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# **Logistics Collaboration in Supply Chains**

– A Survey of Swedish Manufacturing Companies

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# Abstract

The purpose of this thesis is to describe logistics collaboration in supply chains. During the past two decades, a new trend towards integration and collaboration in supply chains has been recognised among researchers as well as among business practitioners. This philosophy is called supply chain management and has received enormous attention in logistics research. Collaboration based on supply chain management is expected to reduce total cost and improve service towards the supply chain's end customers at the same time.

The argumentation in existing literature is however seldom underpinned by more rigorous empirical material and becomes therefore conceptual and superficial. Furthermore, it is incongruous about what actually is done when companies collaborate and what more specific effects are achieved. Therefore more research, especially survey based, is needed in order to verify existing literature. In this thesis the perspective of a focal company is taken in order to concretise the ideas from supply chain management and investigate what it means for an individual company.

Based on supply chain management literature, a questionnaire was constructed which focused on the content of the collaboration and its driving forces, barriers and effects. Furthermore, differences between triadic collaborations, i.e. collaborations where both the supplier and customer of the focal company are involved, and dyadic collaborations (collaboration with either a supplier or a customer) were investigated.

The questionnaire was mailed to 482 Swedish manufacturing companies which had a turnover of more than SEK 100 Million per annum and with more than 100 employees. This population was considered as a typical target group for the supply chain management literature. 177 usable answers were received which gives a response rate of 37.8%.

The results from this study are summarised in five propositions. It is proposed that the content of logistics collaboration in the Swedish manufacturing companies' supply chains is rather operative in its character and does not reach the strategic level that is advocated by the literature. In particular, the degree of process approach in the collaborations is low. This area has a great potential for improvements.

The results also indicate that the intensity of the collaboration, i.e. frequency of information sharing, degree of joint operative planning of involved supply chain activities, and process approach, are positively related to the effects experienced of the collaboration. The relation

between joint strategic planning and the operative collaboration issues is however weak and does not seem to influence the effects experienced as a consequence of the collaboration.

Furthermore, engagement from top management is recognised as an important driver for successful collaboration. Top management involvement means an increased internal focus on the collaboration and facilitates more intensive collaboration.

Finally, differences in attitude and behaviour are recognised depending on whom the collaboration partner is. The study shows that the traditional way of managing supply chain relations still dominates, where the focal company “demand what he wants” upstream much more than in the case for downstream relations. Such differences according to SCM literature should not exist and can be considered as a serious threat for SCM based collaboration.

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Linköping, May 2005

Erik



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**APPENDIX A:** Cover letter to the questionnaire

**APPENDIX B:** The questionnaire

**APPENDIX C:** The research questions and their relation to the questions in the questionnaires

**APPENDIX D:** SPSS Analyses



# 1 Introduction

## **1.1 Background**

As a consequence of increased globalisation, the competition among companies is growing and new ways have to be found to succeed in the new business climate. During the 1980s and 1990s a new trend towards integration and collaboration instead of so-called arm's-length agreements between suppliers and customers has been recognised by researchers as well as business practitioners. Actors participating in the same supply chain identify tradeoffs with their adjacent customers and suppliers and have started to realise the importance of integration in the chain in order to focus on what is offered to the end customer in terms of cost and service. Internal excellence is not enough anymore; there is also a need for external excellence in the whole supply chain. This management philosophy is called supply chain management, SCM, and has received enormous attention in research journals as well as in industry and consultancy firms. (Christopher, 1998; Lambert & Cooper, 2000)

The core message of SCM is that companies in a supply chain should create a collaborative atmosphere where mutual trust, the sharing of risks and rewards and extensive information sharing should prevent suboptimisations in the supply chain. It is suggested that collaboration will lead to more integrated supply chains where independent companies together act as one single entity. Actions and strategic decisions in the supply chain should be managed by demand from end customers, since these finally will have a crucial impact on how successful the supply chain members will be. (Stevens, 1989; Christopher, 1998)

One of the most important areas embraced by the SCM philosophy is logistics. Logisticians are by nature occupied with cross-functional matters and SCM has therefore had enormous importance in logistics research the last two decades. Within the field of logistics, we know about best practice companies that have applied collaboration based on the SCM philosophy and have achieved extraordinary good results. As an example, Wal-Mart's CPFR (Collaborative planning, forecasting and replenishment) collaboration with their suppliers is a well-known success story. Literature about SCM, which often takes its the starting point in such collaborations represented by Wal-Mart, is most often very straightforward; SCM initiatives in supply chains is something very positive and is expected to be beneficial for all parties involved. The discussions and conclusions are however often made on a conceptual level and are seldom based upon more rigorous theory (Bechtel & Jayaram, 1997) or empirical material (Lee & Whang, 2000; Stank et al., 2001) and therefore often becomes superficial and comprehensive.

The sparse survey-based empirical research that does exist indicates that collaboration based upon the thoughts of SCM still cannot be considered as fully implemented in many supply chains. Speakman et al.(1998) conclude from their survey-based research into the subject that "It is apparent from these findings that although we espouse the benefits of supply chain management and sing the virtues of closer ties throughout levels of the supply chain, the results suggest that business has not yet fully operationalised the concept of supply chain management" (Speakman et al., 1998, p. 646)

Thus, to go from arm's length agreements where only internal short-term costs have been in focus, to collaboration, seems to be a difficult task for companies, despite the many obvious advantages mentioned in the literature. Perhaps one reason is that SCM, still after twenty years, is a blurry and not very well defined expression (Larson & Halldorsson, 2004). Larsson & Halldorsson (2004) claim that there is a problem with the lack of a well-defined SCM expression, which the parties involved agree upon:

"There is a danger in entering negotiations on SCM matters before all parties share a common definition of the term. At a minimum, all supply chain participants should understand each other's perspective on SCM". (Larson & Halldorsson, 2004, p. 28)

In order to cope with the blurry definition of SCM, different firms in different industries have tried to realise SCM by creating for them suitable business and management concepts (Svensson, 2003). Very often consultants and other experts have been involved in this when investigating effects and work out a strategy and structure for how to start collaborate in the best manner. The promised effects of SCM, such as a lower total cost, service improvements

and reduced inventory levels, should via the management concepts more easily be implemented and realised. Within the field of logistics, concepts such as Quick Response, QR, Efficient Consumer Response, ECR, Vendor Managed Inventory, VMI, and Collaborative Planning, Forecasting and Replenishment, CPFR, are examples of such concepts.

However, even if the journey towards the ultimate SCM has been facilitated by the business and management concepts, these issues have still proved to be a difficult task for most companies and not many companies have therefore arrived successfully in a total SCM environment. When reading research literature as well as management magazines, subject titles like “How efficient is Efficient Consumer Response” (Knill, 1997), and “VMI – Very Mixed Impact?” (Cooke, 1998) confirm the difficulties.

Apart from the fact that collaboration based upon SCM is still something unusual, there also seems to exist a gap between the ideas behind the concepts and empirical research about the promised effects of collaboration. It seems like those companies that have realised SCM and started to collaborate have not always been rewarded with all the positive effects that are outlined by the concept advocators. As an example, empirical research into CPFR shows that many of the promised effects could not in fact be seen (Stank et al., 1999; Skjoett-Larsen et al., 2003; Småros, 2003). In an article Stank et al. (1999) present a survey from 1998 focusing on CPFR. In the article it is concluded that:

“This research fails to verify the existence of broad-based performance enhancements related to implementation of CPFR, but it does indicate that firms engaging in high levels of CPFR can expect to realize reduced overall cost. That is good, but it does not speak of the many other benefits often attributed to CPFR. Significant improvements in customer service, reduced stock-outs, less instance of damaged, returned and refused goods, and lower inventory levels with faster returns are all expected benefits of collaborative demand planning that were not supported at a statistically significant level by this research.” (Stank et al., 1999, p. 84)

Småros (2003) argues that more research into different types of CPFR-based collaboration is needed:

“Still, considerable research efforts are required before we can reach the goal of being able to understand what kind of collaboration is successful in different situations. There is currently very little descriptive research available on how companies collaborate in logistics planning

and forecasting. Practice-oriented case studies as well as surveys from both the USA and Europe would be very valuable.” (Småros, 2003, p. 257)

To conclude the discussion so far, it can be stated that despite more than two decades of discussion about SCM and its many promising effects, both by researchers and by consultants, little SCM can be found in real, existing supply chains. This indicates that the change from arm’s lengths agreements into collaboration is difficult and involves many problems. Furthermore, research concerning effects of existing collaboration is incongruous and is often only based on single best practice cases; there is a gap between theory and successful case stories (such as Wal-Mart) on the one hand, and survey-based results on the other hand.

With the discussion above it becomes evident as Småros (2003) also states above that, more research about collaboration based upon SCM is needed. As a starting point for this thesis it can be concluded that SCM and collaboration are very broad terms, which makes the area difficult to cover. This could be the reason for the sometimes confusing previous research results. Even if this thesis is narrowed to only focus on logistics issues, the area is still very broad. Thus, from a logistics perspective the question of what SCM and collaboration really means for the individual company in a supply chain could be asked. How is collaboration performed and what actions are undertaken? What parts of the very broad spectrum of actions suggested by literature have been accepted and realised? For what reasons is collaboration applied and what barriers to collaboration exist? What are the consequences of collaboration in terms of effects?

## ***1.2 Purpose of this study***

To answer these questions a description of the situation in real existing supply chains concerning logistics collaboration is needed:

***The purpose of this study is to describe logistics collaboration in supply chains***

In order to provide a complete description of logistics collaboration in supply chains a number of issues should be dealt with. First of all, the content of the collaboration, i.e. what companies actually do when they collaborate and in what logistics areas this is performed, will be investigated. Secondly, the number of companies involved in the collaboration is considered. Finally, in accordance with the discussion in the background, driving forces, barriers and effects will be related to the content of the actual collaboration. These issues and more thorough research questions are presented in chapter 3.

A survey approach will be applied in this study. The reason for this is twofold. First, the purpose of the study together with the questions at the end of the previous section is suitable for a survey approach (see chapter 4 for a methodological discussion). Second, as is supported from the discussion in the previous section, there is a need for more survey-based studies in order to extend the knowledge base of SCM, which today often is built upon case studies of best practice companies.

This study has a theoretical as well as a practical relevance. To start with the theoretical part, an important task for this study is to contribute to more specific knowledge of what areas of the SCM literature that are actually applied and performed in reality. This will make more directed and focused research in the area possible. Based upon what actually is done in existing supply chains, this study will suggest more narrowed research areas that are worth more focus and attention in the future. Moreover, this will also contribute to a better understanding of suitable theoretical starting points for future research.

There is also undoubtedly a need for more research in the area of suggested effects and barriers, depending on the content of the collaboration. As discussed in the background chapter, research results are incongruous and it is not enough anymore to conclude that collaboration in general contributes to lower costs and improved service. A more specific description of the collaboration must be given in order to go further and increase the understanding of collaboration specifically, and SCM in general.

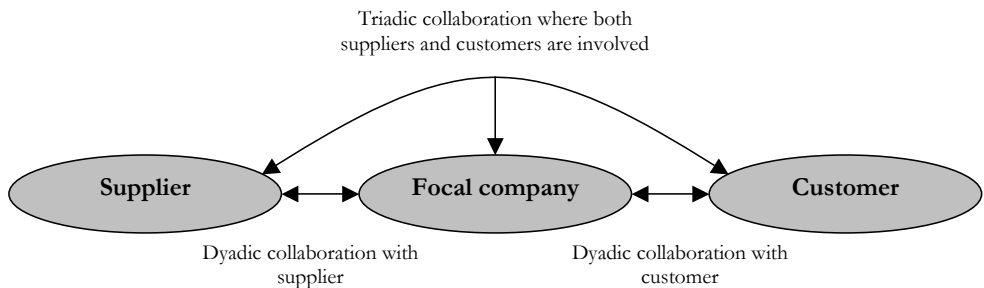
Research on the effects of collaboration is also relevant from a practitioner's perspective. For an individual company, it is today difficult to understand and judge what to do since the literature most often is too generalised; it only say that actors in a supply chain should collaborate, but gives seldom advice as to what part of the literature is of special interest for a certain company. This study can contribute to providing a clearer picture of possible actions and ways to behave for the individual company and connect it to what barriers and effects that can be expected as a result.

### ***1.3 Scope and focus of the thesis***

Ever since the expression SCM was founded, the dominating perspective in SCM literature has been a supply chain perspective in which all companies are considered to work together in order to fulfil the purpose of the whole supply chain. This perspective, which does not consider the individual companies involved, is fundamental in order to understand the basic principles and the many advantages of SCM. For example, this perspective pays attention to the end customer, who in the long run will decide the whole supply chain's destiny. However,

in recent years as SCM research has grown more mature, a greater need for “how to do it”-research can be seen in research journals as well as in business magazines (see e.g. Barratt, 2004). To be able to understand how an individual company situated in a supply chain should act and behave, the supply chain questions must be considered from a company perspective. Thus, this perspective could be very valuable as a complementary perspective and can be used in order to increase the understanding of SCM on a company level.

In this study, the perspective of a focal company situated in a supply chain is taken. Focus is on how the focal company should act and behave in line with SCM literature. Figure 1.1 below shows the focal company and its main collaboration possibilities in the supply chain. The focal company can be involved in three types of collaboration that will be investigated in this study; a triadic collaboration where both the supplier as well as the customer to the focal company are involved, or dyadic collaboration with either a supplier or a customer.



**Figure 1.1 The chosen perspective and the three types of collaboration investigated in this study**

The main advantage of this perspective is the possibility to investigate how a focal company links actors situated on different sides of the company and compare the three different collaboration possibilities to each other. The chosen perspective distinguishes this study from other studies with a survey approach. Other surveys, see e.g. Selldin (2002) or Forslund (2004), have also investigated SCM issues in Swedish companies, but with a different perspective and focus to the one taken in this study.

Due to the perspective chosen, this research will only consider the focal company’s perceptions and attitude. This means that despite the fact that interorganisational collaboration issues always involve at least two actors, the whole picture of the collaboration is in this thesis based upon one side’s description. For further discussion about methodological consequences of this perspective, see discussion about validity in chapter 4.3.



As pointed out in the figure, another important restriction in this thesis is that it only deals with so-called primary members of the supply chain (see e.g. Lambert & Cooper, 2000). This leaves e.g. collaboration between the focal company and a third party logistics provider outside the scope of this thesis.

## **1.4 Some important definitions**

The large amount of research in the SCM area has led to a wide range of definitions, expressions and concepts (Mentzer et al., 2001; Larson & Halldorsson, 2004) and it is therefore necessary to discuss the expressions supply chain management and logistics management in order to further specify and describe the focus of this thesis. Thereafter collaboration and its connection to SCM is discussed.

### **1.4.1 Supply Chain Management and Logistics Management**

Considering definitions of SCM and logistics management, the definitions made by the Council of Supply Chain Management Professionals, CSCMP (former Council of Logistics Management, CLM), are one of the most cited sources. In a document on their homepage, SCM is defined as follows: “Supply chain management encompasses the planning and management of all activities involved in sourcing and procurement, conversion, and all Logistics Management activities. Importantly, it also included coordination and collaboration with channel partners, which can be suppliers, intermediaries, third-party service providers, and customers. In essence, Supply Chain Management integrates supply and demand management within and across companies” ([www.cscmp.org](http://www.cscmp.org)).

Mentzer et al. (2001) make a valuable contribution to the understanding of SCM when they argue that a reason for the confusion and many definitions of SCM is that authors try to include *two different things within the same definition*. In order to sort out the somewhat unclear definition, Mentzer et al. (2001) distinguish between SCM as a management philosophy on the one hand, and the actions undertaken to realise the philosophy on the other. It is suggested that the management philosophy, called supply chain orientation, SCO, is a prerequisite for SCM, which should be interpreted as actions undertaken by actors in a supply chain in order to realise the SCO. SCO is defined as “the recognition by an organisation of the systemic, strategic implications of the tactical activities involved in managing the various flows in a supply chain” (Mentzer et al., 2001, p. 11). SCM in turn, is defined as “the systemic, strategic coordination of the traditional business functions and the tactics across these business functions within a particular company and across businesses within the supply chain, for the purposes of improving the long-term performance of the individual companies and the supply chain as a whole” (Mentzer et al., 2001, p. 18).

As stated in the two definitions of SCM above, all kinds of business functions in a company can be included in the SCM expression. Following these definitions, one part (as clearly stated in the definition from CSCMP) of SCM is logistics management.

In their definition of logistics management, CSCMP again clearly point to the fact that SCM is considered as a broader definition: “Logistics management is that part of supply chain management that plans, implements and controls the efficient, effective forward and reverse flow and storage of goods, services and related information between point of origin and the point of consumption in order to meet customer’s requirements. Logistics management activities typically include inbound and outbound transportation management, fleet management, warehousing, materials management, order fulfilment, logistics network design, inventory management, supply/demand planning, and management of third party logistics services providers.” (www.cscmp.org)

The relationship between SCM and Logistics management is however not always easily understood and different opinions exist about what they actually encompass. Sometimes SCM and Logistics management are interpreted in the same way and are therefore often used interchangeably in literature. With results from a survey as a basis, Larson & Halldorsson (2004) highlight the different understandings of the terms among logistics/SCM experts in the United States. The survey shows four different views on how to interpret the functional scope of SCM vs logistics, see Figure 1.2.

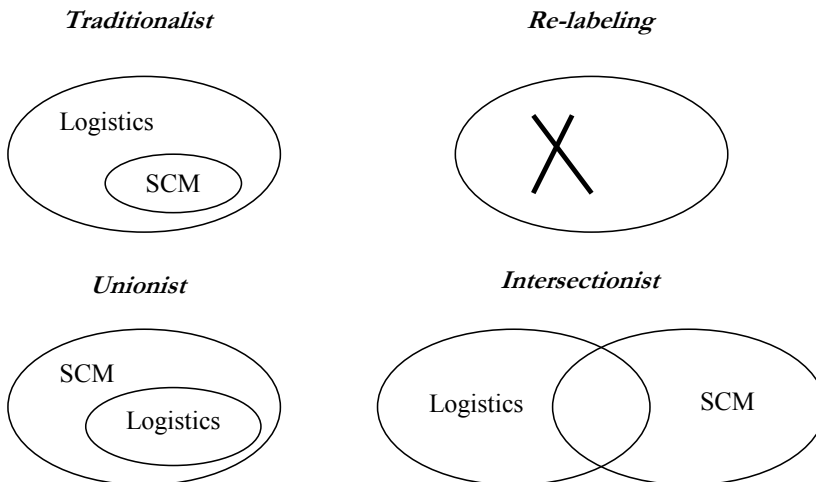


Figure 1.2 Four different understandings of the scope of SCM (Source Larson & Halldorsson, 2004, p. 19)

The four figures represent four different ways to interpret the scope of the two expressions relative to each other. However, other ways to distinguish them can also be found in the literature. One often mentioned difference according to literature is whether they are occupied with internal or external issues. Christopher (1998) argues that SCM is “no more than an extension of the logic of logistics” (Christopher, 1998, p. 16) and claims that “Logistics management is primarily concerned with optimising flows within the organisation whilst supply chain management recognises that internal integration by itself is not sufficient.” (Christopher, 1998, p. 16).

Another difference is that the main focus for the expressions differs. According to Christopher (1998), the main focus for logistics is to create a single plan for the flow of products and information through a business and try to optimise this as much as possible. SCM is instead concerned with external relations with other members of the supply chain by linking and co-ordinating processes, which concerns many different members.

From the discussion above it can be concluded that this thesis is about interorganisational logistics collaboration and at the same time it can be placed within the SCM field. Considering Larson & Halldorsson’s (2004) discussion above about functional scope, this study has an intersectionist’s view, as the issues dealt with in this study can be placed in the area covered by both SCM and Logistics. Thus, this thesis investigates logistics collaboration issues, but these can also be seen as a part of the SCM expression. In line with the view of an intersectionist, this study is based on the idea that the areas of logistics and SCM overlap each other, but are also separated from each other. For example, pure internal logistics issues such as internal transportations that do not influence any interorganisational issues, are only covered in the logistics field in Figure 1.2 above. An example of a SCM matter that is not covered in the logistics field is e.g. marketing activities or financial issues.

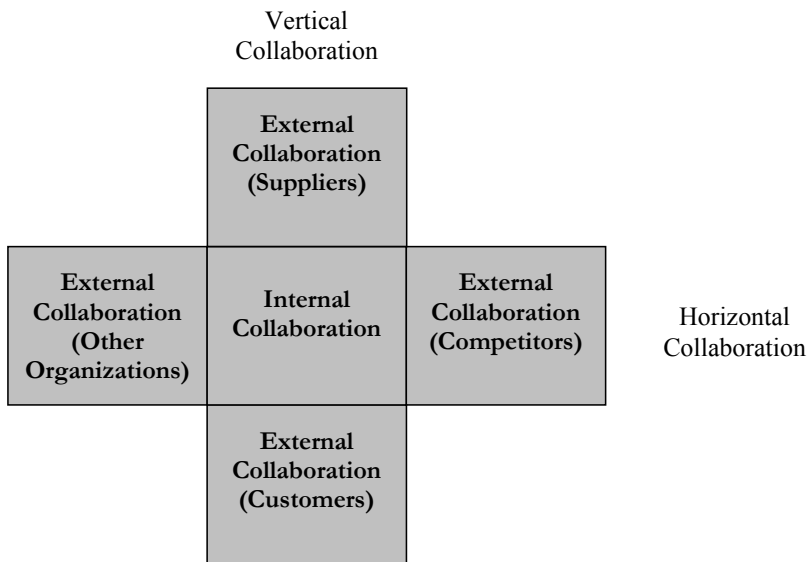
The focus on the issues investigated in this study can be related to both relations (the focus of SCM studies) as well as issues related to the physical flow and the optimisation of it (the focus of logistics management).

#### **1.4.2 Logistics collaboration**

Even if the distinction between SCO and SCM made by Mentzer et al. (2001) contributes to a better understanding of the SCM expression, the SCM definition presented in the previous section is still very vague and needs therefore to be explained and interpreted further. The importance of interorganisational coordination and integration are considered by most authors as key tasks for SCM. But when e.g. Mentzer et al. (2001) state that SCM is about “coordination of the traditional business functions and the tactics across these business

functions”, what is then really suggested? The answer given by most authors is that the coordination and integration is achieved by collaboration among actors in the supply chain. In fact, (Horvath, 2001) argues that collaboration is a prerequisite to achieving SCM; without collaboration, there can be no SCM.

Barratt (2004) distinguishes between internal and external collaboration and whether it is vertical or horizontal, see Figure 1.3 below. Note that collaboration is not equal to SCM. In fact, collaboration can be considered as a broader expression. In the figure, this study only deals with external collaboration in a vertical direction, i.e. collaboration with suppliers and customers. This vertical, external collaboration can in this study be interpreted as SCM. Note that according to the discussion above, SCM also includes internal issues. However, these are not considered in this study and therefore SCM is equal to vertical, external collaboration in this study.



**Figure 1.3 Different types of collaboration (Source Barratt, 2004, p. 32)**

The definitions of collaboration made by researchers as well as column writers in business magazines are not incongruous, nor are they ever the same; it seems extremely difficult to develop a general one-sentence definition of collaboration (Barratt, 2004). Similar to Mentzer’s et al (2001) understanding of SCM as two different things covered by the same definition, collaboration in this thesis should be considered as containing two elements. First, collaboration can be characterised as a certain type of relation between independent companies (compare with the expression supply chain orientation by Mentzer et al, 2001).

Second, collaboration also consists of activities that are performed by the participating actors in the collaboration (to be compared with SCM according to Mentzer et al, 2001).

The relationship in a collaboration is characterised by openness and trust between the parties involved (Lee & Billington, 1992; Ireland & Bruce, 2000; Moore, 2003), where win-win thinking and a mutual understanding for each other's business is a prerequisite. A willingness and commitment is also needed among all the involved parties. (Speakman et al., 1998; Ireland & Bruce, 2000; Lee & Whang, 2000; Skjoett-Larsen et al., 2003). For a further discussion of these issues, see chapter 2.4.4 in the frame of reference about SCO.

Concerning actions undertaken in the collaboration a broad spectrum of activities are suggested by the literature and these together with the SCO will be further investigated in this study. On a general level, it could be argued that collaboration is about companies that share information and jointly negotiate and decide something of common interest. This means a two-way communication with goals, which have been commonly agreed. Since collaboration should contribute to improvements in the supply chain, the possibility for both parties to influence the collaboration is important, otherwise there is a risk that major opportunities to improvements can be lost as well as the win-win situation. (Cooper et al., 1997a; Cooper et al., 1997b; Ireland & Bruce, 2000)

Based upon these features collaboration will in this thesis be defined as a relationship characterised by openness and trust and where risks, rewards and costs are shared between the parties. Furthermore, a basic prerequisite is that all involved parties should be able to influence the design of the collaboration. Typical activities performed in the collaboration are joint planning and information sharing.

## ***1.5 Thesis outline***

This thesis starts with a background leading to the purpose of this thesis. Thereafter the scope of the study and the expressions SCM and collaboration are discussed. The terms are very broad and a discussion of how they will be used in this thesis is therefore necessary. The second chapter, which is the frame of reference, starts with a more thorough explanation of SCM and its organisational and functional scope. The content of SCM, i.e. its fundamental ideas, is thereafter discussed from a functional, processual, and an organisational perspective.

The content of SCM is however only described on a conceptual level and it is therefore necessary to clarify the content. This is done with a description of the three logistics business concepts Efficient Consumer Response, Vendor Managed Inventory, and Collaborative Planning, Forecasting and Replenishment. In this study these concepts are considered as

concrete examples of how to implement and realise the SCM philosophy. The frame of reference is thereafter concluded by a presentation of four important aspects for a company situated in a supply chain to consider when applying the ideas suggested by the SCM literature. The aspects are based on the previous two chapters in the frame of reference.

The frame of reference is followed by a new chapter where four research questions are presented and further broken down one by one. This break down procedure is based on the frame of reference.

Thereafter, chapter 4 discusses the methodology of the study. A short discussion about research design results in the conclusion that this study should have a survey approach. Thereafter the different steps in the study are described in order to give the reader a good possibility to understand the method applied in the study.

Chapter 5 presents the results of the survey, i.e. the analyses made in SPSS. The chapter begins with a short presentation of the company characteristics of the participating respondents and is followed by a presentation of results on each research question.

In chapter 6 the results are analysed and compared to existing literature. In chapter 7 conclusions from this study are drawn with five propositions that summarises the most important findings in the study. Finally, chapter 8 presents some subjects for future research in the area.

## **2 Frame of Reference**

The frame of reference in this thesis can be divided into three main parts; the first part deals with the term supply chain management on a higher, more abstract level. The second part consists of a short presentation of three collaborative-based business concepts with strong logistics profiles. In this thesis, these will be regarded as examples of how to implement the somewhat blurry and not well-defined SCM term. The main purpose for this part is to provide the reader with a better picture of how SCM can be realised.

The third part summarises the frame of reference with four important aspects of SCM to consider from a focal company's perspective. These four aspects together give the reader a picture of how the SCM literature suggests that a focal company should behave in its supply chain.

Since this thesis has a logistics perspective on SCM, the chapters below are dominated by literature from the field of logistics research.

### ***2.1 The scope of Supply Chain Management***

In this section the development of the functional and organisational scope of SCM is described and concludes where the SCM literature stands today concerning these issues. The fundamentals of SCM, i.e. the content, is thereafter described from three different perspectives; a functional, a processual, and organisational. The reason for the choice of these perspectives is the strong focus on processes in recent SCM literature; the process view is becoming more and more central and has therefore to be studied further. In contrast to the

process view, the functions are often discussed and are therefore closely related to the discussion about the processes. Finally, since the process approach puts new demands on the organisations involved, this perspective also becomes important; without an organisation that manages the change towards a process approach, SCM will always be nothing other than a utopia.

### **2.1.1 The functional scope of Supply Chain Management**

The term supply chain management was founded and developed in a logistics context. Within this area there is a natural need for cross functional thinking and in the beginning of the 1980s, SCM was introduced by consultants as a term for how to manage inventory across several functions in the supply chain more efficiently and effectively (Cooper & Ellram, 1993; Cooper & Lambert, 2000). Over the years SCM has become a very popular research area in many different disciplines.

In their literature review Croom et al (2000) presents eleven different bodies of literature, all dealing with SCM:

1. Purchasing and supply literature
2. Logistics and transportation literature
3. Marketing literature
4. Organisational behaviour, industrial organisation, transaction cost economics and contract view literature
5. Contingency theory
6. Institutional sociology
7. System engineering literature
8. Network literature
9. Best practices literature
10. Strategic management literature
11. Economic development literature

As many different research disciplines are involved in SCM research, its functional scope has been widened more and more (Cooper & Lambert, 2000). Studying articles published from mid 80s until now shows this development clearly. Houlihan (1985), one of the first authors writing about SCM, found that there was a need for a new approach within the area of materials management in order to avoid a sub-optimal utilisation of assets. Jones & Riley (1985) claimed that “supply chain management deals with the total flow of materials from suppliers through end-users” (Jones & Riley, 1985, p. 19). Stevens (1989) extended SCM to also contain the information flow connected to the physical materials flow. Lee & Billington



(1992) mentioned for the first time R&D in an inventory context and argued that the involvement of R&D could reduce inventory and distribution costs. Perhaps this was the first step to integrate also R&D in the SCM term.

In literature, the focus on inventory levels and logistics decreased and in 1997 Cooper et al stated the following: “There is definitely a need for the integration of business operations in the supply chain that goes beyond logistics. New product development is perhaps the clearest example of this since all aspects of business ideally should be involved, including marketing for the concept, research and development for the actual formulation, manufacturing and logistics for their respective capabilities, and finance for funding.” (Cooper et al., 1997a, p. 1).

The authors argue that this development is natural and explains the logic behind; to be able to decrease the inventory levels there is a need for increased information availability. Marketing and customer service also become involved since these must have access to accurate information about product availability etc. These functions will in turn influence other functions in the company. Thus, soon all “traditional intrabusiness functions” (Mentzer et al., 2001) are enclosed in the SCM term. Today, this is the most common understanding of the functional scope of SCM. However, even if the focus on inventory management has decreased in the literature, it is still considered as one of the major tasks of SCM. For example Childerhouse & Towill published an article in 2003 with the title “Simplified material flow still holds the key to supply chain integration” (Childerhouse & Towill, 2003).

### **2.1.2 The organisational scope of Supply Chain Management**

The organisational scope of SCM should be interpreted as the number of companies involved. Two main views about the organisational scope of SCM exist in literature. The first is that all companies from point of origin to point of consumption are involved and the other one is that at least three companies should be involved. Just as the question about the functional scope of SCM, the opinion about number of involved organisations in SCM has changed. In earlier articles, which represents the first view, the authors seems to agree that the scope covers all companies involved “from the supplier to end customer” (Houlihan, 1985, p. 26, Jones & Riley, 1985, p. 17) or that SCM involves “the entire channel and not just a few channel pairs” (Cooper & Ellram, 1993, p. 13)

In recent years however, the organisational scope of the supply chain seems to have been narrowed. The reason for this is perhaps the increased efforts in the literature and by companies to realise and implement SCM and that a company perspective therefore often is taken instead of a supply chain perspective. Some of the older articles have very high

demands on what can be called SCM and therefore it is almost impossible to see such SCM in reality. Cooper et al (1997b) argue instead that the supply chain (and the organisational scope) can be defined as “three or more organisationally distinct handlers of products” (Cooper et al., 1997b, p. 67). They argue that the focus on the total supply chain system was “a lofty and difficult goal to achieve. Few organisations, if any, even have a good understanding of how various functions, teams, and other units within their own organisation interact.” (Cooper et al., 1997b, p. 68).

The interpretation of the organisational scope is closely related to the understanding of what a supply chain is; some authors distinguish between “traditional commodity chains” and supply chains, and some authors do not. Cooper & Ellram (1993) and Cooper et al (1997b), who represent the first view, distinguish between the traditional commodity chain and the supply chain and argue that not all companies are automatically involved in a supply chain. Cooper & Ellram (1993) identifies a number of aspects that differentiates a traditional commodity chain from a supply chain, see Table 2.1 below:

**Table 2.1 Aspects that distinguish a traditional commodity chain from a supply chain (Source Cooper & Ellram, 1993, p. 16)**

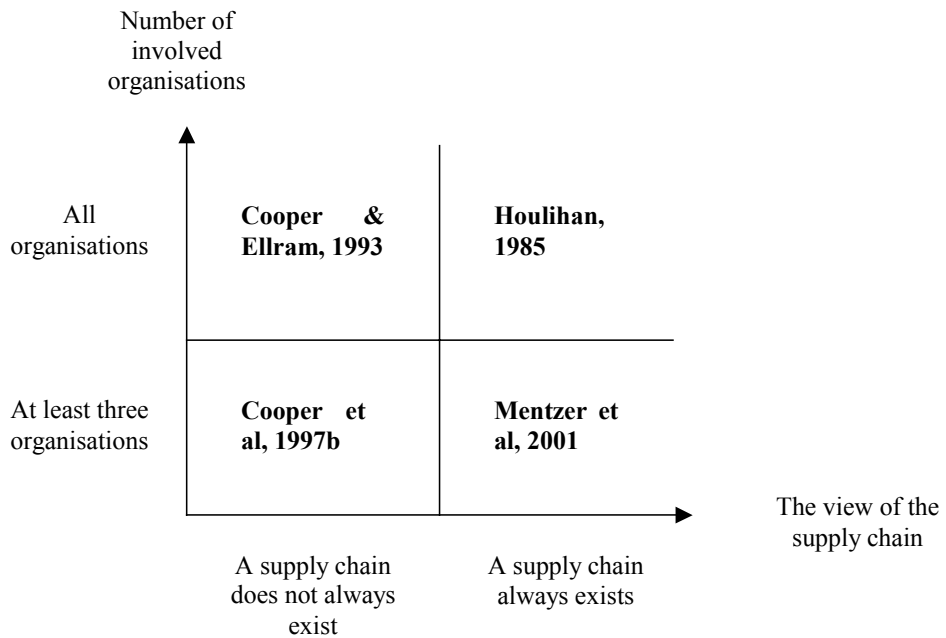
Element	Traditional	Supply chain
Inventory Management Approach	Independent efforts	Joint reduction in channel inventories
Total Cost Approach	Minimize firm costs	Channel-wide cost efficiencies
Time Horizon	Short term	Long term
Amount of information sharing and monitoring	Limited to needs of current transaction	As required for planning and monitoring processes
Amount of Coordination of Multiple Levels in the Channel	Single contact for the transaction between channel pairs	Multiple contacts between levels in firms and levels of channel
Joint Planning	Transaction-based	On-going
Compability of Corporate Philosophies	Not relevant	Compatible at least for key relationships
Breadth of Supplier Base	Large to increase competition and spread risk	Small to increase coordination
Channel Leadership	Not needed	Needed for coordination focus
Amount of Sharing of Risks and Rewards	Each of its own	Risks and rewards shared over the long term
Speed of Operations, information and inventory flows	“Warehouse” orientation (storage, safety stock) interrupted by barriers to flows; localized to channel pairs	“DC” orientation (inventory velocity) Interconnecting flows; JIT, Quick Response across the channel

Thus, according to these authors, the supply chain only exists where there is SCM. In other words, the supply chain is equivalent to the organisational scope of SCM.

