier is selected before determining the technical specifications causing uncertainties and risks. The additional legal documents when having joint product development causes issues in projects as they most often are not signed on time. The problems occurring due to the legal documents are therefore analyzed below.

### **6.3.1 Legal Documents**

At 3P, there are two specific legally binding documents when having joint product development, the development agreement and the Statement of Work (SOW). The documents are standardized but allow some modifications as some sections can be removed. The development agreement causes issues since it rarely is signed on time due to resistance from suppliers demanding several adjustments of the agreement. Concerning the SOW, issues arise at 3P since the document is considered to be too complex both concerning the content and the format. It is thus time consuming to attach all data needed. Moreover, inexperience of the SOW entails issues since there is difficult to know where to find the data that should be attached in the document.

According to literature, the benefits of contracts decrease as the uncertainties of project increase since it is more difficult to define the business deal in detail. Contracts for SIPD projects therefore tend to be less useful due to the usage of functional specifications. However, some factors are more critical when contracting and if they are not included in the agreement, issues might arise. Problems at 3P might therefore occur since the contract is not signed upon on time, thus critical factors are not agreed upon before starting the joint product development.

According to literature, it is essential to have well defined accurate tolerances of the specifications in order to be successful when having joint product development with suppliers. Thus, the tolerances have to consist of relevant factors with an accurate tolerance span. Besides that, it is important to apply a supply chain approach and therefore have scheduled partial payments to avoid driving suppliers towards bankruptcy. However, by having consistent and shared understanding of key milestones of the project, the uncertainties and risks of failure with a project decrease since the involved actors are united. Therefore, frequency of meetings and communication should be included in the contract. It is especially important to determine what the deliveries at each milestone should be. However, to cope with the issues at 3P, the question is rather how to get the agreements signed on time rather than what to include in the agreement.

In some projects at 3P, the issues due to the legal documents have been occurring to a less extent. In one project, a consultant was hired to fill in all needed information in the SOW and the buyer included in the project had previous knowledge of the legal documents. Moreover, the resistance of suppliers to sign the development agreement decreases when 3P previously had been working with the supplier. Thus, experience in the legal documents of both supplier and 3P speeds up the process. In one project, a special part of the contract was a section of risks and opportunities that stated that changes were allowed up until a certain point without adding extra expenses for 3P. One organization included in the external research believes that a supplier that signs too extensive contracts does not know what is being signed whereby the company is aiming at improving their supplier relationships instead of improving their agreements. They thus use less aggressive agreement to make sure they are signed on time and cover the most critical parts. This has also been used in projects at 3P after extensive discussion of necessary adjustments. By reducing the amount of requirements, the agreement was signed and thus the most critical parts were covered instead of having more requirements but nothing signed. Another company has one experienced employee at each department that signs all agreement to speed up the process and writes one specific agreement for each occasion to contract upon the right things. In addition, one organization forces the supplier to sign the agreement within five days as long as they do not have any questions or wanted changes. One organization agrees upon how to solve upcoming conflicts while another makes the supplier responsible for increased cost due to changes if these changes are not communicated in advance. However, skilled lawyers will always find ways around agreements. Hence, a well working relationship based on trust and commitment reduces risks more than any contracts. Yet, to improve contracting, the legal documents can be adjusted to each occasion to negotiate upon relevant things and the complexity of the documents can be reduced by simplifying their format.

### **6.3.2 Summary**

The development agreement and SOW cause issues when sourcing development components due to inexperienced employees and complex documents. The issues can be reduced by being able to adjust the legal documents for each occasion to a further extent in order to contract upon necessary parts and by simplifying the format of the documents. In addition, by using one development agreement for each supplier instead of one for each component, the process can be simplified. Specific implementation suggestions of how to improve efficiency and effectiveness to reduce cost when sourcing development components at 3P are presented in the conclusions.





