Supply chain collaboration in the fast moving consumer goods industry

Vroegindeweij, R.M.

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Supply Chain Collaboration in the Fast Moving Consumer Goods Industry

Thesis report

Robert Vroegindeweij

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Supervisors

Dr. N. (Néomie) Raassens, TU/e ITEM

Dr. T. (Tarkan) Tan, TU/ e OPAC

TUE. School of Industrial Engineering

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Abstract

This explorative research tries to identify the impact of supply chain collaboration on supply chain performance. Supply chain collaboration is the incorporation of knowledge and information of suppliers and customers into the supply chain processes, which should lead to win-win situations and in turn will have a positive impact on total supply chain performance. In this study, it is explored if and how this positive relationship is affected by the product's position in the life cycle. In this study interviews are conducted at a supplier for products in the fast moving consumer goods market. Interviews were also conducted with the retailers to get insights into the relationship on a dyadic level. The content of the interviews are regarding the elements of supply chain collaboration found in literature. It is found that collaboration is not differentiated based on the life cycle of a product, but by proactively managing reoccurring events. These events could be, for example, new product introductions, delistings, promotions, or stock-outs. These events can negatively impact the performance of the supply chain and it is found that these special events require closer collaboration between suppliers and retailers to maximize the output of the supply chain. The closer collaboration could result in a more efficient supply chain and a more responsive supply chain, which is flexible to react on changing market needs. After collaborative event management has been embedded in an organization the life cycle stages can be used to implement collaborative process management for the whole product portfolio.

Acknowledgements

The decision of starting the master innovation management was also a decision to start a new chapter in my life. I came into a new environment, the city of Eindhoven, and made new friends during my master who I hopefully will keep seeing after finishing my master.
During my master I learned a lot of new concepts, theories and ways to look towards problems. I became more mature because of the challenges given during the courses in my master, going abroad for four months to the city of Helsinki, and finally living in Utrecht to write my master thesis and combining this with an internship at a great company.

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My family who supported me during the writing of my master thesis and special thanks to my sister who has acted as second coder of all the conducted interviews.
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Closing this chapter of my life leaves me with mixed feelings. At first, the relief I finished my master, but also an end of three great years of my life in which happened a lot. However, the next challenge is already in place and that is working abroad for one year at my thesis company in Canada. I will get ready for this new challenge and will receive it with open arms.

Robert Vroegindeweij
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New beginnings are often disguised as painful endings.
Lao Tzu

Management summary

Introduction

Because of the intensified competition companies must work together with other companies in the supply chain to be as competitive as possible (Bowersox & Closs, 1996). This can be done by, for example, sharing information, developing shared plans or making use of shared inventory. The incorporation of supplier and customers is called supply chain collaboration and the main outcome of this collaboration is the creation of win-win situations, which positively impacts the total supply chain performance (Barratt & Oliveira, 2001). It is found in literature that supply chain collaboration can result in mutual benefits; however companies must find their own way of collaborating (Småros, 2010).

The research is done at an important supplier of retailers in the fast moving consumer goods business. The focus of this research is the difference in supply chain collaboration depending on the life cycle stage of a product. There is also looked into the relationship between supply chain collaboration and supply chain performance. The research question that is answered can be formulated as follows:

"What is the relationship between supply chain collaboration and supply chain performance and what is the role of the product life cycle stage?"

Literature review

First, a literature study was conducted to get theoretical insights regarding the topics (1) supply chain performance, (2) supply chain collaboration, and (3) the different life cycle stages of products. Two frameworks are used to define supply chain performance, i.e. the frameworks of Beamon (1999) and Gunasekaran and Tirtiroglu (2001). Next, the methods of supply chain collaboration have been discussed. The implementation of supply chain collaboration takes time because trust must grow between different parties, resulting in a more responsive supply chain, which can better respond to end-consumer demand (Kulp et al., 2004). Supply chain collaboration can evolve from transaction-based information sharing, to collaboration on special events, and finally integrating several processes from suppliers and retailers (Whipple & Russell, 2007).

Several elements in literature have been found which can have an influence on the success of the implementation of supply chain collaboration, such as information sharing, incentive alignment, and decision synchronization.

Finally, the four different life cycle stages, i.e. introduction, growth, maturity, and decline, were examined. In literature little is written about the difference in collaboration depending on the product life cycle stage. However, Cox (1967) finds an increase in demand variability in the introduction and growth stage because of the high peak in sales. Therefore, the assumption is made that there is more variability in demand in the introduction and growth stage compared to the maturity stage. Småros (2003) found a different way of forecasting for new products compared to products in a maturity stage. The synchronization of decisions and content of information sharing can be different depending on the life cycle stage (Whipple & Russell, 2007). This literature review showed there are differences between the product life cycle stages and elements of supply chain collaboration. This knowledge is used as input for this research.

Methodology

As the aim of this research is to get in-depth knowledge and to understand the meaning of supply chain collaboration, qualitative research has been done (Mason, 2002). A quantitative analysis on sales data has been performed to check assumptions made in chapter one.

The literature study of this research was used to get theoretical insights into supply chain collaboration and supply chain performance. This knowledge is used to structure the interviews that were conducted during this research. These interviews were conducted to gain understanding of the implementation of supply chain collaboration within the focal company and to identify if the life cycle has an impact on the way of collaborating. Supply chain collaboration is done with retailers; therefore also retailers have been interviewed to get insights from both parties.

Qualitative data analyses are often seen as a subjective process, based on the intuition of the researcher (Aken et al., 2012). Therefore, a template approach has been chosen to make the process less subjective. Additionally, a second coder is incorporated in the study to ensure the objectivity of the (interpretation of the) results.

Results

The sales data of products was used to check the difference in demand variability depending on the four life cycle stages. The test did not show significant differences in demand variability between life cycle groups. The variability in demand could be caused by different aspects, such as promotion and marketing activities instead of only the product life cycle stage of a product.

During the interviews, supply chain performance was discussed using the frameworks found in literature. The internal key performance indicators were plotted on the two frameworks. It has been found that the output, in the form of customer service, is important in all life cycle stages. However, while during the introduction and growth stage the emphasis is on flexibility, a shift towards efficiency takes place in the maturity and decline stages. This switch in emphasis also has an impact on the way of collaborating in each life cycle stage. Next, each element of supply chain collaboration, developed by Cao et al. (2010), has been discussed. It has been found that the content of elements can differ depending on special events that occur. There were found four special events during this research, i.e. (1) new product introductions, (2) promotions, (3) out of stocks, and (4) delisting of products. Finally, the characteristics of each life cycle stage were discussed, resulting in information regarding the timing, process, challenges, and emphasis of supply chain performance per product life cycle stage.

Conclusion

This research shows that supply chain collaboration is not segmented on the product life cycle stages, but on special events at the focal company. It is found that the focal company is proactively managing reoccurring events, such as: new product introductions, promotions, delisting's, and out of stocks. Currently the focus is on embedding processes around these certain events, because quick wins can be achieved. It is found that certain events occur in one particular life cycle stage and other can occur in multiple stages. Therefore, the life cycle stages can be used to plot when certain events occur. The life cycle stages could also become useful when the processes around events are formalized. After formalization, there can be build towards a way of collaborating over the whole product portfolio. This means incorporating processes from both parties and managing the whole product portfolio in a collaborative manner.

In all product life cycle stages there is a focus on output in the form of high customer service. The goals of the supplier and retailer are aligned because on shelf availability is important for both parties. Products need to be on shelf in order to sell them. However, a shift in supply chain performance focus has been found, from flexibility in the introduction and growth stage towards efficiency in the maturity and decline stage of the product life cycle.

The findings from this study can be used by supply chain managers to identify which challenges can occur in which product life cycle stage. These challenges can have a negative impact on supply chain performance. Supply chain collaboration can help to mitigate the impact of these challenges. There has been developed a template which can be used to identify challenges and to see which action can be taken to mitigate risks. This can be used to work from transaction based collaboration, towards events based collaboration, and finally collaborative process management. Finally, this research also showed that retailers only want to collaborate if the supplier can show a direct need and if there are mutual benefits. Therefore, event based collaboration (type II developed by Whipple & Russell, 2007) seems to be the most suitable option to truly capitalize the power of supply chain collaboration at this moment. However, when trust grows between the two parties there could be moved towards collaborative process management to manage the whole product portfolio in a collaborative way.

List of figures

List of tables

Contents

1. Introduction

1.1 Phenomenon of interest

Companies no longer compete against other companies alone. But competition takes place on the level of supply chain against supply chain (Gunasekaran et al, 2004). To be fully effective in today's competitive environment, firms must expand their integrated behaviour to incorporate customers and suppliers what is called supply chain collaboration (Bowersox & Closs, 1996). Collaboration is the act of managing interdependencies between activities performed to achieve a goal (Malone and Crowston, 1994). When collaborating with partners the supply chain performance will improve (McCarthy & Golicic, 2002) which will have a positive effect for both companies, creating a win-win situation. Indeed, supply chain collaboration is identified as an important factor to improve the performance of the total supply chain (Barratt & Oliveira, 2001). The mutual benefits manifest themselves in the form of improved stock levels, shortened lead times, reduction of inventory, and increased sales (Parks, 2001). Supply chain collaboration is the main topic of interest in this study.

1.2 Background

True partnering between companies by cooperating, coordinating, and collaborating for certain activities is needed to achieve good results (Spekman et al., 1998). This can be for example by sharing information, sharing resources, and making joined plans. This need for collaboration resulted in several methods to increase supply chain collaboration. Various practices are found, such as vendor-managed inventory (VMI), Continuous Replenishment (CR), and Collaborative Planning and Forecasting and Replenishment (CPFR). However, the implementation of such collaboration initiatives is not as easy as it seems (Barratt, 2004). Partnering takes time and trust must grow between parties before real collaboration can occur.

Studies show that collaboration can be beneficial but companies need to find their own ways of collaborating (Småros, 2010). Rather than developing one single process model, a framework for selecting the right approach is needed (McCarthy and Golicic, 2002; Småros, 2010) This means that there is not a one size fits all solution and when implementing collaboration initiatives companies must cooperate in making a collaboration initiative work. The core expected benefit of supply chain collaboration is: To increase the accuracy of demand forecasts and replenishment plans is necessary to lower inventories across the supply chain and attain high service levels of the right products in the right location (Seifert, 2002, p.87).

1.3 Research focus

There is chosen to look into the product life cycle of products (Figure 1). Different challenges depending on the life cycle could be determined. This could be for example the introduction or delisting of a product. Also, promotions to increase the numbers of sales during the growth stage or to boost sales in a mature market could result in challenges for the supply chain. The introduction of new products, delisting of old products, or promotions on products are all causing variability in demand. This risk of variability in demand can be reduced by collaborating with supply chain partners, if information is shared, business plans are synchronized, and companies discuss actions with each other (Barratt & Oliveira, 2001).