The second standpoint is that all companies are always involved in a supply chain. For example, Mentzer et al (2001) do not demand more than the existence of a set of companies structured so that one organisation (or individual) supplies another and that this organisation in turn supplies another organisation, to call it a supply chain. Thus, no distinction between commodity chain and supply chain is made. The reason for this approach is the opportunity to more easily be able to distinguish between a “supply chain” and “supply chain management”. They argue that: “...we draw a definite distinction between supply chains as a phenomena that exists in business and the management of those supply chains. The former is simply something that exists (often also referred to as distribution channels), while the latter requires overt management efforts by the organisations within the supply chain.” (Mentzer et al., 2001, p. 4).

Lambert & Cooper (2000) also discuss that all firms participate in supply chains all the time, reaching from raw material to the ultimate consumer. However, which parts or links of the supply chain that should be managed is quite another question. These parts are considered to be involved in SCM.

Combining the number of companies involved and the understanding of a supply chain, gives us four possible standpoints to the organisational scope of SCM, which are all represented in the literature, see Figure 2.1:



**Figure 2.1 Four different opinions on the organisational scope of SCM**

Another example of how to simplify and clarify the organisational scope of SCM is to distinguish between primary and supporting members of the supply chain (Lambert & Cooper, 2000). Primary members are defined as “those autonomous companies or strategic business units who carry out value-adding activities (operational and/or managerial) in the business processes designed to produce a specific output for a particular customer or market.” (Lambert & Cooper, 2000, p. 70). Supporting members in turn are defined as “companies that simply provide resources, knowledge, utilities, or assets for the primary members of the supply chain.” (Lambert & Cooper, 2000, p. 70). This classification can be compared with Mentzer et al’s (2001) three degrees of “supply chain complexity” (Mentzer et al., 2001, p. 4); direct supply chain, extended supply chain and ultimate supply chain. In a direct supply chain a focal company, a supplier and a customer are involved. This view, with three independent units, is seen as a minimum to SCM. In the extended supply chain, the supplier’s supplier and the customer’s customer are also added. Finally, in the third type called ultimate supply chain, all “organisations involved in all the upstream and downstream flows of products, services, finances, and information from the ultimate supplier to the ultimate customer” (Mentzer et al., 2001, p. 4). This means that e.g. carriers and third party logistics companies also are covered in the organisational scope of SCM (see also Tan, 2001).

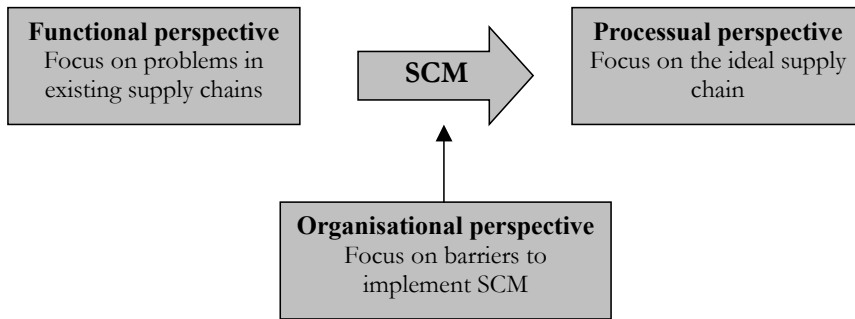
The increased efforts recent years to realise SCM and make it less difficult to achieve, has also brought into focus that all relations should not be embraced by the SCM philosophy and characterised with a collaborative atmosphere (Cooper et al., 1997b). Barratt (2004) is for example questioning collaborative relationships with all other members in a supply chain;

“What is not clear in the literature is whether we can collaborate with everybody. The answer is probably “no”, but it is not as disappointing as it may sound. Organisations need to realise that the resource intense nature of collaboration means that they need to focus their attention on a small number of close relationships rather than trying to collaborate with everyone. But why would organisations want to collaborate with everyone; some relationships may well be “optimal” in the sense that they are most suited to an arm’s-length, purely cost based type of relationship, i.e. collaboration would not create any further added value or benefit” (Barratt, 2004, p. 33)

To conclude, the interorganisational scope of SCM nowadays seems to be considered as at least three organisationally independent actors; in its simplest form this could be a supplier, a third party logistics provider, and the supplier’s customer. When considering only primary members of the supply chain (which is the case in this study) a supply chain could consist of a focal company and its customer and supplier.

## ***2.2 Three perspectives on SCM***

When considering the content of SCM from the three perspectives process, function and organisation, the following picture is clear (see Figure 2.2 below); the essence of SCM is about solving the problems with functional silos that occur within and between independent organisations (functional perspective). The suggested prescription to do this is a change towards a process view (processual perspective) where the whole supply chain (i.e. all functions) act as one single entity which focus on end customer demand. This change is however not easily made and lots of barriers are presented in the literature, where above all organisational issues (organisational perspective) are discussed.



**Figure 2.2** The content in the three perspectives on a conceptual level

### **2.2.1 SCM from a functional perspective**

In SCM literature function is often equivalent to a company’s different departments such as e.g. sales, marketing, purchasing and logistics. As such, a functional description of a company therefore hints at how a company’s resources are utilised and organised. Within each function a number of activities are performed. A function is always specialised in some way, and therefore the activities performed by the function are similar and/or needs the same type of resources/knowledge provided by the function.

From a functional perspective, most SCM literature is concerned with the so-called “functional silos”(see e.g. Lambert & Cooper, 2000), both within companies and between companies. The authors recognise that there is a trade off between the functions and that the main task for SCM is to balance and coordinate the functional objectives and find the best overall solution. Houlihan (1985) for example propose the idea that the objectives of marketing, sales, manufacturing and distribution are constantly in conflict with each other; “The imbalances resulting from these conflicts have become almost structural in nature and traditionally have been bridged by inventory and excess capacity. It is not necessary to challenge the direction of the individual strategies of each of those functions. What is needed rather, is a critical evaluation of the opportunities for trade-offs between the key elements of these strategies, and examination of the implication...Supply chain management suggests a quite different approach: addressing the imbalances directly and evaluating opportunities for minimising them.” (Houlihan, 1985, p. 30)

The need for trade-offs between the functional silos can also be interpreted as the trade-off between costs and service, which is also discussed by many authors. For example, Stevens (1989) argues that “To achieve the necessary balance between cost and service involves trade-offs through the chain. For the benefit of such trade-offs to be fully achieved it is necessary to

think in terms of a single integrated chain rather than narrow functional areas.” (Stevens, 1989, p. 3)

To conclude, there exists a natural need for trade-offs between different organisational functions. For example a production department, which can be considered as a function, can be measured and managed with functional related measurements such as production cost per unit. In such cases, there are no incitements to increase production cost per unit in order to improve service towards the department’s customers. The service towards its customers is outside the scope of the function and the credit for an improved service would be taken by another function, e.g. a marketing function. In such cases it is therefore not interesting for the production department to make service improvements with higher production costs as a result.

In the SCM literature, an example like this is perhaps the strongest argument for SCM since SCM helps to tackle these problems and avoid suboptimisations as described above. In recent literature, the way how to overcome the problem becomes very clear; the actors in the supply chain should focus on, and be organised around, a number of processes in order to achieve better coordination and avoid suboptimisations (Cooper & Ellram, 1993).

### **2.2.2 SCM from a processual perspective**

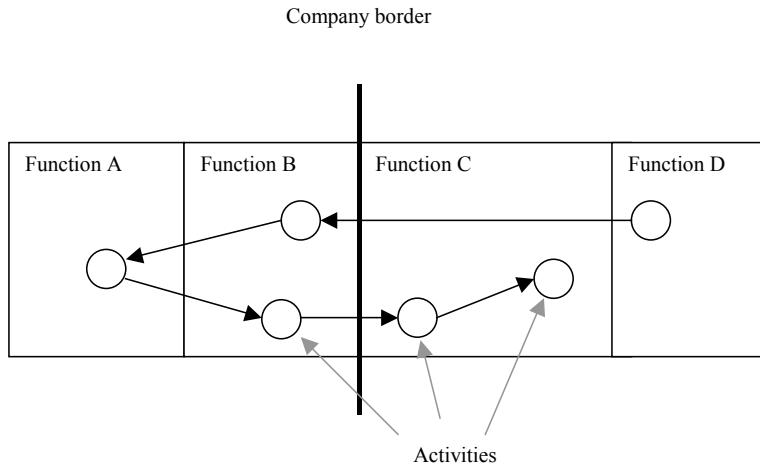
As stated in the previous section, more recent SCM articles stress the importance of managing the supply chain with a process approach. In fact, when considering the section above, almost everything written about functions can be seen as an argumentation for a more process oriented view of the organisation. The functional oriented organisation with its functional silos should be reorganised in favour for a more process-oriented management. The processes should penetrate the functional silos and stretch over different functions as well as different organisations (Lambert & Cooper, 2000).

According to Cooper et al. (1997a) a process is “a specific ordering of work activities across time and place, with a beginning, an end, and clearly identified inputs and outputs, a structure for action.” (Cooper et al., 1997a, p. 5)

Since the expression “process” can have many different meanings, Willoch (1994) calls this type of process “a working process” in order to make a clearer statement of its meaning. Willoch (1994) further concludes that a working process has two main characteristics;

1. It has always an internal or external “customer”, i.e. a receiver of the output from the process.
2. It goes through different functions and crosses organisational borders, both internal as well as external ones.

Figure 2.3 below shows a generalised example of a process and how it crosses functional and organisational borders.



**Figure 2.3 A generalised example of a process stretching over a company border**

One of the main advantages of a process approach is that it increases the awareness of the different activities performed by a company and how they are related to each other (Melan, 1993). This makes better coordination and integration possible and is therefore in line with the objectives of SCM. Furthermore, since a process approach always pays attention to what comes out to its customer, the service towards the receiver becomes more important and gets more attention in the SCM literature. The service focus is one of the main differences between the process approach and a more functional approach (Cooper et al., 1997a).

Tan (2001) argues that it is the service aspect and customer satisfaction that actually drives the change towards SCM and the importance of having a process approach: “A key facilitating mechanism in the evolution of supply chain management is a customer-focus corporate vision, which drives change throughout a firm’s internal and external linkages.” (Tan, 2001, p. 41).



### **2.2.3 SCM from an organisational perspective**

To get the SCM philosophy to work in a supply chain means automatically a movement from a functional orientation towards a process view, which puts new demands on the organisations involved. Organisational change is not easily accomplished and many SCM articles only briefly discuss common problems connected to the implementation of SCM (exceptions exist though, see e.g. Sabath et al., 2001, who discuss the impact of the organisational structure in automatic replenishment programs).

Above all, human-related and often more intangible problems are mentioned by authors. On an interorganisational level, Mentzer et al's (2001) SCO discussed in chapter 1, put new demands on e.g. organisational compatibility and trust. Because of its interorganisational nature, thinking in terms of processes means an increased need for such circumstances. Human related problems are however not only an interorganisational matter, but also an intraorganisational issue. Typical intraorganisational problems mentioned are the company's tradition and corporate culture (Jones & Riley, 1985; Melan, 1993; Tan, 2001). Coordination and interplay among departments and functions within the same organisation is also of great importance (Cooper & Ellram, 1993; Melan, 1993).

A central question of concern and a main task for SCM is how actors in the supply chain should be integrated with each other. Extensive information sharing between actors is considered to be a prerequisite for this and many problems related to this are highlighted in the SCM literature. For Mason-Jones & Towill (1999) "sharing in-depth information sounds easy, but does not come naturally for most companies. In fact, company policy has in the past frequently actively discouraged it. Information has traditionally been perceived to be power, that is, those with the knowledge have a strategic advantage." (Mason-Jones & Towill, 1999, p. 16)

Another issue, which can be regarded as both an intraorganisational as well as an interorganisational problem, is the new demand for process related measurements instead of functional ones. One of the main problems with working processes is that by nature they cross functional borders and this makes them difficult to measure with common functional related measurements. In a total functional managed organisation, no single department or person will have the full responsibility for a process; the process becomes "invisible" (Melan, 1993; Willoch, 1994). Therefore, to be able to manage and improve the process properly, new measurements have to be found (see Figure 2.4) that measure the performance of the whole process; otherwise there is an obvious risk for suboptimisation.

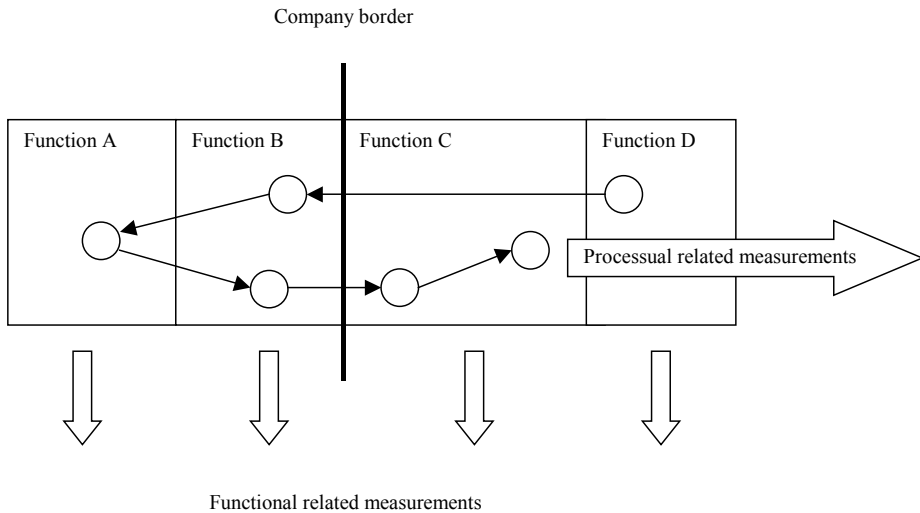


Figure 2.4 Process related vs functional related measurements

### 2.3 *Logistics business concepts based on the SCM-philosophy*

Since the expression SCM was founded in the early 1980's, several approaches and concepts have been applied to realise the main idea behind SCM. This chapter aims to describe three of the concepts further in order to clarify what SCM can mean in a real existing supply chain environment. Since much research in SCM deals with the concepts, it is useful to give a short presentation of the concepts in order to provide the reader with some necessary information. In the rest of the thesis, many examples are drawn from research based on the concepts, starting with the next section, chapter 2.4.

The three concepts to be presented below are Efficient Consumer Response, ECR, Vendor Managed Inventory, VMI, and Collaborative Planning, Forecasting and Replenishment, CPFR. ECR was chosen due to its widespread use in companies and since it is considered as a foundation for many other collaborative concepts ([www.cpfr.org](http://www.cpfr.org)). VMI is perhaps the most common and famous collaborative concept and has been applied in many different types of industries during the last twenty years. VMI is also representative for a number of other similar concepts such as Automatic Replenishment Programs (Sabath et al., 2001), and Co-Managed Inventory ([www.cpfr.org](http://www.cpfr.org)). Finally, the concept CPFR was chosen because of the attention it has received recent years. This is considered to be the latest concept following in

the footsteps of ECR and VMI and its importance is expected to increase over the next few years ([www.cpfr.org](http://www.cpfr.org)).

### **2.3.1 Efficient Consumer Response, ECR**

In the 1980s and beginning of 1990s the grocery industry in the United States was characterised by distrust between trading partners and so-called arms length agreements. This “war” in the industry led to loss of productivity and market shares (Alvarado & Kotzab, 2001). At that moment, the grocery industry started to look at other industries and was inspired by the garment industry and their concept of QR (Hoffman & Mehra, 2000; Kurt Salmon Associates, 1993; Schary & Skjott-Larsen, 2001), which can be considered as a precursor to ECR, although less comprehensive and more focused on bar coding and the technology base of Electronic Data Interchange, EDI ([www.cpfr.org](http://www.cpfr.org)). In 1992, 14 trade association sponsors in the grocery industry in the United States created a group called Efficient Consumer Response Movement whose purpose was to change the business climate considerably. The ECR Movement hired the consultant firm Kurt Salmon Associates to investigate how to optimise the business practice for the management of the supply chain. (Barratt & Oliveira, 2001)

The report from Kurt Salmon Associates was presented in 1993 and can be seen as the foundation document for ECR. In the report ECR is defined as “a grocery-industry strategy in which distributors and suppliers are working closely together to bring better value to the grocery consumer. By jointly focusing on the efficiency of the total grocery supply system, rather than the efficiency of individual components, they are reducing total systems costs, inventories, and physical assets while improving the consumer’s choice of high quality, fresh grocery products.” (Kurt Salmon Associates, 1993, p. 1). As the definition implies, the report and the cornerstones of ECR are clearly influenced by the thoughts of SCM.

The report from Kurt Salmon Associates identifies four main processes where interorganisational activities should be harmonised and improved, see Table 2.2 below. To realise the ideas it is suggested that special interorganisational and interdepartmental working groups should be formed:

**Table 2.2 The scope of the four ECR processes (Based on Kurt Salmon Associates, 1993, p. 29)**

<b>ECR Process</b>	<b>Scope</b>
Efficient Store Assortments	Providing a complete, easy-to-shop, assortment of products wanted by the consumers
Efficient Replenishment	Maintaining high in-stock levels of the required assortment
Efficient Promotion	Harmonising the promotion activities between manufacturer and retailer by communicating benefits and value
Efficient Product Introductions	Developing and introducing new products the consumers really want by meeting their ultimate needs

European companies, with their own organisation for ECR similar to the American one, have a similar understanding of ECR. They divide the ECR-concept into three so-called focus areas (Bernardi et al., 1997):

A. **Category Management** is the process whereby supplier and customer together work with product categories as strategic business units in order to improve marketing activities.

B. **Product Replenishment** concerns logistics in the supply chain and its goal is to minimise the total logistic costs and improve the service levels.

C. To make the two first areas work, **Enabling Technologies**, such as EDI (Electronic Data Interchange) solutions are needed. Many of the technologies are not new and are already well established in many companies. However, through ECR they are linked and synchronised with each other in a new way.

With the three focus areas as a base, ECR Europe has defined 14 “success concepts” that companies can combine in different ways depending on individual conditions and circumstances. These are:

A1. **Establish Infrastructure**: the choosing of a partner and start cooperation in Category Management and Product Replenishment.

A2. **Optimise Product Introductions**: cooperation concerning product introductions.

A3. **Optimise Assortment**: the supplier and customer together evaluate different product categories and plan the assortment and placement in the shop.

A4. **Optimise Promotions**: planning concerning special campaigns and offerings.

- B1. Automated Store Ordering:** to use bar coding and other scanning methods for forecasting as a base for ordering.
- B2. Continuous Replenishment:** letting the supplier be responsible for the replenishment of the customer's warehouse on the basis of POS data.
- B3. Cross Docking:** to organise deliveries from supplier to the customers' shops without having conventional inventory warehouse.
- B4. Synchronised Production:** to make production plans based upon continuous sales information, which will minimise the total inventory level.
- B5. Reliable Operations:** to improve service levels according to production and deliveries.
- B6. Integrated Suppliers:** to integrate the sales with raw material and packaging material.
- C1. Electronic Data Interchange (EDI):** using electronic technology to automatically send business documents and sales information between companies.
- C2. Electronic Funds Transfer (EFT):** using electronic technology to automatically send invoice messages and payments.
- C3. Item Coding and Database Maintenance:** to implement and use European Article Numbering, EAN, to verify purchase and invoices.
- C4. Activity Based Costing (ABC):** to use ABC calculations within and between companies to better control introduction of Category Management and Product Replenishment.

The 14 suggested concepts/actions presented above shows that ECR is a broad concept, with possibilities to make improvements in many business areas. But, even if ECR involves more areas than only pure communication and bar coding, which is the case for QR, above all ECR is about information sharing (Christopher, 1998). Hoffman & Mehra (2000) means that the underlying idea with ECR is that sharing e.g. point-of-sales data will create a natural pull strategy in the supply chain. These thoughts are also supported by e.g. Larsson (2002): "Behind this thinking lies the belief that consumer activity information is more valuable than order or delivery information. The effectiveness of production and inventory management depends very much on the forecast accuracy. The more accurate the forecast, the less amount of safety stock is required...The ECR program provides access to such data to the suppliers" (Larsson, 2002, p. 19).

Looking closer to ECR, it can be seen that ECR is more of a strategy than a concept. The ECR strategy can be seen as an umbrella term (Christopher, 1998), including and suggesting a wide range of more concrete concepts, see e.g. the 14 concepts suggested by ECR Europe above. However, ECR in itself lacks more thorough guidelines to implement and realise the concepts and could therefore be interpreted as a strategy to try to make channel members starting communicate to each other. Above all, ECR contributes to the idea that sharing information

will create mutual benefits for the parties involved. Barratt & Oliveira (2001) also regards ECR as above all an enabler for other more concrete actions in the supply chain:

“Whilst ECR brings many potential benefits to both suppliers and retailers in terms of efficiency improvements, the biggest opportunity it presents is to enable real supply chain collaboration. By sharing information, it enables supply chains to become demand driven and in so doing, to deliver enhanced customer value. Therefore, ECR can be seen as an enabler of the drives towards an integrated supply chain.” (Barratt & Oliveira, 2001, p. 267)

Applying an ECR strategy does not mean the same for all companies; the parties can choose from a range of different concepts and solutions. Therefore, it is difficult to foresee effects from ECR implementations. Instead, other more concrete concepts, which are sometimes included in an ECR strategy, must be evaluated. One of the most common which is often connected to ECR is Vendor Managed Inventory, VMI.

### **2.3.2 Vendor Managed Inventory, VMI**

The need for more concrete results forced the grocery industry to go from the strategies in ECR to developing concepts to implement them. One of the most commonly mentioned outcomes from ECR which is more of a concept ready to implement, is VMI (Sabath et al., 2001). Even if VMI existed before 1992 when the ECR Movement was founded, ECR can be seen as the driving force behind the spread of VMI (Cooke, 1998; Barratt & Oliveira, 2001; Schary & Skjott-Larsen, 2001). Probably one of the most common examples of a fully implemented VMI is the one between Procter & Gamble and Wal-Mart in the USA. This project was considered to be very successful and is one of the explanations for the spread of VMI in the grocery industry. Nowadays, VMI is well established in many industries and is especially successful in the automotive industry. (Cooke, 1998; Sabath et al., 2001)

Since VMI has been adopted by many industries and among many types of companies (both suppliers, manufacturers as well as retailers can be involved in VMI collaborations), the understanding of the concept differs. However, the main idea is the same in all VMI collaborations; the normal order procedure from customer to supplier (vendor) is omitted and the vendor automatically replenishes the customer’s inventory. The source of information that is the basis for the replenishment decision (instead of a purchase order) varies. According to Waller et al. (1999) the inventory level at the customer’s warehouse is the information source. However, other possibilities or other complementary sources also exist, e.g. point of sales data transferred from the customer.

As in the case for all business concepts, VMI is expected to have many positive effects for the involved parties. Waller et al (1999) argue that VMI contributes to two main effects, namely reduced costs and service improvements. In their article, they describe the benefits for both parties (supplier and buyer) separately.

From the supplier's point of view, the main, basic explanation why VMI reduces costs according to the authors is that the concept can reduce uncertainty of demand and allow a smoother demand pattern. This results in less need for capacity in production and inventory buffers. With VMI, it is also possible for the supplier to coordinate transports to several customers and make better, more efficient route planning of transports. The buyer in turn, can be absolved from his performance measurements dilemma. It is argued that the performance measurement inventory level, usually measured at the end of each month, is in conflict with another common measurement, namely the service level; the buyers normally decrease their inventory level at the end of the month to get better inventory level result with a decreased service level as a result. With VMI, the replenishment is performed more often and the inventory level can be decreased without any negative consequences on the service level. (Waller et al., 1999)

When considering service, it is argued that both parties gain from a high level of service towards the end customer (in this case the buyer's customer). With VMI, the supplier can better give priority to critical orders by balancing different buyers' needs and deliver to those buyers who have the most urgent need. If the supplier owns what lies in the buyer's inventory, it is also possible for the supplier to move inventory between different buyers' warehouses if needed. (Waller et al., 1999)

The authors that define VMI as a concept where "only" inventory level data is transferred argue that many companies nowadays have abandoned VMI because of the uncertainty in the supply chain and the lack of accurate forecasts, see e.g. Barratt & Oliveira (2001). These authors argue that more positive effects can be achieved with the visibility of POS-data so that more accurate forecasts can be made. Giving POS data instead of inventory level data from the customer to its supplier will contribute to an even smoother material flow, which will have a positive influence on for example the manufacturer's production, see e.g. Småros et al. (2003).

However, also with access to POS data, VMI is not an efficient tool to manage e.g. customers' promotion activities. The VMI concept is built upon historical data, and no efficient way to deal with information about the future (such as promotions) can be found in the VMI concept. Barratt & Oliveira (2001) argue that this causes a lack of visibility in the

supply chain and that this leads to serious problems with linking the supply side with the demand side in a proper way.

To conclude, another division of planning responsibilities than the traditional can improve the supply chain performance in many ways (as is the case for VMI collaboration), but it will not change the prerequisites for the supply side and the demand side. To be able to do this some kind of “negotiation” or joint agreement is needed in order to make the ends meet. When to hold promotion campaigns is one example when there is a need for joint decision making; even if the supplier has access to the customer’s POS data, a promotion campaign without the full support and readiness of the supplier can cause scarcity in the supply chain.

### **2.3.3 Collaborative Planning, Forecasting and Replenishment, CPFR**

The grocery industry realised the problems with VMI and other concepts with similar structures and in 1995 Wal-Mart together with its supplier Warner-Lambert and the IT companies SAP and Manugistics, and the consulting firm Benchmarking Partners, started up a new way to collaborate in the supply chain. (Småros, 2003) This concept, first called CFAR, was later named Collaborative Planning, Forecasting and Replenishment, CPFR. The CFAR project was successful and soon the association Voluntary Interindustry Commerce Standards Association, VICS, was given responsibility to develop the concept further.

CPFR has a more comprehensive approach than earlier concepts, and includes planning, forecast and replenishment processes (Skjoett-Larsen et al., 2003). A subgroup of VICS, which holds the copyright on the name of CPFR, explains CPFR as “a set of business processes that entities in a supply chain can use for collaboration on a number of buyer/seller functions, towards overall efficiency in the supply chain” ([www.cpfr.org](http://www.cpfr.org))

Skjoett-Larsen et al. (2003) have a more thorough definition: “Collaboration where two or more parties in the supply chain jointly plan a number of promotional activities and work out synchronised forecasts, on the basis of which the production and replenishment processes are determined” (Skjoett-Larsen et al., 2003, p. 532). As an example of what CPFR means, Lee (Lee, 2000) describes the CPFR collaboration between Wal-Mart and Warner-Lambert very well:

“Knowledge exchange is the basis for Wal-Mart’s collaboration with Warner-Lambert (now part of Pfizer) on the forecasting and replenishment of pharmaceuticals and health-care products. Retailers such as Wal-Mart usually have the best knowledge of local consumer preferences through their interactions with customers and their possession of point of sale

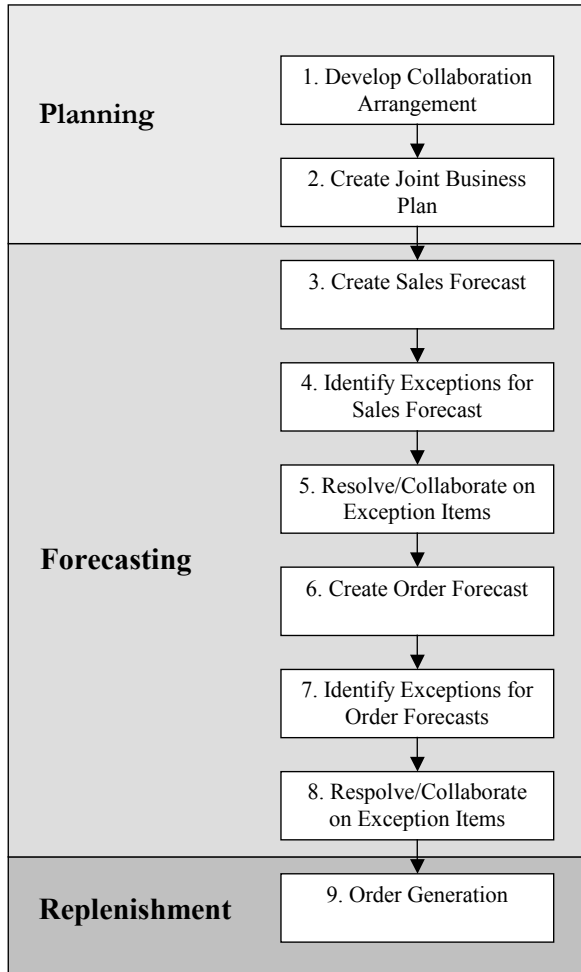


(POS) data. Pharmaceutical companies know about the properties of the drugs they produce and can make use of external data, such as weather forecasts, to help project demand patterns. Both parties contribute their respective knowledge and collaborate closely to determine the right replenishment plan.” (Lee, 2000, p. 4)

Barratt & Oliveira (2001) list some of the issues CPFR addresses in order to “cover the gaps left by previous business practices (such as VMI). With CPFR, several issues are more fully addressed for the first time, such as:

- The influence of promotions in the creation of the sales forecast (and its influence on inventory management policy)
- The influence of changing demand patterns in the creation of the sales forecast (and its influence on inventory management policy)
- The common practice of holding high inventory levels to guarantee product availability on the shelves
- The lack of co-ordination between the store, the purchasing process and logistics planning for retailers
- The lack of general synchronisation (or co-ordination) in the manufacturer’s functional departments (sales/commercial, distribution and production planning)
- The multiple forecasts developed within the same company (marketing, financing, purchasing, and logistics)” (Barratt & Oliveira, 2001, p. 269)

Another difference in comparison to earlier concepts is the thorough guidelines and standardisation of the concept. Today, VICS has standardised CPFR to be implemented with the help of a nine-step model. The nine steps can be seen in Figure 2.5 below.



**Figure 2.5** The nine step model of CPFR by VICS (Source The nine step model, [www.cpfr.org](http://www.cpfr.org))

In the literature, authors often state that CPFR is a joint concept, requiring that both the supplier-side and the customer side are active. CPFR is not only equal to information sharing, but it also demands that the partners jointly plan a number of supply chain activities.

Stank et al. (1999), argue that “CPFR attempts to lessen the problems associated with traditional anticipatory demand forecasts by co-operating with trading partners to better match supply and demand. Thus, it makes firms better prepared and ready to respond to market signals.” (Stank et al., 1999, p. 75) As in the earlier concepts such as VMI, and following the VICS-definition, the authors mean that the aim is to lower inventory levels and avoid stock-outs in the supply chain; “Rather than trying to independently project demand patterns, buyers

and sellers share information in advance and work together to develop realistic, informed, and detailed estimates that can be used to guide business operations.” (Stank et al., 1999, p. 76)

In the footsteps of CPFR, which today is considered by many researchers as one of the most influential approaches to managing the supply chain (Esper & Williams, 2003), new concepts are continuously being developed. One example is Collaborative Transportation Management, CTM, which can be seen as an extension of CPFR. The CTM concept is rather new and is driven by the VICS organisation. Browning & White (2000) present it as “the missing link”, which focuses on transportation management. It is argued that “the natural extension beyond actual order generation is to convert the order forecasts into shipment forecasts and insure their accurate fulfilment. Otherwise, some of the benefits of CPFR will be lost.” (Browning & White, 2000, p. 1). Unlike the CPFR concept, CTM involves not only supplier and customer, but also third party providers.

## ***2.4 SCM from a focal company perspective***

In chapter 1.4.2 it was stated that collaboration among supply chain actors is a necessary prerequisite to realise SCM. This chapter summarises the frame of reference with four important aspects of SCM and interorganisational collaboration for an individual company situated in a supply chain to consider. The first three aspects are (1) the importance of having a process approach in the collaboration, (2) how the planning of supply chain activities are performed within the collaboration, and (3) the importance of information sharing between the participating actors. These three aspects together summarise the frame of reference for suggested actions to be undertaken by a focal company.

As stated in chapter 1.4.1 and 1.4.2, SCM and collaboration respectively, are however not only about actions, but also about the intentions behind the actions. Therefore, another important aspect for a focal company to consider is their SCO, as this forms the basis for their collaboration.

### **2.4.1 Process approach**

In the first part of this chapter it was stated that the SCM philosophy clearly advocates a process view when the supply chain is designed. The change towards a process view is without doubt one of the most important characteristics of SCM. For an individual company, this can mean an organisational restructuring, both internal as well as towards adjacent suppliers and customers in the supply chain (Skjoett-Larsen et al., 2003). For example, special management teams responsible for business processes can be set up in order to visualise the processes and their ownership (Cooper & Ellram, 1993). Another important task for the

individual company and often discussed in literature, is to find suitable measurements for the processes. Note that the whole process should influence the measurements. This is the main characteristic of process related measurements. (Melan, 1993)

What drives the change towards a process approach is the focus on end customer demand that the SCM philosophy advocates (Tan, 2001). In the ideal supply chain, customer demand would be met to 100%, but in most cases however this is just a utopia since it is not achievable to a reasonable cost. Instead, focus should be on creating as much value as possible for the end customer for a reasonable cost. (Stank et al., 2001)

For the individual company, the superior goal with focus on end customer demand could sometimes also be difficult to realise. This is a lofty and difficult goal to work towards, especially for supply chain actors that are situated several companies away from the end customer. Thus, in cases of dyadic and triadic collaboration, this goal can be operationalised so that the collaboration must be designed and managed as a process in order to create as much value as possible for the next level in the supply chain.

#### **2.4.2 Planning of supply chain activities**

A process approach in the collaboration puts a natural focus on the coordination and integration of the activities involved (Melan, 1993; Willoch, 1994). Aronsson (2000) suggests that the question of organisational responsibility for the different activities should be considered later when the process already is optimised. From this it follows that the division of the organisational planning responsibility between actors in a collaboration could be changed from a traditional view towards other, better integrated, solutions. Defining and describing a process could make these possible options more visible for the actors.