## **7. Conclusions**

In this chapter, suggestions of how to improve efficiency and effectiveness when sourcing SIPD parts are concluded. The chapter is divided into three subchapters: Cross Functional Teams, Supplier Relationships and Contracting in order to describe how the three main problem areas can be improved. In total 18 specific implementation suggestions are given to the management team at Vehicle Dynamics. These suggestions are described and illustrated in the Appendices and which of these implementation suggestions that will be conducted is up to the management team of Vehicle Dynamics. For the chosen implementations, project groups will be assigned to run the implementations.

### **7.1 Cross Functional Teams**

Three main factors cause issues in cross functional teams when sourcing SIPD parts: late involvement of purchasing, lack of internal communication and misaligned cost targets. Issues due to late involvement of purchasing can be reduced by having active buyers in advanced engineering or by restructuring the purchasing organization. Internal communication between functions can be improved by having cross functional training to increase the understanding of other functions' work and constraints and by communicating each buyer's responsibilities on the intranet. Internal communication within projects can be improved by arranging collaboration workshops, creating a well working IT-system for communication within projects and by having internal pre-meeting before supplier meetings to make sure that everyone is on the same page. Moreover, internal communication between projects can be improved by appointing one SIPD expert at Vehicle Dynamics so inexperienced employees knows who to ask when having questions and by creating instructions of how to work with SIPD that e.g. includes common mistakes. Finally, issues due to misaligned cost targets can be decreased by having internal and external market oriented cost targets.

### **7.2 Supplier Relationships**

Two main factors cause supplier relationship issues when having joint product development: lack of commitment and trust and lack of communication. The issues regarding commitment and trust can be solved by applying a best partner approach while communication issues can be improved by giving suppliers access to teamplaces on the intranet, by having residential engineers located at 3P and by involving suppliers early to take their knowledge into consideration.

### **7.3 Contracting**

The additional legal documents used when having joint product development cause issues due to inexperienced employees and complex documents. The issues can be reduced by simplifying the format of the legal documents and by making it possible to adjust the document for different occasion to a further extent than today. Moreover, the sourcing process can be improved by having one development agreement for the main development suppliers at Vehicle Dynamics instead of one agreement for each component. However, during the thesis work it was noticed that changing the contracts requires more effort than what you can gain as it is hard to write contracts for a component where the technical specifications are not determined completely from start.



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## Appendix 1

### Questions used for the Initial Interviews

#### Introduction

- What is your position at Volvo 3P?
- Your background?
- How are you affected by sourcing of development components?

#### Further questions

- **What do you think about the process of development components?**
  - Good/problems?
  - Why and what?
  - Have you experienced these?
  - Why have these arisen?
  - How can they be solved?
- **How many contracts have been signed?**
- **Success stories/Failures of development components?**
- **Did you follow the theoretical process?**
  - Why not?
  - What is the biggest difference between the used process and theoretical process?
  - How do the internal cost objectives work?
  - Do you experience it as an immature process?
- **What is your view of single/multiple sourcing**
  - Experience of this?
  - Why long lead-time?
  - Reaction/feedback from suppliers concerning the process?
  - Measurement of supplier product development ability?
  - How to ensure that Volvo gets the best resources?
- **Do you have a dream vision?**
  - Hinders to get there?
- **Important contacts/resources that you think might be useful for us?**





## Appendix 2

### Questions used for the Further Interviews

#### General

- How do you work in SIPD projects?
- Are there any problems that tend to be reoccurring?
- What do you think about the SIPD process?
  - What is well functioning?
  - What works less successful?
- How many developments have totally been signed at your department?

#### Project specific

- Tell us more about the specific project?
- Did you use single or multiple sourcing?
  - Who was responsible for the product cost?
- On what criterion did you choose the supplier/s?
- How did purchasing and product development work together?
  - When was purchasing integrated in the process?
- What would you say were the key success factors in this project?
- How did it function with the internal cost objectives?
- How did the development agreements function within the project?
  - Standardized?
  - Signed in time?
  - Used for all SIPD components?
- Who was responsible for the contact with the supplier?
  - How often did you meet the supplier?
- How often did you have project meetings?