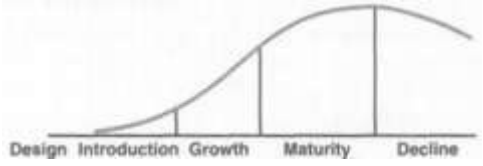


Figure 1 - Product life cycle stages (Cox, 1967)

The research is held at a supply chain department of an important supplier for the retail market. The company is manufacturing so-called "packaged goods" instead of the "dairy" goods, what are found to be the two universal product segments for the Fast Moving Consumer Goods (FMCG) business (Parthasarathy, 2009). The focal company is one of the biggest food and beverages companies in the world with a worldwide turnover of over 66 billion dollar, employing 274.000 people in over 200 countries. In the Netherlands there are around 650 employees working in the company, stationed in the Head office in Utrecht, or the three production sites in Rotterdam, Zaandam, and Broek op Langedijk. The focal company only needs to focus on the food side of the company; these are the products potato chips, nuts, and cereals. The company is also divided around these products. This means that there is a marketing department for nuts, chips, and cereals and there are also three teams for the supply of the three production sites. The focal company owns most of the production sites. Therefore, there is looked into supply chain collaboration at the demand-side by working together with retailers to find unexplored benefits.

When the term customer is used in this report, the customer of the supplier is meant. This can also be seen as the retailer. When the term consumer is used in this report, it is used to appoint the end consumer who will buy a product from the retailer.

1.4 Research objective and questions

Retailers in consumer good firms are naturally reluctant to share information in advance, fearing the information will somehow fall into the hands of competitors or to lose control in some way (Weele, 2010). Managers are reluctant to transform their traditional, often adversarial, trading relationships into an open partnership. So a big obstacle of collaboration in the supply chain is not from a technical but from a managerial nature.

A lot of collaboration methods are described in literature but are not widely used in practice, because of these managerial obstacles. Therefore, the main purpose of this study is to investigate how implementation of supply chain collaboration can be made more effective. In much literature researchers focused on supply chain collaboration as a whole without differentiation. While Whipple and Russell (2007) developed a typology of supply chain collaboration types to show differences in way of collaborating with supply chain partners depending on the situation, no distinction in collaboration between the different product life cycle stages is found in literature. Aitken et al. (2003) finds that supply chains must be engineered to match product characteristics and customer requirements and these requirements dramatically change when products proceed throughout their life cycle. These are differences between new product introductions and products in a growth, maturity, or decline stage. For example, newly introduced products represent 15% of the net earnings for most consumer products companies (Forecasting benchmark study, 2014) which makes new products important. Fisher (1997) makes a distinction between functional and innovative products and describes which supply chain is needed. This is the distinction between an agile supply chain which is responsive for changes in the market versus a lean supply chain what is producing at lowest costs. Because of this distinction in supply chain strategies depending on the product and product life cycle stage it is also interesting to investigate if there is a difference in supply chain collaboration methods between the different life cycle stages.

The adoption of supply chain collaboration has been conservative and slower than expected due to factors such as costs, technological barriers, lack of an easy format, and confusion of what is entails (KJR Consulting, 2002). Therefore, this research differentiates supply chain collaboration depending on the life cycle stages. By making this differentiation there can be focussed on specific products and challenges within each life cycle stage. By focussing on these specific products the costs, time, and technology needed for collaboration can be lowered while creating a higher output (Whipple & Russell, 2007). Certain elements of collaboration in the supply chain can differ between the different life cycle stages (Aiken et al., 2003; Småros, 2010).

Småros (2010) describes the difference in information sharing between companies when introducing a new product versus an existing product. The difference between new and existing products is one way of looking at the subject but these two can also be seen as a different life cycle stages. Literature also finds that the subject of decision synchronization can change during a life cycle stage (Cao et al., 2010). When introducing a new product, decision synchronization focuses particular on the moment of introduction, while in the maturity stage the amount of promotional volume is important. In this study a focus is taken on the differences in collaboration with retailers on products that are just introduced, in a growing market, in a steady mature stage, or in a decline stage. This is done to explore if there are not only differences between new and existing products, but also with products in the decline or growth stage.

In sum, there are found two main research gaps. First, the influence of the elements of supply chain collaboration is explored. This is done in order to see the impact of the elements on supply chain collaboration, which in turns impacts supply chain performance. The second gap is regarding the difference in supply chain collaboration dependent on the stage of a product within the life cycle.

Accordingly, the following research question is defined:

"What is the relationship between supply chain collaboration and supply chain performance and what is the role of the product life cycle stage?"

This research question is broken down into the following sub research questions:

1. What is supply chain performance?
2. What is supply chain collaboration?
3. What are the antecedents of supply chain collaboration?
4. Which impact has supply chain collaboration on supply chain performance?
5. Is the way of supply chain collaboration different dependent on the life cycle stage of a product?
6. How to implement a supply chain collaboration process dependent on the product life cycle stage?

1.5 Theoretical and managerial relevance

In literature the relationship between the elements of supply chain collaboration and supply chain performance is not described. This research will give insights about the influence of these elements on supply chain performance. Secondly, current research only described the influence of supply chain collaboration on supply chain performance regarding financial outcomes. Non-financial outcomes, such as relationship quality could also impact supply chain performance and should be studied (Martin & Patterson, 2009; McCarthy & Golicic, 2002). In this study also non-financial performance measures are investigated by incorporating the measures of Gunasekaran and Tirtiroglu (2001). Maskell (1991) finds that financial measurements are appropriate for strategic decisions, but daily operational measurements might be supported better with non-financial measures. There is looked into this to identify if on an operational level, non-financial performance measures are preferred. A further explanation of financial and non-financial outcomes is given in chapter two. Third, there has not been found research, which investigates differences in supply chain collaboration dependent on the position of a product in the life cycle, which is done in this research.

The retail sector is pressurising the industry to manufacture and supply at the lowest possible price and to decrease the response time (Bala & Kumar, 2011). This problem is also found during the preliminary interviews at the focal company. The focal company wants to become more efficient, by throwing fewer products away while keeping high customer service. A good way to achieve this is by becoming more demand-driven. One way to reach this is by working together with the retailers and aligning supply better with demand. The current way of working between new and existing products is different. However, there is no formal way on how to collaborate with retailers depending on the life cycle stage. The outcomes of the report can be used to change the collaboration strategy depending on the life cycle. The elements of supply chain collaboration are investigated as well which can be used to improve the relationship between the retailers and the focal company.

1.6 Outline

The master's thesis consists of the following elements: In chapter two a review of relevant literature regarding the subject is described. In this chapter, answers are given on the first four research questions which are input for research questions five and six. Chapter three describes the method that is chosen for this research, including the procedure, sample, and statistical analysis used. Chapter four consists of a results section displaying all relevant outcomes of the research that are needed to answer the research question. In chapter five a discussion is given regarding the results. This is followed by a conclusion with theoretical and managerial implications, the limitations of this research, and recommendations for further research in chapter.

2. Literature review

Introduction

This literature review is used to get theoretical insights about the subject under study and to answer the first four sub questions described in chapter one.

Paragraph 2.1 of the literature study describes the definition of supply chain performance, because supply chain collaboration has an impact on supply chain performance. Different concepts are given and a choice is made on what definition of supply chain performance is used during this research. In paragraph 2.2 the definition of supply chain collaboration and the stages of supply chain collaboration are described. This chapter also describes the benefits and drawbacks of supply chain collaboration and the ways to implement it. Paragraph 2.3 describes the implementation of supply chain collaboration. Paragraph 2.4 describes the elements, enablers, and inhibitors that influence the success of supply chain collaboration, which can be seen as the elements. Paragraph 2.5 describes the lifecycle stages with their characteristics. This paragraph is developed to introduce the life cycle stages which are used in the rest of this study.

2.1 Supply chain performance

The term supply chain performance is explained because supply chain collaboration has an effect on supply chain performance. It needs to be clarified what performance entails in order to see what kind of effect supply chain collaboration has. Supply chain performance is broken down into two measures. Paragraph 2.1.1 describes frameworks regarding to the outcomes of supply chain performance. In paragraph 2.1.2 literature is presented regarding to the unit of analysis. In paragraph 2.1.3, aforementioned frameworks are combined and a decision is taken on what framework is used during this research.

2.1.1 Outcomes of supply chain performance

Supply chain models mostly have two performance measures, mainly based on a combination of cost and customer responsiveness (Cohen and Lee, 1988 Davis, 1993; Lee and Feitzinger, 1995; Newhart et al, 1993). The use of a single performance measure is attractive because of its simplicity. A supply chain performance measurement system that consists of a single performance measure is generally inadequate since it is not inclusive, ignores the interactions among important supply chain characteristics, and ignores critical aspects of organizational strategic goals (Beamon, 1999).

Multiple frameworks are developed that describe different performance measures in different categories (Beamon, 1999; Bullinger et al., 2010; Chan, 2003). These frameworks are divided in quantitative measures, regarding costs and resource utilization and qualitative measures such as quality, flexibility, visibility, trust, and innovativeness (Chan, 2003). When investigating supply chain performance literature two frameworks are often used to build new theories, which gives them a strong conceptual foundation, i.e. the framework of Beamon (1999) and Gunasekaran and Tirtiroglu (2001). These two frameworks are described below.

Resource, output, and flexibility (Beamon, 1999)

Beamon (1999) describes a framework that focuses on three aspects, i.e. resources, output, and flexibility. The use of resources, the desired output, and flexibility (how well the system reacts to uncertainty) have been identified as vital components of supply chain success. Therefore, a supply chain management system must place emphasis on three separate types of performance measures: resource measures (R), output measures (O), and flexibility measures (F). The performance measure types all have different goals and purposes, which are described in Table 1.

Performance measure type	Goal	Purpose
Resources	High level of efficiency	Efficient resource management is critical to profitability
Output	High level of customer service	Without acceptable output, customers will turn to other supply chains
Flexibility	Ability to respond to a changing environment	In an uncertain environment, supply chains must be able to respond to change

Table 1 - Goals of performance measure types (Beamon, 1999)

Resource measures look mainly to the efficiency of the system, too little resources can negatively affect the output, while to many resources artificially increase a systems requirements. This is measured by inventory levels, personnel requirement, equipment utilization, energy usage, and cost (Beamon, 1999). Output measures are described by the number of items produced, time required to produce, and number of on-time deliveries. Qualitative measures can also be used, such as customer satisfaction and product quality (Beamon, 1999). Flexibility measures check the system's ability to accommodate volume and schedule fluctuations. This includes range flexibility, which means the extent to what the operation can be changed (Slack, 1991). The other flexibility measure is regarding to response flexibility, which can be volume flexibility, delivery flexibility, mix flexibility, and new product flexibility. Mix flexibility includes the ability to change the variety of products produced and new product flexibility includes the ability to introduce and produce new products (Slack, 1991).