In the dyadic, collaborative-based concepts presented above, the planning responsibility of the logistics activities is one of the most important features that distinguishes them. In the case of ECR the participating actors plan the collaboration design jointly, but on a more operative level no change in planning responsibility for logistics activities can be seen. When instead considering VMI, this change of responsibility can be seen clearly since the main idea behind VMI is the recognition of that the vendor has a better position in the supply chain to plan and decide the replenishment of the customer's warehouse. When finally considering CPFR, the participating actors do the planning of some activities jointly. Thus, the three concepts represent three different opportunities for handling the planning responsibility of activities involved in the collaboration.

### **2.4.3 Information sharing**

Information sharing among the supply chain members is an important prerequisite for collaboration (Lee & Whang, 2000; Yu et al., 2001; Xu & Dong, 2004) and has a great impact on the performance in the supply chain (Barratt, 2004). The general reason for this statement is that information sharing among supply chain members can reduce different kinds of uncertainties that cause higher costs. Yu et al (2001) explain the logic behind this;

“While every single member [of the supply chain] has perfect information about itself, uncertainties arise due to a lack of perfect information about other members. To reduce uncertainties, the supply chain member should obtain more information about other members. If the members are willing to share information, each of them will have more information about others. Therefore, the whole system’s [supply chain’s] performance will be improved because each member can gain improvement from information sharing.” (Yu et al., 2001, p. 115)

The research into information sharing in supply chains is to a great extent based on Forrester’s research about order information visibility among supply chain members and its effects on inventory levels, namely the dampening of the so-called bullwhip effect. In the literature (Lee, 2000; Larsson, 2002) it is argued that an increased knowledge about inventory levels and expected demand, i.e. forecasts, will make the flow of material through the supply chain smoother and reduce the bullwhip effect.

Information sharing between supply chain members is one of the most explored areas within SCM, and is perhaps therefore one of the most theoretically underpinned areas. As an example, Croom et al (2000) deal with Forrester’s work in their literature review and mean that models such as Forrester’s industrial dynamics model are needed “to inform our understanding of the supply chain phenomena” (Croom et al., 2000, p. 68). Childerhouse & Towill (2003) for example test and validate 12 rules about simplified material flow for the practitioner which are based upon the work from Forrester’s research. Another example is Mason-Jones & Towill (1999) who use Forrester’s work when they investigate where in the supply chain the information decoupling point should be placed.

The development within the IT and technology sector over the last decades has had a great impact on information sharing in supply chains and is seen as an enabler. Apart from the fact that technology for effective information sharing now exists, it also exists at a reasonable price (Lee & Whang, 2000). The importance of information sharing with advanced IT tools can be seen in the concepts presented above. They are all built upon information sharing and contain massive use of IT.

Lee & Whang (2000) list and discuss a number of information types that are common for information sharing in supply chains. These are presented further below.

### ***Inventory levels***

Inventory levels are one of the most common pieces of data that is shared between actors in supply chains. This type of data is closely related to the research into the Bullwhip effect presented above and therefore a lot of research is being done in order to describe effects of sharing information about inventory levels. It can be argued that inventory and communication substitute each other and that access to information about inventory levels can lower the total amount of inventory in the supply chain.

### ***Sales data***

Another important piece of information that can help dampen the Bullwhip effect is sales data. The reason for this is that variance of orders is often larger than the variance of sales data, which means that the uncertainty can be reduced if sales data is shared.

### ***Order status for tracking/tracing***

Since a typical supply chain involves many different functions and independent actors, it can be difficult to track and trace an order and check its status. Lee & Whang (2000) suggest that in practice these problems can be reduced by linked web sites or access to each other's databases.

### ***Sales forecast***

The sharing of sales forecasts and its impact on performance (see e.g. Småros, 2003) has been highlighted in the literature during recent years. The basic underlying assumption is that other actors in the supply chain may have better knowledge to make better, more accurate, forecasts. A common form of forecast sharing is when actors share their forecasts with their suppliers upstream in the supply chain. In such cases, it is expected that the actor situated closest to the end customer will have a better knowledge and thereby make a better judgement of future demand.

The other opposite situation is however also interesting sometimes. Lee & Whang (2000) take Warner-Lambert, a pharmaceutical manufacturer, as an example. This company is considered to have better knowledge about end customer demand than the retailers because of their in depth knowledge about how weather conditions influence the sales of their pharmaceutical products. Thus, Warner-Lambert is able to make accurate forecasts based on weather reports.

### ***Production/delivery schedule***

Another type of information that can have great impact on supply chain performance concerns production and delivery schedules. When a supplier shares this type of information, the customer's manufacturing processes can be improved because of better planning possibilities. The same reasoning also applies for information sharing about different types of capacities, e.g. production capacities.

### ***Performance metrics***

Performance metrics can be shared and used in order to identify bottlenecks in the supply chain and thereby function as a first step towards identifying different possibilities to improve the performance in the supply chain. This reasoning could also be compared with the discussion about the need for process related measurements in the section above.

## **2.4.4 Supply chain orientation**

As stated and shown in the sections above, SCM and collaboration can mean a broad range of activities for companies in a supply chain. However, apart from suggesting what the actors actually should do, most authors also comment on (even if they seldom discuss it more extensively) and stress the importance of undertaking the actions with the "right" intentions, referring to trust, win-win thinking and common goals. In their literature review Mentzer et al (2001) call these intentions supply chain orientation, SCO. The authors regard SCO as a first step (and a prerequisite) towards SCM and that *all* the supply chain members involved in SCM *must* have a SCO. The SCO is summarised by three main characteristics of the supply chain actors;

1. The supply chain actors should have a *systems approach* and regard the supply chain as a whole.
2. A *strategic orientation* where cooperative efforts by the supply chain members should synchronise and converge operational as well as strategic capabilities into a unified whole.
3. A *focus on customer value* in order to create customer satisfaction.

In their literature review on the subject, the authors list seven antecedents for a SCO:

### ***Trust towards partner/partners***

Trust towards partner is perhaps one of the most commonly mentioned prerequisites and cornerstones of the SCM philosophy. Trust will contribute to stability and long term relationships between the parties (Waller et al., 1999; Barratt, 2004). The importance of trust between the participating actors has also been shown empirically in a Danish study where

trust is considered as the most important prerequisite for successful collaboration (Skjoett-Larsen et al., 2003).

### ***Commitment***

Commitment, i.e. a willingness to cooperate with other supply chain members is of central concern for a SCO and is also an important factor for successful collaboration (see e.g. Hoffman & Mehra, 2000). Win-win thinking is a prerequisite for this, otherwise the other part will not collaborate of their own free will which is a must for a true SCO.

### ***Interdependence***

In order to get an actor committed, a mutual dependence is needed since this will foster and develop a “supply chain solidarity”. It is this interdependence that motivates the willingness to share things such as resources and information with other supply chain members.

### ***Organisational compatibility***

It is important that the cultures in the organisations are compatible. Cultural aspects are important for the collaboration (Cooper et al., 1997a; Barratt, 2004).

### ***Vision and key processes***

All parties involved must share the same vision and what key processes that exists (Speakman et al., 1998). To succeed with this a win-win thinking is a must, it is not possible to say “I win, you figure out how to win” (Ireland & Bruce, 2000).

Closely related to the vision and key processes, the understanding of each other’s businesses is seen as an important prerequisite for the collaboration to be successful. As an example, Hoffman & Mehra (2000) mean that one of the reasons for the moderate success for the ECR concept is the low rate of understanding between the companies.

### ***Leader***

Research shows that a leader is needed for successful SCM. Cooper & Ellram (1993) argue that a prerequisite for SCM to function is a channel leadership, i.e. that one actor is responsible for the formation and coordination of the supply chain. The channel leader, referred to as “the champion”, should “have a profound effect on the character and makeup of the supply chain”, and “strategic planning during the life of the supply chain will be heavily influenced by the channel leader”. (Cooper & Ellram, 1993, p. 20)

### ***Top management support***

The company’s top management must support the struggle towards SCM. To carry out the change needed for SCM, there is definitely a need for top management and senior management support (Andraski, 1998; Ireland & Bruce, 2000).



# 3 Research questions

The purpose of this thesis is to describe logistics collaboration in supply chains. A description can mean many things and it is therefore necessary to explain what the reader can expect from this study. Below the research questions to be investigated are presented. The discussion is based on the frame of reference and chapter 1 in this thesis.

In the background and the frame of reference, it was stated that the SCM literature is not provided with a generalised, straightforward road map of actions and behaviour which can be undertaken in all situations. As an example, CPFR which is presented in the previous chapter is concerned with joint planning of a common forecast. In ECR, extensive information sharing with other supply chain members is performed but no joint planning is however suggested. What actually is done in a collaboration depends on the situation and therefore never looks the same. A natural start for a description is therefore to focus on what is done by companies when they collaborate. At the end of the frame of reference four different aspects were discussed and considered to be important for a company when it realises the SCM philosophy. Three of them, namely the process approach, the planning of the supply chain activities, and information sharing, are concerned with the question of what is done when collaborating. These aspects, and how they are related to each other, are therefore a good starting point for a description of collaboration.

The fourth aspect discussed at the end of the frame of reference was the SCO; collaboration based on SCM according to Mentzer et al. (2001) is not only about what is done in the collaboration, but also what intentions and attitudes precede the actions undertaken. The focal company's SCO must therefore also be included in the description.

A fifth aspect to consider is the playground for the collaboration, i.e. in what logistics areas it is performed. With the definition of logistics in mind, literature suggests a broad range of different possibilities such as transportation, warehousing etc.

These five aspects can together be considered to describe the content of logistics collaboration. Note that the description will include both a separate description of each aspect as well as a comparison between them. The discussion above leads to the first research question in this thesis:

***Research question one: What is the content of logistics collaboration?***

Literature states that SCM and collaboration contribute to many positive effects for the participating actors; both cost as well as service improvements are expected. These expected effects could be considered as the strongest reason for why companies should collaborate. To verify if the expectations, i.e. the driving forces, match with the experienced effects it is of interest to investigate what driving forces the focal company had.

With regard to effects of the collaboration, it was stated in the background that there is a gap between results from case studies of best practice companies on one hand, and more rigorous survey-based studies on the other. In general, the survey-based studies are more sceptical about the effects achieved by the collaboration. This study, which considers a broad spectrum of suggested effects in literature, can further contribute to an increased understanding of what effects that really can be expected from collaboration initiatives in the supply chain.

Finally, the barriers of collaboration will be considered. Research has shown that surprisingly little SCM-based collaboration (see chapter 1) can be seen despite the many obvious advantages. A reason for this could be that the problems are larger than suggested by literature and advocates of the SCM concepts. It is therefore of interest to investigate this issue further.

The questions about driving forces, barriers and effects of the collaboration can be summarised in the following research question:

***Research question two: From a focal company's perspective, what are the driving forces, barriers and effects of logistics collaboration?***

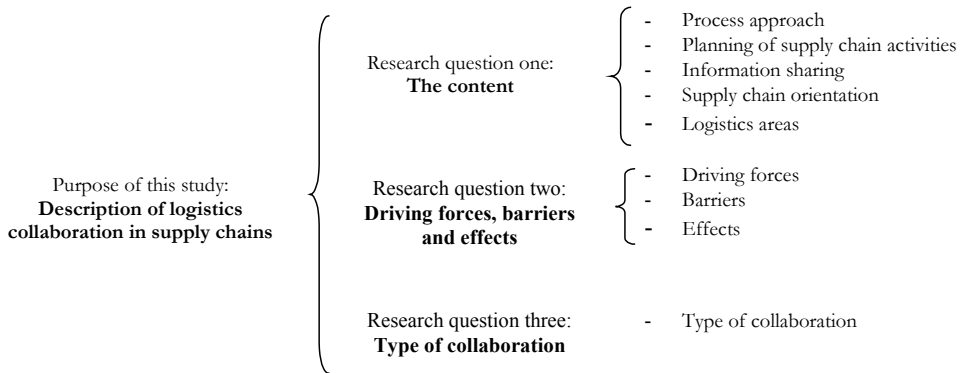
Finally, the perspective of a focal company automatically pays attention to another important aspect to investigate, namely whether the collaboration is performed with a supplier, a customer, or both of them. Since recent SCM literature demands the involvement of at least

three participating actors in the collaboration to refer to it as SCM (see chapter 2), it is of interest to investigate if such collaboration exists.

This leads to the third research question:

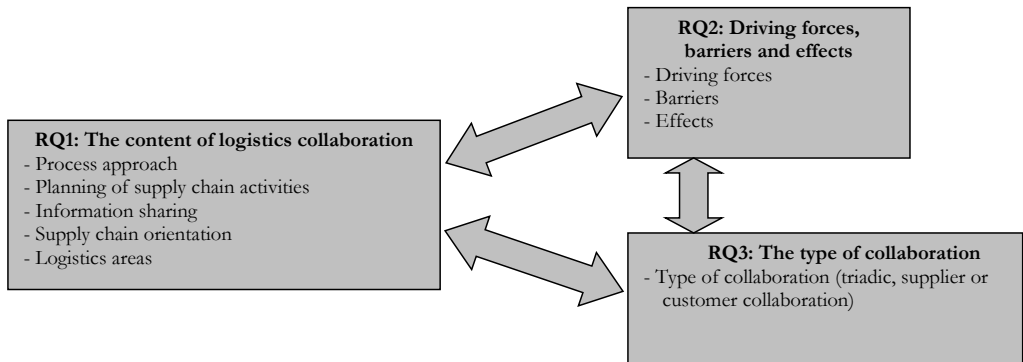
***Research question three: What types of logistics collaboration are performed?***

Figure 3.1 below summarises the different parts of the description to be given in this study. All in all nine aspects divided among three research questions have been presented. Together they cover the research area of this thesis well, and contribute to a good description of logistics collaboration in supply chains.



**Figure 3.1 The purpose, the first three research questions and the nine aspects considered in this study**

This study however is not only concerned with the presented research questions individually. The connections *between* the research questions are also essential in order to describe logistics collaboration (A similar discussion can be seen in Barratt, 2004). Figure 3.2 below shows on the three interfaces between the research questions to be investigated in this study.



**Figure 3.2 Research question four: The three interfaces between the other research questions**

Starting with the connection between the content and driving forces, barriers and effects of the collaboration, it can be concluded that there is a need to relate the questions to each other. Since collaboration is interpreted as a very broad term a discussion about e.g. effects in general would not contribute to a better description of logistics collaboration than that already existing. Instead, it is necessary to investigate what part of the content contributes to a specific effect. The same reasoning is also valid for driving forces and barriers.

The three different types of collaboration are also interesting to relate to the content aspects, as well as driving forces, barriers and effects. SCM literature does not normally distinguish between the three different types of collaboration that are investigated in this study. There exists however empirically based research (Speakman et al., 1998) that indicates important differences in attitudes and behaviour in dyadic collaborations depending on if the collaboration is performed with a supplier or a customer. For example, the study by Speakman et al. (1998) shows that companies with supplier collaborations are less likely to consider their partner as irreplaceable and essential to their future business and that they tend to focus more on cost issues: “We wonder whether buyers are trained to be more sceptical or whether they are reluctant to acknowledge a mutual dependence for fear of the consequences one might pay, literally. Certainly, to focus on price minimises the leverage and loyalty engendered from one’s supply base. Such behaviour ignores the contribution one’s suppliers can make to a buyer’s corporate strategy.” (Speakman et al., 1998, p. 640-641) Since these differences are a serious threat towards SCM based collaboration, the question about types of collaboration can not be ignored in this study.

Moreover, many authors (see e.g. Cooper et al., 1997b) indicate that dyadic collaboration is good for the supply chain as a whole, but that triadic collaboration is even better. This study can verify whether or not this is true when considering experienced effects of the different

collaboration types. It could also be questioned if companies involved in triadic collaboration experience more internally related problems since the company should be able to connect its customer with its supplier and vice versa. In dyadic collaborations this is not needed to the same extent.

The discussion above leads to a fourth research question in this thesis:

***Research question four: What are the relations between the content, driving forces, barriers and effects, and type of collaboration?***

Below follows a discussion about the three first research questions and how each aspect can be further broken down. An even more thorough break down to questions in the questionnaire can be found in Appendix C.

### **3.1 The content of logistics collaboration**

The content of logistics collaboration will be investigated with five aspects that will be clarified below.

#### **3.1.1 The process approach**

As discussed in the frame of reference, one of the main messages of SCM is that a process approach, instead of a functional approach should be taken in the supply chain. In this thesis the process approach will be described and evaluated by three variables; if the involved companies together have defined and described the activities involved in the collaboration as a process, if the collaboration is measured by process related measurements, and if the participating actors have a standardised of how costs and savings in the collaboration should be shared between the partners. Together, these three variables give a good indication whether the actors have a process approach or not.

##### ***Defined and described the collaboration as a process***

A first, and necessary, step towards having a process approach in the collaboration is to define and describe the collaboration in terms of a process. Because of its cross-functional nature and due to the fact that the process concerns two or more actors, all participating actors must jointly define and describe the process. To define a process, one must be able to describe the starting point, the end point, and what triggers the process.

### ***Process related measurements***

In order to focus on the process and be able to improve it, proper measurements for the collaboration must be set up and used. Metrics that evaluate the whole process must be applied, stretching over all actors involved in the collaboration. Such measurements are difficult to carry out and most existing measurements are in fact internal measurements, limited to measure the performance of a specific function. Barratt (2004) argues that as long as no supply chain metrics are used, i.e. metrics that measure the whole process and not only internal activities at one actor, the supply chain actors will “continue to operate in different directions and will not be aligned” (Barratt, 2004, p. 38).

The process related measurements in this thesis are divided into three main subgroups; total logistics costs for activities involved in the collaboration (performed in all participating companies), different types of lead times between the actors, and service related measurements between the actors.

### ***How costs and savings are shared***

A process view means to focus on end customer demand and output from the process as a whole, even if the process stretches across organisational borders. In real life this view can mean that to improve the process, the own company’s cost could be increased in order to facilitate even greater savings for other organisations involved in the process. To get this function and make improvements happen, the company with the increased costs must be compensated with a part of the savings from the other actors involved. To facilitate the improvements, it is preferable if the procedure of sharing is predefined and standardised. It is therefore interesting to investigate to what extent the collaboration has a predefined procedure of how to share costs and savings between the participating actors.

### ***The focal company’s internal process approach***

Related to the discussion above about the importance of having a process approach in the collaboration, the supply chain members’ internal process approach is also of interest in this study. The reason for this is an expectation that the internal process approach becomes a necessary prerequisite for successful triadic collaboration when the focal company’s supply side should be linked with its customer side appropriately. A proper internal process approach in the focal company will avoid internal barriers in the company, such as synchronisation problems between the production and the procurement department (see e.g. Skjoett-Larsen et al., 2003).

When considering dyadic collaboration, the internal process view also becomes interesting, due to the expectation that a developed internal process approach would lead to better effects on the other side of the company. The reasoning for this is similar to that in the case for

triadic collaborations; a properly functioning internal process approach will help to integrate the internal functions and make the possibilities of the collaboration visible for the other side of the focal company.

As in the case for the external process approach, the focal company's internal process approach will be investigated with the degree of internal process documentation and the use of internal process related measurements. Moreover, the internal process approach can be influenced by the organisation's degree of centralisation when considering logistics development issues and should therefore also be considered.

### **3.1.2 The planning of supply chain activities**

In the frame of reference it was shown that the business concepts represent three different ways of how to handle the planning of the logistics activities performed in the collaboration. Below follows a more thorough description of the different possibilities.

#### ***Individual planning***

As in the case for e.g. ECR, collaboration does not necessarily mean any change in how the logistics activities are planned; collaboration can mean nothing other than sharing information. In such cases, no efforts to coordinate or synchronise the activities between the participating actors in the supply chain is made *together*. Attempts to coordinate and synchronise the activities may be made, but these are done individually by the supply chain actors, without specific knowledge of how the other actors plan.

#### ***Delegated planning***

Instead of individual planning, a rearrangement of the planning responsibility of the supply chain activities so that one actor plans for one or several other members can sometimes improve the supply chain performance considerably.

A concept based on this is VMI. As explained in the frame of reference, the logic behind VMI is that the supplier is found to be the most suitable planner when for example the customer's inventory should be replenished. Waller et al. (1999) mean that the supply chain can be improved both with regard to costs and service with VMI. The authors argue that VMI facilitates better planning possibilities concerning production, inventory levels (in order to lower them) and transportation, which improves both the service and costs. For example, the supplier is provided with a better overview and can therefore coordinate transportation to several customers, improve fill rate in trucks and get a more efficient route planning. Another benefit of VMI is the possibility to balance inventory between customers.

In practice, the two parties only negotiate on e.g. lowest in-stock level in the customer's warehouse (see e.g. Lee, 2000), and then it is up to the supplier to manage the replenishment. Lee (2000) explains this with an example:

“The exchange of decision rights in VMI programs is not simply for the sake of dampening the bullwhip effect and improving forecasting and replenishment decisions. It also recognizes that the vendor is the best position to analyze and coordinate the optimum shipment plans for replenishing goods to customers. For example, the vendor may coordinate the replenishment plans of multiple customers to maximize the number of full truckloads. This leads to significant savings in freight costs while at the same time providing more responsive customer service.” (Lee, 2000, p. 5)

### ***Joint planning***

Another possibility is shared planning and decisions regarding one or more business processes. This planning can be performed on an operative as well as a strategic level. CPFR is an example of a mixture of both operative and strategic joint planning with two actors involved. For the first time, such collaboration allows the demand side and the supplier side to agree upon one, joint plan for forecasts and replenishment. This allows the supply chain to become even smoother. Joint planning can only be done with a frequent, continuous dialogue between the actors. This in turns leads to increased knowledge about each other, which can contribute to other, more intangible improvements.

### **3.1.3 The information sharing**

The sharing of information is central to all collaboration based on SCM. Apart from the type of information, i.e. what the information is about, the frequency of sharing and whether the information is processed or not, have shown to be important aspects for the success of the collaboration. Related to these statements, the importance and influence of means of communication have been investigated and discussed by several authors.

#### ***Type of shared information***

A lot of different types of information can be shared among the members of a supply chain. Since this thesis is about logistics, information connected to this area is focused. Lee & Whang (2000) list a number of possible information types to be shared in supply chains, see chapter 2.4.3. Examples of such information types are forecasts, inventory levels and POS-data.



### ***Frequency of sharing***

The value of information sharing can be measured by how often the information is shared. Angulo et al. (2004) discuss the implications of using “delayed” information, i.e. “old”, not updated information instead of new. Their research shows that this can have a great impact on several performance factors in the supply chain. Waller et al. (1999) also conclude in their article about VMI that the inventory reduction achieved by VMI could to a great extent be realised for instance through more frequent inventory reviews and order intervals.

### ***The degree of processed data***

For information sharing to be successful is however not only a question about sharing the right information with a high frequency, but also how the transferred information is used and implemented by the receiving company. Lee & Whang (2000) conclude that the information sharing in itself should only be considered as an enabler, and not a solution, to achieve better effects in a supply chain:

“Finally, we should note that information sharing is only an enabler for better coordination and planning of the supply chain. Hence, companies must develop capabilities to utilise the shared information in an effective way. We have heard that some manufacturers demanded POS data from the retailers, but then did not know how to make use of the data to improve their forecasts. Consequently, the benefits of information sharing were not fully realised.” (Lee & Whang, 2000, p. 385-386)

Thus, how the received information is implemented is often crucial for a positive impact on supply chain performance. An important factor to facilitate the implementation and usage of the information is to share processed data instead of non-processed, i.e. share data that is more specifically developed for the receiver’s needs. Such data is often more valuable and will have a greater impact on planning efficiency and performance in the supply chain (Xu & Dong, 2004).

### ***Means of communication***

Related to the aspects of information discussed above are the different means of communication, which can be used in order to facilitate the information sharing. This thesis divides means of communication in three main areas, namely traditional means such as telephone, fax and e-mail, Electronic Data Interchange, EDI, and Internet based EDI (based on extensible markup language, XML)

### **3.1.4 The supply chain orientation**

Another important part of a content description of logistics collaboration is whether the participating actors have the right conditions and intensions towards other members in the supply chain. As presented in the frame of reference, Mentzer et al. (2001) discuss these issues in a broader sense and call it supply chain orientation. They list a number of factors (antecedents) that can be considered as prerequisites for having a SCO. These will form the basis for how the focal company's SCO is to be investigated in this thesis.

Since this thesis is limited to a focal company's perspective, it will only investigate whether the focal company has a SCO or not. This makes the antecedent interdependence suggested by Mentzer et al. (2001) impossible to answer in a satisfactory way and is therefore considered as outside the scope of this thesis. Furthermore, Mentzer et al (2001) argue that this orientation should be directed towards both the supplier side as well as the customer side. This is true in the case of triadic collaboration where both sides of the focal company are involved. In cases of dyadic collaboration however, only a SCO towards the partner will be considered.

### **3.1.5 Logistics areas where collaboration is performed**

A description of the content of logistics collaboration should also include what logistics areas are involved in the collaboration. The understanding of the functional scope of SCM is today very broad and covers all the traditional "intra-business functions" within the company (Mentzer et al., 2001). From a logistics perspective this means a broad range of different kinds of areas, where numerous collaboration possibilities exist.

Since logistics is a not well defined expression with regard to functions (activities) that are embraced, a generally accepted division of logistics areas do not exist. In this thesis the following five areas are considered to embrace logistics collaboration on a general level;

1. Production planning,
2. Forecasting,
3. Inventory management and replenishment,
4. Transportation/distribution, and
5. Strategic planning of e.g. outsourcing, supplier sourcing, etc.

These areas were chosen on the basis of the nature of companies investigated in this study (i.e. the fact that the sample of this thesis is manufacturing companies) and the three business concepts presented in the frame of reference.

To start with production planning, which is probably one of the most dominant due to the fact that the sample for this thesis (see chapter 4) is manufacturing companies. Many logistics activities could directly influence the production and the production planning. Furthermore, the production planning and logistics are often placed in the same organisational unit in these types of companies.

When considering CPFR, forecasting is one of the most important areas in this concept and is a well known area for logistics collaboration. The same applies to inventory management and replenishment, which is central to the VMI concept.

The transportation area is important in order to connect the companies and has a great impact on the inventory management and replenishment decisions. Furthermore, it has a direct connection to the concept of CPFR since during the last few years this has been widened to include transportation (see chapter 2.3.3).

Finally as the areas presented above are all rather operative in their character, it is also necessary to include a more strategic area where focus is on strategic planning.

## ***3.2 Driving forces, barriers and effects of collaboration***

Below expected driving forces, barriers and effects of collaboration are presented(i.e. those suggested by the literature). These form the basis for the questions to be put in the questionnaire.

### **3.2.1 Driving forces**

According to the SCM literature and from a theoretical point of view, collaboration among supply chain actors results in many positive effects. On a general level when authors discuss effects of SCM and collaboration lowered total costs, improved service and shorter lead times are often mentioned. Also more intangible effects, such as the wish to strengthen the company's market position and increase its competitiveness, can be seen as driving forces. These expected positive effects should be seen as the strongest argument and driving force for SCM and collaboration.

In this thesis it will be argued that all driving forces could be related back to either a wish to lower costs and/or to improve service. Thus, this thesis will investigate whether it was service and/or cost related factors that were the driving force for the collaboration.

### **3.2.2 Barriers**

As mentioned in the background to this thesis, research indicates that surprisingly little SCM and collaboration among companies can be seen in supply chains. Despite the many obvious advantages, collaboration is still something unusual. Furthermore, the positive expected effects of the collaboration can not always be seen.

A reason for the absence of logistics collaboration and positive effects could be that barriers for collaboration have not been tackled successfully. The question to be answered in this thesis is what types of barriers mentioned in SCM literature are really experienced by the focal company. Two main categories of barriers can be identified in SCM literature; those related to technology and those related to human beings.

For technology related barriers, a “collaborative technology infrastructure” (Horvath, 2001, p. 206) is needed, since SCM and collaboration is built upon extensive information sharing between independent actors. In previous literature, the large investments connected to e.g. EDI solutions, were assumed to make it difficult for small companies to collaborate successfully. However, recent technology development of Internet based alternatives to EDI with lower costs gives also small companies access to the technology and opportunities to more extensive and advanced collaboration. Despite this, barriers related to technology may still exist in many supply chains since the question about successful implementation of the technology still is a matter of concern. The possibility to buy technology to a reasonable price is good, but it does not automatically guarantee that it is successfully implemented and used. In their study about the adoption of ECR among companies in the grocery industry, Hoffman & Mehra (2000) discuss this problem and state that technology barriers still have to be tackled: “If there is one element that can cause the breakdown of any “best designed” supply channel, it is the technology factor. In this stage, a clear understanding of the technology needs of all partners must be assessed followed by information flow planning.” (Hoffman & Mehra, 2000, p. 372)

As a consequence of technological development new problems also emerge that were not an issue before. Horvath (2001) argues that the security aspect of the new technology is important in collaborative relationships. Nowadays, when technology has made it possible to integrate and connect actors’ computer systems rapidly and efficiently, the partners must be able to make fast and accurate decisions concerning the other company’s access to sensitive information.

With regard to human related problems a main barrier to SCM is the absence of a SCO towards the partners (Mentzer et al., 2001). In SCM literature and in the discussion above the voluntary nature of collaboration is taken for granted, i.e. that all participating actors in the collaboration should have a true SCO as described by Mentzer et al. (2001). However, collaboration in reality is not always built upon solid SCOs among the supply chain members. In fact, the balance of power between actors in a supply chain can mean that actors are forced to collaborate (Mattsson, 2002). Such a forced collaboration initiated by coercion from one side does not guarantee the mutual gains and better optimisations for the whole supply chain which are in line with the purpose of SCM (Hoffman & Mehra, 2000).

Another often discussed, and perhaps most common, human related barrier to collaboration is trust. Moore (2003) argues that two types of trust are needed to get the collaboration function; trust between actors and trust between humans and the technology.

### **3.2.3 Effects**

SCM literature suggests that there are both positive cost and service related effects from logistics collaboration. Furthermore, intangible effects such as increased competitiveness have been recognised and suggested. However, research in the area seems to be incongruous. Some research, often more quantitative studies such as surveys, indicates that there is a gap between theory made upon case studies represented by e.g. Wal-Mart, and existing collaboration (Stank et al., 2001). Thus, the effects of collaboration are important to investigate further to see what kind of effects really are experienced by the focal company involved in the collaboration. As in the case for the other aspects, the effects should also be related to the content of the collaboration (research question one) in order to explain what parts of the content contribute to a specific effect.

Another important area to investigate further is the implications of collaboration on other actors in the supply chain. It could for instance be questioned if dyadic collaborations influence relations with actors situated on the other side of the focal company. For example, does dyadic collaboration on the customer side of the focal company also result in positive effects for the supplier companies?

### **3.3 Type of collaboration**

In the frame of reference it was concluded that at least three independent actors in a supply chain should be involved in the collaboration to regard it as implemented SCM. Thus, dyadic collaboration is good, but not seen to be enough to regard it as realised SCM. The question could be raised as to how much triadic collaboration exists in today's supply chains. Successful dyadic collaboration can for sure be found in many companies, while triadic collaboration is a much greater challenge and puts new demands on the focal company's internal capabilities to function as a unified entity. Among other things, it can be argued that an internal process approach reaching all the way from procurement to the sales office is needed.

Following the research results from Speakman et al. (1998) presented above, it becomes interesting to differentiate the types of collaboration and investigate possible differences. For example, it could be questioned if the focal companies' SCO is the same for respondents with supplier collaboration and those with customer collaborations.

# 4 Methodology

## **4.1 Research design**

When deciding the research approach for a study, the researcher can choose between several approaches, all characterised by specific strengths and weaknesses. The most important condition for choosing an appropriate approach is to identify the type of research questions that should be answered. Yin (1994) presents five different types of questions; “who”, “what”, “where”, “how”, and “why”-questions.

With regard to the research questions of this thesis, the word “what” dominates in all the research questions. “What”-questions can be further divided into exploratory and descriptive “what”-questions. In this study the latter type is represented, and can be characterised as “how many” and “how much”-questions. Examples of such questions are how many of the respondents have defined and documented their collaboration in terms of a process?; and how much joint planning can be seen in the collaboration, i.e. to what extent does the actors jointly plan logistics activities?

Other important groups of questions to be answered in this thesis can be labelled “who” and “where”-questions. The “who”-questions are concerned with the characteristics of the respondents. For example, are there any differences among industries considering how much collaboration that can be seen? An example of a “where”-question is where in the supply chain is collaboration performed?

To conclude, the research questions in this thesis can all be characterised as typical “what”, “who” and “where”-questions. Common for these types of questions is that they are all suitable for a survey study (Pinsonneault & Kraemer, 1993; Yin, 1994), and therefore this approach was chosen for this study.

Researchers in the area point out that there is a difference between “surveys” and “survey research”. While a survey can be made for many reasons not connected to research, such as political opinion investigations and TV viewing polls, survey research aims to increase the scientific knowledge in a research area. Thus, this thesis applies a survey research, which aims to increase the scientific knowledge within the research area of collaboration and SCM. (Pinsonneault & Kraemer, 1993; Malhotra & Grover, 1998)

Three main characteristics distinguish a survey approach from other approaches such as case studies or experimental studies. First, the collection of information is done by *asking people* in a structured manner. Collection methods in a survey approach could be mailed questionnaires, interviews face to face, or telephone calls. Second, a survey approach is a *quantitative method* that demands standardised information from and/or about the studied subject, e.g. individuals, groups or organisations. Third, information is generally *gathered from a sample*, which is a fraction of a specific population. The sample should be chosen in such a manner that the answers from the sample can be generalised to the whole population. (Pinsonneault & Kraemer, 1993; Malhotra & Grover, 1998)

In this thesis a suitable method to collect the empirical material was a questionnaire which was mailed to logistics managers. Since the purpose of this thesis is to describe logistics collaboration, i.e. to describe a situation, it is important that the chosen method can reach many potential respondents. This is typical of a mailed questionnaire and is also a rather cheap way of conducting a survey. The main reason for mailing the questionnaire instead of using email (which would have been even cheaper and reached even more possible respondents) was the belief that a mailed questionnaire would result in a better response rate.

Depending on its purpose, three different kinds of survey research are presented in research literature; explorative, descriptive, and explanatory surveys. Again, in accordance with the purpose and research questions in this study, the questionnaire in this thesis can in the first place be characterised as a descriptive survey. Examples of a descriptive survey can be to investigate the level of adoption of software for statistical process control (Forza, 2002), or documenting the types of manufacturing processes being used by small and large manufacturing firms (Malhotra & Grover, 1998).