## Appendix 3

### Questions used for external research

#### The purchasing process/Supplier relationships

- What does the standardized sourcing process look like? (for commodity products)
- What does the sourcing process look like for components where the supplier is involved in the product development process?
- How big share of your components have suppliers involved in the product development phase?
- Are there any common problems that arise when sourcing components with suppliers involved in the product development phase?
- Do you have an existent strategy concerning when to have single or multiple sourcing?
  - Do you let several suppliers develop a prototype/concept?
  - What is the view from product development concerning having multiple sourcing in the prototype/concept phase?
  - Do you reimburse the supplier concept development cost?
- Depending upon what criterion do you choose suppliers that are involved in the product development?
- How do you guarantee that the sourced component fulfils your requirements?
- When in the sourcing process do you decide upon the supplier chosen to be involved in the product development?
- Have you experienced any specific problems when having suppliers involved in the product development phase?
  - Why?
- What do you perceive as the key success factors when involving supplier in the product development process?

#### Cross functional Teams

- How do purchasing and product development work together concerning components that are developed together with suppliers?
- When is purchasing integrated in the development process concerning products with suppliers involved in the product development process?
- Who is responsible for keeping in touch with the supplier?

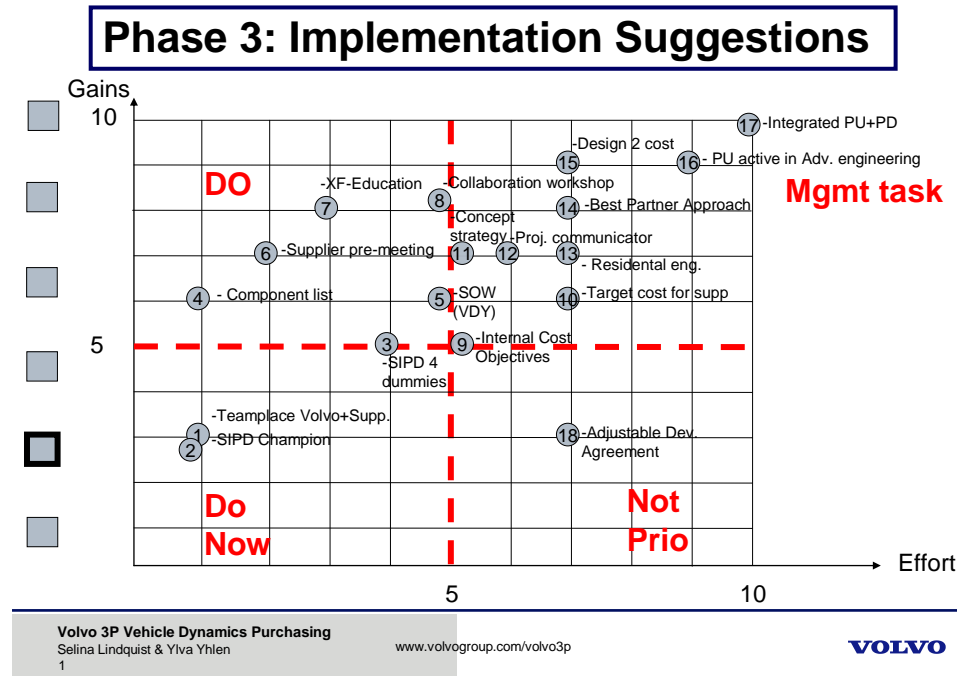
#### Contracting

- Does contracting differ depending upon if the contract concerns a commodity product or a product where the supplier is involved in the product development phase?
  - Do you have a complementary contract for components developed together with suppliers in order to secure Intellectual Property Rights?
- How do you proceed in order to avoid misunderstandings with suppliers?
- Do you use standardized development contracts?
- What does the development contract include?
- How long time does it generally take to get the development contract signed?
- For how long have you been using these development contracts?
- Do you experience any difficulties in getting these signed?