Plan, source, make, and deliver (Gunasekaran and Tirtiroglu, 2001)

The framework presented above is a good starting point. However, the performance system lacks a distinction between metrics at strategic, tactical, and operational levels. The distinction in levels can be useful to assign the right measure to the appropriate management level (Gunasekaran and Tirtiroglu, 2001). When focussing on the inventory level, this can be seen as a day-to-day activity and would be on the operational level. The accuracy of forecasting techniques, influencing the inventory level, is a tactical performance measure and the buyer-supplier partnership is on the strategic level (Gunasekaran and Tirtiroglu, 2001). A performance measure can also be classified as either financial or non-financial or can sometimes include both (Gunasekaran and Tirtiroglu, 2001).

Gunasekaran and Tirtiroglu (2001) grouped their findings by using the SCOR-model (Figure 2). This has measures and metrics at four basic links in a supply chain, i.e. plan, source, make/assemble, and deliver, which will result in customer service and satisfaction. This makes it easy to see what part of the supply chain is responsible for what kind of performance measure. Baba & Kumar (2011) ranked different supply chain performance measures and find that the SCOR model qualifies strong for the FMCG market what makes this framework suitable for this research.

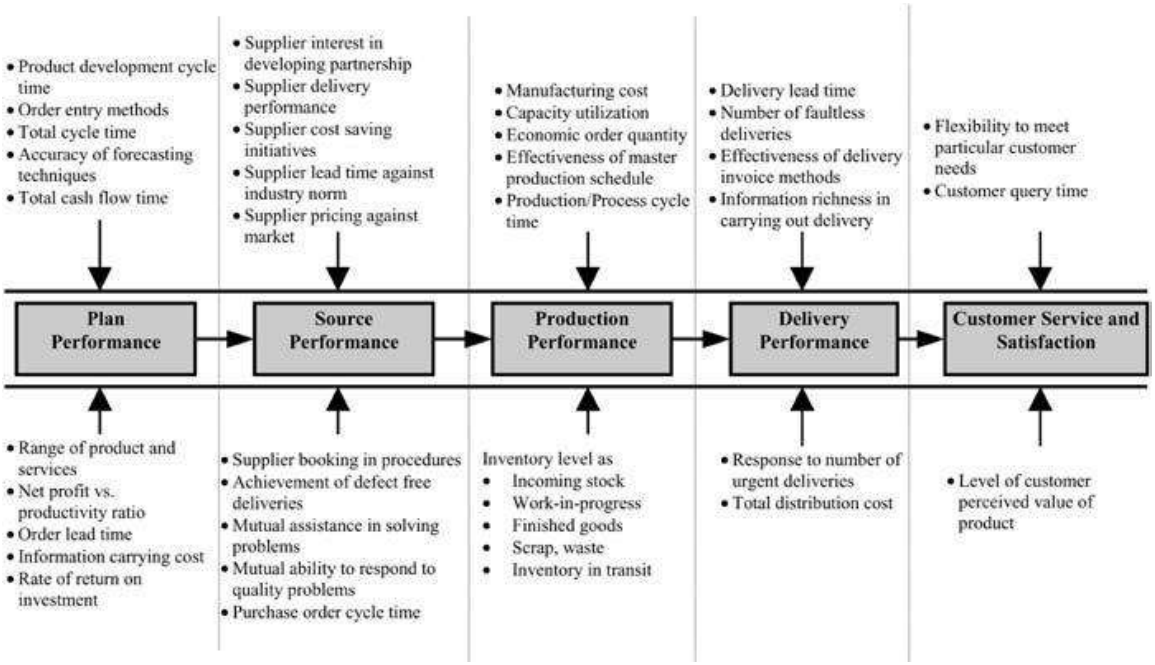


Figure 2 - Measures supply chain performance (Gunasekaran and Tirtiroglu, 2001)

The main findings of the research of Gunasekaran and Tirtiroglu (2001) in Table 2 show that non-financial performance metrics are also important. Instead of only focusing on financial performance, non-financial performance is also important to include in this research. These performance metrics can be used in research as an addition to the model developed by Beamon (1999).

Level	Performance metric	Financial	Non-financial
Strategic	Total cash flow time		X
	Rate of return on investment	X	
	Flexibility (customer needs)		X
	Delivery lead time		X
	Total cycle time		X
	Level and degree of buyer-supplier partnership		X
	Customer query time		X
Tactical	Extent of co-operation to improve quality		X
	Total transportation costs	X	
	Truthfulness of demand predictability/forecasting methods		X
	Product development cycle time		X
Operational	Manufacturing costs	X	
	Capacity utilization		X
	Information carrying costs	X	
	Inventory carrying costs	X	

Table 2 - Performance metrics (Gunasekaran and Tirtiroglu, 2001)

2.1.2 Unit of analysis of supply chain performance

There are different units of analysis to measure supply chain performance. These are described as possible supply chain performance indicators (Bullinger et al., 2010). There are four main units of analysis that could be taken (Bullinger et al., 2010). When, for example, a demand planning function is subject under study there is looked from a function perspective. One step further is a firm perspective, which focusses on the results of a single firm. A dyadic analysis looks at the results of two firms. The most extensive unit of analysis is the network perspective which could be, for example, the entire supply chain perspective.

2.1.3 Combination of theories

The frameworks discussed in paragraph 2.1.1 and 2.1.2 are used to guid the research. The distinction of supply chain performance between resource, output, and flexibility are used, because it is the most comprehensive framework found in literature. However, the framework are complemented with the three levels (i.e. operational, tactical and, strategic) and the distinction between financial and non-financial measures proposed by Gunasekaran and Tirtiroglu (2001) to break it down even further. The unit of analysis is taken on dyadic perspective because the research will investigate the relationship between two companies, i.e. the focal company and its customers (retailers).

2.2 Supply chain collaboration

Paragraph 2.2 describes what the term supply chain collaboration entails. In paragraph 2.2.1 the definition of supply chain collaboration is described. Working towards supply chain collaboration goes through some stages which are described in paragraph 2.2.2. Paragraph 2.2.3 enumerates the benefits and downsides of supply chain collaboration. Several methods of implementation of supply chain collaboration are given in literature, which are described in paragraph 2.2.4.

2.2.1 Definition of supply chain collaboration

Generally speaking, collaboration is the act of managing interdependencies between activities performed to achieve a goal (Malone and Crowston, 1994). Enterprises are often implementing strategies for collaboration. By working together resources in the supply chain can be used more efficiently and knowledge of suppliers and customers can be captured. An attempt to achieve this is by integrating production and information flows through the whole supply chain (Caridi, Cigolini, and De Marco 2005; Lejeune and Yakova, 2005; Verwaal and Hesselmans, 2004). In literature, two primary conceptualisations of collaboration are surfaced: (1) collaboration as an interorganizational business process and (2) collaboration as a foundation of interorganizational relationships.

Collaboration has been viewed as a business process whereby collaborative partners work together towards common goals that mutually benefit the partnering firms (Mentzer et al., 2001; Stank et al, 2001). These processes include joint-decision-making (Stank et al, 2001) and joint-problem-solving (Spekman et al., 1997) as a natural extension of sharing information among independent supply chain partners. A collaborative supply chain involves two or more independent companies that work jointly to plan and execute supply chain operations with bigger success than when acting in isolation (Simatupang and Sridharan, 2002).

Collaboration has been portrayed as the formation of interfirm linkages or partnerships in which the involved parties work together and share information, resources, and certain degrees of risk in order to accomplish mutual objectives (Bowersox et al., 2003; Golicic et al., 2003; Ellram and Edis, 1996; Sriram et al., 1992).

Often cited factors are mutuality of benefits, rewards, and risk sharing together with the exchange of information as the foundation of the collaboration (Barratt and Oliveira, 2001; Stank et al., 1999). There are three major types of collaborative relationships, i.e.

manufacturing/supplier collaboration, manufacturer/customer collaboration, and collaboration with third party and fourth party logistics providers (Lapide, 1999).

In the study is focussed on the relationship between the manufacturer and the customer, because most of the manufacturing sites are owned by the manufacturer. The collaborative opportunities between manufacturers and customers centre on demand planning and inventory replenishment. The focus is on jointly developing an understanding of demand at the point of consumption, followed by the creation of a mutually agreed replenishment plan (Sahay, 2003).

2.2.2 Stages towards supply chain collaboration

The definition of supply chain collaboration is described in paragraph 2.2.1. However, companies go through several stages before real collaboration occurs, these stages are described in this paragraph.

Supply chain management (SCM) involves integration, coordination, and collaboration across organizations and throughout the supply chain. The concept includes the broad array of activities needed to plan, implement, and control sourcing, manufacturing, and delivery processes from the point of raw material origin to the point of ultimate consumption (Stank and Keller, 2001). The supply chain covers the whole area from raw material to end product. This means that collaboration through the supply chain could be conducted with both, suppliers and customers, what is called supplier- and customer collaboration (Devaraj et al., 2007).

As indicated earlier, companies no longer compete against other companies alone. Competition takes place on the level of supply chain against supply chain (Gunasekaran et al, 2004). Co-operation emphasizes the need to integrate functional silos and views these units as interdependent parts charged with meeting the end-user customer's needs. Equally important are the co-operative ties that extend to external buyers and suppliers who work together to maximize the overall effectiveness of the supply chain. What evolves is a network of interrelated firms whose primary objective is to gain a strategic advantage for the entire supply chain (Spekman et al., 1998). As visualized in Figure 4, firms go from co-operation, to co-ordination and as a final step to collaboration. When trading parties co-operate and co-ordinate certain activities, they will still not behave as true partners, but these are necessary steps to grow to collaboration. These steps require changes in mind set and strategic orientation among supply chain partners and trust and commitment are seen as important factors when companies want to collaborate (Spekman et al., 1998). Collaboration has become an important facet of supply chain management because tasks have become interdependent and information and knowledge need to be shared among partners (Anderson and Narus 1990; Bhote, 1987; Ellram, 19990; Kapoor, 1988).

The complexity and the strategic importance of collaboration are high. During the four stages, complexity and strategic importance goes from both low to both high.

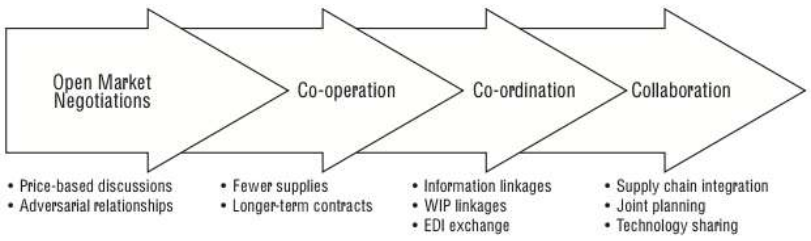


Figure 3 - Transition from open market negotiations to collaboration (Spekman et al., 1998)

Working as partners, rather than simply transferring information between parties, leads to the biggest benefits. When manufacturers collaborate with their retail customers, the supply chain as a whole can respond more quickly to end-consumers demand through better production scheduling, better inventory management, and enhanced products and services (Kulp et al.,

2004). This will result in a more stable flow of products which will be good for the supply chain performance as discussed in paragraph 2.1. The typology developed by Whipple & Russell (2007) described in chapter one can also be seen as three stages towards more elaborate collaboration. This typology starts at the co-ordination stage from Spekman et al. (1998) with collaborative transaction management, towards collaborative event management, and ends with collaborative process management which is an elaborative form of collaboration.