Above all, a descriptive survey aims to describe “what situations, events, attitudes, or opinions are occurring in a population” (Pinsonneault & Kraemer, 1993, p. 80). Hypothesis as a means of connections between variables can be investigated. However, in contrast to an explanatory study, no causal hypotheses are set up and tested; “Analysis stimulated by descriptive questions is meant to ascertain facts, not to test theory. The hypothesis is not causal but simply that common perceptions of the facts are or are not at odds with reality” (Pinsonneault & Kraemer, 1993, p. 80).

In this thesis no clear, determined hypothesis will be tested. However, since the questions in the questionnaire were all generated from the SCM literature, they can all be considered as theoretically underpinned and therefore is the SCM literature indirectly tested towards the empirical material. For example, SCM literature suggests that a process approach will improve the supply chain performance and effects of a collaboration. This thesis investigates whether or not this can be seen among the respondents of the questionnaire.

## 4.2 The different steps in the study

The different main steps in the study can be depicted as in Figure 4.1 below. This chapter will discuss some of the steps more in detail.

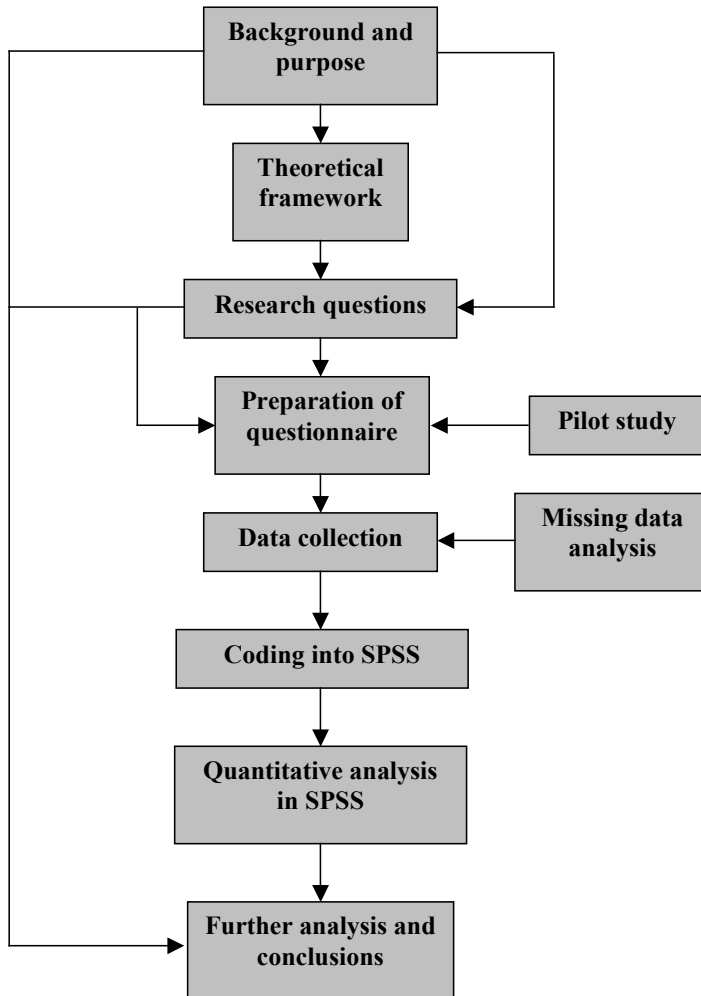


Figure 4.1 The different steps in the study

### **4.2.1 Preparation of a questionnaire**

Constructing a questionnaire means a thorough break down procedure starting with the purpose and ending with a number of questions that are possible for a respondent to answer in a questionnaire (Forza, 2002). The breakdown procedure in this study should be regarded as a translation of the theoretical concepts and ideas presented in the frame of reference into concrete questions. As stated above all the questions in the questionnaire have their origin in the SCM literature and can therefore be related back to existing literature about SCM and collaboration. This means that the empirical material can be compared with existing literature in order to investigate e.g. what parts that really are applied in existing collaborations.

The presentation of the purpose and the focus of this study should be seen as the first step in the break down process. As a second step towards reasonable questions to be put into the questionnaire is the presentation of the research questions in chapter 3. In connection to the research questions a short discussion followed each research question where it was further defined and broken down. For example, the content aspect information sharing was narrowed down to include four more concrete questions, namely what type of information was shared, the frequency of sharing, the degree of processed data, and what communication means that were used in the collaboration. The connection between the research questions and the questions in the questionnaire can be seen in Appendix C.

The break down procedure can cause many errors, which will be further discussed in chapter 4.3 and 4.4 which consider reliability and validity.

### **4.2.2 Layout of the questionnaire**

The final version of the questionnaire consists of 30 questions on ten pages and can be seen in Appendix B. The questionnaire is divided into two main sections where the first deals with general questions about the respondent's company profile and their internal process approach. In addition to this three questions about information sharing in general were attached but are not however further discussed in this thesis.

In the next section, the respondents are instructed to choose one specific relation they have that can be described as a collaboration. The respondents are instructed in the first place to choose a collaboration they have involving both customers and suppliers. If the respondent does not have any such relation, he or she is asked to choose either a supplier- or customer relation. Thereafter follow questions about this specific collaboration based upon the nine aspects taken up in the research questions presented in chapter 3.

The respondents also received a cover letter together with the questionnaire (see Appendix A). In this letter the purpose of the research project was described and some further instructions on how to answer it were given. To ensure that the respondent would have the same understanding of the expression “collaboration” as presented in this thesis, the cover letter also included a more thorough description of how to interpret the term.

### **4.2.3 The pilot**

An obvious prerequisite for properly carried out survey research is that the respondents must understand and interpret the questionnaire in the same way as the researcher. Even if the researcher has a perfect understanding of the content and knows exactly how it should be analysed, the answers can be useless if the respondents interpret the questions in a different manner (see chapter 4.3). To avoid this, senior colleagues at the department were engaged as test persons. Above all these colleagues looked for important questions that were not in the questionnaire and for readability, i.e. how difficult/easy it was to understand the questions. Thereafter the questionnaire was further developed using their opinions. As a final step before mailing the questionnaire, three logistics managers at Swedish manufacturing firms (which is the chosen population in this thesis) were contacted as a last test. These were asked for their opinions on the readability of the questions and how possible it would be to answer them.

### **4.2.4 The sample**

To fulfil the purpose of this thesis, suitable respondents had to be found. The population, which in literature can be defined as “the entire group of people, firms or plants or things that the researcher wishes to investigate” (Forza, 2002, p. 163), should here be interpreted as Swedish manufacturing companies (SNI codes starting with D). Furthermore, the population only covers companies with more than 100 employees and a yearly turnover of more than SEK 100 Million. The main reason for choosing this population is that this type of companies (together with retailers) is the one most considered in SCM literature. Much of the existing research on SCM issues is performed on this group and it can therefore be considered as a target group for SCM research. Furthermore, this population also represents different industries which all have specific characteristics and constraints, but which have many similar logistics challenges in common.

Another important group discussed by SCM literature is retailers, which are not represented in this thesis as focal companies. The main reason for excluding retailers as focal companies in the study was that retailers seldom have collaboration with their customers since these often are private consumers. Indirectly they will be included since many manufacturing companies

have answered about the collaborations they have with their customers, who often are retailers.

Since the chosen population contains a huge number of companies, the questionnaire could not be mailed to the whole population. Instead a subset of the population, a sample, was mailed. The selection of companies and individual respondents that should be included in the sample is called the sampling process. It is very important that the sampling process is performed correctly; otherwise there is a risk that the possibility of generalising the answers to the total population can be lost. (Forza, 2002)

The sampling process was done by hiring the company PAR. This company provides information about Swedish companies, such as addresses and names of responsible managers in the companies. PAR was ordered to list all the manufacturing companies (SNI codes starting with D) in their database where they also had a name for the logistics manager. The reason for this was to increase the response rate by only sending personal letters. Furthermore, PAR was instructed to only select companies with at least 100 employees and a yearly turn over of at least SEK 100 Million.

500 randomly chosen names of logistics managers in 482 manufacturing companies were delivered from PAR. In 18 companies there were two names mentioned as logistics managers. In these cases only one of the two managers was mailed, which means that in total 482 questionnaires were mailed. Some of the logistics managers on the list from PAR belonged to the same company group. They belonged however to different parts of the organisation (different subsidiaries) and were therefore considered as different legal companies.

Also note that the respondents were instructed to only answer questions about collaboration with external companies that did not belong to the same legal organisation. The reason for this was to avoid logistics managers in large companies answering the questionnaire with internal customers or suppliers in mind.

As a key informant the logistics manager was considered as a good choice. If one single person at the company would be able to answer the questionnaire, it would probably be he or she. At least, it was expected that this person would be able to forward the questionnaire to a more suitable respondent at the company.

#### 4.2.5 Data collection and response rate

The questionnaire and the cover letter were mailed to the 482 logistics managers in November 2004. After two weeks, 105 randomly chosen respondents were phoned and reminded about the questionnaire. If they did not answer the in phone, the respondent was later e-mailed and reminded about the survey. The purpose of the phone call was above all to increase the response rate (Forza, 2002), but also to investigate why the respondent had not answered the questionnaire, see missing data analysis below.

As an overall “gross response rate”, including all questionnaires received (which was 182) and with no adjustment on the possible total number of respondents, 37.8% (182/482) was achieved.

Of the answers received, 177 questionnaires were considered useable and were coded in SPSS. After considering returned mail with unknown receives and the reminder with phone calls, the possible numbers of answers could be reduced to 468, due to the following reasons shown in Table 4.1 below.

**Table 4.1 Reasons for the reducement of possible respondents**

<b>Reason</b>	<b>No of reduced respondents</b>
Same receiver was mailed twice due to employment in two different companies within the same business group	3
Finished employment/sent back because of unknown receiver	9
The questionnaire not applicable on the receiver company	2
<b>In total:</b>	<b>14</b>

Thus, this means a net response rate of 37.8% (177/468). In her doctoral thesis, Forslund (2004) makes a literature review on response rates in other similar research projects. Those response rates ranged between 5 and (10 16 19 20 24 27 31 33 38 39) 58%. In comparison, it can be concluded that the response rate received in this thesis is satisfactory. Furthermore, 37.8% is far more than the minimum suggested by Forza (2002), which is 20% for mailed questionnaires.

#### 4.2.6 Missing data analysis

A net response rate of 37.8% with 177 useable answers can be considered as good and enough for the analyses made in this thesis. However, the amount of missing data is large and needs therefore to be tackled properly. In order to be able to generalise the findings, assurance that the sampling frame is representative for the whole population is needed (Malhotra & Grover, 1998; Forza, 2002). In other words, it must be certain that there are no systematic differences

between respondents and non-respondents. For example, there is an obvious risk that logistics managers in the sample without collaboration will not have answered the questionnaire to the same extent as those who have logistics collaboration. As a consequence of this the rate of collaboration would be higher by the respondents than by the non-respondents. In a similar way the logistics managers with a less positive attitude towards the actual collaboration are perhaps less willing to answer the questionnaire, which leads to differences between the respondents and the non-respondents.

Three actions were undertaken to investigate possible differences among respondents and non-respondents. First, differences in number of employees were investigated between respondents and non-respondents. The respondents as well as the non-respondents were divided into three groups, see Table 4.2 below. With a chi square test it was concluded that no differences on a 5% significance level could be found between the groups (Dahmström, 2000).

**Table 4.2 The number of employees among respondents and non-respondents**

Number of employees	No of respondents in the sample	Received responses	Expected responses
100-199	145	46	53
200-499	157	54	58
More than 500	180	77	66
<b>Total</b>	482	177	177

As a second action to investigate differences between respondents and non-respondents 105 randomly chosen logistics managers that had not answered the questionnaire were phoned. 41 were contacted by phone. These were interviewed briefly with the following results, see Table 4.3 below.

**Table 4.3 Results from telephone interview**

Main outcome from the interview:	No of respondents:
Promised to answer the questionnaire	21
Have no time to answer the questionnaire, but have collaboration with customers or suppliers. These are in all cases regarded positive for the company.	18
Have no time and no collaboration with customers or suppliers	2
Interviewed respondents in total:	41

Note that the respondents that promised to answer the questionnaire after they had been phoned did not get any further information about the questionnaire, as this could have meant that some respondents had more information than others when answering the questionnaire.

The phone interviews described above can not be regarded as statistically sufficient since only 20 of the respondents were asked about their situation concerning collaboration. Still the interviews show that time is undoubtedly the main reason for not participating, and nothing actually point on other factors. 18 of 20 of the respondents who ignored the questionnaire due to lack of time had collaboration that they considered positive. Thus, nothing points towards a lower interest to answer the questionnaire because of bad experiences of collaboration.

Despite these results, no further discussion about how “common” collaboration is in supply chains will be taken in order to avoid wrong conclusions being drawn. A more thorough investigation of the non-respondents would have been needed for this. Instead, the focus of this thesis is on differences in existing collaborations’ content, driving forces, barriers and effects, and type of collaboration.

Finally, as a third action to investigate systematic differences between respondents and non-respondents, early respondents (i.e. those respondents that answered the questionnaire within two weeks) were compared with late respondents (those respondents that answered after two weeks). The variable tested was what type of collaboration they had chosen to answer questions about (question v12, see Appendix B), including whether they had collaboration or not. The results are shown in Table 4.4 below. A chi square test on a 5% significance level shows that no significant differences between early and late respondents exist.

**Table 4.4 Results from investigation of possible differences between early and late respondents**

Type of collaboration	Counted early respondents	Expected early respondents	Counted late respondents	Expected late respondents
Collaboration with both supplier and customer	33	31	11	13
Collaboration with supplier	43	42	17	18
Collaboration with customer	35	39	21	17
No collaboration	13	12	4	5
<b>Total</b>	124	124	53	53

#### **4.2.7 Analysis methods in SPSS**

The data analysis of the questionnaire was made in SPSS 11.5. Apart from purely descriptive statistics such as mean values, standard deviation, and frequencies also factor analysis, cluster analysis, ANOVA (Analysis of Variances), and cross tabulations with chi square tests were used.



The main purpose of factor analysis is to investigate if some “hidden”, factors can be found from a larger number of variables, i.e. the results on the variables can be explained by a smaller number of hidden variables (factors). In this thesis factor analysis was used as a means to confirm expected (based on the literature) correlations between variables. Thus, the method was used with a pure descriptive purpose and no further studies with e.g. factor scores were performed.

Cluster analysis means to find groups of respondents that have answered similarly on a set of variables, e.g. the variables investigating effects in this study. Thereafter, characteristics of the different groups could be investigated with e.g. ANOVA analysis.

Another way to group respondents is that the researcher himself specifies the criteria that should decide what group/cluster a certain respondent should belong to. This method was also applied here. For example, the respondents were divided into two groups depending on how intensive the information sharing they had was. The criterion that divided the respondents was the number of information types that was shared with a certain frequency; respondents that shared at least two types of information at least once a week were placed in the first group, and the others in the second.

A third way to group respondents that was applied in this study was to group respondents with high answers (i.e. answered 4 or 5 on a specific Likert scale) in one group and respondents with low answers (i.e. 1 or 2) in another. Thereafter mean values between the different groups were investigated with ANOVA analysis. In these analyses the respondents that had answered 3, and therefore represented a neutral opinion, were removed so that the extremities could better be seen.

Mean values between clusters/groups of respondents were investigated with ANOVA analysis. All differences were tested on a significance level of 5%. The use of ANOVA demands from the material that parametric tests can be performed, i.e. that the variables have a normal distribution. Most of the variables in the questionnaire have Likert scales, which is the same as ordinal scales. In practice, ordinal scales are often handled in the same manner as interval scales (Hays, 1974). As such, it is assumed that these scales are parametric, i.e. have a normal distribution ([www.infovoice.se](http://www.infovoice.se)). When three or more groups were compared Levenes homogeneity of variance test was performed. In the case of similar variance Bonferroni’s post hoc test was used. In case of non-homogenous variance, Tamhane’s T2 test was used. (SPSS, 2002)

For variables measured on nominal scales cross tabulations and chi square test, which is a non-parametrical test, were used to investigate differences between groups. All significance levels were set to 5%.

#### **4.2.8 How the analysis was performed**

As can be seen in Figure 3.1, the research questions consist of in total nine different aspects of collaboration, which can be regarded as nine separate sections. These are:

1. The process approach
2. The planning of the supply chain activities
3. Information sharing
4. The focal company's supply chain orientation
5. Logistics areas where collaboration is performed
6. Driving forces
7. Barriers
8. Effects
9. The different types of collaboration

A short presentation of the different steps in the analysis is given below. The same order is followed in chapter 5 where the results of the study are presented.

##### ***Step one: Separate analysis of each section***

As a starting point, each variable (i.e. a question in the questionnaire) in every section was analysed one by one with mean values, standard deviation and frequencies. The main goal of this part of the analysis was to present an overall picture of the empirical material and comment some of the more interesting results. This step was also necessary in order to get a better grip of the material as a starting point for further analysis (Forza, 2002).

Many of the answers in the questionnaire are given on a five point Likert scale where value one stands for a negative view, e.g. "disagree", and a five for a positive view, e.g. "agree". This means that the answer three could be interpreted as a neutral position. Even if the respondents are given the possibility to answer "do not know", etc., it is in some cases meaningful to investigate if the answers are really separated from three. This was made with one-sample t-tests on a 5% significance level. If relevant, these analyses are presented in chapter 5. Furthermore, the distribution of the respondents is shown for some of the variables presented in chapter 5 as a complement to the mean values and standard deviations.

Finally, some relations to the characteristics of the respondents were also presented and discussed shortly.

***Step two: Analysis of relations between aspects included in the same research question***

In two of the research questions more than one aspect is included. The relations between these aspects were therefore investigated in order to get a better understanding of the results for the research question as a whole. The analysis methods presented in the previous section were applied to investigate the relations. The results are presented as a last section under each research question, see chapter 5.2.6 and 5.3.4 in the following chapter.

***Step three: Analysis of relations between aspects corresponding to different research questions***

In order to answer the fourth research question, analyses of relations between the three first research questions were performed (see Figure 3.2). As in the case for step two, the analysis methods presented in the previous section were applied. For example, ANOVA analysis was used to investigate if there were any differences in effects experienced of the collaboration between the respondents who had defined process in their collaboration and those without.

Note that not all possible combinations between the three questions were investigated. The analyses that were performed were all theoretically based, i.e. before each analysis was run a hypothesis/idea about the result were set up.

#### **4.2.9 Further analysis and discussion**

Based on the analyses in SPSS presented in chapter 5, a more comprehensive description of logistics collaboration and analysis could be presented in the following chapter. Chapter 6 aims to answer the research questions on a higher, more qualitative level, and relate the findings to previous literature and research in the area.

When performing statistical studies it is important to distinguish between statistical correlations and causal relationships. A statistical correlation does not necessarily mean that any causal relationship exists between the variables (Hinkle et al., 1994). In chapter 5 where all the analyses made in SPSS are presented, only statistical relationships between variables are considered. This means that when for instance considering the content of logistics collaboration, it is not concluded whether one aspect leads to another or vice versa. For example, the results in this study show that respondents with more intensive frequency of information sharing also use EDI and Internet based EDI more often. No efforts are however made to investigate if the implementation of EDI caused an increased frequency of information sharing, or if a high frequency of information sharing caused the implementation of an EDI solution between the participating actors in the collaboration.

Another important task when performing this type of research is that the correlation between the variables is not caused by a third, “hidden” variable that is the reason for the relationship. The discovered correlations and relations between variables were all investigated and discussed on a qualitative level with support from relevant literature. (Hinkle et al., 1994; Dahmström, 2000) In some of the analyses performed on variables corresponding to research question one (the content) and two (driving forces, barriers and effects) relations between them could not be found to be valid independently from the type of collaboration that was performed. In these cases the reader is informed by a footnote in chapter 5.

To conclude, no causal relationships will be investigated in this study. However, in some cases the relationships could be interpreted as causal due to differences in time between the variables (Hinkle et al., 1994). In this study this is valid for the relationships between e.g. the content of collaboration and questions about experienced effects of the collaboration. In such a case it could be argued that the content comes before the experienced effects and therefore can be considered as causal relations. Possible causal relationships are discussed in chapter 6.

### **4.3 Validity**

Validity and reliability are the most important quality criteria when conducting a survey and need therefore to be handled carefully in order to achieve good results. Validity measures to what extent the chosen method really measures what the researcher wants to be measured (Björklund & Paulsson, 2003).

A common and obvious mistake is to first design the questionnaire and then, when the questionnaire has already been mailed, discover the more thorough and correct questions to be answered. There is a risk that “wrong” questions have been put in the questionnaire and that they cannot answer the research questions posed and thus jeopardise the purpose of the study. An important first step in the breakdown procedure discussed in chapter 4.2.1 is therefore to assure that the research questions fulfil the purpose of the study. The next step and important task when constructing a questionnaire is to ensure that the theoretical concepts that should be measured really can be measured by the questions in the questionnaire. It is also important that the concepts are correctly “translated” into the questions in the questionnaire. Expressed somewhat differently, it is important that the empirical questions correspond well with the theoretical concepts. A lot of effort with constructing the questionnaire can help to increase the validity. An important step when constructing the questionnaire was to perform pilot tests (Dahmström, 2000). Many valuable comments on the translation of the theoretical concepts were considered and improved the validity of the questionnaire.

The perhaps most difficult theoretical concept that was translated in the questionnaire for this study is the supply chain orientation expression, explained in the frame of reference. One of the purposes behind the questionnaire was to investigate to what extent actors in a supply chain have a SCO when they collaborate. To be able to break down the expression, a literature review in Mentzer et al. (2001) was used as a basis. The authors claim that according to existing SCM literature, the SCO expression is preceded by eight aspects; trust, commitment, interdependence, organisational compatibility, vision and key processes, leader, and top management support. Thus, in order to achieve a high validity, all eight aspects had to be considered in the questionnaire. Some of the aspects were represented with one single question (e.g. the trust aspect, v19\_3 in the questionnaire, see Appendix B) while others were answered with several questions (e.g. vision and key processes, v19\_5, v19\_6, and v19\_7, see Appendix B).

Validity can not be measured exactly, but can only be estimated. It can be argued that since all aspects were covered in the questionnaire, a high validity was achieved. However, whether or not more questions should be asked to cover the SCO expression even better is a matter of concern for discussion. For example, is one single question about trust enough?

Finally, a crucial question connected to validity is the chosen perspective of this study presented in chapter 1. The fact that only one actor (the focal company) answers the questions about the collaboration will have great impact on the type of conclusions that can be drawn. Obviously, it is impossible to draw conclusions of type; “most of the actors participating in collaborations have a positive attitude towards the collaboration”. To make this conclusion, all actors involved must be contacted. In this study only one half (in the cases of dyadic collaborations), or one third (in the cases where both customers and suppliers are involved) of the actors participate. Even if studies where all participating actors are considered exist (see e.g. Forslund, 2004, and Speakman et al. 1998), the most common perspective is however similar to the perspective taken in this study (Gimenez & Ventura, 2005).

Such pitfalls as those described above have been avoided in the result and analysis of this thesis. Instead focus has been on matters such as differences among the respondent concerning effects depending on in what area the collaboration is performed, or what type of planning is performed, or what barriers the respondents think have been the most difficult to overcome. Such analysis can be performed without opinions from the other part of the collaboration.

## **4.4 Reliability**

One prerequisite for obtaining good validity is good reliability, which can be defined as the capability to generate the same result at different points of time, i.e. to avoid influence by chance. An example of low reliability would be when measuring attitudes or perceptions and when the same attitude results in different answers. This can be caused by e.g. tiredness, stress or bad motivation of the respondent. (Rosengren & Arvidsson, 2002)

To improve the reliability of a survey, the construction of the questionnaire is important. It must be easy to understand and answer the questions. These should be neutral, and strong words and ambiguity should be avoided as far as possible. In the pilot study, these concerns were tested carefully. To further increase reliability, the crucial question about what collaboration the respondent would answer questions about, and its content (see Appendix B, question v12 and v13), was followed by an open question (v14). The purpose of this question was to check and assure that the respondents had understood the former two questions properly. When coding the questionnaire into SPSS five questionnaires were excluded from the study due to suspicions of low reliability on these questions and other answers in the questionnaires.

Another crucial aspect when constructing a survey is the risk of making the questionnaire too extensive, which will take too long to answer. In such cases there is an obvious risk that the response rate would be lower and the reliability less, due to a higher risk of tiredness and lack of motivation by the respondent. The constructed questionnaire includes 30 questions and is 10 pages. In comparison to similar research (see e.g. Nehler, 2001; Forslund, 2004), the scope of this questionnaire seems reasonable.

Apart from the questionnaire, the cover letter also provided the respondent with important information in order to increase reliability. For example, the cover letter included a discussion about how the expression collaboration should be interpreted. Telephone number and email contact was also provided in the cover letter to make it possible for respondents to ask questions about the questionnaire. The fact that very few respondents used this possibility speaks for a well constructed questionnaire and thereby a high reliability.

# 5 Data analysis

This chapter presents the findings from the questionnaire. In total, 177 answers were found to be usable and are the basis for the presentation below. The chapter begins with some general information about the respondents and thereafter follows a description based on the first three research questions. Each chapter starts with an individual presentation of the aspects included in the research question, and is finished with a presentation of the relationship between the different aspects. The findings, if relevant, are also related to the company characteristics presented in the first chapter. Finally, results of the fourth research question, i.e. analyses made on variables that correspond to different research questions, are presented.

## **5.1 Basic characteristics of the respondents**

The defined population in this study is manufacturing companies (companies with SNI codes starting with the letter D). Furthermore, only companies with more than 100 employees and SEK 100 Million annual turnover are included in the population. The largest subgroup of companies (27.7%) is "Basic metals and fabricated metal products". This is also the largest group in the sample, represented by 24%. A complete list of the distribution of respondents in the different subcategories is shown in Table D.1, see Appendix D.

Because of the chosen industry, most of the respondents characterised themselves primarily as a supplier or manufacturer (14.7% and 83.1%, respectively). Furthermore, a majority of the respondents belong to a business group (94.4%). The mean number of employees of the companies was 490 and mean annual turnover was SEK 1344 Million.

The characteristics of the products manufactured by the respondents were investigated with two five point Likert scales; one ranging from “single products” to “volume products”, and the second ranging from “customer specific products” to “standard products”. The mean values and standard deviations are presented in the Table 5.1 below:

**Table 5.1 Characteristics of the respondents' products**

Type of product	Mean	Standard deviation
Single vs volume products	3.84	1.18
Customer specific vs standard products	2.66	1.35

## **5.2 The content of logistics collaboration**

### **5.2.1 The process approach**

As discussed in the frame of reference, SCM literature stresses the importance of a process approach in order to avoid sub optimisations in the so-called functional silos within and between companies. The focal company’s process approach is therefore an important aspect to consider when describing logistics collaboration. In the questionnaire a process was defined as “a repetitive and planned chain of logistics activities that are performed after each other in a predefined way” (translated from Swedish). As a follow up question, the respondents were also asked (if they had defined a process in their collaboration) to describe the process’ beginning, end, and what event had triggered its start.

Despite the importance of a process approach discussed by the literature, only 24% of the respondents have together with their partner/partners described and defined their collaboration in terms of a process.

The use of process related measurements in the collaboration was investigated with three different types; total logistics costs for the collaboration and different kinds of lead times and services between the actors. The mean values and standard deviations of the answers, given on five point Likert scales, can be seen in Table 5.2 below<sup>1</sup>. In general it can be stated that different types of services and lead times are much more common measurements than logistics costs.

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<sup>1</sup> One-sample t-test shows that the values for total logistics costs and service between the companies are significant separated from 3.



**Table 5.2 The use of process related measurements in the collaboration**

Type of measurement	Mean	Standard deviation
Total logistics costs	1.97	1.19
Lead times between the companies	3.16	1.38
Service between the companies	3.28	1.35

With ANOVA analysis it can be concluded that respondents with a defined process in their collaboration also measure the collaboration more (see Appendix D, Table D.2). This is valid for measurements related to total logistics costs as well as measurements related to different types of lead times and services between the companies involved.

The third variable that investigated the process approach in the collaboration was to what extent costs and savings as a consequence of the collaboration were shared between the parties in a predefined way<sup>2</sup>. The mean value (standard deviation in parenthesis) for the respondents was 2.54 (1.19), which implies a rather low rate of predefined way of how to share costs and savings.

No relation between the sharing of costs and savings and if the respondent had defined their collaboration as a process could be found<sup>3</sup>. The same also applies for the use of measurements in the collaboration<sup>4</sup>, which implies that the variable of how costs and savings are performed in the collaboration is independent of the other variables that investigate the process approach in the collaboration.

The questionnaire also contained questions about the respondents' internal process approach. The respondents were asked to estimate to what extent<sup>5</sup> they had documented their processes in the different areas procurement, production and distribution of their company. They were also asked about the documentation of their whole internal process stretching through the entire company. The mean values (standard deviation in parenthesis) are shown in Figure 5.1 below.

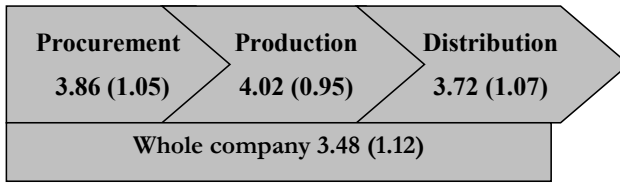
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<sup>2</sup> Measured on a five point Likert scale ranging from "the cost/the saving always goes to the partner where it is created" to "the cost/saving is always shared between the parties in a predefined way".

<sup>3</sup> Investigated with ANOVA analysis.

<sup>4</sup> Investigated with ANOVA analysis with respondents using the certain measure to a high respectively low extent (i.e. have answered 4 or 5, or 1 or 2, respectively).

<sup>5</sup> Measured on a five point Likert scale ranging from "Not at all" to "To a high degree".



**Figure 5.1 The degree of internal process documentation at the focal company**

The use of internal measurements was investigated on a nominal scale with four different process related measurements. The Table 5.3 below shows the percent of the respondents that use the measurement, i.e. how common the measurements, respectively, are<sup>6</sup>. As in the case for the use of measurements in the external collaboration, service related measurements are in general more commonly used than cost related ones.

**Table 5.3 The use of process related measurements at the focal company**

Process related measures at the focal company	Frequency	Percent
Total logistics costs of the company	60	33.9
Throughput time	86	48.6
Customer order lead time	81	45.8
Delivery service towards customer	155	87.6
Other process related measures	8	4.5
Do not use process related measures	9	5.1
No answer/Don't know	2	1.1

Furthermore, the degree of centralisation of the respondent's company, with regard to the development of the logistics, was investigated<sup>7</sup>. The mean value (standard deviation in parenthesis) for the respondents was 3.26 (1.00)<sup>8</sup>.

ANOVA analysis shows that no differences in mean values between respondents with a defined process in their collaboration and those without exist as far as the degree of internal process approach is concerned (i.e. internal process documentation and the degree of centralised development of logistics issues). Thus, no positive relation between internal and external process approaches can be identified in this study.

<sup>6</sup> Note that since respondents can use more than one measure, the total percent is not 100%.

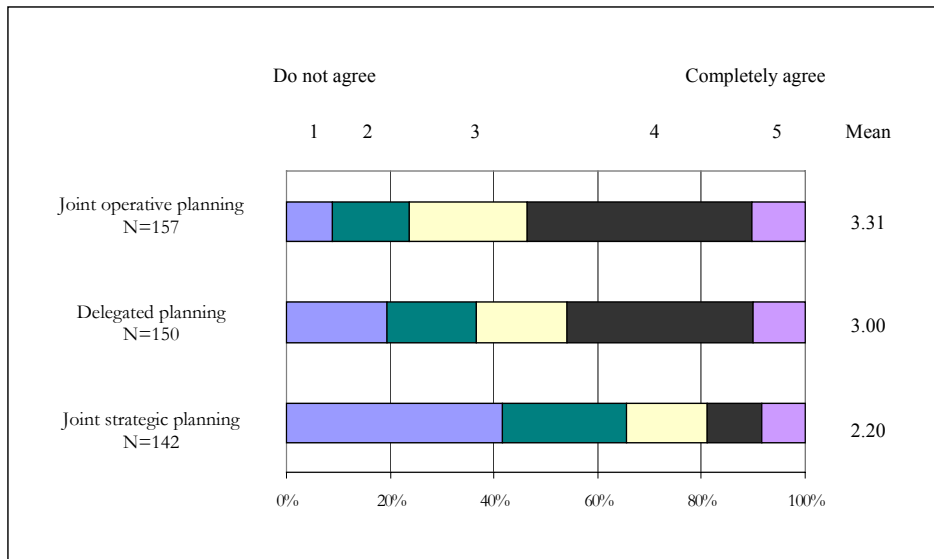
<sup>7</sup> Measured on a five point Likert scale ranging from "Development completely decentralised" to "Development completely centralised".

<sup>8</sup> One-sample t-test shows that this value differs significantly from three.

No differences in company characteristics, such as company size or if the respondent is a supplier or manufacturer, and the degree of process approach (both internal as well as external) could be found in the study<sup>9</sup>.

### 5.2.2 The planning of supply chain activities

In the frame of reference it was stated that there are three main opportunities to plan logistics activities within a collaboration; individual planning, joint planning, and planning where one actor plans for not only himself, but also for other actors in the supply chain (delegated planning). Furthermore, these planning possibilities can be done on an operative and/or a strategic level. In the questionnaire, the planning of the supply chain activities was investigated by three questions as shown in Figure 5.2 below<sup>10</sup>.



**Figure 5.2 How planning of logistics activities is performed in the collaboration**

Figure 5.2 above indicates that the most common way to plan logistics activities within a collaboration is joint planning on an operative level. This can also be considered as the least advanced and less demanding type of planning. Interestingly the degree of joint operative planning is not positively related to the degree of joint strategic planning and vice versa<sup>11</sup>.

<sup>9</sup> Investigated with cross tabulations and ANOVA analysis.

<sup>10</sup> The questions were put as a statement as to what extent the collaboration had changed the planning of supply chain activities. The answers were given on a five point Likert scale ranging from “do not agree” to “completely agree”.

<sup>11</sup> Investigated with ANOVA analysis.

46% of the respondents have answered four or five to the planning type where one actor plans for all parties including himself. This relatively high percentage is probably due to the fact that many of the collaborations are inspired by the logistics business concept VMI. Even if not asked for specifically in the questionnaire, many of the respondents have answered on open questions (follow up questions) that their collaboration is a “typical VMI-collaboration” etc.

### 5.2.3 The information sharing

This study shows that the type of information that is shared within collaborations and the frequency of sharing differ considerably. Table 5.4 shows mean values (in days) of sharing frequency of a certain type of information.