## Appendix 4

### Implementation Suggestions



The implementations suggestions are described according to efforts and gains. Gains are defined as to what extent efficiency and effectiveness is enabled if the implementation is successful. Effort is defined as the amount of time and resources needed to see the implementation suggestion through. The graph illustrates four different categories; Do Now, Do, Mgmt Task and Not Prio. The Do Now category has low effort and moderate gains, the Do category has low effort and substantial gains. Mgmt task are suggestions that need great amount of effort and have substantial gains and therefore need management interference to see them through. The Not Prio category has high effort and low gains and does therefore not include implementation suggestions that the authors see as urgent. All implementation suggestions were elaborated through an extensive amount of brainstorming sessions during Phase 3 by the authors of this master thesis and close evaluation was conducted together with managers at Vehicle Dynamics as well as 20 of the employees that were interviewed during Phase 1 and 2. The Implementation suggestions will be presented in detail below.

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## 1. Common Teamplace Volvo + Supplier

Do  
Now



**Description:** A common teamplace for Volvo & suppliers for SIPD parts level 2 & 3. It should be implemented after supplier selection consisting of 3 main focus folders; timeplan, technical performance & purchasing. For example; price agreements, D.A, technical specification, timeplan, meetings are included and shared. Already existent in some projects.

**Problem to be solved:** Lack of communication & storage of information

**How does it improve the situation?**

Increases transparency through shared information. Beneficial when PST folders are removed

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## 2. Appoint a SIPD Champion

Do  
Now



**Description:** The person most experienced within SIPD projects at VDY should be appointed SIPD Champion. The title should be linked to one specific position (portfolio with the most SIPD components). The SIPD champion should give feedback to the process owner and should be given extra training in SIPD.

**Current situation:** Difficulties of working with SIPD, inexperienced employees, nobody to ask for guidance which is time consuming

**How does it improve the situation?**

Reduced lead time through knowing who to ask and learning from others' experiences

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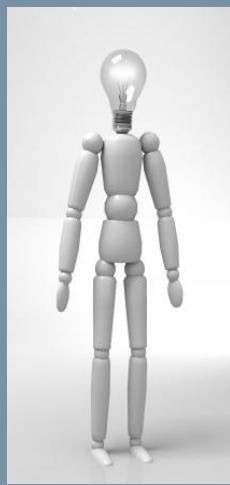
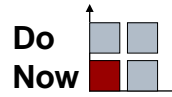
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### 3. Create SIPD for Dummies



**Description:** The current document "training for SIPD" should be updated with additional information such as best practices, how to avoid common mistakes, how to proceed, available links, responsible persons, how to involve aftermarket and instructions for Statement of Work and development agreements.

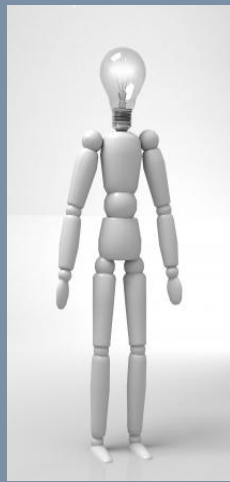
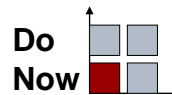
**Current situation:** Immature process & lack of experience

**How does it improve the situation?**

Efficient data collection, less misunderstandings & avoidance of repeating others' mistakes

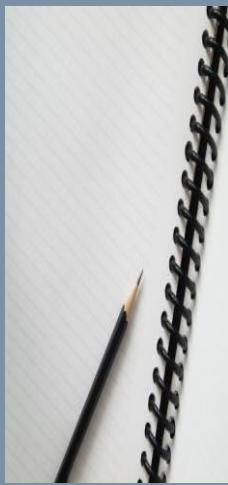
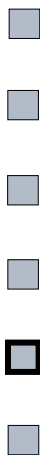
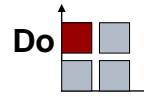
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### 3. Create SIPD for Dummies