2.2.3 Benefits and drawbacks of supply chain collaboration

Supply chain management has been known as a collaborative strategy that attempts to deliver value to end consumers (Simatupang and Sridharan, 2005). However, a real collaborative supply chain develops joint initiatives to ensure that each member has a stake in the success. This means that members of a supply chain create a win-win situation by working towards the same goal (Min et al., 2005). This is different when a supply chain is developed on adversarial relationships where partners behave opportunistic and take a bigger advantage over other companies (Lambert et al., 1996). While there are several benefits when collaborating, there are also some drawbacks. These benefits and drawbacks are described in this paragraph.

Benefits of supply chain collaboration

The need for a close, integrated relationship between manufacturers and their supply chain partners has been described in the literature (e.g., Armistead and Mapes, 1993; Lambert et al., 1978). Global competition has caused organizations to rethink the need for cooperative, mutually beneficial supply chain partnerships (Lambert and Cooper, 2000; Wisner and Tan, 2000) and the joint improvement of inter-organizational processes has become a high priority (Zhao et al., 2008). Instead of brand versus brand or store versus store competition, it is now suppliers—brand—store versus suppliers—brand—store, or supply chain versus supply chain (Lambert and Cooper, 2000). Because of this intensified inter-network competition, inter-organizational relationships between two or more separate organisations have become important.

The basic proposition of collaboration is that the chain members are able to effectively fulfil customer demand at less cost. For example, in a make-to-stock supply chain, seamless information sharing allows the retailer and the supplier to create a demand driven supply chain, which results in efficient use of production capacity, lowering of inventory levels, reduction of out-of-stocks, and better customer service (Simatupang and Sridharan, 2005).

Wal-Mart collaborated with Warner-Lambert to attain mutual benefits of collaborative planning, forecasting, and replenishment (CPFR) (Parks, 2001). This included an improvement in stock levels on Listerine from 87 to 98 percent, shortened lead-times from 21 to 11 days, on-hand inventory was cut by two weeks, orders were more consistent, and sales increased by 8.5 million dollars. General Electric (GE) collaborated with its retailers and both parties eliminated the cost of holding inventory and assembling full truckload orders. GE was able to save about 12 percent of distribution and marketing costs and obtained half of the retailers' sales. The retailers were able to reduce out-of-stocks and gained increased profit margins on GE products.

When vendor managed inventory (VMI), a form of collaboration, is implemented on a large scale, the flexibility in the replenishment schedules enables the supplier to create full truck loads, which will result in a reduction of transportation costs (Lee, 2004; Waller et al., 1999). Another advantage for the supplier is a reduction of inventory costs. Because uncertainty is reduced considerably, obsolescence of safety stocks at the supplier is reduced (Dong and Xu, 2002; Kumar and Kumar, 2003; Tyan and Wee, 2003). An important advantage for the supplier is the establishment of a long trustworthy relationship with the customer resulting in more loyal customers and thus secured sales (Vergin and Barr, 1999; Xu et al., 2001). According to McCarthy and Golicic (2002), the advantages of CPFR can be summarized as follows: increased responsiveness, product availability assurance, optimized inventory and associated costs, increased revenues and earnings. Other researchers claim that the main opportunities for

retailers are reducing inventory levels and associated costs, increasing inventory turns, reducing or eliminating out-of-stock situations, maximizing the profitability of the product mix and buying at the lowest costs, saving on invoice processing, resolving exceptions and transactions costs (Simatupang & Shridharan, 2005; Småros, 2010).

Drawbacks of supply chain collaboration

While supply chain collaboration can be beneficial for partnering firms, there are also some drawbacks when collaborating with partners. The main drawbacks are the significant time and resources leading to high costs needed to implement such an initiative (Barratt, 2003). This is based on the transaction cost theory (Coase, 1937). With this theory a determination can be made if transactions are more efficient to do within an enterprise or in the market.

Transaction costs can be divided into coordination costs and transaction risk (Clemons and Row, 1992). Coordination costs are direct costs, such as bargaining costs, to integrate decisions between economic activities. A form of transaction risk is the possibility to get exploited in the relationship (Clemons and Row 1992:3), this could be for example the loss of intellectual property. Uncertainty and asset specificity are two factors, which increase coordination costs and transaction risk respectively (Williamson, 1975, 1985). The costs of coordination between two companies will become higher when more collaboration between companies takes place. Also the loss of control, resulting in risk, is described as a type of transaction cost. When collaborating with a partner some control is lost because transactions are done outside the boundaries of the firm. These problems are also described in agency theory. The problems are the mismatch between goals of the principal and the agent and the loss of control of the principal who cannot verify if the agent behaved appropriate (Eisenhardt, 1989). The loss of control and the need for coordination between companies result in costs. These costs should be lower compared to the costs when not collaborating to make collaboration a viable option to pursue.

2.3 Implementation of supply chain collaboration

The collaboration between supply chain partners is heavily dependent on extensive information sharing and process alignment (Kulp et al., 2004). Organizations need to understand how to translate real demand and manufacturing requirements into a collaborative planning (Barratt, 2004). To be effective in matching demand with supply, manufacturers and retailers need to collaborate in the supply chain (Hammond et al, 1994; Holmström et al, 2002).

Because companies are competing on a supply chain level there are developed several methods to increase collaboration. The most common methods that are described in literature are Vendor Managed Inventory (VMI), Continuous Replenishment (CR) and Collaborative Planning (CP). Also a mix of these terms such as Collaborative Planning, Forecasting and Replenishment (CPFR) can be used. The visibility of inventory levels is the best when using collaborative planning (see Figure 4). When conducting CPFR, the manufacturer and the retailer exchange market place information in order to come up with a customer-specific plan that can substantially reduce inventory (Andraski, 2003). The other two methods, VMI and CR, are collaboration methods that result in a lower visibility of inventory levels. That is why in this research collaborative planning is taken as a starting point. Literature describes that in the FMCG industry there is now significant collaboration between manufacturers and retailers in the form of Collaborative Planning, Forecasting and Replenishment (CPFR) initiatives (Christopher, 2004). VMI and CRP are more about efficient replenishment and supply, whereas CPFR puts more emphasis on the demand side (Pramatari, 2007). This means more information sharing and making decisions together and to become more responsive towards demand.

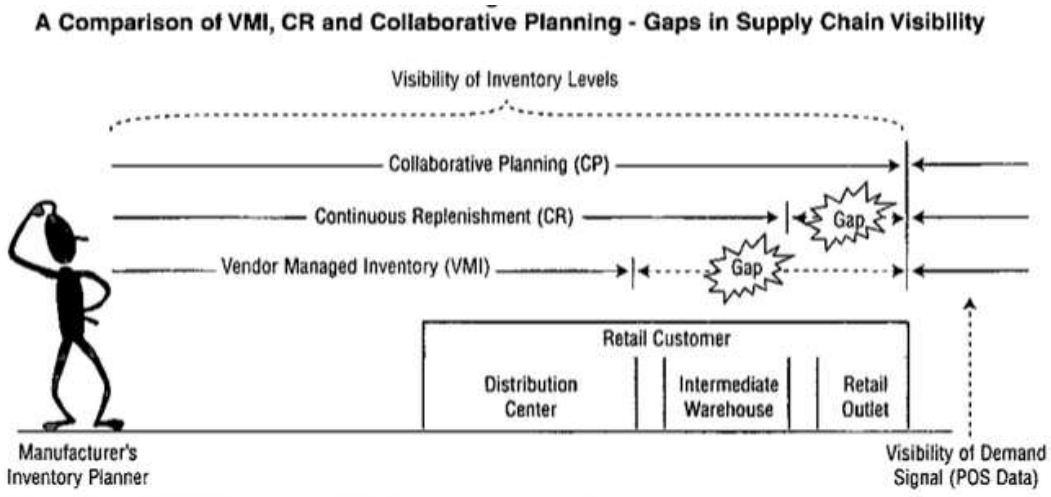


Figure 4 - Comparison collaboration alternatives (Barratt, 2003)

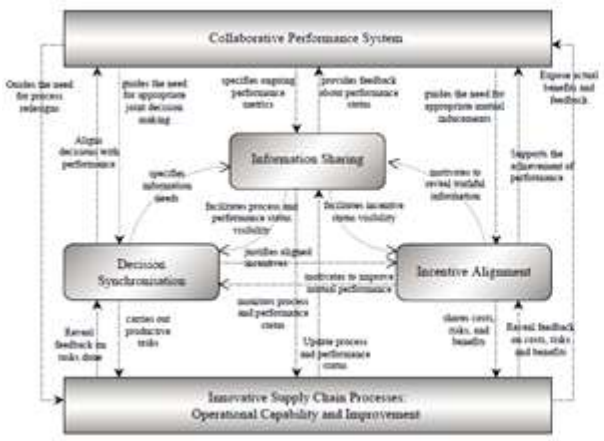
A part of collaborative planning is the collaborative forecasting that is done between two companies. This is the purposive exchange of specific and timely information between trading partners to develop a single shared projection of demand (McCarthy and Golicic, 2002). Collaborative forecasting exists in two forms, i.e. (1) internally within organizations as functional business units work together (Diehn, 2001) and (2) between firms in a supply chain (Ireland et al, 2000). The main outcome of this process is a shared forecast for the products that will be manufactured for a certain time. The other elements of supply chain collaboration are described in paragraph 2.4.

2.4 Elements of supply chain collaboration.

The benefits of collaboration are shown and ways to implement are available as well. However, there is a belief just a few firms have truly capitalized on the potential of collaboration (Barratt, 2003; Crum and Palmatier, 2004). Collaboration is difficult to implement, as there are some enablers and inhibitors (Barratt, 2004). Also some elements need to be in place before supply chain collaboration can occur. All these factors have an influence on the effectivity of collaboration and can therefore be seen as antecedents of supply chain collaboration. These antecedents can be incorporated in the research to be more complete. The elements of supply chain collaboration are described in paragraph 2.4.1 using two frameworks. The enablers and inhibitors are described in paragraph 2.4.2 using the paper of Barratt (2004), because of the depth of the paper. Together they form the antecedents of supply chain collaboration.