**Table 5.4 The mean values for frequency of sharing on different types of information**

Information type	Number of respondents	Percentage of respondents sharing the type once a month or more often	Mean (in days)	Standard deviation
Production planning	111	71%	9.09	7.37
Inventory levels	118	76%	8.97	7.52
Forecasts	149	94%	12.23	7.49
Sales information (point of sales data)	68	43%	13.37	8.09
Error messages etc	126	81%	8.67	7.16
Product campaigns	58	37%	16.76	6.09
Price levels and pricing	35	22%	18.17	4.91
Future deliveries etc	124	79%	11.84	7.75
Confirmations, track and trace, etc	104	66%	6.85	6.20

Note that the mean values in days are only based on those respondents that share the certain type of information at least once a month (e.g. 111 respondents, or 71%, share information about production planning at least once a month and the average number of days between sharing for these respondents is 9.09 days).

58.8% (104 respondents) of the respondents share at least two types of information at least once a week with their partner/partners. In coming analyses this group of respondents is considered to be respondents with a high frequency of information sharing.

The degree of processed data, i.e. the degree of adjustment for the specific receiver, of the shared information was investigated with a five point Likert scale, ranging from “the information is not adjusted/processed” to “the information is very adjusted/processed”. The mean value (standard deviation in parenthesis) for the answers was 3.66 (1.12). This indicates a high degree of adjustment of the information that is shared, which in turn speaks for good possibilities for the receiver to use the information properly.

With ANOVA analysis it can also be stated that respondents with more frequent information sharing (i.e. sharing at least two types of information at least once a week) also share information that is considered as more processed and adjusted for the receiver (see Appendix D, Table D.3).

The respondents were also asked questions about what main means of communication they used in the collaboration. Table 5.5 below shows how common traditional communication means, EDI and Internet based EDI is in the collaborations<sup>12</sup>:

**Table 5.5 The use of communication means in the collaboration**

Used communication means in the collaboration	Frequency	Percent
Traditional communication means, such as telephone, e-mail, fax etc	111	69.8
Electronic Data Interchange, EDI	59	37.1
Internet based EDI (based on XML)	33	20.1
Do not know	1	0.6

When grouping respondents with either EDI and/or Internet based EDI it can be concluded that 50.6% (N=78) of the respondents belong to this group. The other 49.4% (N=76) only use traditional communication means in their collaborations.

Cross tabulation and chi square test shows that respondents with EDI or Internet based EDI in their collaboration also belong to the 58.8% of the respondents that share at least two types of information at least once a week. This result was expected due to the better possibilities to share information in a more efficient manner with EDI and other Internet based alternatives.

With ANOVA analysis (See Appendix D, Table D.4) it can be concluded that it is above all the more operative information types, such as inventory levels, error messages etc, that are shared more often by respondents with EDI and/or internet based EDI. When considering more strategic information types (e.g. future process and information about future campaigns) no significant differences can be found.

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<sup>12</sup> Note that since respondents can have answered more than one communication mean, the total percent is not 100%.

## 5.2.4 The respondents' supply chain orientation

With Mentzer's et al. (2001) definition and antecedents as a starting point (see chapter 1.4), a number of questions were included (in the questionnaire) about the respondent's SCO.

Experienced problems connected to the antecedents trust, organisational compatibility, commitment, vision and key processes were investigated with statements on a five point Likert scale ranging from "Do not agree" to "completely agree". A high value indicates more problems experienced. The mean values and standard deviation are shown in Table 5.6 below<sup>13</sup>:

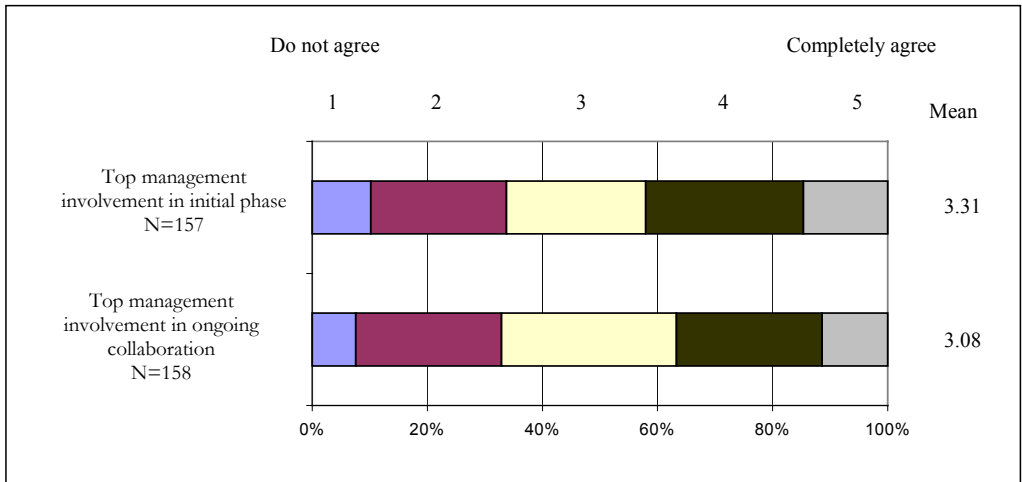
**Table 5.6 Mean values of experienced problems connected to the SCO of the focal company**

Antecedents measuring the SCO at the focal company	Mean	Standard deviation
Trust between the participating companies	2.48	1.10
Personal chemistry and different cultures	2.40	1.17
Different logistics competence	2.96	1.12
Understanding from the own company	2.18	1.11
Involved companies have different goals	2.54	1.10
Different opinions of how costs and savings shall be shared	2.61	1.26
Different opinions about responsibility areas	2.30	1.06

The antecedent top management support from the focal company was investigated with two statements about the management's involvement during the initial phase of the collaboration and the involvement during the ongoing collaboration. The answers were given on a five point Likert scale ranging from "do not agree" to "completely agree", which indicates a high involvement for high values. The mean values and distribution of respondents can be seen in Figure 5.3 below.

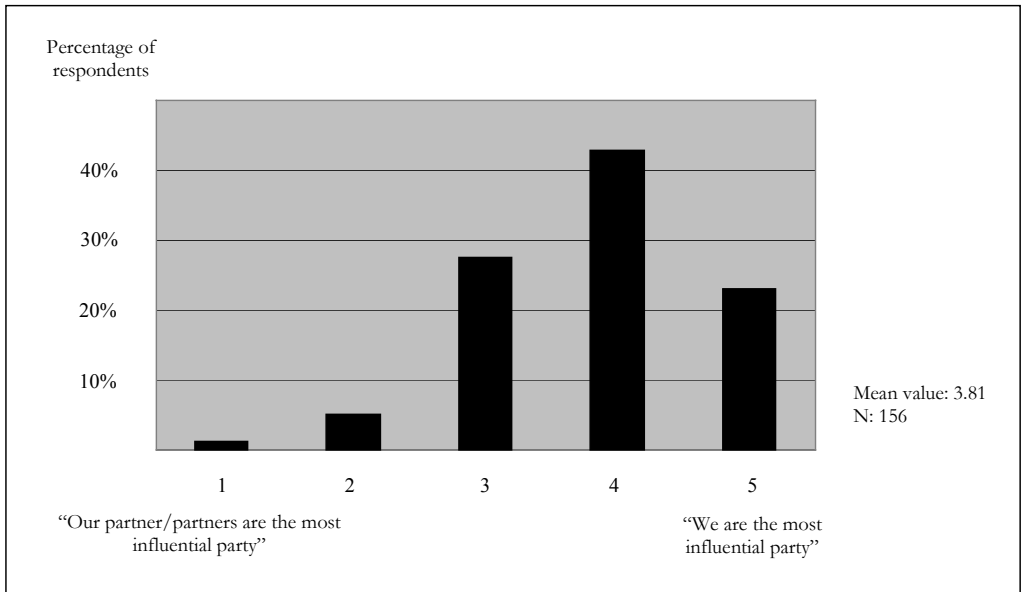
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<sup>13</sup> All variables except from "Different logistics competence" differs significant from 3 (investigated with one-sample t-test)



**Figure 5.3 The degree of top management support from the focal company in the collaboration**

Finally, the question about leadership in the collaboration was also investigated by a question about which of the participating actors (relatively to each other) was the most influential in the collaboration. The question was investigated on a five point Likert scale ranging from “Our partner/partners are the most influential party” to “We are the most influential party”. The result implies that the respondents feel that they are able to influence the collaborations to a high extent. Mean value and distribution of respondents are shown in Figure 5.4 below.



**Figure 5.4 The possibility to influence the design of the collaboration**

### 5.2.5 Logistics areas where collaboration is performed

The respondents were asked to specify on a five point Likert scale<sup>14</sup> to what extent their collaboration was performed in a certain logistics area. The mean values are presented below in Table 5.7 and can be interpreted as a measurement on how common logistics collaboration is in a specific area:

**Table 5.7 Mean values investigating to what extent the collaboration is performed in a certain logistics area**

Logistics area	Mean	Standard deviation
Production planning	2.77	1.29
Forecasting	3.88	1.07
Inventory management and replenishment	3.44	1.27
Transportation planning	3.43	1.24
Strategic planning	2.25	1.19

As can be expected, strategic planning (e.g. warehouse localisations, supplier selection etc) is the most unusual area to collaborate within. Note that there is a difference between the question of how the planning of logistics activities is performed and the logistics area

<sup>14</sup> Ranging from “The collaboration is not performed in this area” to “The collaboration is to a great extent performed in this area”



strategic planning. While the planning of the supply chain activities is an interorganisational issue which focuses on how the participating actors shares the planning responsibility for the activities performed within the collaboration, the strategic planning as a logistics area is concerned with how the respondent regard the collaboration from their own company's perspective.

### **5.2.6 Relations between aspects corresponding to the content of logistics collaboration**

In this chapter the five aspects that investigate the content of logistics collaboration are related to each other.

#### *Actions undertaken in the collaboration*

Starting with the three first aspects, which together represent what actions are undertaken in the collaboration, it can be concluded that they are closely related to each other. On a general level it can be stated that "more of one thing also means more of the other two". Below follows some separate analyses on relationships between variables corresponding to the three different aspects, which are summarised in Figure 5.5.

To start with, respondents with a defined and documented process in their collaboration have more joint operative planning<sup>15</sup>. There is also a positive relation between to what extent measurements are used (valid for all three types of measurements; total logistics costs, lead times, and services) and respondents with a higher intensity in joint operative planning in the collaboration.<sup>16</sup>; respondents with more joint planning also measure more. Furthermore, respondents with a defined process in their collaboration belong to the group of respondents with more intensive information sharing (sharing two types of information at least once a week)<sup>17</sup>.

Moreover, respondents with more intensive information sharing also use measurements (valid for all three types of measurements) to a higher extent than other respondents<sup>18</sup>. This group of respondents also have more joint operative planning in their collaborations<sup>19</sup>.

Finally, as already discussed in the section above about information sharing, respondents with more intensive information sharing also use EDI and Internet based EDI alternatives to a higher extent. Related to this, cross tabulation and chi square test also shows that respondents

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<sup>15</sup> Investigated with ANOVA analysis. The significance level is 5.2%, see Appendix D, Table D.5.

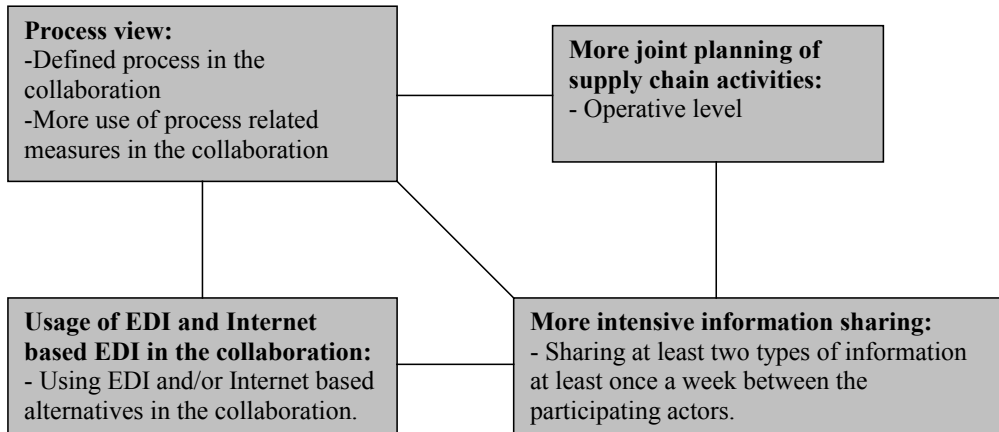
<sup>16</sup> Investigated with ANOVA analysis.

<sup>17</sup> Investigated with cross tabulations and chi square test, see Appendix D, Table D.6 .

<sup>18</sup> Investigated with ANOVA analysis.

<sup>19</sup> Investigated with ANOVA analysis.

with a defined process also use EDI and Internet based EDI alternatives more. Furthermore, respondents with EDI and Internet based alternatives also measure significantly more in their collaborations (valid for all three types of measurements).



**Figure 5.5 Relations between aspects describing the content of logistics collaboration**

In the figure the process approach is represented by the variable about the definition and documentation of the process within the collaboration, and to what extent different types of measurements are used. When considering how the sharing of costs and savings in the collaboration is performed, which also investigated the respondent’s process approach, no relations to variables in the other aspects could be found. This was also expected due to the description of the process approach given in chapter 5.2.1 where it was concluded that no correlation between how costs and savings in the collaboration were shared and the other variables investigating the process approach (i.e. documentation of the process and use of measurements) could be found.

Similar to the reasoning above about the process approach, the joint planning of supply chain activities is only represented by joint operative planning in Figure 5.5. The reason for this is the lack of correlation between the two levels of joint planning (see chapter 5.2.2) and the lack of relation between strategic joint planning and the other variables describing the actions undertaken in logistics collaboration. The only relations that could be found was that respondents with a defined and documented process in their collaboration also have more joint strategic planning and that this is positively related to the usage of cost and lead time measurements.<sup>20</sup>

<sup>20</sup> Investigated with ANOVA analysis.

With regard to the degree of delegated planning this is, as can be expected, positively related to the frequency of information sharing in the collaboration; respondents with more delegated planning also share information more frequently<sup>21</sup>. This can be interpreted as something necessary to get delegated planning to function. The degree of delegated planning is however not related to the process approach in the collaboration and is therefore not included in the figure above.

As can be seen in the Figure 5.5 above, the use of EDI and Internet based alternatives are related to both the variables investigating the intensity of the information sharing as well as the process approach. These are in turn related to the degree of joint operative planning. But when considering the direct connection between the usage of EDI and Internet based EDI and the degree of joint planning in the collaboration, no such connection can be found<sup>22</sup>. Thus, the use of EDI and Internet based alternatives does not in itself contribute to more joint planning of the supply chain activities.

#### ***The logistics areas where the collaboration is performed and their relation to the actions undertaken in the collaboration***

Several analyses were performed to investigate if there were any differences in actions undertaken in the collaboration depending on in what logistics area the collaboration was performed. Without success, factor analysis as well as ANOVA analysis was used to find possible correlations between the actions undertaken and certain logistics areas. The result implies that the logistics area where the collaboration is performed and the actions undertaken are independent from each other, i.e. no specific actions are undertaken in certain logistics areas.

#### ***The supply chain orientation related to the other aspects describing the content of collaboration***

According to SCM literature the respondent's SCO is an important prerequisite for successful collaboration and it could therefore be expected that respondents with more intensive collaboration would be forced to have a better SCO in order to be successful in the collaboration.

This can however not be supported by this study. For respondents with a defined process in their collaborations, ANOVA analysis shows that these respondents in fact experience significantly *more* problems with different goals between the participating actors in the collaboration. Moreover, also when considering the planning of supply chain activities and

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<sup>21</sup> Investigated with ANOVA analysis.

<sup>22</sup> Investigated with ANOVA analysis.

information sharing no significant differences can be found that indicate a better SCO for respondents with more intensive collaboration<sup>23</sup>.

There is however one exception from the statement above; top management is more involved in more intensive collaborations when considering the frequency of information sharing and the degree of joint operative planning. ANOVA analysis (see Appendix D, Table D.7) shows that in collaborations with more frequent information sharing the top management is also more involved in the ongoing collaboration<sup>24</sup>. The involvement from top management, both in the initial phase as well as in the ongoing collaboration, is also higher in collaborations with more operative joint planning<sup>25</sup>. However, there can surprisingly not be found any correlation between the degree of top management involvement and the degree of joint planning on a strategic level<sup>26</sup>.

ANOVA analysis also shows that cost related measurements were also used significantly more by respondents with a high degree of top management involvement in the ongoing collaboration as well as in the initial phase of the collaboration.

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<sup>23</sup> Investigated with ANOVA analysis and cross tabulations.

<sup>24</sup> Note that in chapter 5.5 a significant difference between supplier and customer collaborations when considering the intensity of information sharing is presented. Due to low number of respondents, the presented analysis above can not be shown to be valid independently from the type of collaboration. When only considering customer collaborations a significant difference is however found between respondents with different rates of top management involvement and intensity of information sharing (investigated with cross tabulation and chi square test).

<sup>25</sup> Investigated with ANOVA analysis, see Appendix D, Table D.8.

<sup>26</sup> Investigated with ANOVA analysis.

## 5.3 Driving forces, barriers and effects of logistics collaboration

### 5.3.1 Driving forces for logistics collaboration

The driving forces for the collaboration, i.e. the reasons for why the collaboration was started, were categorised and measured by two main factors: cost- and service related ones<sup>27</sup>. Figure 5.6 below shows the mean values and distribution of the respondents for the results<sup>28</sup>:

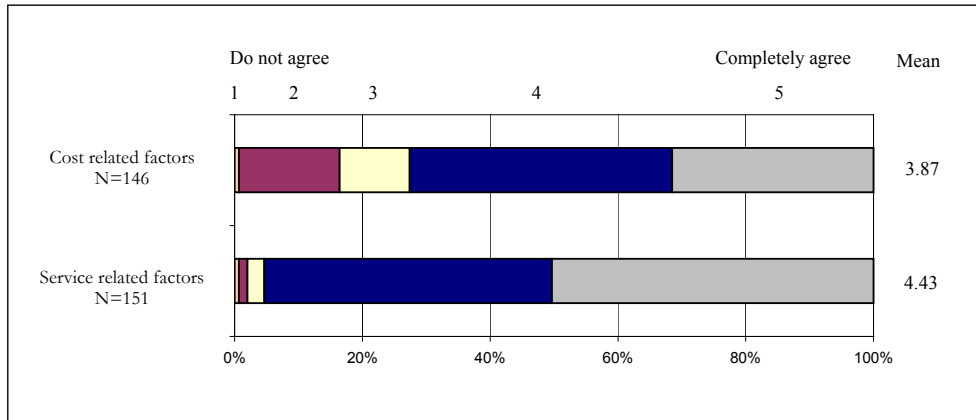


Figure 5.6 Mean values for variables measuring the driving forces for the collaboration

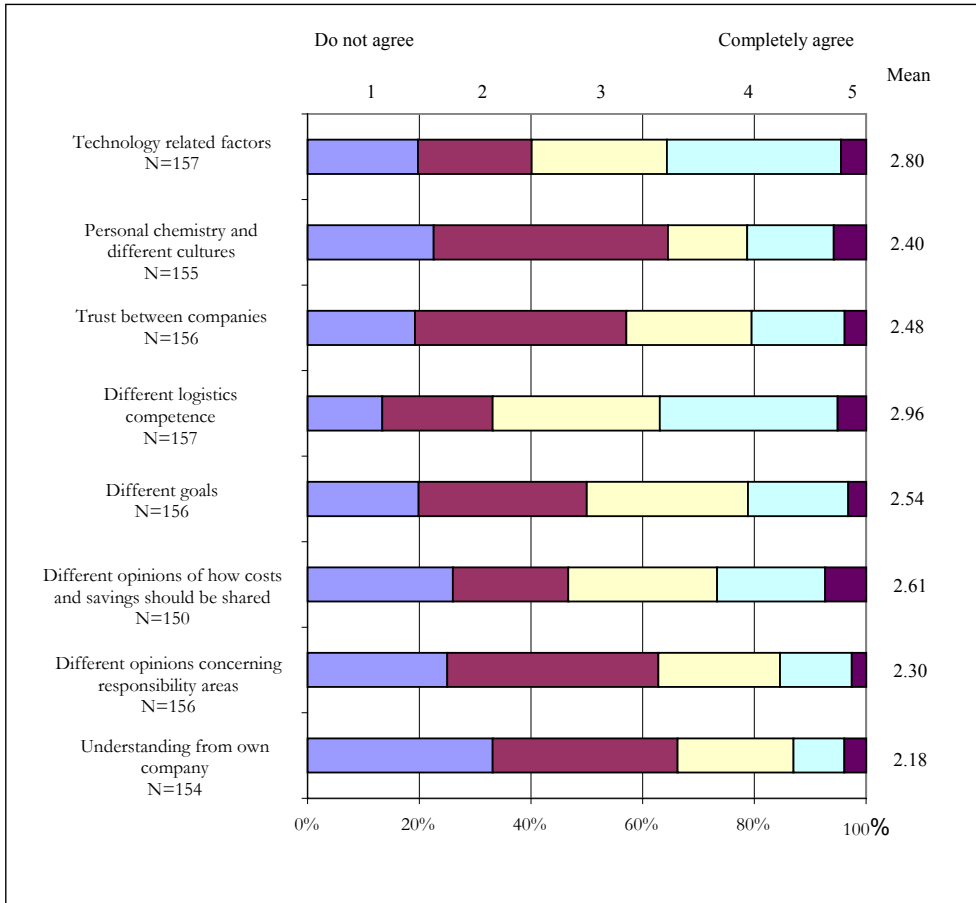
As can be seen in the table, both factors are considered to be very important for setting up the collaboration. No differences in company characteristics and driving forces for the collaboration can be found.

### 5.3.2 Barriers for logistics collaboration

The barriers of the collaboration were investigated with statements about to what extent different factors had made the collaboration more difficult. Eight statements on a five point Likert scale ranging from “disagree” to “agree” were included in the questionnaire. Figure 5.7 below shows mean values and distribution of the respondents. Note that a high value indicates more problems experienced.

<sup>27</sup> In service related measurements are answers related to lead times and “create more efficient information flow” included.

<sup>28</sup> The questions were put as a statement and the answers were given on a five point Likert scale ranging from “Do not agree” to “Completely agree”.



**Figure 5.7 Mean values of experienced barriers to the collaboration**

Apart from human related barriers (i.e. barriers related to a poor SCO) such as trust between the participating companies often discussed in the SCM literature, problems with IT and technology were also investigated in this study. In comparison to the other mean values, the variable “technology related problems” has the second highest value after the variable investigating problems with different logistics competences between the participating actors.

No differences were found concerning barriers and background variables such as e.g. company size, type of product etc.

### 5.3.3 Effects of logistics collaboration

Nine statements on a five point Likert scale ranging from “disagree” to “Completely agree” investigated to what extent the respondents had experienced specific effects of the collaboration. Figure 5.8 below shows mean values and distribution of answers for the nine statements.

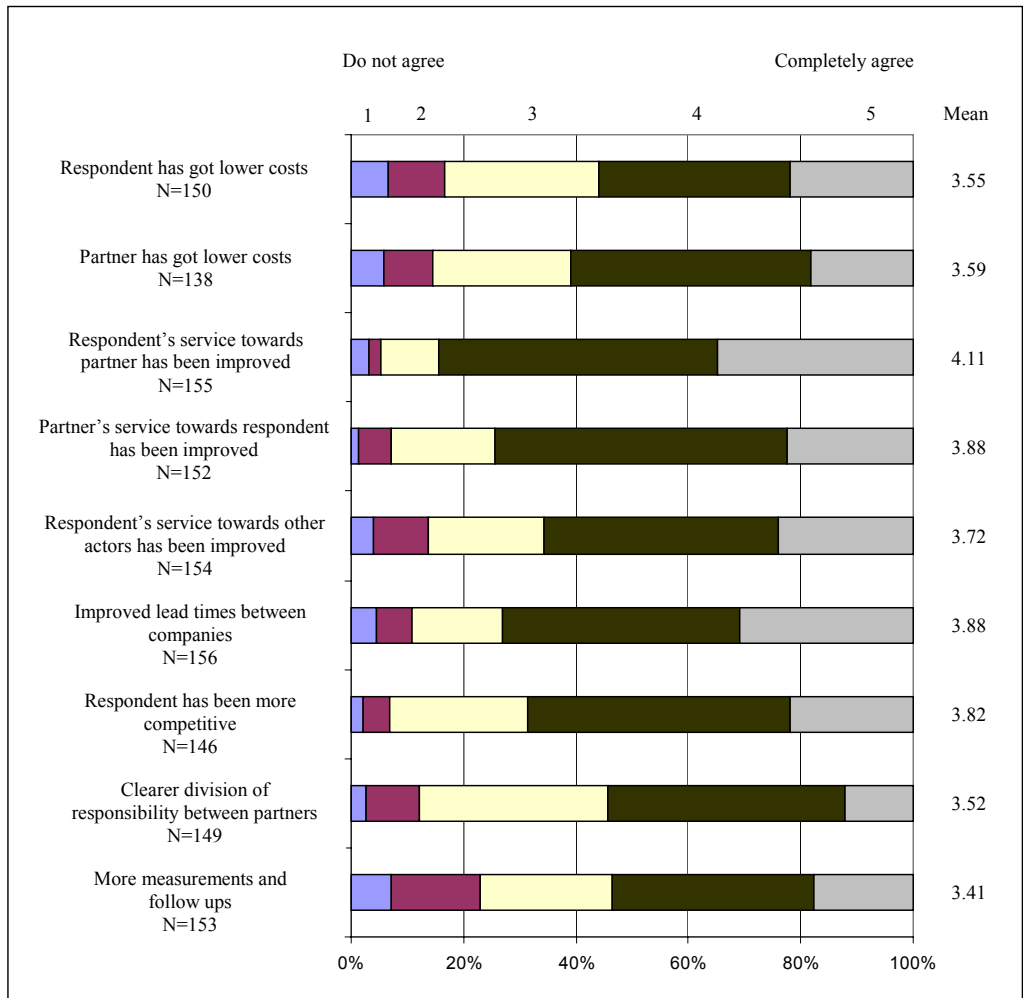


Figure 5.8 Mean values of variables investigating experienced effects of the collaboration

When considering the statements in the figure above it could be expected that the variables would be correlated to each other. Considering the first five variables, factor analysis results in two main factors with costs and service related issues (See Appendix D, Table D.9). The remaining four variables could be either cost and/or service related and were therefore investigated one by one in factor analysis together with the five first variables.

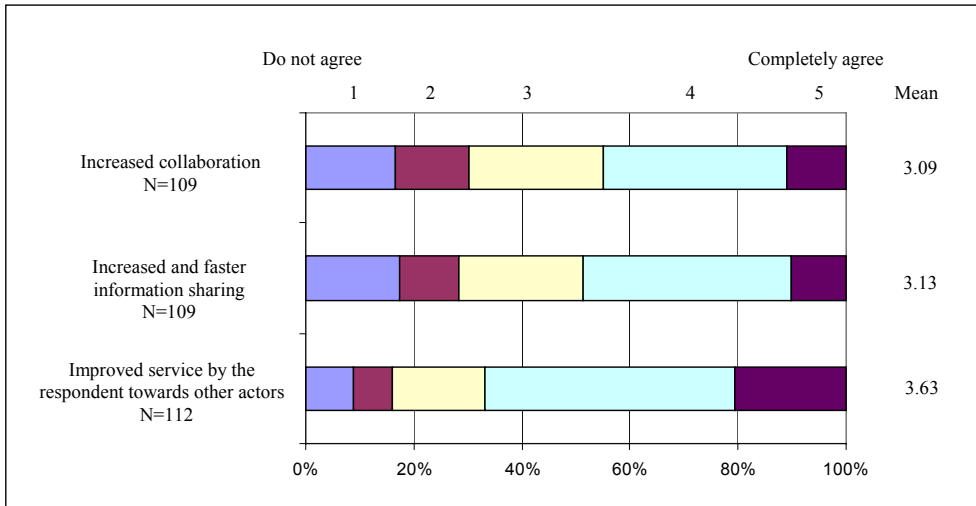
With regard to the variables “shorter lead times”, “more competitive”, and “clearer division of responsibility” it can be concluded that these are related to both costs and services. Considering the variable “more follow ups and measurements” it can be concluded that this is only correlated to service. (See Appendix D, Table D.10)

To further investigate the effects of collaboration, cluster analysis was used in order to group respondents who experienced more or less positive effects of the collaboration. The final cluster centres for the respondents in the more positive effect cluster were in all nine variables found to be 4. In the less positive cluster, the corresponding figures were in all nine variables found to be 3. Thus, the two clusters differ from each other in their opinion in all nine variables. (See Appendix D, Table D.11)

Using the two clusters based on the nine effect variables, ANOVA was used to investigate differences in background variables and in that way get a better picture of the respondents included in each cluster. No differences could however be found between the respondents in the different clusters. Instead, other characteristics such as the content of the collaboration seem to be decisive for how successful (concerning better effects experienced) the collaboration will be. In the sections below differences in content and effects experienced are further discussed.

In cases of dyadic collaborations, this study also investigated the impact of the collaboration on relations with other supply chain actors on the other side of the respondent’s company. I.e., respondents answering questions about a supplier collaboration were asked questions about its impact on relations with their customers and vice versa. Effects on relations on the other side of the company are shown in Figure 5.9 below. From the figure it can be concluded that improved service towards other members of the supply chain is the most experienced effect.

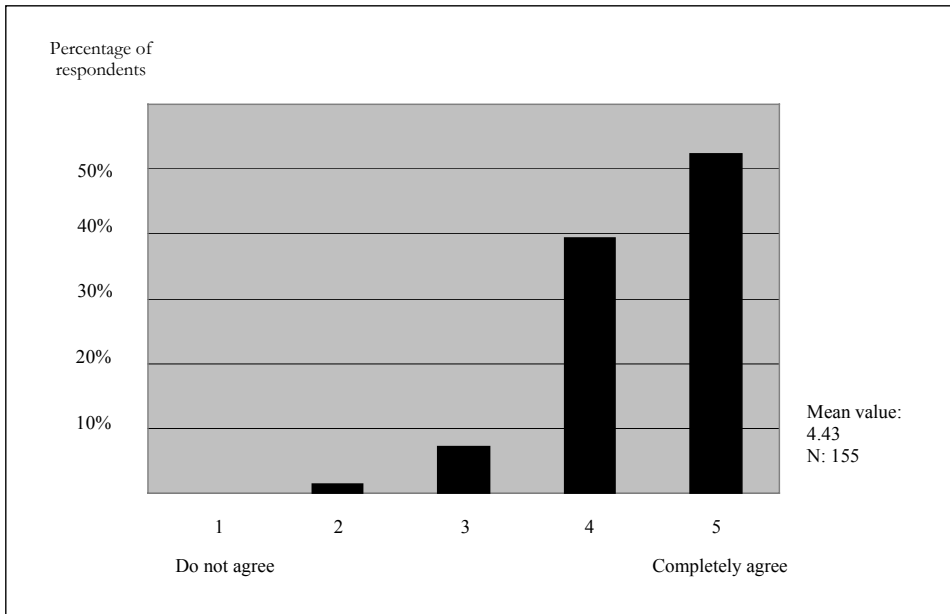




**Figure 5.9 Experienced effects on relations with actors on the other side of the respondent's company**

Finally, in order to measure the respondents' overall attitude towards the collaboration, the respondents were also asked to define<sup>29</sup> how positive they were towards the collaboration as a whole. Distribution of respondents and mean value are shown in Figure 5.10. As can be seen in the table, the mean value was 4.43, which implies that the respondents in general are very satisfied with their chosen collaborations.

<sup>29</sup> The question was put as a statement and the answer was given on a five point Likert scale.



**Figure 5.10** The respondents' attitude towards their collaboration as a whole

### 5.3.4 Relations between driving forces, barriers and effects of the collaboration

When considering relations between driving forces, barriers and effects of the collaboration, few can be found, despite the fact that some could be expected. For example, the driving forces for the collaboration would be mirrored in the effects experienced. However, no such relation<sup>30</sup> could be found in the material. Factor analysis also shows that the variables in the three aspects (i.e. driving forces, barriers and effects) are correlated to each other at first place and can therefore be regarded as three separate factors.

Furthermore, no differences in mean values of the driving forces were found between the two clusters with more or less positive experienced effects<sup>31</sup>. Thus, the reasons (i.e. driving forces) for why the collaboration once was started do not seem to be related to the outcome (i.e. the effects) of the collaboration.

When considering differences between respondents in the two effect clusters and their experienced barriers, ANOVA analysis shows that respondents belonging to the cluster with more positive effects also experience more problems related to technology. The reason for

<sup>30</sup> Investigated with factor analysis and ANOVA analysis.

<sup>31</sup> Investigated with ANOVA analysis.

this could be due to the fact that the respondents belonging to the cluster with more positive effects also share information more extensively and use EDI and Internet based EDI to a higher extent.

Except from more experienced technology related problems, no differences in experienced barriers could be found between the respondents in the two effect clusters.

## **5.4 Type of collaboration**

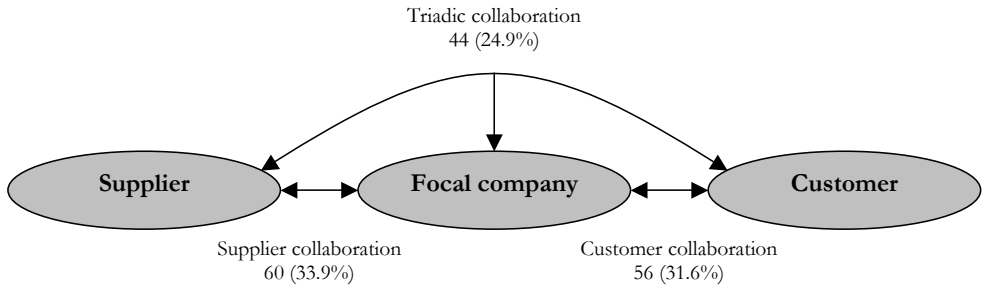
In this study three possibilities for a focal company to collaborate with other actors in the supply chain were investigated; triadic collaboration where both adjacent suppliers as well as customers are participating, or dyadic collaboration with either a supplier or a customer. In the questionnaire the respondents were asked to choose one of their relations that they considered to be a collaboration within the logistics field. In the remaining part of the questionnaire the respondents were instructed to only consider this particular relation when answering the remaining questions. The respondents were also instructed that they in the first place should choose a collaboration where both customers and suppliers were involved. Only in such cases when they did not have any triadic collaboration, they were asked to choose a dyadic collaboration with either a supplier or a customer.<sup>32</sup>

As stated in chapter 1.4.2, collaboration was in the questionnaire defined as “a relation characterised by openness and trust and where risks, rewards and costs is shared between the parties” (translated from Swedish). Furthermore, the respondents were informed that a basic prerequisite to regard a relationship as a collaboration was that all involved parties should be able to influence the design of the collaboration.