- Welcome to SIPD for Dummies
- What is SIPD
- The wiki: SIPD excellence
- How to start a SIPD project
- Who to contact
- How to fill in the Statement of Work
- How to work with the Development Agreement
- Which systems do I need
- Which servers / teamplaces to I need access to
- What tools can support my work
- What do these abbreviations mean
- How to structure my project documentation
- Which training path should I follow

## 4. Component Allocation List



**Description:** Create two lists; one of the components in each portfolio and one of suppliers linked to each buyer. The lists should be available on the intranet for all employees to assure that PD have access to the information.

**Current situation:** PD doesn't know which buyer to contact for new components.

**How does it improve the situation?**

Reduced lead time and frustration since it is easier to find the right buyer.

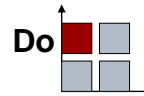
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## 5. Adjusted Statement of Work for VDY



**Description:** Create 1 instruction document & change the format of the statement of work so that it only consists of tables where documents are attached. The instruction documents includes guidance text. For example stating which headings that are optional for different kinds of projects: "Section XX is optional for VDY SIPD projects level 2" → key parts for different projects are highlighted. The statement of work has tables in 3 different colors: if blue Volvo attaches file, yellow the supplier & green both Volvo & supplier.

**Current situation:** Confusing document & all parts not relevant for all projects.

**How does it improve the situation?**

Less paperwork, less confusion and less non-valueadding activities.

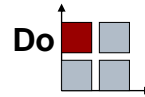
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## 5. Adjusted Statement of Work for VDY



Document name	Document number	Appendices
- Volvo to add name of document describing a mutually agreed change request procedure - to be used for changes that affect scope and/or overall budget frame -		[Appendix X ]

**4.2.9. Data Management**

Document name	Document number	Version
- Supplier to add the name of a document describing the data management policy to be used -		

**4.3.Reviews**

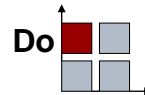
Document name	Document number	Appendices
- Volvo and Supplier to add the name of a document describing the joint review process to be used -		[Appendix X ]

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## 6. Supplier Pre-meeting



**Description:** Establish a routine regarding preparation for certain supplier meetings. It should be mandatory to set up a communication plan early in the project stating when it is necessary to have internal meetings before meeting the supplier e.g. when negotiating. Appoint 1 person as meeting arranger. The purpose of the meetings is to communicate each function's goal with the supplier meeting & discuss do:s & don't:s.

**Current situation:** Functions are not aware of critical factors of other functions & give different messages to the supplier.

**How does it improve the situation?**  
Increased cooperation & transparency implying less frustration

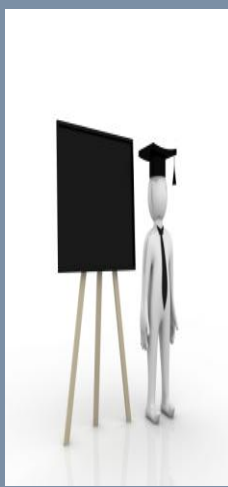
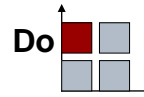
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## 7. Cross Functional Education



**Description:** Create a presentation that gives insight in other functions daily work. About 4 hours powerpoint education of each function with optional attendance but recommended by managers. The presentation shall include core areas such as an ordinary day at work, common scenarios as a buyer/engineer, how to read a drawing, training of e.g. KOLA, GSP, sharing of PBP:s. Each function decides what they want to include in their presentation. This has been done at CAB some years ago.

**Current situation:** Lack of understanding of other functions daily work causing frustration  
**How does it improve the situation?**  
 Increased cooperation through increased understanding

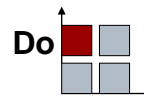
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## 8. Collaboration Workshop



**Description:** Establish a collaboration workshop in order to increase commitment in projects by having clear responsibilities, expressing targets & constraints. This could be enabled by involvement of all functions at the same point in time & early discussion of strategies such as number of suppliers in concept phase.