2.4.1 Elements of supply chain collaboration

Supply chain collaboration is not easy to implement because it needs several elements in place before it can be truly effective (Mentzer et al, 2000). In literature there are frameworks developed which describe these interconnecting elements (Cao et al., 2010; Simatupang and Sridharan, 2005, 2008). Cao et al. (2010) used an extensive literature research to identify the elements of supply chain collaboration. In addition, Simatupang and Sridharan (2005) develop a framework describing the interconnections between these elements. The combination of the extensive literature research identifying the elements and the framework describing the interconnections between them was the reason to investigate both.



Supply chain collaboration
Information sharing
Goal congruence
Decision synchronisation
Incentive alignment
Resource sharing
Collaborative communication
Joint knowledge creation

Figure 5 - 7 elements (Cao et al., 2010) & Simaputang and Shridharan (2008)

Both papers were compared based on their elements (Figure 5) to see which of them was most suitable for research. Cao et al. (2010) identifies seven interconnecting dimensions and constructed instruments to measure supply chain collaboration. The developed scales meet the requirements for reliability and validity.

These identified elements and associated scales can be used in the research. Cao et al. (2010) build on the research of Simaputang and Shridharan (2008), which creates some overlapping elements i.e. information sharing, decision synchronization, and incentive alignment. Because Cao et al. (2010) build on the work of Simaputang and Shridharan (2008) and others this is the most complete framework. Therefore, the framework will be used, however it could be some elements are less useful within the fast moving consumer market.

The information sharing element entails all information that is shared by a firm with partners. There should be focused on quality of shared information (Gosain et al., 2004) including accuracy and completeness (Simaputang and Sridharan, 2005). Goal congruence is the extent to which supply chain partners perceive their own objectives are satisfied by accomplishing the supply chain objectives (Angeles and Nath, 2001). Decision synchronization contains a joint planning aligning partners and coordinate decisions on inventory replenishment, order replacement, and order delivery (Simaputang and Sridharan, 2005). Incentive alignment motivates the members to act in a manner consistent with overall objectives such as revealing closely held and relevant information (Simaputang and Sridharan, 2005). Resource sharing entails the leveraging of capabilities and assets with supply chain partners (Cao et al., 2010). Collaborative communication is the contact among supply chain partners in terms of frequency, direction, mode, and influence strategy (Goffin et al., 2006). At last joint knowledge creation is the extent to which supply chain partners develop a better understanding of and response to the market and competitive environment by working together (Malhotra et al., 2005).

2.4.2 Inhibitors

By making use of case studies, Barratt (2004), found several inhibitors of supply chain collaboration (Table 5). A distinction is made on what levels these inhibitors occur.

Inhibitor	Level of occurrence
Mechanistic relationships behaviour	Strategic
Collaboration Slippage	Tactical and Operational
Differing Trading Strategies	Strategic
Functional Management Styles	Tactical and Operational
Organizational Size	Strategic, Tactical and Operational
Lack of Honesty	Tactical and Operational
Lack of Trust	Tactical and Operational
Information Accuracy	Tactical and Operational
Mutual benefit identification	Strategic, Tactical and Operational
Lack of Process Visibility	Tactical and Operational
Gaps in Information Flow	Tactical and Operational
Understanding the Role of Information	Strategic, Tactical and Operational

Table 3 - Collaborative Planning Inhibitors (Barratt, 2004)

As described before sharing of information is difficult to arrange because retailers in consumer goods firms are naturally reluctant to share information in advance, fearing that the information will somehow fall into the hands of competitors or they will lose control in some way (Weele, 2010). The main obstacle to supply chain collaboration is not technical but managerial. Many managers are reluctant to transform their often adversarial relationships into the open partnership. Collaboration cannot be reached through individual self-interested activities of the participants. It requires cooperation and trust between trading partners, which are unlikely to happen unless costs, benefits and risks of implementation can be mutually shared. This can be linked towards the inhibitors found by Barratt (2004). Most inhibitors relate to the relationship between two companies and the people who are involved instead of the technical capabilities. Barratt (2004) describes it is not the technical aspect but how people interact with the new data that is available. The outcomes that will result from all these inhibitors are lack of supply chain visibility, lack of competitive advantage, an inflexible supply chain, and non-aligned operations goals (Ramesh et al., 2010).

2.4.3 Enablers

Barratt (2004) also describes the enablers of collaboration in the supply chain (Table 4). These enablers can be linked to the elements from paragraph 2.4.1 i.e. information sharing, decision synchronisation, goal congruence, and joint knowledge creation.

Enabler	Level of occurrence
Board-to-board dialogue	Strategic
Joint promotions processes	Tactical and operational
Information based culture	Strategic, Tactical and Operational
Mutual dependency	Strategic, Tactical and Operational
Common Goals and Objectives	Tactical and Operational
Communication & Information Sharing	Strategic, Tactical and Operational
Openness	Strategic, Tactical and Operational
Behavioural Related Enablers	Tactical and Operational
Understanding Role of VMI	Tactical and Operational
Individual Chemistry	Tactical and Operational
Customer Implants	Tactical and Operational
Joint Training	Tactical and Operational

Table 4 - Collaborative planning enablers (Barratt, 2004)

In another study, six constructs of enablers were found i.e. organisational structure, internal relational behaviour, customer relational behaviour, top management support, information sharing, and business performance measurement system (Wong et al., 2012). These constructs show overlap with the enablers found by Barratt (2004), e.g., board-to board dialogue overlaps with top-management support, and information sharing overlaps with information based culture and communication & information sharing. A combination of both papers is taken to be as complete as possible.

2.5 Collaboration in different life cycle stages

Until now, there is described what supply chain collaboration entails, and what the elements are, inhibitors, and enablers. Little is written about the difference in collaboration between products. By difference in products we mean the difference in stage within the product life cycle (Figure 1).

Between the introduction and growth stage and the growth and maturity stage the sales increase. This also results in an increase in the variability in demand (Cox, 1967). In the maturity stage the volume of the sales becomes more stable what results in less variance in demand. In the decline stage the volume will decrease. It is plausible that it depends on the stage a product is in what kind of collaboration is needed.

When a new product is introduced, a company wants to know if the product becomes a success or not. This is needed to up- or down-scale production of the new product. It is assumed when a product is in the maturity product stage; demand will fluctuate less compared to new introductions. Therefore, it is assumed a different way of collaborating is required.

Småros (2003) describes a difference in collaborative forecasting for new products. When introducing new products no demand data is available, requiring more close collaboration between supplier and retailer. Småros (2003) found the forecasts of suppliers are performing better than the retailer's forecasts when introducing new products. However, point of sales data could be shared in the first weeks by the retailer to check the progress of new products. Information sharing and decision synchronization are elements of supply chain collaboration (Cao et al, 2010). The type of information which is shared between two parties could differ depending on the life cycle stage. Also the synchronization of decisions can be different depending on the life cycle for example on new product introductions, promotions, assortment changes, and out of stock situations Småros, (2007); (Whipple & Russell (2007). It is interesting to study how the elements of supply chain collaboration differ based on the stage of a product within the life cycle.

3. Research method

Introduction

In this chapter the research method is described. It gives an overview of how the research is conducted and describes how data is collected. The literature review from chapter two is used to structure the interviews and to develop questions used in the research. Also internal records are reviewed to gain knowledge during the research. These methods are used to describe the phenomenon supply chain collaboration and to get deep insight knowledge about this subject.

By conducting data analyses, interviews and by using the knowledge gained from the literature review it is possible to answer the final research question. Paragraph 3.1 describes the method taken for research. Paragraph 3.2 describes the sample used both for the quantitative and qualitative research. Paragraph 3.3 describes the instrumentation used in the research and the phases of the data collection. Paragraph 3.4 describes the validity and reliability of the research.

3.1 Method

The main reason for this research is to get in depth insights into the subject supply chain collaboration by doing a case study at a company. When doing a case study there is investigated a contemporary phenomenon within its real-life context. This is done because the boundaries of phenomenon and context are not clearly evident (Schell, 1992). There is focused on the difference between the methods and importance of elements of collaborating depending on the life cycle of a product. These new insights can be used to develop new ideas for possible quantitative research. Therefore, qualitative research is more appropriate for this research. Indeed, the aim is to make understanding of the phenomenon supply chain collaboration (Mason, 2002).

Firstly, assumptions are checked by conducting quantitative data analyses. Secondly, there is made use of literature, observations, interviews, and internal records to develop understanding. The knowledge is gained from employees within the focal company and from the customers of the focal company (retailers).

3.2 Research sample

Quantitative research

An internal database is used describing 208 products of the focal company what is approximately two-third of the total assortment. The other products do not have enough data points and are taken out of the research. This database entails demand data of 2014, regarding the mean of demand per week and standard deviation per week of these products and the forecast of demand and forecast error.

Qualitative part

Qualitative research is done by using semi-structured interviews. These interviews are held with people within the focal company and customers of the focal company. The purpose of these interviews is to gain insights regarding the way of collaborating between partners, dependent on the stage a product is in. Therefore the unit of analysis are on dyadic level, because both the focal company and customers are used as input. Purposive sampling rather than random sampling is used, because the aim is to get in depth knowledge about the subject supply chain collaboration. During the research, new insights are gained what could mean new informants are acquainted. However, there is developed a list with initial interviewees who are presented in table five and six. This list is developed to answer the question if the way of supply chain collaboration is dependent on what stage a product's is in the life cycle. Therefore, it describes the situation that is found and also implications are made what can be altered in the organisation.

informants within the focal company	Function
Account management:	Point of contact between the focal company and the retailer. Has daily contact with customers regarding sales, promotions and other customer related topics. Also involved with the initial coverage when introducing new products.
Category management:	Is an expert for the whole product category, so also has insights in competitor products. Has direct contact with the retailer in order to achieve the growth for the category as a whole, for example salty snacks. Is also consulted with new product introductions. Makes the first estimations for sales when introducing products and also tracks the progress of all products in the category.
Marketing:	Develops new ideas to introduce into the market and develops campaigns around new products or promotions.
Commercialization:	Are project / change managers and help to develop an idea through several stages until it is introduced into the market.
Demand planning:	Makes the demand forecast for all products and translate these together with supply planning into production forecasts. These people use figures from the past, but also work together with sales to make updated estimation. Also in close collaboration with customer service to check if new products are listed at the customers.
Customer service manager	Has profound relations with all retailers at supply chain level and is a convenient contact to get insights from and to make appointments with retailers. Is also in direct contact with supply chain managers at customer side.
Management level supply chain:	Develops plans on strategic level regarding the management of the supply chain of the focal company. Also has the role of customer collaboration manager, to develop plans together with customers to create supply chain benefits.

Table 5 - Informants within the focal company

Informants at retail-side	Function
Supply planning:	People who translate the demand into a forecast, which is sent to the focal company.
Management level supply chain:	It is convenient to have insights from higher management level. This to get insights into the subjects, which are important on the agenda.