Figure 5.11 shows the distribution of what type of collaboration the respondents chose to consider when answering the questionnaire (percentage in parenthesis).

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<sup>32</sup> The respondents were also instructed to only consider collaborations with other primary members of the supply chain (see also chapter 1.3), which leaves collaboration with e.g. third party logistics providers out of the scope of this thesis.



**Figure 5.11 Distribution of different types of collaboration chosen by the respondents**

17 of the respondents (9.6%) answered that they had no relation that they considered as a collaboration.

As far as company characteristics in the different types are concerned, a significant difference<sup>33</sup> between supplier collaborations and triadic collaborations with regard to the degree of customer specific products were found; respondents involved in triadic collaborations had more customer specific products than those involved in supplier collaboration. The mean value for respondents with customer collaborations was placed between the other two types. Apart from this, no differences between background variables and type of chosen collaboration were found. For example, ANOVA analysis shows that no significant difference in company size exists (number of employees and yearly turn over) for the different types of collaboration.

<sup>33</sup> Investigated with ANOVA analysis.

## **5.5 Relations between different research questions**

This chapter corresponds to research question number four, in which variables that belong to the first three research questions are related to each other. In the three subsequent sections the interfaces between the other research questions are investigated one by one.

### **5.5.1 The content and driving forces, barriers and effects of the collaboration**

#### *The content vs driving forces*

With regard to driving forces for the collaboration, these seem in general to be independent from the content of the collaboration. With ANOVA analysis, factor analysis and cross tabulations it can be concluded that e.g. the intensity of information sharing or degree of process approach<sup>34</sup> are not related to the reasons for why the collaboration was set up.

One exception can be found when considering the respondents' SCO; respondents with a high degree of top management in the initial phase as well as in the ongoing collaboration considered cost related factors to be more important for setting up the collaboration<sup>35</sup>.

#### *The content vs barriers*

With ANOVA analysis and factor analysis it can be concluded that, similar to the driving forces discussed above, experienced barriers in general seem to be independent of the content of the collaboration. However, some exceptions can be found. For example, ANOVA analysis shows that respondents with a defined process in their collaboration also experience more problems with different goals among the participating actors in the collaboration (see also chapter 5.2.6).

Furthermore, respondents with more intensive information sharing (i.e. sharing at least two types of information with their partner at least once a week) also experience significantly more technology related problems. The reason for this could be that these respondents also use EDI and Internet based EDI more often (this relation was discussed in chapter 5.2.3 above). However, when considering the mean values<sup>36</sup> between respondents with more complicated technology (respondents using EDI and/or Internet based alternatives) and respondents using traditional means of communication (telephone, e-mail etc) no such

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<sup>34</sup> Measured by if the respondent had defined and documented a process in their collaboration, and to what extent process related measures were used

<sup>35</sup> Investigated with ANOVA analysis.

<sup>36</sup> Investigated with ANOVA analysis.

significant difference can be found. Thus, technology related problems are experienced to the same extent by those respondents that only use traditional communication means.

### ***The content vs effects***

In the frame of reference it was stated that a process approach would lead to better effects from the collaboration. When comparing mean values between respondents with a defined and documented process in their collaboration and those without, it can be seen that for eight out of nine variables (the variable “partner has got lower costs” differs slightly from the others) the mean values are higher for the respondents with a defined process. However, a significant difference<sup>37</sup> can only be found for the variable “clearer division of responsibility between partners”.

Related to the process documentation discussed above it can also be concluded that respondents who use cost related measurements to a high extent (i.e. have answered 4 or 5) in their collaboration also experience significantly more positive cost related effects than their colleagues with a low rate of cost related measurements (i.e. have answered 1 or 2)<sup>38</sup>. The same pattern can be seen when considering the use of service related measurements related to effects experienced; respondents with a high usage of service related measurements also experience more positive effects related to service<sup>39</sup>.

With regard to lead times this measure can be related to both service and cost issues according to the literature. The result of this study shows however only connections with improvements of service related effects. The results from the use of measurements and their relation to effects experienced are shown in Table 5.8. An “S” indicates that significantly more positive effects were experienced by the respondents with a high rate of usage of the specific measurement.

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<sup>37</sup> Investigated with ANOVA analysis, see Appendix D, Table D.12.

<sup>38</sup> Investigated with ANOVA analysis.

<sup>39</sup> Investigated with ANOVA analysis.

**Table 5.8 The usage of measurements and their relation to more experienced effects of the collaboration**

Effect	Use of cost related measurements	Use of service measurements	Use of lead time measurements
Focal company has got lower costs	S	S	
Partner has got lower costs	S		
Focal company's service improved towards partner		S	S
Partner's service improved towards focal company		S	S
Focal company's service improved towards other actors in supply chain		S	S
Improved lead times between partners			S
Focal company has been more competitive			S
Clearer division of responsibility between partners	S		S
More measurements and follow ups	S	S	S

According to the research questions in chapter 3.1.1 about internal process approach, the degree of internal process documentation and degree of centralised organisation could have a positive impact on the effects experienced in triadic collaborations; a better internal process approach would lead to more positive effects of the collaboration. No such relations could however be found.

The joint operative planning of the supply chain activities and its relation to effects experienced of the collaboration was investigated by first dividing the respondents into two groups, one with high answers on the question about joint operative planning (respondents that have answered 4 or 5), and the other group with low answers (respondents that have answered 1 or 2). Thereafter ANOVA analysis was performed to investigate differences in mean values between the groups. The results show that the group of respondents with a high degree of joint operative planning have higher mean values for all nine variables that investigate the experienced effects of the collaboration.

Table 5.9 below shows that significant differences could be found for five variables. An “S” indicates that the respondents with a high degree of joint operative planning experience significantly more positive effects of the particular effect.

**Table 5.9 The degree of joint operative planning of supply chain activities and its relation to different effects of the collaboration**

Effect	Joint operative planning of supply chain activities
Focal company has got lower costs	
Partner has got lower costs	
Focal company's service improved towards partner	S
Partner's service improved towards focal company	
Focal company's service improved towards other actors in supply chain	S
Improved lead times between partners	S
Focal company has been more competitive	S
Clearer division of responsibility between partners	
More measurements and follow ups	S

When making the same analysis for joint strategic planning, no significant differences in effects between respondents with high respectively low rate of joint strategic planning could be found.

SCM literature also suggests that the frequency of information sharing has an impact on how successful the collaboration is in terms of positive effects. On a general level this study can confirm this with cross tabulation and chi square test between the two clusters of respondents experiencing more or less positive effects, and the two groups with different intensity in information sharing. With ANOVA analysis it can be concluded that the group of respondents with more intensive information sharing experience significantly better effects with regard to increased competitiveness and more measurements and follow ups<sup>40</sup>.

When comparing the two effect clusters to variables which investigate the respondents' SCO, no differences were found. The exception is a significant difference<sup>41</sup> between the two clusters with regard to the degree of top management support in the ongoing collaboration, where respondents that belong to the cluster with more positive effects have a more active top management. As in the case for the frequency of information sharing, further analyses of the

<sup>40</sup> As will be presented in chapter 5.5 there is a difference between supplier and customer collaborations concerning the intensity of information sharing; respondents with customer collaborations share information more intensively. Since the number of respondents is too small to make the analysis with the different collaboration types separately, the effects of a higher intensity of information sharing could not be investigated independently from type of collaboration.

<sup>41</sup> Investigated with ANOVA analysis.



relation between top management and effects experienced were not performed due to differences in degree of top management involvement between the types of collaboration, see chapter 5.5.2 below.

When considering logistics areas where the collaboration is performed no differences between the areas and effects experienced could be found.<sup>42</sup>

The analyses presented above were concerned with the direct effects experienced from the collaboration by the involved actors. In the questionnaire, respondents with dyadic collaborations were also asked about consequences (effects) of the collaboration for relations on the other side of the focal company (see chapter 5.3.3 above about effects). According to existing literature in the area, respondents with dyadic collaborations that have a better internal process approach could be expected to experience more positive effects on the other side of their company. No such relations could however be found in this study. The degree of internal process documentation as well as the degree of centralised organisation concerning logistics development seems to be independent of the effects experienced on the other side of the company<sup>43</sup>.

Differences in the intensity of dyadic collaborations (with respect to the degree of process approach, planning of supply chain activities, and frequency of information sharing) and effects experienced on the other side were also investigated with ANOVA analysis. No differences could however be found, which implies that the intensity of the collaboration does not influence effects experienced on the other side of the focal company.

Instead a positive significant relation was found between the rate of top management involvement in the ongoing collaboration and to what extent the collaboration led to increased collaboration also on the other side of the company<sup>44</sup>. These findings are valid for both types of dyadic collaborations, i.e. both upstream and downstream in the supply chain.

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<sup>42</sup> Investigated with ANOVA analysis.

<sup>43</sup> Investigated with ANOVA analysis where the respondents were divided into two groups depending on their degree of internal process approach.

<sup>44</sup> Investigated with ANOVA analysis, see Appendix D, Table D.13.

## 5.5.2 The content in the different types of collaboration

### *Type of collaboration vs process approach*

With regard to the process approach in the different types of collaboration, few differences can be found. To start with, the respondents in the different types have defined and described a process in their collaboration to the same extent<sup>45</sup>. Also the sharing of costs and savings in the collaboration are in all types predefined to the same extent<sup>46</sup>.

When considering use of measurements the only significant difference<sup>47</sup> appears between triadic and supplier collaborations considering lead time and service measurements; respondents involved in triadic collaboration use them more frequently.

Another expected difference was that the degree of internal process approach was expected to be higher in triadic collaborations. Respondents with such a collaboration were expected to have a better internal process approach due to challenges with linking the customer side with the supplier side. This expectation can however not be supported in this study; ANOVA analysis shows that respondents in triadic collaborations do not have a higher degree of internal process documentation, nor do they have a more centralised organisation with regard to logistics development in the company.

### *Type of collaboration vs planning of supply chain activities*

ANOVA analysis shows that no differences can be found between the types of collaboration and how the planning of the supply chain activities is performed in the collaboration. For example, joint strategic planning is performed to the same extent in all the different types of collaborations.

### *Type of collaboration vs information sharing*

Cross tabulation and chi square test show that there are differences between supplier and customer collaborations concerning information sharing. Respondents with customer collaborations tend to belong to the group of respondents sharing at least two types of information at least once a week. Furthermore, these respondents also use EDI and Internet based EDI more extensively than their colleagues with supplier collaborations.

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<sup>45</sup> Investigated with cross tabulation and chi square test.

<sup>46</sup> Investigated with ANOVA analysis.

<sup>47</sup> Investigated with ANOVA analysis.

### ***Type of collaboration vs SCO***

When considering the respondents' SCO in the different types of collaboration it can be concluded<sup>48</sup> that in supplier collaborations top management is significantly less involved in ongoing collaborations than in the other two types. When thereafter considering to what extent the respondents in the different types feel that they can influence the collaboration the situation is the opposite; respondents in supplier collaborations experience that they can influence the collaboration significantly more than the respondents with customer collaborations (no significant differences between triadic collaborations and supplier collaboration could however be found).

With regard to top management support in the initial phase of the collaboration no significant difference can be found between the three types.

### ***Type of collaboration vs logistics areas***

ANOVA analysis shows that there are no differences in mean values between type of collaboration and in what logistics areas the collaboration is performed. The exception is the logistics area called strategic planning, where a significant difference between customer collaborations and the other two types can be found. Respondents with customer collaboration consider their collaboration to be less involved in strategic planning.

At first glance, this result does not seem to be logical since the degree of joint planning of supply chain activities did not differ between the types. However, as discussed in chapter 5.2, the logistics areas represent the own company's thoughts about the collaboration and their expectations from it. Thus, the own company can regard the collaboration as strategic but the joint planning of the logistics activities does not necessarily need to be on a strategic level.

## **5.5.3 The driving forces, barriers and effects in the different types of collaboration**

### ***Driving forces vs type of collaboration***

No significant differences can be found between the types of collaboration and whether cost or service related factors were the reason for the collaboration<sup>49</sup>. Table 5.10 below shows mean values of the driving forces (standard deviation in parenthesis) for the different types.

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<sup>48</sup> Investigated with ANOVA analysis, see Appendix D, Table D.14.

<sup>49</sup> Investigated with ANOVA analysis.

**Table 5.10 Mean values of reasons for setting up the collaboration in the different types**

Driving force	Triadic collaboration	Supplier collaboration	Customer collaboration	Total mean
Cost related factors	3.81 (1.07)	3.84 (1.01)	3.96 (1.10)	3.87 (1.05)
Service related factors	4.52 (0.55)	4.34 (0.75)	4.45 (0.70)	4.43 (0.68)

***Barriers vs type of collaboration***

The mean values (standard deviation in parenthesis) of the barrier variables for each type of collaboration are shown in Table 5.11 below.

**Table 5.11 Mean values of experienced barriers in each type**

Barrier	Triadic collaboration	Supplier collaboration	Customer collaboration	Total mean
Technology related problems	3.02 (1.24)	2.45 (1.17)	3.02 (1.14)	2.80 (1.21)
Personal chemistry and different cultures	2.51 (1.12)	2.29 (1.11)	2.44 (1.26)	2.40 (1.17)
Trust between the participating companies	2.40 (1.09)	2.32 (0.96)	2.72 (1.22)	2.48 (1.10)
Different logistics competence	3.07 (1.07)	3.03 (1.22)	2.78 (1.05)	2.96 (1.12)
Involved companies have different goals	2.64 (1.06)	2.42 (1.18)	2.60 (1.05)	2.54 (1.10)
Different opinions of how costs and savings shall be shared	2.77 (1.22)	2.31 (1.21)	2.83 (1.30)	2.61 (1.26)
Different opinions about responsibility areas	2.26 (1.06)	2.31 (1.15)	2.33 (0.98)	2.30 (1.06)
Understanding from the own company	2.24 (1.14)	1.98 (1.15)	2.33 (1.03)	2.18 (1.11)

As stated in chapter 3, two main categories of barriers to logistics collaboration are discussed in existing SCM literature; human related and technology related barriers. With regard to technology related barriers these are experienced less by respondents with supplier collaborations, probably due to the fact that this type of collaboration also shares information less frequently<sup>50</sup>.

Concerning human related barriers no differences in mean values between the respondents with triadic collaborations and dyadic collaborations can be found. When only taking into account the dyadic collaborations in ANOVA analysis, differences occur on the variable “Different opinions of how costs and savings shall be shared”, where respondents with

<sup>50</sup> Investigated with cross tabulation and chi square test.

customer collaboration experience more problems than their colleagues with supplier collaborations.

***Effects vs type of collaboration***

The mean values for the nine variables investigating effects for each type of collaboration are presented in Table 5.12 below:

**Table 5.12 Mean values of experienced effects in the different types of collaboration**

Effect	Triadic collaboration	Supplier collaboration	Customer collaboration	Total mean
Respondent has got lower costs	3.65 (1.17)	3.64 (1.06)	3.37 (1.19)	3.55 (1.14)
Partner has got lower costs	3.78 (1.04)	3.40 (1.14)	3.61 (1.00)	3.59 (1.07)
Respondent's service towards partner has been improved	4.23 (0.83)	3.82 (0.98)	4.31 (0.80)	4.11 (0.90)
Partner's service towards respondent has been improved	3.98 (0.86)	3.98 (0.76)	3.69 (0.97)	3.88 (0.87)
Respondent's service towards other actors has been improved	3.93 (0.85)	3.68 (1.10)	3.59 (1.16)	3.72 (1.06)
Improved lead times between companies	4.02 (0.95)	3.84 (1.27)	3.81 (0.89)	3.88 (1.06)
Respondent has been more competitive	3.98 (0.78)	3.51 (0.97)	4.00 (0.85)	3.82 (0.90)
Clearer division of responsibility between partners	3.70 (0.94)	3.48 (0.82)	3.40 (1.00)	3.52 (0.92)
More measurements and follow ups	3.73 (1.11)	3.09 (1.10)	3.49 (1.20)	3.41 (1.16)

Comparing the mean values, a significant difference<sup>51</sup> between supplier and customer collaborations can be found for the variable “Respondent’s service towards partner has been improved”; respondents with customer collaborations claim that they have improved this type of service more. The respondents with customer collaborations as well as those with triadic collaborations also experience that their competitiveness has been improved significantly more in comparison to the respondents with supplier collaborations.

Finally, the respondents with triadic collaborations also experience significantly more positive effects for the variable “More measurements and follow ups” than the respondents with supplier collaborations.

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<sup>51</sup> Investigated with ANOVA analysis, see Appendix D, Table D.15.

As far as the dyadic collaboration types are concerned, no differences in effects experienced on the other side could be found, i.e. the respondents experience effects to the same extent independent of whether the collaboration is performed upstream or downstream in their supply chain. Mean values (standard deviation in parenthesis) are shown in Table 5.13.

**Table 5.13 Mean values of experienced effects on the other side by respondents with supplier and customer collaborations**

<b>Effect on the other side</b>	<b>Supplier collaborations</b>	<b>Customer collaborations</b>	<b>Total mean</b>
Increased collaboration	2.92 (1.23)	3.04 (1.27)	2.98 (1.24)
Increased and faster information sharing	2.88 (1.24)	3.17 (1.27)	3.02 (1.26)
Improved service by the respondent towards other actors	3.62 (0.99)	3.55 (1.36)	3.58 (1.17)

# 6 A comparison to the literature

In the previous chapter a description of logistics collaboration in supply chains was given in accordance with the purpose of this thesis. In this chapter the most important findings are analysed and compared to existing literature.

## **6.1 *The content of logistics collaboration***

Five aspects to describe the content of logistics collaboration have been investigated. The three first (process approach, planning of supply chain activities, and information sharing) together can be used to give a description of actions undertaken in the collaboration. The fourth and fifth aspects correspond respectively to the respondents' SCO and in what logistics area the collaboration is performed.

### **6.1.1 The process approach**

Starting with the process approach, it can be seen that the respondents to a relatively high extent have documented their internal processes in all parts of their companies. This can be interpreted as a consequence of the widely spread application of ISO 9000 certifications.

The use of processes in the collaboration with adjacent suppliers and/or customers is however very low, and does not seem to be related to the internal process documentation. Only 24% of

the respondents have together with their partner/partners defined and described their collaboration in terms of a process. This figure must be considered as surprisingly low due to the massive amount of literature advocating a process approach the past two decades; SCM literature and logistics business concepts such as CPFR as well as other management concepts such as business process reengineering all stand for a more process oriented view of the firm.

According to the frame of reference, the definition and documentation of a process facilitates a proper measurement of it. The results of this study confirm this; respondents with a defined and documented process in their collaboration also measure it more, both with regard to costs, lead times and service.

In general, lead times and service measurements are considerably more used than measurements related to the total logistics costs. This also agrees with the internal use of measurements at the respondents' companies where service related measurements are far more applied. Other studies report similar findings (see e.g. Aronsson, 2003) and can probably be explained by the difficulties of measuring logistics costs. The exact cost for different logistics activities involved in the collaboration are often not available at the companies. Furthermore, even if the total cost figures for a certain activity can be found, there could still be difficulties in identifying a correct cost driver.

The respondents have not applied a predefined way of how to share costs and savings in the collaborations to any great extent (a mean value of 2.54 on a five point Likert scale). This result is also in line with the results presented by Speakman et al. (1998), who found that risks and rewards were shared equally between the partners to a very low extent. These findings indicate a great potential for improvements in this area for future collaborations.

### **6.1.2 The planning of supply chain activities**

When considering the planning of supply chain activities involved in the collaboration, joint planning on an operative level is regarded as the most common way. The degree of joint strategic planning is lower when regarding mean values and distribution for the respondents (see Figure 5.2). 66% of the respondents have answered one or two at the question about to what extent joint strategic planning of supply chain activities is performed. This indicates a low degree of strategic joint thinking in most of the collaborations. Thus, when considering the planning of supply chain activities involved in the collaboration, it seems to involve operative joint issues, but at a strategic level the planning is done individually. Furthermore, the extent of joint, operative respectively strategic planning in the collaboration, are not positively related to each other. Thus, more strategic planning does not seem to facilitate or lead to more operative planning or vice versa.



### **6.1.3 The information sharing**

58.8% of the respondents share at least two types of information at least once a week, which has been considered in this study as the lower limit to describe the information sharing as intensive. The type of information that is shared by most respondents at least once a month is forecasts (see Table 5.4), which is shared by 94% of the respondents. Forecasts are relatively easy to share and is also reported as the most commonly shared type of information in other survey based studies, see e.g. Selldin (2002).

When considering mean values for the frequency of sharing for the respondents that share a certain type of information at least once a month, operative information types such as confirmations, error messages and inventory levels are the most frequently shared, as can be expected

According to the respondents the shared information is in average to a high extent processed and adjusted for the specific receiver. The degree of processed/adjusted information is also significantly higher for the respondents that belong to the 58.8% that shares information more intensively.

EDI and Internet based EDI are considered to be the main means of communication by 50.6% of the respondents. This group of respondents also shares information more frequently than those with only traditional means. This result was expected due to the better possibilities to share information in a more efficient manner with EDI and other Internet based alternatives.

The use of such communication means however does not seem to influence and facilitate to what extent the shared information is processed and adjusted for the receiver. The results imply that the use of EDI and Internet based alternatives facilitates the transferring of information, but not the content of the information, i.e. to what extent the information is processed and adjusted for the receiver. This is also supported when considering what types of information are shared significantly more frequently in collaborations with EDI or Internet based EDI. Above all it is operative information types such as error messages and inventory levels that are shared more frequently by EDI users. The need for adjustments of these types of information is probably lower than for instance forecasts and other information types that are more difficult for the receiver to interpret.

### **6.1.4 The actions undertaken in the collaboration**

Considering the three aspects that together represent actions undertaken in the collaboration, Figure 5.5 shows statistical relations between several variables investigating the different aspects. On a general level, the results of this study show that “the more of one aspect, the

more of the other two”. On an operative level, the “intensity” of the three aspects that investigate the actions undertaken in the collaboration are closely related to each other.

According to the literature about SCM and collaboration, a higher intensity of information sharing and joint planning of supply chain activities could be facilitated by a clear process approach. As discussed in the frame of reference, a clear process description will increase the knowledge about the activities involved and how they are related to each other. In addition, the output from the process becomes clearer and can therefore be more focused. This could lead to better incitements for the participating actors to increase their information sharing and the degree of joint planning since the advantages will be more obvious.

However, this study only investigates statistical relations and what comes first of the three aspects in the collaboration is therefore not investigated. Most probably, it would not be possible to make a strictly causal order of the aspects. For example, as stated above a collaboration could start with a clear process approach and cause more intensive information sharing due to an increased understanding for the need of sharing more information. The opposite order is however also possible; an intensive information sharing could force the actors involved to specify their collaboration in terms of a process in order to be able to use the shared information in an efficient way. Furthermore, a need for an intensive information sharing could justify implementation of EDI between the partners, which in turn could demand a process definition to bring about correct use.

### **6.1.5 The respondents’ supply chain orientation**

As stated in the frame of reference, the companies’ SCO is considered an important prerequisite to collaboration based on SCM. On a general level when considering mean values and distribution of answers in the different variables, the respondents seem to have a good SCO.

Apart from a prerequisite in the ongoing collaboration, a good SCO could also function as an important trigger for improvements of the collaboration. It could be argued that respondents involved in more intensive collaborations would in general have a better SCO than their colleagues with less intensive collaboration. For example, in the planning of supply chain activities, an intensive joint strategic planning would most probably demand a well functioning SCO with a high degree of trust, good personal chemistry, compatible company cultures etc.

The results of this study can however not support this view since most of the variables investigating the respondent’s SCO are independent from the other content variables. In fact,

in one case the contrary relation is found; respondents with a defined process in their collaboration experience *more* problems with different goals between the companies. This result is further discussed in chapter 6.4, which examines the content and barriers experienced in the collaboration.

The only SCO variable that seems to be positively related to the intensity of what is done in the collaboration is the involvement of top management in the ongoing collaboration. The results in chapter 5 show that top management is more involved in collaborations with more frequent information sharing and joint operative planning of the supply chain activities. A reason for this could be that involvement from top management gives the logistics department the authority to carry out the collaboration and bring it to a more intensive level. As stated in the frame of reference, the involvement from top management means an increased focus on the collaboration and is regarded as a necessary prerequisite to get SCM based collaboration to function (see e.g. Ireland & Bruce, 2000).

For the same reason a higher degree of involvement from top management should also increase the degree of joint strategic planning between the actors. No such relation can however be found in this study; a higher degree of top management involvement in the ongoing collaboration is not positively related to the degree of joint strategic planning of supply chain activities.

To conclude, top management has a more active role the more intensive the collaboration is on an operative level, but however not in collaborations with more joint strategic planning. A reason for this interest could be that it is the intensity of the collaboration on an operative level that causes the positive effects of the collaboration rather than if the collaboration includes joint planning on a strategic level (see also chapter 6.4). The results can be interpreted as if the top management engage in operative issues since these are connected to the intensity of the collaboration. It is the intensity that in turn causes the positive effects of the collaboration, rather than joint planning on a strategic level.

#### **6.1.6 Logistics areas where collaboration is performed**

In chapter 3 it was stated that logistics collaboration covers a broad range of different logistics activities/areas. This study shows that collaboration is performed within all the areas of production planning, forecasting, inventory management and replenishment, and transportation management. Forecasting is, as can be expected when looking at the information types that are shared, also considered to be the most common logistics area where collaboration is performed.

Collaboration in the fifth area, strategic planning, was less common. This can probably be explained due to its more strategic character in comparison to the other areas, which can be considered as more operative. When compared with the results for how planning of supply chain activities were performed the same pattern can be seen; the respondents' collaborations are in general more operative than strategic in their character.

## **6.2 *Driving forces, barriers and effects of logistics collaboration***

The second research question is concerned with the driving forces, barriers and effects of the collaboration. Below, each aspect is discussed one by one.

### **6.2.1 Driving forces**

With regard to driving forces for the collaboration, 72.6% of the respondents have answered 4 or 5 to the question of how important cost related factors were. The same figure for service related factors was 95.3%. Mean values were 3.87 and 4.43 respectively. The results are valid for all types of companies, i.e. size of company and product characteristics.

The results indicate that both cost and service are considered as important reasons for setting up a collaboration. This is in line with the SCM literature, which advocates improvements to both cost reduction as well as service enhancements as a consequence of increased SCM and collaboration. The findings are also in line with previous survey based research made by Speakman et al. (1998), who found that the most important reasons to engage in SCM collaboration could be found both on issues related to cost reduction as well as service. The most important reasons for this, according to their study, were increased end-customer satisfaction, improved profits, satisfy supplier/customer requests and reduction of overall operating costs.

### **6.2.2 Barriers**

In chapter 3 the barriers investigated in this study were divided into two main groups; human related and technology related barriers. The results are shown in Figure 5.7. When considering the human related barriers, which to a high extent are the same questions that investigated the respondents' SCO discussed above, the problems experienced can generally be considered as low.

One factor that can be considered as especially important is the involvement from top management. The positive relationship between the degree of top management involvement and the intensity of collaboration discussed in chapter 6.1.5 indicates that top management involvement is needed in order to make intensive collaboration happen. Thus, an important barrier for collaboration could be a lack of top management involvement.

Technology related barriers are the second most commonly experienced problem according to the respondents. The results of this study are in accordance with the results presented by Hoffman & Mehra (2000) discussed in chapter 3, and show that technology related problems still occur and can not be ignored. Despite the development in the area over the past few decades, IT and technology related problems could still be considered as a main barrier in ongoing collaborations.

### **6.2.3 Effects**

Figure 5.8 shows that the respondents in general experience positive effects from their collaboration. More positive effects are in general experienced on service related issues than cost related ones, even if differences are small. Apart from positive effects directly connected to either cost reduction or service improvements, this study also shows on more intangible effects of the collaboration, i.e. increased competitiveness, clearer division of responsibility between partners, and more measurements and follow ups.

The high mean values on experienced positive effects, together with the rather low rates of experienced barriers, can probably explain the very high mean value (4.43) of the variable which investigates how positive the respondents were towards their collaborations as a whole. The results were not unexpected due to the method chosen in the study. The respondents were asked to choose one of their collaborations and answer questions about this specific relation. Even if they were asked to choose the most important relation, many respondents have probably chosen a collaboration they were fairly satisfied with.

In dyadic collaborations the effects for the other side was also investigated. The most commonly experienced effect considering mean values is that the focal company has improved their service towards actors situated on the other side of the company. 42.4% of the respondents have answered 4 or 5 to this variable, indicating a high degree of service improvements. From this result it can be concluded that the respondents' dyadic collaborations on one side of the company also have had an impact on companies situated on the other side of the company. This is valid for both types of dyadic collaborations, i.e. independent of whether the collaboration is performed with a supplier or with a customer.

These results could be due to the information sharing between the collaborating actors, which could facilitate an improved service also towards actors situated before and after the collaborating partners in the supply chain. Thus, the increased transparency of information can explain why the respondents experience that their service towards other actors in their supply chain has been improved.

### 6.3 The type of collaboration

The third research question investigates what type of collaboration was performed. In the questionnaire the respondents were asked to choose one of their existing relations that they regarded as a collaboration and answer questions about this specific collaboration.

The distribution of what type the respondents chose to consider when answering the questionnaire is roughly a fourth choosing triadic collaborations and a third in each type of dyadic collaboration, see Figure 6.1 below. The remaining 9.6% answered that they had no relation that they considered as a collaboration. The distribution shows that the majority of all companies are not engaged in triadic collaboration, which is considered as a minimum for SCM.

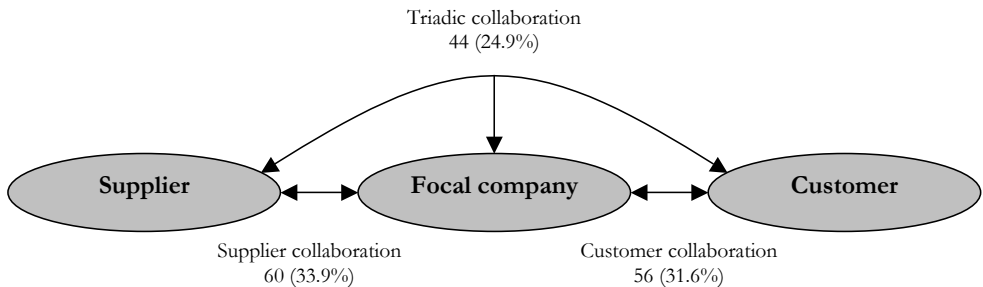


Figure 6.1 The distribution of chosen type of collaboration

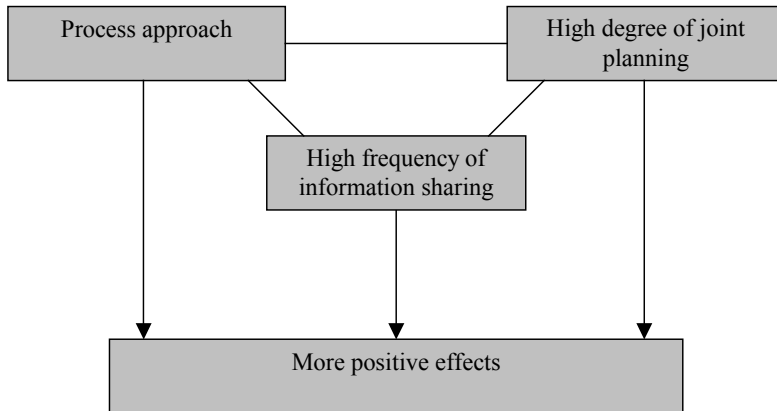
## **6.4 Relations between different research questions**

The fourth research question is concerned with relations between the other three research questions. The main results that will be discussed and analysed further in this chapter can be summarised as follows:

- According to existing literature a process approach, a high intensity of information sharing and joint planning would cause more positive effects in a collaboration. This study can confirm the positive relations between a process approach and joint operative planning on one hand, and more positive effects on the other.
- As to the degree of joint strategic planning concerns, this seems to be independent of the effects experienced. The reason for this could be that joint strategic planning is only weakly related to what is done on an operative level in the collaboration.
- Involvement from top management, apart from its importance in the collaboration (see chapter 6.1 above) seems also be important in order to achieve positive effects towards companies situated on the other side of the focal company.
- There exist some main differences in attitude and behaviour between the different types of collaboration.

### **6.4.1 The content of logistics collaboration and experienced barriers and effects**

In chapter 6.1 it was concluded that the three aspects investigating actions undertaken in the collaboration were closely related to each other and that “more of one thing also means more of the other two”. According to SCM literature, a high intensity of these actions would lead to improved supply chain performance, which in turn would lead to more positive effects, see Figure 6.2.



**Figure 6.2 The intensity in actions undertaken in the collaboration and their relation to more positive experienced effects**

Below follows a discussion based on existing literature and the results from this study.

***The process approach***

Starting with the process approach, the argumentation in literature for the importance of a process approach in the collaboration can be summarised and related to this study with the following logical chain of reasoning starting with a description of a process and leading to better achieved effects:

A description and definition of the collaboration in terms of a process will lead to a better understanding of what activities are involved in the collaboration and how they are related to each other. This becomes especially important in interorganisational collaboration when the process stretches over company borders, since it is often difficult to understand and get a good insight in other actors' internal activities. A good knowledge about the objectives of the process (i.e. the collaboration), and how involved activities are structured and related, is considered as a prerequisite in order to be able to measure the outcome from the collaboration properly. The measurement is in turn a prerequisite for improvements of the collaboration; without proper measurements it is far more difficult to know if a certain change in the collaboration really contributed to an improvement of the collaboration. (Melan, 1993; Willoch, 1994)

In chapter 5 analyses were presented that can confirm the importance of a having a process approach in order to achieve positive effects in the collaboration. To start with, respondents with a defined process in their collaboration experience a significantly clearer division of



responsibilities between the participating actors. As discussed above, the description of a process will make the actors aware of the activities involved and this will contribute to a better understanding of the collaboration. Thus, a clearer division of responsibility between the participating actors can be interpreted as a consequence of a clear process approach. It can also, together with proper measurements, be interpreted as an important driver for improvements of the collaboration. A clear responsibility description makes it less possible to avoid taking actions for improvements and instead think that someone else will do it.

The respondents with a defined process also measure the collaboration more, both in terms of costs and lead times as well as service. Moreover, the results show that respondents that measure more also experience better effects of what they measure. In Table 5.8 it can be seen that respondents who measure costs also experience more positive cost related effects. The same can be seen for those respondents that use service related measurements to a high extent. Concerning lead times this seems to have an impact on service related effects and the more intangible effect of being more competitive.