**Current situation:** Functions are not aware of critical factors of other functions causing misunderstandings & conflict.

**How does it improve the situation?**  
 Increased cooperation and transparency.

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## 9. Internal Cost Objectives



**Description:** Communicate the purpose of the internal cost objectives. There should be education of e.g. how cost objectives should be used, what facts they are based upon, how they can be adjusted/updated & for which geographical region they are valid.

**Current situation:** Incorrect use of cost objectives implying rework & frustration

**How does it improve the situation?**

Increased credibility & correct negotiation input.

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## 10. Target Cost for Supplier



**Description:** Create a new model for determining the target cost for suppliers. Different suppliers' RFQ:s are analyzed & a target is set based on market situation or a target cost is set for the development cost e.g. based on manhours needed. For example; if the RFQ consists of three costs (A, B, C) the target cost is the sum of the lowest A cost, B cost & C cost.

**Current situation:** End cost is not equal cost in RFQ

**How does it improve the situation?**

Improved cost control

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## 10. Target Cost for Supplier

Mgmt Task



The target cost is the sum of the lowest offer of each cost item.

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## 11. Concept Sourcing Strategy

Mgmt Task



**Description:** Evaluate when to have single or multiple suppliers in concept phase for SIPD parts. Concept sourcing strategy for SIPD should be part of the segment strategy. Conduct 2 SWOT-s, 1 for having 1 supplier & 1 for having several suppliers for some segments/components. The SWOT-s are conducted on a strategic level. If selecting several suppliers, it has to be determined during what phases. For example; estimation of costs can be done by comparing engineering hours, development- & testing cost, tooling & part price.

**Current situation:** Different sourcing strategies are not evaluated in projects which leads to PD developing for 1 supplier & PU trying to involve several suppliers.

**How does it improve the situation?** Increased cooperation by having 1 shared target.

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## 12. Project Communicator Tool



**Description:** Implement a programme linked to teamplace to store conversations between team members in 1 place. Everyone having access to a teamplace automatically have access to the articles in the programme. In the programme there is a list of components e.g. Fan hubs instead of employees. Earlier updates are visible when opening the conversation window for an article. Automatic updates are sent to the program when changes occur in e.g. KOLA & GPS. Each week, 1 email is sent to all participants listing all updates of the week plus TO DO and responsibilities stated by the SIPD leader.

**Current situation:** Conflicts & communication problems

**How does it improve the situation?** Better overview, especially for newcomers since everything is stored in 1 place. Reduces the amount of emails & increases cooperation.

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## 12. Project Communicator Tool



The screenshot shows two overlapping windows. The 'Office Communicator' window displays a contact list with 'Fan hubs' at the top, followed by 'Plastic Pistons', 'Stabilizer Bar', 'Global Fittings', and 'Iron Castings'. The 'Fan hubs - Conversation' window shows a chat history with a welcome message and a list of tasks: 'Find new drawing in KOLA', 'Find updated timeplan in teamplace', and 'New drawing put in the supplier folder in teamplace'.

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## 13. Residential Engineers

Mgmt Task



**Description:** Assign 1 person from the supplier to be located inhouse in order to increase communication and reduce misunderstandings. The size of the project affects the length of the residential engineer stay due to workhours needed. When to have residential engineers should be stated in the segment/component strategy. It might for example be appropriate for monopolistic situations, large projects, new technologies & when the supplier is small compared to Volvo.

**Current situation:** Inefficient product development with suppliers implying long lead time.

**How does it improve the situation?** Early involvement of supplier, less probability of rework due to geographical closeness.