Table 6 - Informants at retail-side

For information at the retail-side also an internal report is used to gain knowledge. This report is called 'the advantage group'[1] Advantage is one of the leading business-to-business market research companies operating worldwide. Advantage helps clients create more rewarding business relationships through benchmarking. This report benchmarks the biggest suppliers in the fast moving consumer goods market on several aspects. Also supply chain management is a separate business function. Interview results are available which can be used to gain insights in how retailers think about the supply chain function of the focal company. The person who developed the report can be contacted to get more in depth knowledge of the report.

[1] The full TAG-report is available upon request

3.3 Instrumentation / data collection

Quantitative part

For the quantitative analysis a list with products is used. These products need to be classified into the product life cycle stage they were in when the data was gathered. The product can be either in the introduction, growth, maturity, or decline stage (Figure 1). These stages are well-grounded in theory and can be used to classify the products.

The brand managers are asked to assign each product to a stage. To be more objective, also the demand planners of the different brands are asked to assign each product to a stage. The answers are validated and differences are discussed with the two parties. This will lead to a list with each product assigned to a stage.

Data analyses are done using SPSS. The data is separated into four groups, depending on the stage a product is in the life cycle. There is checked if there is a difference in variance in demand depending on the stage a product is. To check if there is a significant difference between groups an ANOVA and Kolmogorov-Smirnov test is used.

Qualitative part

For the qualitative part semi-structured interviews are conducted. These interviews are recorded to capture the interview and transcripts are used to code information gathered from the interviews. The analysis of qualitative data is sometimes described as a subjective process, thriving upon the intuition of the researcher (Aken et al., 2012). However, there are methods which explain how raw data turned into findings and conclusions. There are two main approaches i.e. grounded theory approach, which is data-driven and the template approach, which is more theory-driven (Aken et al., 2012). Therefore, there is chosen for a template-approach, because we will test a theory based on the data which is gathered. The template approach assumes it is known in which phenomena new insight want to be created. The conceptualization of these phenomena is the template for analysing data. Miles and Huberman (1994) present a large collection of template-based techniques to structure and analyse data. All relevant parts of the interviews are placed in a cell of a matrix. Different aspects are analysed at the same time, using different people and groups. The different people are placed in rows and the different aspects in columns. The cells of such a matrix contain information about a particular person or group with regard to a particular phenomenon (Miles and Huberman, 1994). This way the data is displayed in a systematic way, what gives more structure and gives the opportunity for valid analysis. There is made use of a second coder, who will fill in the matrix independently. This is done to check if the same decisions are taken by the different coders. When there are differences in opinions these need to be discussed. This way results are more objective, because two independent people coded the results of the interviews.

An exploratory, largely descriptive study is done. Therefore, the parameters or dynamics of a social setting are unknown. Closed-ended devices or initial instrumentation are inappropriate. Semi-structured interviews are used to have some guidance. However, other questions can be asked if needed. When a semi-structured interview is used a set of questions is already developed beforehand (Dawson, 2002).

At the beginning of the interview introductory questions are asked to establish a relation with the interviewee (Blumberg et al., 2011). This is an introduction of the interviewer, the content of the interview, and questions to make the interviewee feel comfortable.

Saunders et al. (2003) described that the investigator is not required to follow a specific order of questions but can vary in order depending on the flow of the conversation. In this research there are three main topics of interest, i.e. supply chain performance, supply chain collaboration, and the different life cycle stages of products. All questions are categorized under above mentioned

topics (Dawson, 2002). Interview questions within the topics begin with general questions regarding the subject and will become more specific during the interview (Dawson, 2002). There is started with the topic supply chain performance. After that the elements, inhibitors, and enablers of supply chain collaboration, found in literature, in general are discussed. The final topic is the differences in above mentioned elements depending on the life cycle stages of products.

In the design of the interviews the topics are structured and initial questions are developed. A template of the interview can be found in Appendix 4. During the interview follow-up questions are used to gain more in-depth knowledge about a certain topic and to check if the interviewee is understood correctly. Probing questions will also be used to refer to a specific part of an answer (Blumberg et al., 2011). Structuring questions are used when a certain topic is covered sufficiently before moving to another topic. As a closing question the interviewee is asked if there are any topics missed from his/her opinion, if this is the case this subject is discussed. At the end of the interview, the interviewee is thanked for his/her time. [2]

3.4 Validity and reliability

Quantitative part

The reliability of the quantitative part of the research is strong. Analysis on the database with products could be replicated and a second analysis should give the same results. A data analyst from the focal company checks the analyses to ensure the quality of the analyses. The analyses are done on products of the focal company only. This is a limitation of the study; results are less generalizable because only products of one company are analysed.

Qualitative part

To make the interpretation of interviews less subjective the template approach and a second coder is used (Miles and Huberman, 1994). This is done to ensure that if the first coder is biased in some way discussion is needed when results are processed and conclusions are drawn. By making use of the template approach the internal validity is enlarged. By interviewing different people from multiple disciplines within the company a more accurate representation is developed as well. Interviews are held on a dyadic level, with people from the focal company and the customers of the company. This will give in depth insights into the studied relationships, but results will not be generalizable. The interviews are planned, however when progressive insights are gathered and more data is needed secondary interviews are held. These secondary interviews will zoom into the subjects where additional information is needed.

[2] Transcripts are available upon request.

4. Results

Introduction

In this chapter the results of this study are presented to answer the sub questions described in chapter one of this research.

At first, quantitative analyses have been conducted on sales data from 2014 presented in paragraph 4.1. Using this analysis, the assumption is checked regarding the difference in variability among product life cycle stages. After the assumption is checked qualitative data was gathered using interviews, internal documents, and a benchmark report. The information found in the interviews are described in paragraph 4.2

4.1 Quantitative analyses of demand data

At first, demand data was checked for the total product category of the focal company to check the assumption of different variability in demand among groups.

4.1.1 Descriptive statistics

An internal database of 208 products has been used describing the demand data of 2014. This is approximately two third of the total product assortment. The other products had too few data points to be used in the analysis. After the cleaning of data brand managers and demand planners of the different categories divided the products into four groups (Table 7).

Amounts of products per category		Average mean per stage	Average standard deviation	Median
Introduction	13	1349	1093	927
Growth	15	1882	946	740
Maturity	155	2269	1167	625
Decline	25	916	409	399

Table 7 - Product portfolio (4 life cycle stages)

Table 7 shows the average mean and average standard deviation per group. The average mean of demand will go up when it goes from introduction towards the growth and maturity stage. The average mean will cave when products go from the maturity towards the decline stage. This is also in line with the findings from the literature review written in paragraph 2.5. The standard deviation is used to analyse if there are differences between groups in demand variability. The standard deviation of demand of each product is used and divided by the mean of each product. These values are used to see if there is more variability in demand between groups.

4.1.2 Analysis

At first an ANOVA test was conducted to check if there are significant differences between groups in demand variability. The ANOVA did not give a significant result (0,815), which means there are not found significant differences between groups based on the life cycle stage a product is in. After the ANOVA, a Kolmogorov-Smirnov test was conducted to check the difference in distribution between groups (Appendix 2). This was done to check if the distributions between groups differ significantly. There are found significant differences between the distributions of groups. This means the reach of the standard deviation of demand differs between groups. However, this analysis cannot determine what is causing the differences in groups. Only a separation between life cycle stages is not covering all differences. During interviews, retailers told that promotions bring fluctuations in their ordering. A lot of promotional volume is sold during the growth and maturity phase. Because the database did not separate demand in base and promotional volume further analyses could not be conducted to see the influence of promotions.

4.2 Qualitative analyses of interviews

Interviews at the focal company have been conducted (N=8) with people from various backgrounds at the supplier side. Three retailers have been interviewed because of the limited amount of time. To complement the interview data a report has been used called the TAG-report to get more insight from the retailer perspective. At first the findings regarding supply chain performance are presented. After that the elements of supply chain collaboration are discussed using information found in the interviews. In the end the four product life cycle stages are discussed with the characteristics and challenges in each stage.

4.2.1 Supply chain performance

As discussed in the literature review two frameworks are used to measure supply chain performance. The frameworks have been mapped on the internal supply chain performance metrics found in the interviews and internal records. A summary of the findings can be seen in Table 8. Supply chain collaboration can positively impact these performance metrics. Therefore, this matrix is developed to see which internal metrics are used to describe supply chain performance within the focal company and which influence supply chain collaboration has.

From interviews within the focal company the focus on output is very important. The customer service manager said: "The output aspect is fixed because this is the most important performance indicator within the supply chain. The service to customer of 99% plus is a sacred metric which is of vital importance to ensure on shelf availability. "Demand planners told that: "Service to customer is most important. Only when there are serious problems with stock levels at our distribution centre this could be an issue. In these times quotation takes place to ensure on shelf availability at all retailers." This can also be seen from the key performance indicators (KPI's) in Table 8, because they all serve to maximize the output in the form of high customer service except the cost aspect. The KPI's regarding costs and inventory are measured by the amount of days on hand stock: *On hand Inventory/ (7 days average forward demand / 7)*. Customer service is measured using: *# cases delivered on time/ # cases ordered* and forecast accuracy is measured by *100% - SUM(Abs forecast error)/SUM(Actual value)*.

Internal supply chain performance metrics	Description	Performance measure (resource, output, flexibility)	Level
Service level	Order fulfilment and timeliness	Output	Strategic (non-financial)
Forecast accuracy	Absolute accuracy, absolute error and bias	Resource, Output	Tactical (non-financial)
On Shelf Availability	If the product can be bought by consumers	Output	Strategic /Tactical /Operational (non-financial / financial)
Cost	Reduction of total supply chain costs	Resource	Operational / Tactical (financial)
Inventory	Amount of stock on hand	Resource / Flexibility /Output	Operational (financial)
Joint business plan	Joint KPI's between two companies / joint decision making	Flexibility / Resource / Output	Strategic / Tactical (non-financial)
Customer service	Response time when problems occur	Output / Flexibility	Strategic / Tactical (non-financial)

Table 8 – Supplier supply chain KPI's mapped to frameworks

"The customers want to have full orders, so it is our task to keep delivering." Because the mutual goal is on shelf availability both parties want to work together to maximize this. Therefore, five of the seven KPI's are of non-financial nature because they try to maximize on shelf availability. The KPI's, regarding cost and inventory, are the next step to become more efficient while remaining the high service level towards the customers. The retailers also have several KPI's in place as described in the TAG-report (Appendix 1) and discussed during interviews. These KPI's correspond to the KPI's mentioned in Table 8.

The on-time delivery of a complete and accurate order is of vital importance as described in the TAG-report. Also during the interviews retailers said: "The most annoying what could happen is when we have empty shelves due to a stock-out." The retailers told the stock-outs can be caused by both the supplier and the retailer. Stock-outs could be caused by a supplier due to production problems and at retailer side because of errors in ordering volumes. Therefore, the other important supply chain performance indicator from retailers is the collaboration on forecasting to prevent out-of-stocks.