Related to the process approach, the importance of having a predefined way of how to share costs and savings in the collaboration was discussed in chapter 3. This would further facilitate improvements to the collaboration being made. This study can however not support any differences in effects experienced between respondents with more or less predefined ways of how to share costs and savings. As discussed in chapter 6.1.1 the low rate among the respondents about a predefined way of sharing implies a great potential for further improvements. This reasoning is also applicable for the low rate (24%) of respondents with a defined and documented process in their collaborations.

### ***Information sharing***

The positive relation shown in Figure 6.2 between a more frequent information sharing and more positive effects experienced is another fundamental relation when considering SCM literature. As stated in chapter 2.4.3, information sharing is a prerequisite for collaboration and has a great impact on performance in the supply chain. The underlying basic explanation for this statement is that access to information can reduce uncertainties in the supply chain (Yu et al., 2001). An increased frequency of information sharing can help to reduce the uncertainty and dampen the Bullwhip effect, and thereby reduce the need for example inventory as a buffer between actors in the supply chain.

On a general level the arrow in Figure 6.2 between a higher frequency of information sharing and more positive effects could be confirmed in this study; respondents that belong to the cluster with more positive effects (see chapter 5.5.1) also share information more frequently. However, due to the differences in intensity of information sharing among the types of

collaboration and a too low rate of respondents, the results can not be considered as independent from what type of collaboration that is performed. Thus, this study can neither support nor disprove the existing literature.

### ***The planning of supply chain activities***

The explanation as to why a higher rate of joint planning causes better effects of the collaboration could also be explained with the starting point in the reduction of uncertainty. Joint planning can be considered as a kind of information sharing since it demands communication between the actors. As stated in the frame of reference about the concept of CPFPR, this communication with a constant “negotiation” connects and integrates the actors with each other, which in turn leads to problem solving and improved effects. (Barratt & Oliveira, 2001)

As shown in chapter 5, this study can confirm the relation between a high level of joint operative planning and more positive effects from the collaboration. It is above all service related effects, lead time improvements, and other more intangible effects that are improved by the joint operative planning.

The expected positive relation between a high degree of joint strategic planning of supply chain activities and better effects (as shown in Figure 6.2) can not be confirmed by this study. The lack of relationship could be due to the fact that the study also shows on weak relations between a higher rate of strategic planning and increased intensity in the collaboration (concerning actions undertaken in the collaboration). Thus, a reason for the lack of relationship could be that it is the intensity that causes the positive effects, and a high degree of joint strategic planning does not contribute to this.

The increased process approach and intensity in information sharing and joint operative planning is however not easily carried out and is in some cases connected to more problems experienced in the collaboration. For example, respondents with a defined process experience more problems with the variable “different goals of the participating actors”. This should however not be interpreted as if documentation of processes makes the collaboration more difficult. Instead, this result should be interpreted as respondents who work with processes in their collaborations become more aware of the problems and thus have a better possibility to deal with them and minimise them. Actors collaborating without processes may not even be aware of some of the problems.

#### **6.4.2 The content and effects on the other side of the company**

Respondents with dyadic collaboration were also asked questions about effects experienced on the other side of their company, i.e. a respondent with a supplier collaboration was asked if this collaboration had generated positive effects for his relations with customers, and vice versa.

Ireland & Bruce (2000) state that dyadic collaboration is good due to the increased integration of interorganisational issues in the supply chain. It provides a great step forward but still the main challenge exists, namely to link the supplier side with the customer side. To make this happen, internal collaboration is needed, which is often harder to carry out than external due to factors such as the lack of internal performance metrics (Barratt, 2004). Based on existing literature, it was in chapter 3 assumed that an internal process approach was needed to facilitate the internal collaboration and link the two sides of the company more properly.

The results of this study can however not support this argumentation. The degree of internal process documentation was not positively related to experienced effects on the other side of the company. This result should however not be interpreted as if internal process documentation is unimportant. Instead, the lack of a positive relationship could be due to the fact that the respondents' internal process documentation is not used and applied properly in the company.

Instead of an internal process approach this study shows that an important factor for achieving positive effects on the other side of the company seems to be the involvement from top management in the collaboration. A positive relationship between top management involvement in the ongoing collaboration and increased collaboration on the other side was found. It could be argued that a high degree of commitment in the collaboration makes the top management aware of the possibilities for the other side of the company. Thus, thanks to the top management involvement in the dyadic collaboration on one side of the company, relations on the other side of the company could be positively influenced.

Andraski (1998) claims that external as well as internal collaboration “will only become reality if driven by effective leadership” (Andraski, 1998, p. 11). Top management must understand what the collaboration means (Ireland & Bruce, 2000), and have an *active* role and be *involved* in the collaboration. Note that the word “driven” used by Andraski above indicates that “support” is not enough. In this study the word “involvement” has been used in order to distinguish from top management support.

### 6.4.3 Differences between types of collaboration

When considering the results of research question one (the content) and two (driving forces, barriers and effects), some important significant differences between the types were found. These differences are discussed in this chapter.

#### *Supplier vs customer collaborations*

Starting with the dyadic collaborations, it can be concluded that some main differences in attitudes and behaviour between supplier and customer collaborations exist, despite the fact that no differences concerning background variables such as e.g. company size and characteristics of the products can be found. The most important differences are shown in Table 6.1.

**Table 6.1 Differences between respondents with supplier and customer collaborations**

Supplier collaborations	Customer collaborations
More influence on the design of the collaboration	More top management involvement
Less problems with the sharing of costs and rewards between the parties	More intensive information sharing and use of EDI and internet based alternatives
Involves more strategic planning	More technology related problems
	More improvements on service towards collaboration partner
	More increased competitiveness

According to conceptual SCM literature these differences should not exist. SCM philosophy advocates a focus on end customer demand and that the whole supply chain should be managed as one single entity. This leaves possible differences in behaviour depending on if the partner is a supplier or a customer out of the scope for most SCM literature.

In comparison to the supplier collaborations, customer collaborations seem to be more important for the focal company and are in general more advanced. They are getting more attention from top management and contain more intensive information sharing. Related to this, (probably as a consequence thereof) EDI and Internet based communication means are used to a higher extent. This is also mirrored in the barriers experienced of the collaboration; respondents collaborating with their customers also report significantly more technology related problems.

Despite the lower top management involvement, respondents with a supplier collaboration consider their collaboration to involve more strategic planning than their colleagues with customer collaborations (even if the rate still is low). Note that this is the respondent's own

opinion and that the discussed strategic planning is made within *their own* company; no differences can be found when considering the degree of *joint* strategic planning in the collaborations.

An explanation for why respondents with a supplier collaboration feel that their collaborations contain more strategic planning could be that these respondents also feel that they have significantly more influence on the design of their collaborations. The more the own company can influence and manage the collaboration, the more strategic it becomes for the company.

When considering effects of the collaboration the difference between upstream and downstream relations becomes even clearer. Respondents with customer collaborations experience to a significantly higher extent that their service towards their partner has been improved and that they have been more competitive as a consequence of their collaboration. These results are in line with Mattsson (2002), who discusses differences in attitudes between suppliers and customers. The differences can be explained by the fact that respondents with customer collaborations often find themselves in a weaker negotiation position than their colleagues with supplier collaborations. They feel that they need to struggle for keeping their customers and therefore the service towards their customers becomes important. The collaboration can also increase their competitiveness due to the closer ties with the customer, which in turn strengthens the opportunities to keep the customer.

### ***Triadic vs dyadic collaborations***

When considering the results of triadic collaborations and comparing these to the other two types it can be stated that triadic collaborations are similar to supplier collaborations in some respects and similar to customer collaborations in others. Not a single analysis in SPSS was made where a significant difference with both customer and supplier collaboration was found. Looking at mean values the third type is then placed in between the other two (see e.g. Table 5.12).

Triadic and supplier collaborations are similar with respect to their greater possibility to influence and design the collaboration and that it is considered to involve more strategic planning (in comparison to the customer collaborations). With its position in the middle of the collaboration, these features of the triadic collaborations can be considered to be expected. As already discussed, the focal company should be able to link the supplier with the customer and has probably a great responsibility for the transfer of information etc between the customer and the supplier. The fact that the respondents with triadic collaborations also use considerably more service and lead times related measurements also supports this<sup>52</sup>. The

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<sup>52</sup> As discussed in chapter 5.5.2 a significant difference was found only between triadic and supplier collaborations, but the mean values between triadic and customer collaboration also differs considerably.

measurements could be an important instrument in order to link the other actors successfully and facilitate the recognition of possible sources of errors in the collaboration.

When considering top management involvement in ongoing collaboration and the effect “we have been more competitive”, the triadic collaboration resembles the customer collaboration. The high degree of top management support in ongoing collaborations can be explained in the same way as for its importance for achieving effects on the other side of the company in dyadic collaborations; the focal company’s position in the middle demands an active top management. As is the case for the involvement of top management in dyadic collaborations when considering effects on the other side of the company, top management support is expected to remove functional silos and enable an efficient and effective collaboration.

Similar to respondents involved in dyadic customer collaborations, respondents with triadic collaborations experience that their collaborations have increased their competitiveness significantly more than respondents with supplier collaborations. In the same way as in the case for dyadic relations, earlier studies (Mattsson, 2002) show the importance of having close relations downstream.

# 7 Conclusions

As discussed in the background chapter of this thesis, SCM aims to improve the total supply chain performance through collaboration among independent actors in the supply chain. The supply chain should be managed as one single entity where end customer satisfaction is the superior goal for all involved actors. This demands collaboration on a strategic level and that all involved actors have a true supply chain orientation. This new way of thinking, which in turn demands an extensive strategic change in the mindsets of the supply chain actors, should enable them to work and act in one common direction towards common goals.

Such collaboration based on a supply chain orientation has however proved to be a rare occurrence in real existing supply chains. Ireland & Bruce (2000) argue that despite success stories where logistics collaboration has contributed to extraordinarily positive benefits, most companies of today have not understood the potential of SCM based collaboration. They are still occupied with internal optimisations and have not adopted the SCM philosophy.

In addition to this, Speakman et al. (1998) identify some main differences in attitude and behaviour depending on whether the collaboration is performed with a supplier or a customer. These differences, which are in conflict with a true supply chain orientation, can have serious consequences for the supply chain:

“In summary, we have implied that business has yet to crack the code; supply chain partners still do not share a common vision or react to the same set of metrics. If this is true, opportunities have been lost and many challenges remain. For a number of firms, talk is cheap and supply chain management is still only part of today’s jargon. A number of firms are

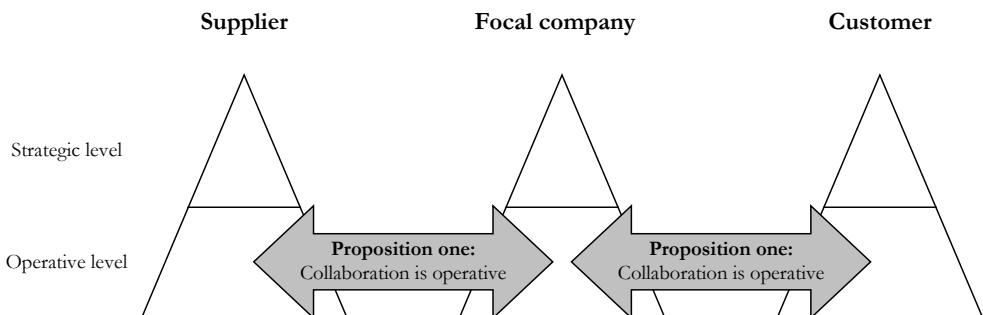
sacrificing cost effectiveness, revenue enhancement, and customer satisfaction because they are unable to work effectively across the firms that comprise their supply chains.” (Speakman et al., 1998, p. 648)

Mattsson (2002) describes this phenomenon as “the traditional view” of supplier-customer relations where the customer “demands what he wants” from the supplier. The reason for these differences is that the customer in many cases has a stronger position for negotiation and that this position is used to optimise the own company’s business.

The results of this study confirm previous findings that the reality is far from that total SCM environment described in many conceptual articles on the subject. In fact, the description of logistics collaboration given in this thesis shows that companies involved in collaboration are still concerned with operative issues and that their collaboration is seldom brought to a strategic level. In addition to this, the results indicate that there are serious differences in attitude and behaviour between supplier and customer collaborations. The study also shows that it is more intensive collaboration on an operative level that contributes to the achievement of better results, and that top management involvement has shown to be an important driver for such collaboration. Below five propositions summarise the most important findings of this thesis.

***Proposition one: Logistics collaboration as practiced today is concerned with operative issues, and is seldom brought to a strategic level***

When considering the content of the respondents’ collaborations, it can be concluded that they are to a high extent concerned with operative issues and that the degree of strategic elements is very low, see Figure 7.1 below:



**Figure 7.1 Logistics collaboration as practiced today is concerned with operative issues**

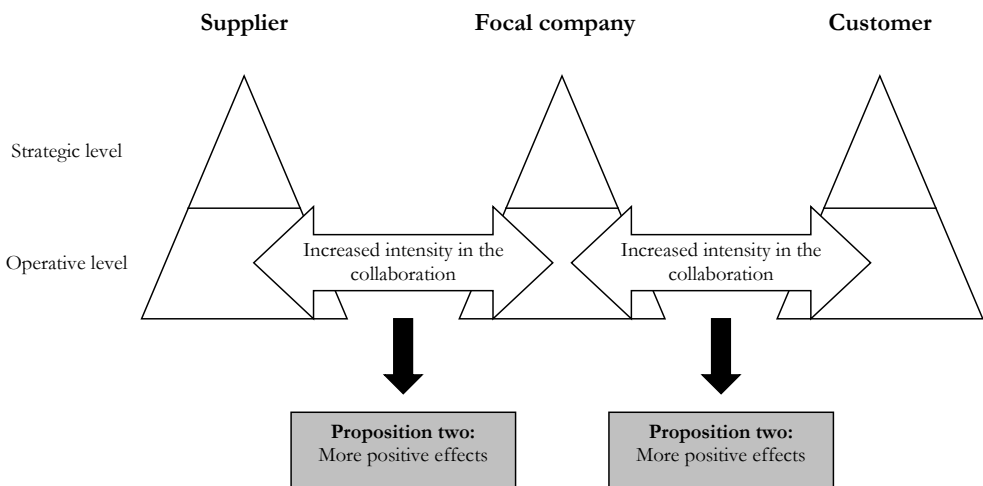


This result confirms that SCM as it is discussed in conceptual articles is a rare occurrence. Collaboration based only on operative issues can not be regarded as enough to consider SCM as realised; it is first when strategic issues are involved that a shift towards real SCM based collaboration can be possible.

The low rate of strategic issues in the collaboration could also be the reason for why the respondents' SCO seems to be rather good among the respondents. The operative content in existing collaborations does not challenge the respondents' SCO since such collaboration can be managed without demanding a change of mindset among the participating actors.

***Proposition two: Companies with more intensive collaboration on an operative level achieve better effects from their collaboration***

Several of the analyses presented in this study show that respondents with more intensive collaborations on an operative level achieve better effects of their collaborations, see Figure 7.2:



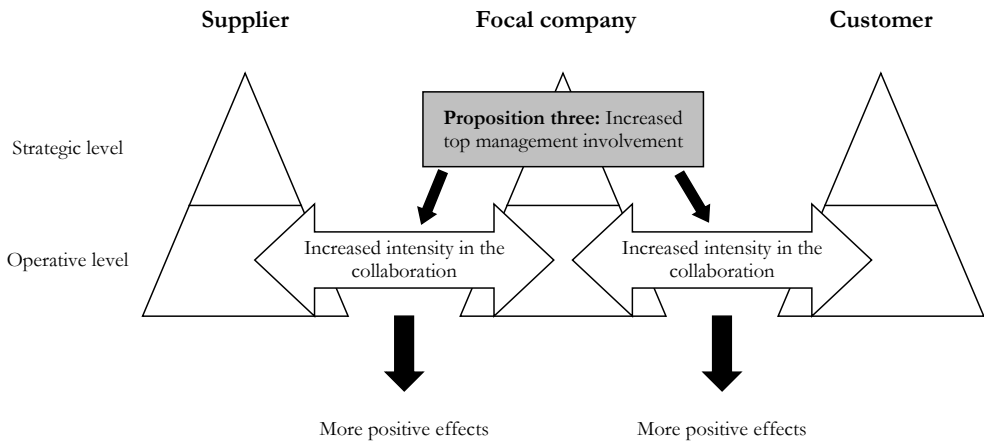
**Figure 7.2 Increased intensity of the collaboration on an operative level contributes to the achievement of better effects**

In accordance with the SCM literature and common sense this observation is obvious. Existing collaborations can however despite the obvious advantages not always be considered as intensive. The process approach in the collaborations is perhaps the area with the greatest potential for improvements in order to bring about more intensive collaboration. The degree of process approach in collaborations is very low, which implies that it still is neglected among existing collaborations. An improved process approach could also be an enabler for more strategic collaboration, which is needed for true SCM collaboration (see proposition one).

***Proposition three: Top management involvement is an important driver for increased intensity in logistics collaboration***

This study supports the view that together with an improved process approach in the collaboration, top management involvement is as an important driver to increase the intensity of the collaboration and thereby achieve better effects. Note that support from top management is not enough; the management must also be involved in the collaboration as an active part.

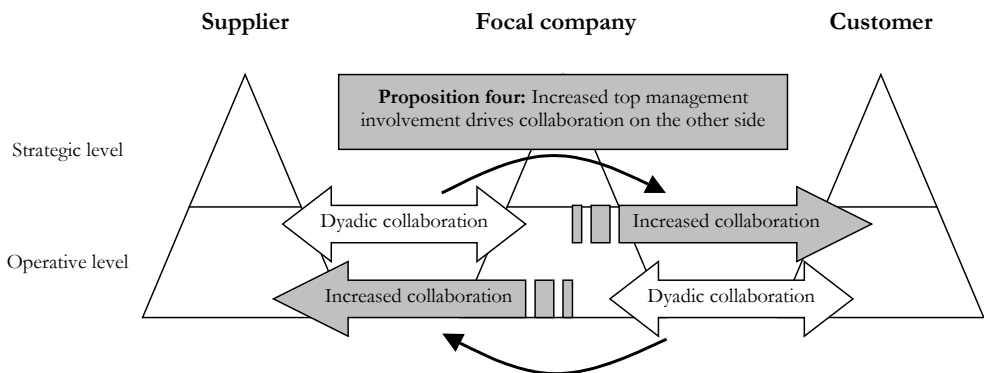
The proposition is presented in Figure 7.3:



**Figure 7.3 The connection between top management involvement, intensity of the collaboration and experienced effects**

***Proposition four: Top management involvement in dyadic collaboration is an important driver for increased collaboration on the other side of the focal company***

In case of dyadic collaboration, top management has also proved to be an important driver for increased collaboration with companies situated on the other side of the focal company. Top management is expected to facilitate the internal collaboration at the focal company, which is a prerequisite for linking the supplier side with the customer side and vice versa. Thus, as a consequence of their involvement in dyadic collaboration on one side of their company, top management also functions as a driver for more collaboration on the other side, see Figure 7.4:

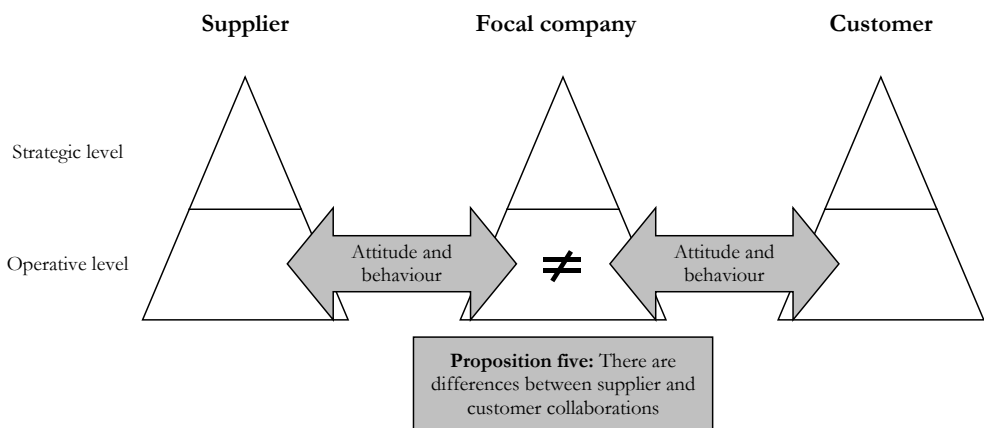


**Figure 7.4 Top management involvement drives collaboration on the focal company's other side**

***Proposition five: There are differences in attitude and behaviour between customer and supplier collaborations***

Apart from a low rate of strategic issues in the collaborations, the differences identified between supplier and customer collaborations (see Figure 7.5 below) also indicate that SCM based collaboration is more of an utopia than a reality. Speakman et al. referred to above presented their discouraging results about differences among supplier and customer collaborations in 1998. These results can still be considered to be valid seven years later, at least in case for Swedish manufacturing companies.

In general this study points to the fact that the focal company upstream seems to be able to manage and design relations in the supply chain much more than in the case for relations downstream. This recognised pattern can have serious consequences and risk a true supply chain orientation among the actors in the supply chain.



**Figure 7.5 Differences between supplier and customer collaborations**



## 8 Future research

This study takes the perspective of a focal company on SCM and collaboration issues in a supply chain. It is my belief that more studies on SCM issues with a company perspective should be undertaken. This would make the research into SCM and its consequences progress. Three areas of special interest for further research can be identified in this study.

One of the most interesting results from this study is the respondents' low degree of process approach in their collaborations. Therefore this area has a great potential for improvement in the collaboration. As a first step the reasons for the low figure must be investigated and analysed further. Here more in-depth studies have to be performed in order to increase the understanding for the underlying reasons. One possible reason for the lack of process approach could be that in reality most companies have to manage several relations that they consider to be collaborations. Since a process approach encourages continuous improvements of the activities involved, the focal company will have to constantly evaluate such a change for all relations they have. A change could be difficult to realise due to interest conflict between different relations. On a basic level this question is concerned with the classic conflict between a functional oriented organisation and the process approach advocated by SCM. More research is needed on the subject of why functional interests still seem to override a process approach in the organisation.

Another phenomenon observed in this study is the lack of relationship between strategic joint planning and what is done in the collaboration on an operative level. It is in turn these issues that are found to be positively related to the investigated effects of the collaboration. Thus, the amount of strategic joint planning does not make any difference to the results (effects) of the

collaboration, at least not the effects that were investigated in this study. Further studies are needed in order to explain the mechanisms and the interplay between the different levels of planning and the effects of collaboration.

Finally, the recognised differences between supplier and customer collaborations cannot be ignored in future research. The results from this study show that reality is far away from SCM based collaboration and that research therefore has to adapt to this fact. This specific area could be further developed by more influences from literature about power and dependence.

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# **Appendix A**

**Cover letter to the questionnaire**





## **Enkät om Supply Chain Management och samarbete i försörjningskedjor**

### **Bästa respondent!**

På avdelningen Logistik, Linköpings universitet, pågår just nu ett forskningsprojekt som behandlar Supply Chain Management och samarbete i försörjningskedjor. Vi undrar om Ni vill främja den svenska logistikforskningen genom att besvara en enkät som utarbetats inom ramen för projektet.

Enkäten skickas till ca 500 svenska företag inom tillverkande industri (SNI-kod D) och handlar främst om eventuella logistiksamarbeten Ni har med Era kunder och/eller leverantörer. Syftet med enkäten är att få en klarare bild över hur företag samarbetar kring logistik i försörjningskedjor och vilka effekter det egentligen får.

Enkäten tar ca 25 minuter att fylla i. I första hand vänder sig enkäten till logistikchefen på respektive företag, men om Ni anser någon annan i företaget vara mer lämplig för att besvara den kan Ni förstås låta denna person göra det.

Era svar behandlas naturligtvis konfidentiellt, dvs ingen utanför avdelningen Logistik på Linköpings universitet kommer att ta del av några enskilda företags svar. Alla svar kommer enbart att presenteras i aggregerad form, vilket innebär att inga enskilda respondenters svar kommer att kunna urskiljas.

Om Ni är intresserad av att få en sammanställning av resultatet från enkäten ber vi Er att tillsammans med enkäten bifoga Er e-mailadress.

Ansvariga för enkäten är professor Mats Abrahamsson samt doktorand Erik Sandberg. Vi vore mycket tacksamma om Ni inom två veckor besvarar enkäten och skickar tillbaka den med det bifogade svarskuvertet.

Om Ni har några frågor får Ni gärna kontakta Erik på:

Tel nr 013-284492  
E-mail: [ersan@eki.liu.se](mailto:ersan@eki.liu.se)

Med vänliga hälsningar

Erik Sandberg

Mats Abrahamsson

## Förtydligande av samarbete

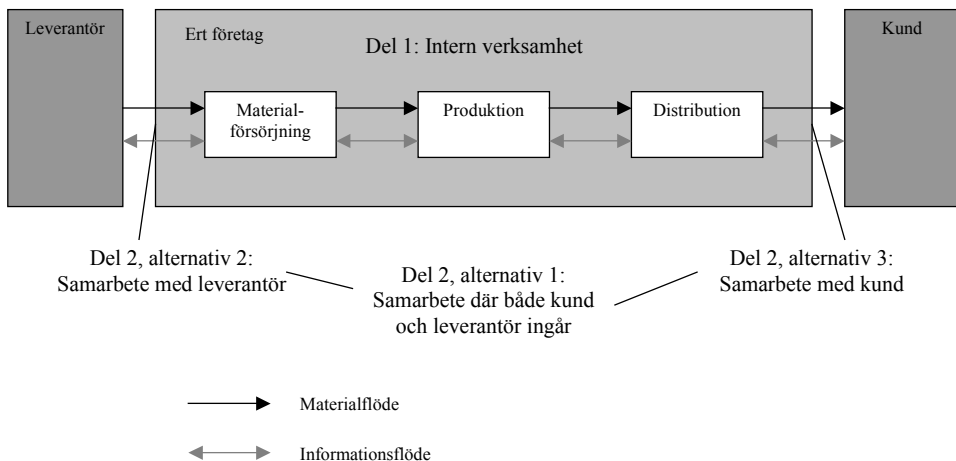
Denna enkät handlar om kund- och leverantörsrelationer som kan betecknas som logistiksamarbeten. Med detta avses relationer som präglas av öppenhet och förtroende och där risker, vinster och kostnader delas mellan parterna. Ett ”grundkrav” för att få kalla en relation för samarbete är att alla inblandade parter aktivt kan vara med och påverka samarbetets utformning. Samarbetet kan handla om exempelvis utbyte av logistikrelaterad information, samplanering av leveranser, lagerpåfyllnad mm.

Sådana typer av logistikrelaterade samarbeten kan man ha med flera olika sorters företag. Vi är dock enbart intresserade av eventuella samarbeten Ni har med andra aktörer som finns i Er direkta försörjningskedja, dvs Era kunder och leverantörer av fysiska produkter. Observera att detta inte innefattar sk tredjepartslogistikföretag eller konsultbolag.

En del av respondenterna till denna enkät tillhör stora multinationella koncerner där det kan vara svårt att uttala sig om hela koncernens logistikverksamhet. Vi ber Er därför att i sådana fall enbart svara för den företagsenhet/dotterbolag eller dylikt där Ni bedriver verksamhet.

## Enkätens utformning

Efter ett par inledande frågor om Ert företag (Del 1) kommer Ni bli ombedd att välja ut **en** kund- och/eller leverantörsrelation som Ni själva betecknar som ett logistiksamarbete och besvara frågor kring detta (Del 2), se figur nedan. Ifall Ni har ett samarbete där både en kund och en leverantör till Er ingår, ber vi Er i första hand välja detta samarbete. I de fall där Ni inte anser Er ha ett samarbete där både en kund och en leverantör till Er ingår, ombeds Ni att välja ut ett samarbete med **antingen** en kund **eller** en leverantör. Samarbetet Ni väljer bör ha en betydande påverkan på Er logistikverksamhet.





# **Appendix B**

**The questionnaire**









**10. Om Ni betraktar Ert företag utifrån de tre övergripande enheterna materialförsörjning, produktion och distribution, i vilken grad har Ni dokumenterat Ert företags interna logistikprocesser?**

*Med "logistikprocess" avses en repetitiv och planerad kedja av logistikaktiviteter som utförs efter varandra på ett standardiserat sätt*

	Inte alls		I hög grad			Ingen åsikt/Vet ej
	1	2	3	4	5	
Vi har dokumenterat våra aktiviteter i <b>materialförsörjningen</b> i form av processer	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Vi har dokumenterat våra aktiviteter i <b>produktionen</b> i form av processer	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Vi har dokumenterat våra aktiviteter i <b>distributionen</b> i form av processer	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Vi har dokumenterat <b>hela</b> vår interna logistikprocess som löper genom alla tre enheterna	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**11. Mäter Ni på något sätt Er logistik med hjälp av processrelaterade nyckeltal, och i så fall vilken typ använder Ni? (Här är mer än ett svarsalternativ möjligt.)**

- Total logistikkostnad för hela företaget
- Genomloppstid (tex från råvarulager till uttransport)
- Kundorderledtid (tex tid från det att en kundorder inkommer till dess att varan är färdig för utleverans)
- Leveransservice (tex andel orderrader som levereras enligt överenskommen leddtid)
- Annat: \_\_\_\_\_
- Vi använder inte processrelaterade nyckeltal
- Vet ej













## 21. Hur ställer Ni er till följande påstående om samarbetet som helhet?

Vi anser att samarbetet är positivt för vårt eget företag:

Håller inte alls med	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Instämmer helt	Ingen åsikt:
	1	2	3	4	5		<input type="checkbox"/>

## 22. Vilken typ av information utbyter Ni och Er partner/Era partners inom ramen för samarbetet och hur ofta?

Information som handlar om...	Varje dag	Minst en gång per vecka	Minst en gång varannan vecka	Minst en gång var tredje vecka	Minst en gång i månaden	Mer sällan eller aldrig
Produktionsplanering	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lagernivåer	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Prognoser/kommande behov	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Försäljningsdata (tex point of sales data)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Felmeddelanden, avvikelser mm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Framtida produktkampanjer mm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Framtida priser och prissättning	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Framtida leveranser o dyl	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bekräftelser och spårning av olika slag, tex leveransbesked och priser	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Annat:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

## 23. I vilken grad är informationen Ni utbyter anpassad/bearbetad för just mottagaren?

Informationen är inte alls anpassad/bearbetad	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Informationen är mycket anpassad/bearbetad	Ingen åsikt:
	1	2	3	4	5		<input type="checkbox"/>

## 24. Vilken är den huvudsakliga kommunikationsformen som används inom ramen för samarbetet?

Traditionella kommunikationsformer (telefon, e-mail, brev, fax mm)

EDI       Internet (XML eller dylikt)       Vet ej



**25. Har Ni tillsammans med Er partner/Era partners definierat och beskrivit Ert samarbete i termer av en process?**

Ja       Nej → *Gå till fråga 27*       Vet ej → *Gå till fråga 27*

**26. Kan Ni kort beskriva var processen börjar (tex en avdelning), var den slutar, och vad som sätter igång processen (tex en händelse, såsom en inkommande order)?**

Processens start: \_\_\_\_\_

Processens slut: \_\_\_\_\_

Vad som sätter igång processen: \_\_\_\_\_

**27. Mäter Ni logistikprestationer inom ramen för samarbetet och i vilken utsträckning använder Ni följande nyckeltal?**

Vi använder nyckeltal som behandlar..	Inte alls					I stor utsträckning	
	1	2	3	4	5	Ingen åsikt/Vet ej	
Totala logistikkostnader för aktiviteter som påverkas av samarbetet (inom båda företagen)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Olika typer av ledtider mellan företagen	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Olika typer av service mellan företagen	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Annat: _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

**28. Hur fördelas eventuella besparingar eller ökningar av logistikkostnader, om en förändring i samarbetet genererar en sådan?**

Besparingen/den ökade kostnaden tillfaller alltid den part där den uppstår	1	2	3	4	5	Besparingen/den ökade kostnaden fördelas mellan parterna på ett fördefinierat sätt	Ingen åsikt/Vet ej
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
							<input type="checkbox"/>



Nedan följer en fråga som vi vill att Ni ska besvara om Ni ovan valt **alternativ två eller tre**, dvs svarat på frågor som rör ett samarbete på antingen Er kund- eller leverantörssida. Vi är härunder intresserade av att veta mer om detta samarbets konsekvenser för Ert företags andra sida, dvs om Ni ovan besvarat frågor kring ett samarbete med en leverantör vill vi nu att Ni funderar över dess konsekvenser för Era kunder och vice versa.

**29. Hur ställer Ni Er till följande påståenden om hur företag på Er andra sida (kund- eller leverantörssidan) har påverkats av Ert samarbete?**

	Instämmer inte alls				Instämmer helt		Ingen åsikt/Vet ej
	1	2	3	4	5		
Samarbetet har lett till ökat samarbete och fördjupade relationer även på den andra sidan av vårt företag	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>
Samarbetet har inneburit att företag på den andra sidan har fått mer information snabbare om tex prognoser och försäljningsinformation (point of sales data)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>
Företag på den andra sidan har tack vare samarbetet kunnat få en bättre service av oss	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>
Annat: _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>

**30. Avslutningsvis undrar vi om Ni är intresserade av att vara med i en mer djupgående studie kring interorganisatoriska relationer, där ett par respondenter kommer att väljas ut och bli intervjuade. Vi ber Er i så fall namnge de företag som ingår i samarbetet Ni besvarat frågor kring ovan**

Ja, vi vill gärna vara med i en mer djupgående studie om samarbete i vår försörjningskedja:

Leverantörens namn: \_\_\_\_\_

Kundens namn: \_\_\_\_\_

Nej tack, vi är inte intresserade

Stort tack för Er medverkan!

Mats Abrahamsson och Erik Sandberg

# **Appendix C**

**The research questions and their relation to the questions in the questionnaire**



## **Company characteristics**

v1-v5

## **The content of logistics collaboration**

### ***Process approach***

Process documentation: v25, v26

Use of measurements: v27

The sharing of costs and rewards: v28

Internal process approach: v6, v10, v11

### ***Planning of supply chain activities***

v17

### ***Information sharing***

Type of information: v22

Frequency of information sharing: v22

Degree of processed/adjusted information: v23

Communication means: v24

### ***Supply chain orientation***

v15, v18, v19\_2 to v19\_8

### ***Logistics areas***

v13, v14

## **Driving forces, barriers and effects**

### ***Driving forces***

v16

### ***Barriers***

v19

### ***Effects***

v20, v21, v29

## **Type of collaboration**

v12, v14

Note that v7-v9 are not included in the thesis.