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## 14. Best Partner Approach (BP)

Mgmt Task



**Description:** Implement the Best Partner Approach for some parts. This is a tool used to evaluate the suppliers performance to improve their operations implying a strategic gain for the supplier. The supplier rates its own performance regarding price, quality & logistics. Then Volvo focuses on the lowest rated parameter & gives up to 5 suggestions of how to improve the performance. By doing this, Volvo becomes a prioritized customer which implies benefits e.g. reduced part price, improved quality, prioritized parts, reduced lead time.

BP might be suitable in some situations e.g. to avoid supplier bankruptcy, increase # of potential suppliers, for key components where quality & lead time are critical, 1st mover advantage available, for small suppliers with low margins.

**Current situation:** Volvo has low leverage towards suppliers due to few potential suppliers & low margins.

**How does it improve the situation?** Improved supplier relationships.

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## 14. Best Partner Approach (BP)



$$BP = P \times Q \times L$$

- BP = Best Partner
- P = Price
- Q = Quality
- L = Logistics

### Price

- Existing price level
- Price development
- Productivity development

### Quality

- Quality systems
- Capability Audits
- Quality statistics

### Logistics

- Lead time
  - Delivery in time for our needs
- Delivery accuracy
  - Ability to meet our need dates
  - Ability to meet quoted lead times

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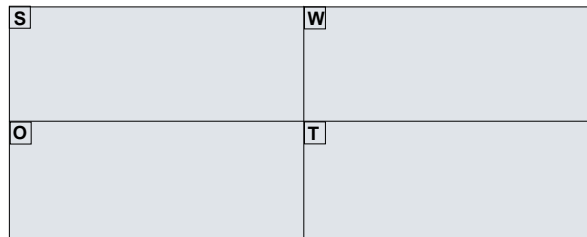
## 15. Design to Cost



**Description:** Investigate what drives cost and what the supplier has to offer in order to optimize QDCF. This can be done by e.g. switching focus from GSC7 to GSC3, presuppose from existing supplier product range, having design workshops with supplier/s, remove zero prototyping for certain components such as design-sensitive parts with high tooling cost. Thus, having a proactive rather reactive approach.

**Current situation:** Late involved suppliers even though cost is determined by design to 80% & sometimes zero prototyping.

**How does it improve the situation?** Supplier as point of reference & early supplier involvement.



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## 16. PU active in Adv. Engineering



**Description:** Make purchasing active in advanced engineering. PU has to show interest in taking part of the process & PD has to invite PU to advanced engineering. The GPM's should be invited to the presentation of the technical roadmaps developed by the GTM:s

**Current situation:** PU not involved leading to design for 1 supplier, lost leverage & supplier lock-in.

**How does it improve the situation?** Earlier involvement of PU & increased probability of having several suppliers in advanced engineering when needed.

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## 17. Integrated PU+PD



**Description:** Investigate the gains of restructuring the purchasing organization. Integration of PU/PD by can be done by restructuring the organization e.g.:

1. having a buyer located at the PD function to snap up changes that he/she reports to the PU function or vice versa. Thus, having an engineer located at the PU function as a technical support explaining why offers differ due to design, RM, production process.
2. having a project buyer; 1 person from PU included in each project. He/she reports to the PU function & is responsible for RFQ, communication with PD.
3. Geographical location meaning: PU's counterpart at PD is located in the same city and PD & PU sit together in the office landscape.

**Current situation:** Collaboration issues and non-holistic approach

**How does it improve the situation?** Increased cooperation.

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## 18. Adjustable Development Agreements

Not  
Prio



**Description:** Make the development agreement adjustable. The key is to get the development agreement signed on time in order to not lose leverage towards the supplier. Several possibilities exists e.g default settings for IPR for each segment, 1 development agreement for the main development suppliers at VDY and necessary information can be added when buying 1 additional component from the supplier, customized agreements for each occasion based on a fix table of contents, certain agreements which gives Volvo 1 year exclusivity for new technologies.

**Current situation:** Takes generally 6 months to sign & is signed too late.

**How does it improve the situation?** Improved efficiency & effectiveness in contracting.

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