The ultimate goal of both companies is selling as many products as possible. This can only be achieved by having 'on shelf availability' so that consumers can buy the products. The resource component of the framework is representing this on shelf availability, because it stands for a high level of customer service. However, this is a result of resource and flexibility. The interviews revealed a shift in focus depending on the life cycle at the supplier side. Flexibility is most important in the introduction and growth stage and this focus shifts towards the resource component in the maturity and decline stage. "When we introduce new products it is important it is a good product and it is on the shelf. This means we have less focus on efficiency because we build high stock at our warehouse. However, we have a lot of flexibility and can respond to changing demand patterns." "In the first twelve weeks after introduction, out-of-stocks are non-acceptable; it is a hard criterion in the yearly objectives of a demand planner." "When delisting takes place demand planners make a plan for zero obsoletes because these are costly. This can sometimes result in out-of-stocks of the old product. Sometimes you take the risk because another production run is too costly because it will result in a lot of obsolete products." This has been visualized in Figure 6. The differences between life cycle stages were already found by Aitken et al. (2003). But this also has an impact on the way of collaborating with supply chain partners. In the introduction and growth stage flexibility is wanted, therefore timely accurate information is needed to adjust production. In the maturity and decline stage different information needs to be shared to become more efficient.

The retailers expect full delivery of products in every stage. However, internally they also look towards efficiency when old products are replaced with new products. Results from the TAG-report revealed that retailers find it important that suppliers proactively and timely send information regarding the status, adjustments and changes of an order. This could be a point of improvement between the supplier and retailer.

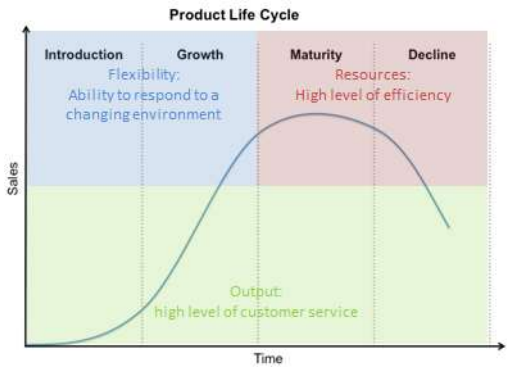


Figure 6 - Supply chain performance focus

4.2.2 Supply chain collaboration elements from the supplier and retailer

The KPI's of supply chain performance have been described in the previous paragraph. Supply chain collaboration impacts these KPI's positively and are the focus in this paragraph. The interviews were structured based on the elements of supply chain collaboration described in the article of Cao et al. (2010) and the enablers and inhibitors described by Barratt (2004). Key findings of the interviews are given below. The full analyses of the interviews can be found in Appendix 3.

Information sharing

In general there is little information sharing between the supplier and retailer: "Retailers are not very eager to share data. Because of the good relation and if we can show a need to have data they will share it." The sharing of data is done during special events, for example new production introductions, promotions, out of stocks, and delisting of products. During new product introductions, information regarding week of introduction, amount of stores, reference product, and actual sales of the first week is shared. "It is hard to determine the initial volume to order, because we do not really know the new product." This was a reaction of a retailer during an interview. It would help the retailers if information is shared regarding the targeting of a new product.

Before promotions take place, plans regarding promotion volume are shared between the two parties. If there is a shortage in products, retailers and the focal company work together to reduce the out of stocks in stores. "During out-of-stocks we get the inventory level of every distribution centre on a daily basis. With this information we can reduce the amount of out-of-stocks at the store level." When products will be delisted (decline stage) the amount of inventory in distribution centres and stores can be shared in order to optimize the latest production schedule. "You have a very good idea about the regular flow of products. The fluctuations such as for example high peaks during promotions or the decline of sales form the challenge for the supply chain. When these events occur, more information exchange is needed between parties to maximize the result for both parties."

Goal congruence

The goal congruence can be linked to the supply chain performance indicators as described in paragraph 4.2.1. Both parties want to earn as much money as possible, however this can only be achieved by having products available for consumers. "The only way we can send an invoice to a retailer is by delivering the products. This works the same at the retailer-side because products can only be sold when they are on the shelf." The on shelf availability is of great importance of both parties and therefore goals are quite aligned. "We need to have a 99% plus on-time delivery and this is the same for the distribution centres of the retailers towards the shops."

Decision synchronization

If promotions are done, both parties make a plan and these are discussed with each other. "Eight weeks before promotion we send a plan to the retailer. Four weeks before a promotion we get it back from the retailer. If there are large discrepancies between the plans these will be discussed." The outcome of this discussion is a final plan with the promotion volume agreed by both parties. During new product introductions there is a separation between account exclusive and nationwide introductions. With account exclusive products the amount of decision synchronization is higher. Synchronization is done on initial base demand, amount of stores, ordering volume of distribution centres to fill stores with initial volume, and the method of marketing and promotion. "All products that are made are for a specific customer so the volume is a joint decision." With account exclusive products, retailers can differentiate from other retailers and are therefore more willing to collaborate with the supplier. When doing nationwide introductions decision can also be synchronized but incentives of the retailers are lower. During a new introduction a reference product could be given to trigger the replenishment of the

product. Two retailers said when a new product is introduced the timing needs to be more synchronized.

Incentive alignment
The products made by the supplier are perishable and therefore a 'best before date ratio' has been agreed on by retailers and supplier. This ratio is always the same for nationwide products; however, the shelf life is lower with account exclusive products. This is due to the higher risks because all the stock available is for one particular retailer. There are also given incentives when retailers comply with goals stated in the contract; however these are confidential. "Remuneration structures are described in the yearly deal, an example is the percentage of full trucks and full pallets that need to be reached to get a discount." "The first reaction of retailers is "you can take the pain." This is the start and during discussion an acceptable solution for both parties is reached." There is found from the interviews and internal records that there are not really formalized structures in place to do incentive alignment.

Resource sharing
The focal company is a market leader for different categories of the retailer. The retailers have 10.000 SKU's and cannot check all categories. Therefore, retailers appoint the market leader of that category to maintain the category and make it grow. The category manager of the supplier develops a vision to make the category grow and can be seen as an objective consultant and can therefore be seen as an ultimate form of resource sharing. "As category manager you are responsible for making the category grow as a whole at the stores. Therefore, a category vision is developed to see where we stand as a category in five years. This vision is translated to the specific needs of a retailer by working together on this." "An expert that develops a demand forecast at the retailer can be consulted to see what kind of knowledge can be distilled from the daily information that is sent by the retailer." Shared projects can be set up to improve supply chain efficiency. During these projects both parties invest time and knowledge is transmitted between the two parties.

Collaborative communication
As the supplier is market leader in several categories of the retailer, the relationship between the supplier and retailers is equal. Account management communicates daily with the retailers. This communication goes both ways. "We need them to sell our products, but they also need us, otherwise a big portion of the shelves will remain empty. Being a big player, this is easier compared to a smaller supplier where the retailer has more power." "It feels like an equivalent relationship where communication comes from both directions."
The category manager from the suppliers has monthly meetings with the category manager of the retailer. The content of these meetings are the performance of the category and ways to improve this. When special events occur the demand planners of different categories of the supplier have contact with the retailer, this contact is from one direction. However, the first contact is always through account management.

From a commercial point of view the contact is daily and from both directions, at supply chain level this is somewhat different. "On the level of the customer service manager this also goes both ways. This communication goes about improvements and to share information regarding risks. Retailers mostly talk about deliveries that were not done properly and what was the cause of this." The mode of contact at supply chain level is mostly incident driven from the retailer's perspective. The demand planner told that on his level only the supplier makes contact with the retailer and not the other way around. The contact of the supplier is mostly driven to get mutual benefits by collaborating with the retailer.

"Sometimes subjects are agreed on at commercial level, but it takes time to get this into the organization of the retailer. These things are only detected when retailers for example keep ordering an old product instead of the new one." People from the supply chain department at the supplier want to establish more close relationships with people from the supply chain

department at the retailer. They hope that if problems occur in the supply chain they can have faster solutions by communicating with people at the retailer side.

Joint knowledge creation
When a new product is introduced there is discussed how this product can be made successful. This is joint effort and especially with account exclusive products. "The mutual goal is to make the new product introduction a success for both parties." The category manager of the supplier develops a general category vision. This vision is shared with the retailers and is adjusted in consultation with the retailer to align these with their special needs. Joint improvement projects are set up to gain mutual efficiency benefits. One example is that the retailer explains their demand forecast information to the supplier. This will give new insights into the demand at the stores for the supplier and can lead to higher forecast accuracy, which will lead to a better service level.

Points of improvements
Each interviewee was asked what they thought an improvement could be regarding the current way of supply chain collaboration. These answers gave new insights which could not be grouped under the elements of supply chain collaboration. These answers gave a new insight that the focal company is looking at events when collaborating instead of focussing the life cycle stage of a product. The people within the focal company described that collaboration with the retailers is always done on event at the moment. They also said they wanted to expand these activities but this will take time. The answers given below are regarding events and also the structure between the two companies:

- "Delisting of products has a high level of risk regarding costs and I think optimization can be reached at that point."
- "New product introductions are a point where collaboration could help to get timely information about the success in the market. This information can be used to up- or downscale production."
- "Promotion plans are shared at the moment. However, decisions need to be synchronized better if volumes deviate from the initial developed plan."
- "Closer relations are needed between the supply chain departments of the supplier and the retailers. This is needed because sometimes communication takes place on commercial level and lingers in the supply chain organization of a retailer."
- "Retailers will share information with us if we can show a need for this. We also need to show them what we have done with this information so they know it can be valuable."
- "We need to have points of contact with the supply chain department of retailers. We do not even have to share daily information. If we are in close contact with key persons at the retailer's supply chain department we can communicate with them directly on critical moments. Examples of critical moments are: new product introductions, delisting of products, loading of promotional volume, and out of stock situations."

These points of improvements are general statements not separated by the life cycle stage of a product. However, some statements can only occur in a specific stage. The findings from the interviews are used for the managerial implications of this study.

4.2.3 Life cycle stages of the products

During the interviews information was gathered regarding the different life cycle stages of the products of the focal company. This resulted in information about the characteristics, timing, current process of managing each life cycle, challenges during each life cycle stage, and the emphasis of supply chain performance. Because each stage is discussed separately there can be distinguished if it is useful to separate supply chain collaboration based on the life cycle stage.

Introduction stage

New introductions can be business breakthroughs (new category), category reframe (new product in existing category) or a brand refresh (new flavor or line extension) and can be listed nationwide or account exclusive. The timing of the introduction stage of products is in the first two weeks after introduction. "Nationwide introductions have more pressure from the suppliers' perspective." The supplier already invested a lot of money in the new product and retailers must be convinced to put it in stores. This is different with account exclusive products, which are a joint effort between the supplier and the retailer. Retailers are more eager to invest time and budget from their side when a product is account exclusive, because they can use the product to differentiate from other retailers and get customers to their stores. Preferably, promotions are not done in the first five to six weeks because the product lacks a steady base demand. However, marketing and sales want customers to pick up the new product as quickly as possible to get the product on rotation.