# **Appendix D**

**SPSS analyses**



**Table D.1: The distribution of the respondents in the sub industries of manufacturing**

<b>Industry</b>	<b>Frequency</b>	<b>Percent</b>	<b>Cumulative percent</b>
Food products, beverages, and tobacco	9	5.1	5.1
Textiles and textile products	7	4.0	9.0
Leather and leather products	0	0.0	9.0
Wood and wood products	9	5.1	14.1
Pulp, paper and paper products; publishing and printing	17	9.6	23.7
Coke, refined petroleum products and nuclear fuel	2	1.1	24.9
Chemicals, chemical products and man made fibres	12	6.8	31.6
Rubber and plastic products	11	6.2	37.9
Other non-metallic mineral products	7	4.0	41.8
Basic metals and fabricated metal products	49	27.7	69.5
Machinery and equipment N.E.C.	14	7.9	77.4
Electrical and optical equipment	18	10.2	87.6
Transport equipment	15	8.5	96.0
N.E.C.	7	4.0	100.0
<b>Total</b>	<b>177</b>	<b>100.0</b>	

**Table D.2: ANOVA analysis on the use of measurements between respondents with a defined process in their collaboration and those without.**

**Descriptives**

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean	
						Lower Bound	Upper Bound
Measurements: Total cost	Yes	33	2,48	1,278	,222	2,03	2,94
	No	97	1,79	1,117	,113	1,57	2,02
	Total	130	1,97	1,194	,105	1,76	2,18
Measurement: Lead times	Yes	37	3,70	1,412	,232	3,23	4,17
	No	104	2,96	1,350	,132	2,70	3,22
	Total	141	3,16	1,400	,118	2,92	3,39
Measurement: Service	Yes	36	3,78	1,124	,187	3,40	4,16
	No	105	3,16	1,360	,133	2,90	3,43
	Total	141	3,32	1,327	,112	3,10	3,54

**ANOVA**

		Sum of Squares	df	Mean Square	F	Sig.
Measurements: Total cost	Between Groups	11,758	1	11,758	8,744	,004
	Within Groups	172,119	128	1,345		
	Total	183,877	129			
Measurement: Lead times	Between Groups	14,991	1	14,991	8,028	,005
	Within Groups	259,576	139	1,867		
	Total	274,567	140			
Measurement: Service	Between Groups	10,168	1	10,168	5,977	,016
	Within Groups	236,470	139	1,701		
	Total	246,638	140			

**Table D.3: ANOVA analysis on to what extent the shared information is processed/adjusted for the receiver between respondents with more or less information sharing.**

**Descriptives**

Degree of processed/adjusted info

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean	
					Lower Bound	Upper Bound
Respondents sharing at least two types of infos per week	100	3,79	1,028	,103	3,59	3,99
Respondents sharing less than two types per week	53	3,42	1,247	,171	3,07	3,76
Total	153	3,66	1,119	,090	3,48	3,84

**ANOVA**

Degree of processed/adjusted info

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	4,869	1	4,869	3,964	,048
Within Groups	185,458	151	1,228		
Total	190,327	152			

**Table D.4: ANOVA analysis on the mean values of frequency of information sharing and the groups of respondents with or without EDI and Internet based alternatives in their collaboration.**

		Descriptives					
		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean	
						Lower Bound	Upper Bound
Info: Production planning	Use only traditional communication means	50	13,18	7,550	1,068	11,03	15,33
	Use of EDI or Internet based sometimes together with trad. c	56	5,71	5,463	,730	4,25	7,18
	Total	106	9,24	7,501	,729	7,79	10,68
Info: Inventory levels	Use only traditional communication means	51	11,88	7,423	1,039	9,79	13,97
	Use of EDI or Internet based sometimes together with trad. c	63	6,90	6,981	,880	5,15	8,66
	Total	114	9,13	7,570	,709	7,73	10,54
Info: Forecasts	Use only traditional communication means	70	16,01	6,254	,748	14,52	17,51
	Use of EDI or Internet based sometimes together with trad. c	73	8,66	6,913	,809	7,04	10,27
	Total	143	12,26	7,540	,631	11,01	13,51
Info: Sales, POS	Use only traditional communication means	23	14,91	7,348	1,532	11,74	18,09
	Use of EDI or Internet based sometimes together with trad. c	44	12,84	8,325	1,255	10,31	15,37
	Total	67	13,55	8,008	,978	11,60	15,51
Info: Error messages	Use only traditional communication means	52	11,58	7,360	1,021	9,53	13,63
	Use of EDI or Internet based sometimes together with trad. c	69	6,91	6,359	,766	5,39	8,44
	Total	121	8,92	7,163	,651	7,63	10,21
Info: Product campaigns	Use only traditional communication means	19	17,68	5,697	1,307	14,94	20,43
	Use of EDI or Internet based sometimes together with trad. c	37	16,38	6,348	1,044	14,26	18,49
	Total	56	16,82	6,114	,817	15,18	18,46
Info: Prices and pricing	Use only traditional communication means	15	18,40	4,983	1,287	15,64	21,16
	Use of EDI or Internet based sometimes together with trad. c	19	17,89	5,087	1,167	15,44	20,35
	Total	34	18,12	4,971	,853	16,38	19,85
Info: Future deliveries etc	Use only traditional communication means	53	14,40	6,960	,956	12,48	16,31
	Use of EDI or Internet based sometimes together with trad. c	66	9,62	7,751	,954	7,72	11,53
	Total	119	11,75	7,754	,711	10,34	13,16
Info: Confirmations	Use only traditional communication means	46	8,67	6,746	,995	6,67	10,68
	Use of EDI or Internet based sometimes together with trad. c	56	5,55	5,383	,719	4,11	7,00
	Total	102	6,96	6,204	,614	5,74	8,18

### ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Info: Production planning	Between Groups	1472,295	1	1472,295	34,527	,000
	Within Groups	4434,809	104	42,642		
	Total	5907,104	105			
Info: Inventory levels	Between Groups	698,304	1	698,304	13,539	,000
	Within Groups	5776,723	112	51,578		
	Total	6475,026	113			
Info: Forecasts	Between Groups	1934,003	1	1934,003	44,417	,000
	Within Groups	6139,424	141	43,542		
	Total	8073,427	142			
Info: Sales, POS	Between Groups	64,855	1	64,855	1,011	,318
	Within Groups	4167,712	65	64,119		
	Total	4232,567	66			
Info: Error messages	Between Groups	645,003	1	645,003	13,925	,000
	Within Groups	5512,171	119	46,321		
	Total	6157,174	120			
Info: Product campaigns	Between Groups	21,406	1	21,406	,568	,454
	Within Groups	2034,808	54	37,682		
	Total	2056,214	55			
Info: Prices and pricing	Between Groups	2,140	1	2,140	,084	,774
	Within Groups	813,389	32	25,418		
	Total	815,529	33			
Info: Future deliveries etc	Between Groups	670,227	1	670,227	12,206	,001
	Within Groups	6424,210	117	54,908		
	Total	7094,437	118			
Info: Confirmations	Between Groups	245,895	1	245,895	6,752	,011
	Within Groups	3641,948	100	36,419		
	Total	3887,843	101			

**Table D.5: ANOVA analysis on to what extent joint planning is performed between respondents with or without a defined process in their collaborations.**

**Descriptives**

Joint operative planning

	N	Mean	Std. Deviation	95% Confidence Interval for Mean	
				Lower Bound	Upper Bound
Yes	38	3,63	1,051	3,29	3,98
No	104	3,22	1,123	3,00	3,44
Total	142	3,33	1,115	3,15	3,52

**ANOVA**

Joint operative planning

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	4,688	1	4,688	3,844	,052
Within Groups	170,756	140	1,220		
Total	175,444	141			



**Table D.6: Cross tabulation between respondents sharing at least two types of information at least once a week and those who do not, and respondents with or without a defined process in their collaboration.**

**Intensity in information sharing \* Described the collaboration as a process Crosstabulation**

			Described the collaboration as a process		Total
			Yes	No	
Intensity in information sharing	Respondents sharing at least two types of infos per week	Count	30	64	94
		Expected Count	24,6	69,4	94,0
	Respondents sharing less than two types per week	Count	8	43	51
		Expected Count	13,4	37,6	51,0
Total	Count		38	107	145
	Expected Count		38,0	107,0	145,0

**Chi-Square Tests**

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	4,503 <sup>b</sup>	1	,034		
Continuity Correction <sup>a</sup>	3,703	1	,054		
Likelihood Ratio	4,768	1	,029		
Fisher's Exact Test				,047	,025
Linear-by-Linear Association	4,472	1	,034		
N of Valid Cases	145				

a. Computed only for a 2x2 table

b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 13,37.

**Table D.7: ANOVA analysis on the involvement from top management in the ongoing collaboration and respondents with more or less intensity in their information sharing.**

**Descriptives**

Top management involvement in ongoing collaboration

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean	
					Lower Bound	Upper Bound
Respondents sharing at least two types of infos per week	104	3,27	1,090	,107	3,06	3,48
Respondents sharing less than two types per week	54	2,70	1,110	,151	2,40	3,01
Total	158	3,08	1,126	,090	2,90	3,25

**ANOVA**

Top management involvement in ongoing collaboration

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	11,368	1	11,368	9,447	,002
Within Groups	187,721	156	1,203		
Total	199,089	157			

**Table D.8: ANOVA analysis on the degree of top management involvement and respondents with low respectively high degree of joint operative planning.**

		Descriptives				
		N	Mean	Std. Deviation	95% Confidence Interval for Mean	
					Lower Bound	Upper Bound
Degree of top management involvement in the initial phase	Respondents with low degree of joint operative planning	37	2,59	1,166	2,21	2,98
	Respondents with a high degree of joint operative planning	82	3,35	1,251	3,08	3,63
	Total	119	3,12	1,270	2,89	3,35
Top management involvement in ongoing collaboration	Respondents with low degree of joint operative planning	37	2,65	1,086	2,29	3,01
	Respondents with a high degree of joint operative planning	82	3,23	1,158	2,98	3,49
	Total	119	3,05	1,163	2,84	3,26

		ANOVA				
		Sum of Squares	df	Mean Square	F	Sig.
Degree of top management involvement in the initial phase	Between Groups	14,690	1	14,690	9,784	,002
	Within Groups	175,663	117	1,501		
	Total	190,353	118			
Top management involvement in ongoing collaboration	Between Groups	8,667	1	8,667	6,715	,011
	Within Groups	151,030	117	1,291		
	Total	159,697	118			

*Comment to Table D.8: The respondents were divided into two groups depending on if they had given low answers (1 or 2) or high answers (4 or 5) on the question of how much joint operative planning that was performed in the collaboration (see also chapter 4.2.7).*

**Table D.9: Factor analysis on the five first variables investigating experienced effects of the collaboration.**

**Communalities**

	Initial	Extraction
Effect: We have got decreased costs	1,000	,787
Effect: Partner has got decreased costs	1,000	,776
Effect: Our service towards partner improved	1,000	,728
Effect: We have become improved service	1,000	,633
Effect: Our service towards other actors improved	1,000	,709

Extraction Method: Principal Component Analysis.

**Total Variance Explained**

Component	Initial Eigenvalues			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2,396	47,924	47,924	2,033	40,665	40,665
2	1,237	24,738	72,662	1,600	31,997	72,662
3	,517	10,343	83,005			
4	,505	10,109	93,114			
5	,344	6,886	100,000			

Extraction Method: Principal Component Analysis.

**Rotated Component Matrix<sup>a</sup>**

	Component	
	1	2
Effect: We have got decreased costs		,884
Effect: Partner has got decreased costs		,862
Effect: Our service towards partner improved	,841	
Effect: We have become improved service	,759	
Effect: Our service towards other actors improved	,842	

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 3 iterations.

**Table D.10: Factor analysis on all nine variables investigating experienced effects.**

**Communalities**

	Initial	Extraction
Effect: We have got decreased costs	1,000	,677
Effect: Partner has got decreased costs	1,000	,781
Effect: Our service towards partner improved	1,000	,679
Effect: We have become improved service	1,000	,565
Effect: Our service towards other actors improved	1,000	,644
Effect: Lead times shorter	1,000	,500
Effect: More competitive	1,000	,487
Effect: More thorough responsibility division	1,000	,490
Effect: More measurement and follow ups	1,000	,297

Extraction Method: Principal Component Analysis.

**Total Variance Explained**

Component	Initial Eigenvalues			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3,836	42,624	42,624	2,848	31,649	31,649
2	1,285	14,273	56,897	2,272	25,248	56,897
3	,836	9,290	66,187			
4	,752	8,353	74,540			
5	,645	7,163	81,703			
6	,576	6,398	88,101			
7	,492	5,463	93,564			
8	,315	3,498	97,062			
9	,264	2,938	100,000			

Extraction Method: Principal Component Analysis.

**Rotated Component Matrix <sup>a</sup>**

	Component	
	1	2
Effect: We have got decreased costs		,821
Effect: Partner has got decreased costs		,873
Effect: Our service towards partner improved	,813	
Effect: We have become improved service	,728	
Effect: Our service towards other actors improved	,802	
Effect: Lead times shorter	,483	,516
Effect: More competitive	,462	,522
Effect: More thorough responsibility division	,562	,418
Effect: More measurement and follow ups	,479	

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

<sup>a</sup> Rotation converged in 3 iterations.

**Table D.11: Cluster analysis on the variables investigating experienced effects of the collaboration**

**Final Cluster Centers**

	Cluster	
	1	2
Effect: We have got decreased costs	3	4
Effect: Partner has got decreased costs	3	4
Effect: Our service towards partner improved	3	4
Effect: We have become improved service	3	4
Effect: Our service towards other actors improved	3	4
Effect: Lead times shorter	3	4
Effect: More competitive	3	4
Effect: Clearer division of responsibility between partners	3	4
Effect: More measurement and follow ups	3	4

**ANOVA**

	Cluster		Error		F	Sig.
	Mean Square	df	Mean Square	df		
Effect: We have got decreased costs	37,058	1	,938	125	39,505	,000
Effect: Partner has got decreased costs	59,301	1	,683	125	86,790	,000
Effect: Our service towards partner improved	25,000	1	,613	125	40,759	,000
Effect: We have become improved service	26,992	1	,533	125	50,602	,000
Effect: Our service towards other actors improved	22,881	1	,956	125	23,925	,000
Effect: Lead times shorter	37,003	1	,776	125	47,662	,000
Effect: More competitive	18,310	1	,687	125	26,651	,000
Effect: Clearer division of responsibility between partners	23,773	1	,624	125	38,111	,000
Effect: More measurement and follow ups	34,610	1	1,059	125	32,669	,000

The F tests should be used only for descriptive purposes because the clusters have been chosen to maximize the differences among cases in different clusters. The observed significance levels are not corrected for this and thus cannot be interpreted as tests of the hypothesis that the cluster means are equal.

**Number of Cases in each Cluster**

Cluster 1	39,000
Cluster 2	88,000
Valid	127,000
Missing	50,000

**Table D.12: ANOVA analysis on the variables investigating experienced effects of the collaboration between respondents with or without a defined and documented process in their collaboration.**

**Descriptives**

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean	
						Lower Bound	Upper Bound
Effect: We have got decreased costs	Yes	36	3,58	1,251	,208	3,16	4,01
	No	101	3,53	1,082	,108	3,32	3,75
	Total	137	3,55	1,124	,096	3,36	3,74
Effect: Partner has got decreased costs	Yes	32	3,56	1,162	,205	3,14	3,98
	No	94	3,62	1,006	,104	3,41	3,82
	Total	126	3,60	1,044	,093	3,42	3,79
Effect: Our service towards partner improved	Yes	38	4,16	,789	,128	3,90	4,42
	No	103	4,11	,959	,095	3,92	4,29
	Total	141	4,12	,914	,077	3,97	4,27
Effect: We have become improved service	Yes	37	4,11	,737	,121	3,86	4,35
	No	101	3,84	,903	,090	3,66	4,02
	Total	138	3,91	,867	,074	3,77	4,06
Effect: Our service towards other actors improved	Yes	38	3,97	1,000	,162	3,65	4,30
	No	102	3,62	1,072	,106	3,41	3,83
	Total	140	3,71	1,061	,090	3,54	3,89
Effect: Lead times shorter	Yes	38	4,11	,894	,145	3,81	4,40
	No	103	3,84	1,127	,111	3,62	4,06
	Total	141	3,91	1,072	,090	3,74	4,09
Effect: More competitive	Yes	35	3,91	,919	,155	3,60	4,23
	No	99	3,84	,889	,089	3,66	4,02
	Total	134	3,86	,894	,077	3,71	4,01
Effect: Clearer division of responsibility between partners	Yes	38	3,79	,875	,142	3,50	4,08
	No	97	3,40	,909	,092	3,22	3,59
	Total	135	3,51	,913	,079	3,36	3,67
Effect: More measurement and follow ups	Yes	38	3,71	1,063	,172	3,36	4,06
	No	101	3,31	1,189	,118	3,07	3,54
	Total	139	3,42	1,167	,099	3,22	3,61

## ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Effect: We have got decreased costs	Between Groups	,063	1	,063	,049	,824
	Within Groups	171,879	135	1,273		
	Total	171,942	136			
Effect: Partner has got decreased costs	Between Groups	,071	1	,071	,065	,800
	Within Groups	136,088	124	1,097		
	Total	136,159	125			
Effect: Our service towards partner improved	Between Groups	,072	1	,072	,086	,770
	Within Groups	116,878	139	,841		
	Total	116,950	140			
Effect: We have become improved service	Between Groups	1,924	1	1,924	2,589	,110
	Within Groups	101,033	136	,743		
	Total	102,957	137			
Effect: Our service towards other actors improved	Between Groups	3,510	1	3,510	3,164	,077
	Within Groups	153,062	138	1,109		
	Total	156,571	139			
Effect: Lead times shorter	Between Groups	1,885	1	1,885	1,647	,201
	Within Groups	159,094	139	1,145		
	Total	160,979	140			
Effect: More competitive	Between Groups	,149	1	,149	,185	,668
	Within Groups	106,157	132	,804		
	Total	106,306	133			
Effect: Clearer division of responsibility between partners	Between Groups	4,098	1	4,098	5,064	,026
	Within Groups	107,635	133	,809		
	Total	111,733	134			
Effect: More measurement and follow ups	Between Groups	4,498	1	4,498	3,362	,069
	Within Groups	183,301	137	1,338		
	Total	187,799	138			



**Table D.13: ANOVA analysis on effects on the other side of the company between respondents with low respectively high degree of top management involvement in dyadic, ongoing collaboration.**

		Descriptives				
		N	Mean	Std. Deviation	95% Confidence Interval for Mean	
					Lower Bound	Upper Bound
Effects on the other side: Increased collaboration	Respondents with low degree of top management in ongoing col	33	2,67	1,315	2,20	3,13
	Respondents with high degree of top management in ongoing co	38	3,47	1,156	3,09	3,85
	Total	71	3,10	1,289	2,79	3,40
Effects on the other side: More info faster	Respondents with low degree of top management in ongoing col	34	2,74	1,310	2,28	3,19
	Respondents with high degree of top management in ongoing co	37	3,30	1,199	2,90	3,70
	Total	71	3,03	1,276	2,73	3,33
Effects on the other side: Improved service	Respondents with low degree of top management in ongoing col	35	3,37	1,285	2,93	3,81
	Respondents with high degree of top management in ongoing co	38	3,82	1,136	3,44	4,19
	Total	73	3,60	1,222	3,32	3,89

		ANOVA				
		Sum of Squares	df	Mean Square	F	Sig.
Effects on the other side: Increased collaboration	Between Groups	11,503	1	11,503	7,573	,008
	Within Groups	104,807	69	1,519		
	Total	116,310	70			
Effects on the other side: More info faster	Between Groups	5,596	1	5,596	3,564	,063
	Within Groups	108,347	69	1,570		
	Total	113,944	70			
Effects on the other side: Improved service	Between Groups	3,597	1	3,597	2,459	,121
	Within Groups	103,882	71	1,463		
	Total	107,479	72			

**Table D.14: ANOVA analysis on SCO variables between the different types of collaboration.**

		Descriptives				
		N	Mean	Std. Deviation	95% Confidence Interval for Mean	
					Lower Bound	Upper Bound
Possibility to influence the collaboration	Triadsamarbete	44	3,93	,925	3,65	4,21
	Leverantörssamarbete	58	4,00	,795	3,79	4,21
	Kundsamarbete	54	3,52	,906	3,27	3,77
	Total	156	3,81	,893	3,67	3,96
Degree of top management involvement in the initial phase	Triadsamarbete	43	3,44	1,201	3,07	3,81
	Leverantörssamarbete	60	2,87	1,268	2,54	3,19
	Kundsamarbete	54	3,17	1,145	2,85	3,48
	Total	157	3,13	1,223	2,93	3,32
Top management involvement in ongoing collaboration	Triadsamarbete	43	3,26	1,157	2,90	3,61
	Leverantörssamarbete	60	2,67	1,100	2,38	2,95
	Kundsamarbete	55	3,38	1,009	3,11	3,65
	Total	158	3,08	1,126	2,90	3,25
Personal chemistry and different company cultures	Triadsamarbete	41	2,51	1,121	2,16	2,87
	Leverantörssamarbete	59	2,29	1,115	2,00	2,58
	Kundsamarbete	55	2,44	1,259	2,10	2,78
	Total	155	2,40	1,166	2,22	2,58
Trust	Triadsamarbete	43	2,40	1,094	2,06	2,73
	Leverantörssamarbete	59	2,32	,955	2,07	2,57
	Kundsamarbete	54	2,72	1,220	2,39	3,06
	Total	156	2,48	1,098	2,31	2,65
Different logistics competencies	Triadsamarbete	42	3,07	1,068	2,74	3,40
	Leverantörssamarbete	60	3,03	1,221	2,72	3,35
	Kundsamarbete	55	2,78	1,049	2,50	3,07
	Total	157	2,96	1,123	2,78	3,13
Different goals	Triadsamarbete	42	2,64	1,055	2,31	2,97
	Leverantörssamarbete	59	2,42	1,177	2,12	2,73
	Kundsamarbete	55	2,60	1,047	2,32	2,88
	Total	156	2,54	1,097	2,37	2,72
Different opinions of how costs and savings should be shared	Triadsamarbete	39	2,77	1,224	2,37	3,17
	Leverantörssamarbete	58	2,31	1,217	1,99	2,63
	Kundsamarbete	53	2,83	1,297	2,47	3,19
	Total	150	2,61	1,263	2,41	2,82
Different opinions about responsibility areas	Triadsamarbete	42	2,26	1,061	1,93	2,59
	Leverantörssamarbete	59	2,31	1,149	2,01	2,60
	Kundsamarbete	55	2,33	,982	2,06	2,59
	Total	156	2,30	1,062	2,13	2,47
Understanding from the own company	Triadsamarbete	41	2,24	1,135	1,89	2,60
	Leverantörssamarbete	59	1,98	1,152	1,68	2,28
	Kundsamarbete	54	2,33	1,028	2,05	2,61
	Total	154	2,18	1,109	2,00	2,35

### Multiple Comparisons

Bonferroni

Dependent Variable	(I) The three collaboration types	(J) The three collaboration types	Mean Difference (I-J)	Std. Error	Sig.
Possibility to influence the collaboration	Triadsamarbete	Leverantörssamarbete	-,07	,174	1,000
		Kundsamarbete	,41	,177	,063
	Leverantörssamarbete	Triadsamarbete	,07	,174	1,000
		Kundsamarbete	,48*	,165	,012
	Kundsamarbete	Triadsamarbete	-,41	,177	,063
		Leverantörssamarbete	-,48*	,165	,012
Degree of top management involvement in the initial phase	Triadsamarbete	Leverantörssamarbete	,58	,242	,055
		Kundsamarbete	,28	,247	,801
	Leverantörssamarbete	Triadsamarbete	-,58	,242	,055
		Kundsamarbete	-,30	,227	,563
	Kundsamarbete	Triadsamarbete	-,28	,247	,801
		Leverantörssamarbete	,30	,227	,563
Top management involvement in ongoing collaboration	Triadsamarbete	Leverantörssamarbete	,59*	,217	,022
		Kundsamarbete	-,13	,221	1,000
	Leverantörssamarbete	Triadsamarbete	-,59*	,217	,022
		Kundsamarbete	-,72*	,203	,002
	Kundsamarbete	Triadsamarbete	,13	,221	1,000
		Leverantörssamarbete	,72*	,203	,002
Personal chemistry and different company cultures	Triadsamarbete	Leverantörssamarbete	,22	,238	1,000
		Kundsamarbete	,08	,241	1,000
	Leverantörssamarbete	Triadsamarbete	-,22	,238	1,000
		Kundsamarbete	-,15	,219	1,000
	Kundsamarbete	Triadsamarbete	-,08	,241	1,000
		Leverantörssamarbete	,15	,219	1,000
Trust	Triadsamarbete	Leverantörssamarbete	,07	,219	1,000
		Kundsamarbete	-,33	,223	,434
	Leverantörssamarbete	Triadsamarbete	-,07	,219	1,000
		Kundsamarbete	-,40	,205	,160
	Kundsamarbete	Triadsamarbete	,33	,223	,434
		Leverantörssamarbete	,40	,205	,160
Different logistics competencies	Triadsamarbete	Leverantörssamarbete	,04	,226	1,000
		Kundsamarbete	,29	,230	,630
	Leverantörssamarbete	Triadsamarbete	-,04	,226	1,000
		Kundsamarbete	,25	,210	,696
	Kundsamarbete	Triadsamarbete	-,29	,230	,630
		Leverantörssamarbete	-,25	,210	,696
Different goals	Triadsamarbete	Leverantörssamarbete	,22	,222	,976
		Kundsamarbete	,04	,225	1,000
	Leverantörssamarbete	Triadsamarbete	-,22	,222	,976
		Kundsamarbete	-,18	,206	1,000
	Kundsamarbete	Triadsamarbete	-,04	,225	1,000
		Leverantörssamarbete	,18	,206	1,000
Different opinions of how costs and savings should be shared	Triadsamarbete	Leverantörssamarbete	,46	,258	,233
		Kundsamarbete	-,06	,263	1,000
	Leverantörssamarbete	Triadsamarbete	-,46	,258	,233
		Kundsamarbete	-,52	,237	,090
	Kundsamarbete	Triadsamarbete	,06	,263	1,000
		Leverantörssamarbete	,52	,237	,090
Different opinions about responsibility areas	Triadsamarbete	Leverantörssamarbete	-,04	,216	1,000
		Kundsamarbete	-,07	,219	1,000
	Leverantörssamarbete	Triadsamarbete	,04	,216	1,000
		Kundsamarbete	-,02	,200	1,000
	Kundsamarbete	Triadsamarbete	,07	,219	1,000
		Leverantörssamarbete	,02	,200	1,000
Understanding from the own company	Triadsamarbete	Leverantörssamarbete	,26	,225	,743
		Kundsamarbete	-,09	,229	1,000
	Leverantörssamarbete	Triadsamarbete	-,26	,225	,743
		Kundsamarbete	-,35	,208	,284
	Kundsamarbete	Triadsamarbete	,09	,229	1,000
		Leverantörssamarbete	,35	,208	,284

\*. The mean difference is significant at the .05 level.

**Table D.15: ANOVA analysis on experienced effects of the collaboration between different types of collaboration.**

		Descriptives				
		N	Mean	Std. Deviation	95% Confidence Interval for Mean	
					Lower Bound	Upper Bound
Effect: We have got decreased costs	Triadsamarbete	43	3,65	1,173	3,29	4,01
	Leverantörssamarbete	55	3,64	1,060	3,35	3,92
	Kundsamarbete	52	3,37	1,189	3,03	3,70
	Total	150	3,55	1,139	3,36	3,73
Effect: Partner has got decreased costs	Triadsamarbete	41	3,78	1,037	3,45	4,11
	Leverantörssamarbete	48	3,40	1,144	3,06	3,73
	Kundsamarbete	49	3,61	,996	3,33	3,90
	Total	138	3,59	1,065	3,41	3,77
Effect: Our service towards partner improved	Triadsamarbete	44	4,23	,831	3,97	4,48
	Leverantörssamarbete	57	3,82	,984	3,56	4,09
	Kundsamarbete	54	4,31	,797	4,10	4,53
	Total	155	4,11	,901	3,97	4,25
Effect: We have become improved service	Triadsamarbete	43	3,98	,859	3,71	4,24
	Leverantörssamarbete	58	3,98	,761	3,78	4,18
	Kundsamarbete	51	3,69	,969	3,41	3,96
	Total	152	3,88	,868	3,74	4,02
Effect: Our service towards other actors improved	Triadsamarbete	44	3,93	,846	3,67	4,19
	Leverantörssamarbete	56	3,68	1,097	3,38	3,97
	Kundsamarbete	54	3,59	1,158	3,28	3,91
	Total	154	3,72	1,057	3,55	3,89
Effect: Lead times shorter	Triadsamarbete	44	4,02	,952	3,73	4,31
	Leverantörssamarbete	58	3,84	1,268	3,51	4,18
	Kundsamarbete	54	3,81	,892	3,57	4,06
	Total	156	3,88	1,059	3,72	4,05
Effect: More competitive	Triadsamarbete	42	3,98	,780	3,73	4,22
	Leverantörssamarbete	53	3,51	,973	3,24	3,78
	Kundsamarbete	51	4,00	,849	3,76	4,24
	Total	146	3,82	,902	3,67	3,96
Effect: Clearer division of responsibility between partners	Triadsamarbete	43	3,70	,939	3,41	3,99
	Leverantörssamarbete	54	3,48	,818	3,26	3,70
	Kundsamarbete	52	3,40	,995	3,13	3,68
	Total	149	3,52	,920	3,37	3,67
Effect: More measurement and follow ups	Triadsamarbete	44	3,73	1,107	3,39	4,06
	Leverantörssamarbete	56	3,09	1,100	2,79	3,38
	Kundsamarbete	53	3,49	1,203	3,16	3,82
	Total	153	3,41	1,161	3,23	3,60

Dependent Variable		(I) The three collaboration types	(J) The three collaboration types	Mean Difference (I-J)	Sig.	95% Confidence Interval		
						Lower Bound	Upper Bound	
Effect: We have got decreased costs	Bonferroni	Triadsamarbete	Leverantörssamarbete	,01	1,000	-,55	,58	
			Kundsamarbete	,29	,676	-,28	,85	
		Leverantörssamarbete	Triadsamarbete	-,01	1,000	-,58	,55	
				Kundsamarbete	,27	,661	-,26	,80
				Kundsamarbete	Triadsamarbete	-,29	,676	-,85
					Leverantörssamarbete	-,27	,661	-,80
Effect: Partner has got decreased costs	Bonferroni	Triadsamarbete	Leverantörssamarbete	,38	,272	-,16	,93	
			Kundsamarbete	,17	1,000	-,38	,71	
		Leverantörssamarbete	Triadsamarbete	-,38	,272	-,93	,16	
				Kundsamarbete	-,22	,952	-,74	,31
				Kundsamarbete	Triadsamarbete	-,17	1,000	-,71
					Leverantörssamarbete	,22	,952	-,31
Effect: Our service towards partner improved	Bonferroni	Triadsamarbete	Leverantörssamarbete	,40	,072	-,02	,83	
			Kundsamarbete	-,09	1,000	-,52	,34	
		Leverantörssamarbete	Triadsamarbete	-,40	,072	-,83	,02	
				Kundsamarbete	-,49*	,012	-,89	-,09
				Kundsamarbete	Triadsamarbete	,09	1,000	-,34
					Leverantörssamarbete	,49*	,012	,09
	Tamhane	Leverantörssamarbete	Kundsamarbete	*				
		Kundsamarbete	Leverantörssamarbete	*				
Effect: We have become improved service	Bonferroni	Triadsamarbete	Leverantörssamarbete	-,01	1,000	-,43	,41	
			Kundsamarbete	,29	,318	-,14	,72	
		Leverantörssamarbete	Triadsamarbete	,01	1,000	-,41	,43	
				Kundsamarbete	,30	,226	-,10	,70
				Kundsamarbete	Triadsamarbete	-,29	,318	-,72
					Leverantörssamarbete	-,30	,226	-,70
Effect: Our service towards other actors improved	Tamhane	Triadsamarbete	Leverantörssamarbete	,25	,480	-,22	,73	
			Kundsamarbete	,34	,265	-,15	,83	
		Leverantörssamarbete	Triadsamarbete	-,25	,480	-,73	,22	
				Kundsamarbete	,09	,970	-,44	,61
				Kundsamarbete	Triadsamarbete	-,34	,265	-,83
					Leverantörssamarbete	-,09	,970	-,61
Effect: Lead times shorter	Bonferroni	Triadsamarbete	Leverantörssamarbete	,18	1,000	-,34	,69	
			Kundsamarbete	,21	1,000	-,31	,73	
		Leverantörssamarbete	Triadsamarbete	-,18	1,000	-,69	,34	
				Kundsamarbete	,03	1,000	-,46	,52
				Kundsamarbete	Triadsamarbete	-,21	1,000	-,73
					Leverantörssamarbete	-,03	1,000	-,52
Effect: More competitive	Bonferroni	Triadsamarbete	Leverantörssamarbete	,47*	,033	,03	,91	
			Kundsamarbete	-,02	1,000	-,47	,42	
		Leverantörssamarbete	Triadsamarbete	-,47*	,033	-,91	-,03	
				Kundsamarbete	-,49*	,015	-,91	-,07
				Kundsamarbete	Triadsamarbete	,02	1,000	-,42
					Leverantörssamarbete	,49*	,015	,07
	Tamhane	Triadsamarbete	Leverantörssamarbete	*				
		Leverantörssamarbete	Triadsamarbete	*				
		Kundsamarbete	Leverantörssamarbete	*				
Effect: Clearer division of responsibility between partners	Bonferroni	Triadsamarbete	Leverantörssamarbete	,22	,754	-,24	,67	
			Kundsamarbete	,29	,368	-,16	,75	
		Leverantörssamarbete	Triadsamarbete	-,22	,754	-,67	,24	
				Kundsamarbete	,08	1,000	-,35	,51
				Kundsamarbete	Triadsamarbete	-,29	,368	-,75
					Leverantörssamarbete	-,08	1,000	-,51
Effect: More measurement and follow ups	Bonferroni	Triadsamarbete	Leverantörssamarbete	,64*	,018	,08	1,19	
			Kundsamarbete	,24	,929	-,33	,80	
		Leverantörssamarbete	Triadsamarbete	-,64*	,018	-,19	-,08	
				Kundsamarbete	-,40	,204	-,93	,13
				Kundsamarbete	Triadsamarbete	-,24	,929	-,80
					Leverantörssamarbete	,40	,204	-,13
	Tamhane	Triadsamarbete	Leverantörssamarbete	*				
		Leverantörssamarbete	Triadsamarbete	*				

\*. The mean difference is significant at the .05 level.



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