Marketing develops a new value proposition. Category management of the supplier develops a game plan, which includes the amount of stores in which the product will be sold and the rotation per week of the product based on a reference product. Account management discusses with category management on the numbers in the game plan and agrees to the final numbers. These numbers are input for demand planning to develop the first demand plans to fill up the pipeline and to cover the sales of the first weeks. This plan is input for the supply planners to manage the plants.

Challenges found during this stage are:

- "We need to remind retailers to order the new product instead of the old product; this is sometimes forgotten by the retailers."
- "The timing when a product will be in store can change from time to time. There are mutation moments; however it could take a while before retailers start ordering the new product."
- The size of initial order quantities, to fill the pipeline of the retailer, is difficult to determine (depends on the amount of stores, rotation figures, shelf size, reference product). It also depends on the retailer, some retailers do a quicker pipeline fill and product introduction compared to others.
- The initial rotation figures towards consumers are unknown. The rotation of a product is not a straight line, there is a peak in the introduction period and after twelve weeks it is going down somewhat and becomes steady.

These issues result in challenges for the supply chain department of both the supplier and the retailer. On shelf availability is the common goal between the parties which they both try to ensure. It was found that during new product introductions information should be shared and decisions should be synchronized between the two parties. During the interviews with retailers they said that: "Communication regarding new product introductions and weeks of transition can be improved." Also in interviews at the focal company there was said: "Decision synchronization should take place regarding the moment of transition from an old to a new product, the reference product and weeks to fill the pipeline, and the amount of distribution centres and stores the product will be on the shelf."

Growth stage

After two weeks of the introduction there is a peak in demand. This takes approximately twelve weeks when it will become somewhat steady. This can be seen as the start of becoming more mature. Heavy marketing and promotion is done in the growth stage to get the product on rotation. The timing of the growth stage is between three and twelve weeks after introduction.

Marketing and category management track the initial numbers of the product, these numbers have a lag of four weeks. Marketing has a marketing calendar to show in which weeks commercials and other product support mechanisms are used. Account management has close contact with the retailers and discusses initial promotion volumes. These volumes are inserted into a program called 'promote'. Account management has weekly meetings with demand planning. The volume of base and promotion volume of upcoming twelve weeks are central in these weekly meetings.

Challenges found during this stage are:

- "Sometimes the moment of mutation shift. For example, the game plan describes the retailer will have the product on shelf in week twelve; however the retailer only starts ordering in week fourteen. This will result in a lower demand in week ten until twelve but will result in a peak demand in week thirteen and fourteen when a retailer has the pipeline fill."
- "A product can be phased into the market in stages. This means the product will first only be available at retailer 1, after two weeks retailer 2 etcetera. This will result in a long unpredictable growth stage. This is hard to manage because the timing of mutations of retailers differs and some buy the old product and other the new one."
- "It is difficult to track the success of a product because actual sales data have a four week delay." (Nielsen data)
- "The moment and volume of the first promotion is a challenge. It is already hard to determine the base demand of a new product. Promotion volume on top of this unpredictable base demand makes forecasting even harder."

During the interviews with the retailers there was said: "The amount of products sold do not deviate that much, only promotions are causing big differences in volume sold." It is hard for the retailers to determine the extra amount of volume. When it is a fast moving product they care less because it will be sold anyway. However, with slow-movers it hard to determine the extra volume sold in promotion. This is also the case with new products, because retailers are not familiar with the product and do not have feeling of amount of volume that will be sold. "It would be nice if there is more decision synchronization and information sharing during promotions." One of the retailers said: "It would be nice if the distribution centre sends the promotion volume of products to us automatically. This saves time from my side to determine the promotion volume and will result in less supply chain variability." This means, retailers would like to work together with the supplier to make more shared decisions regarding promotion on products in general. The success of products in the growth stage are hard to determine for both parties; synchronizing decisions based on mutual information sharing could result in better supply chain performance.

Maturity stage

Products which are in the maturity stage are seen as daily business, because there is established a steady base demand. There is made use of an ABC analysis to track products based on margin and volume. Products with high volume and high margin (A) are given more time compared to products with low margin and volume (C). Promotion volume is put on top of the base demand volumes and sometimes marketing is done when sales numbers drop. This is done to give the product a boost and to get it on the previous level of rotation. Products will enter the maturity stage between twelve and sixteen weeks when the demand becomes more steady and predictable.

There are weekly meetings between demand planning and account management to discuss the numbers for the upcoming three months. Base demand and promotional volumes are discussed weekly between demand planners and account managers in sales and operations planning meetings (S&OP). Demand planners give information regarding base demand and seasonality and account managers give input about the promotion volumes. These numbers are discussed internally what will be input for the production plan.

Challenges found during this stage are:

- "The number of promotional volume in the developed plan should correspond to the real promotion volume that is ordered by the retailer."
- "An increase or decrease in the numbers of stores where the product is on the shelf can have a significant impact in the amount of products sold."

During the interviews there was found that shared decisions are made on the promotion volume. This is a big amount of the volume of products in the maturity stage, because a lot of promotion is done on the products of the focal company. The promotion volume is accorded between account management and the retailers and internally between demand planning and account management. However, it is found that the promotion volume ordered by the retailer is sometimes more than the original plan. "Some retailers buy more promotional volume than was originally in the plan. If this happens we check the volumes that were already send and our own stock level at the distribution centre. If the stock level is sufficient enough we will send the products towards the retailer. This will result in a discussion about the price because the retailers want to have it against promotion price instead of the regular price." The process of synchronization of decisions on promotion resulting in a shared plan is in place. However, processes are lacking when the amount of promotional volume is deviating from the plan.

Decline stage

Products in the decline stage will eventually result in delisting of these products because they are not profitable enough. There are two kind of delistings. Delisting driven from the market: The sales drop and the retailer tells the supplier they want a different product on the shelf at the next moment of mutation. The supplier needs to check if they have a new product or can put a different product on a wider phasing on the shelf. Delisting driven by supplier: The category manager of the supplier identifies a drop in sales and checks new value propositions which can replace the product. This is discussed with account management who will discuss it with the retailer. If an agreement has been reached there will be a product rollover from the old to the new product. The timing of products in the decline stage is not really clear in numbers of weeks. There will be spoken of a decline stage when sales begin to drop and become less compared to the initial base demand.

When this is the case, account management will have meetings with the retailers and discusses the disappointing results of a certain product. Account management will discuss this with the category manager to check the possibilities. Eventually this will lead to the delisting of a product and the introduction of a new product or a broader phasing of an existing product. The retailer will send an in- out list to show the products which will be delisted and new products that will be introduced into the shelf.

Challenges found during this stage are:

- "Sometimes the numbers of stores are scaled back by the retailer without prior notice. This means the amount of stores the product is sold will be lower which has a huge influence on the amount of products sold."
- "It is hard to retain customer service in terms of delivery, while keeping the amount of obsoletes as low as possible when products will be delisted."
- "Shelf-size could be at stake if a competitor has a better product. It is of big importance we have enough good products which have a high selling volume. These products can be used to fill the gap from the delisted product. Otherwise we need to have a new product which can replace the old product."

During interviews it was found that the decline stage is difficult for the suppliers. Retailers expect a high customer service. However, when the amount of products sold will become lower and the amounts of stores are reduced the chance of obsolete products becomes higher. There was also found that there is less focus of account management and the retailers compared to the other stages which could result in high amount of obsoletes at the supplier. "At the moment when a product comes into the decline stage the general trend at the supplier is to leave the product as is. There will be focussed in time and budget on new products." Also retailers are focussing on new products, because products in decline stage have no priority because they look into the future. However, there was found in the interviews that retailers sometimes forget to stop ordering on the old code. "We sometimes see that retailers are ordering on the automatic pilot and keep ordering the old product instead of the new product."

5. Discussion

In this chapter the main outcomes of this study are discussed. There is made an interpretation of the findings. At first the findings regarding variability of demand are discussed. This is followed by the findings regarding the differences in supply chain collaboration dependent on the life cycle. After that, the elements of supply chain collaboration are discussed. Finally, the power-balance between the supplier and retailer is point of topic.

Quantitative analyses regarding demand variability

At the start of the research there was found in literature that the amount of variability in demand will be higher with new products, compared to more mature products. Therefore, the assumption was made that the amount of variability in demand could be explained depending on the product life cycle stage. The analysis in this study could not find significant differences between the groups. Therefore, the assumption this can be explained only by the difference in life cycle stage is likely to be short-sighted.

Quantitative analyses could not find a significant difference between the four groups. This could be explained because other factors play a more significant role. During interviews retailers told promotions have a high influence in the amount of products that are ordered. Promotions are done on products which are in the growth and maturity stage and this could have an influence on the variability in orders. This is in line with the findings of Lee et al. (1997) who find that price fluctuations could influence order variability in the form of forward buying. This happens when retailers buy more products against a lower price and will have stock for a couple of weeks. This problem was also found during this research as found in the interviews. Also marketing actions could have an influence on the amount of sales and order variability because they influence short-term sales (Pauwels et al., 2004). There was not made a separation on the type of products during analysis. The firm is developing products for three different kinds of shelves in the supermarkets. The variability in sales could be different between the product groups, i.e. cereals, nuts, and chips. The quantitative analyses were only used to check initial assumptions. Therefore, no further analyses are conducted in this study because they cannot be used to determine the influence of supply chain collaboration what is the main purpose of this study.

Supply chain collaboration dependent on life cycle stage

This research started with the assumption that the implementation of supply chain collaboration is dependent on the life cycle stage of a product. Therefore, the life cycle stages are used to structure the results in chapter four. However, during the interviews there was found that suppliers collaborate with retailers differently, depending on the events that occur. The focal company did not separate the way of collaborating based on the product life cycle stage, but on special events that occur. The events that were found during this research are new product introductions, promotions, out of stock, and delisting of products. During these events the supplier and retailer have closer collaboration in the form of more information sharing and by synchronizing decisions. This is consistent with the findings of Småros (2003) who describes that new product introduction requires a closer collaboration between supplier and retailer.

The way of collaborating that was found during this research is in line with the research of Whipple & Russell (2007), who developed a typology of collaborative approaches to understand the characteristics, benefits, and limitations of different collaborative approaches. This research resulted in three types of collaboration, i.e. (1) collaborative transaction management, (2) collaborative event management, and (3) collaborative process management, to differentiate the CPFR concept, which is a comprehensive step by step guide for supply chain collaboration. This differentiation can be seen as a guide of which approach to select when supply chain partners choose to collaborate. The supplier and retailers in this research use a type 2 collaboration method, focussing on key events.

In collaborative event management the focus is on joint planning and decision-making around key events, for example new product introductions or promotions, rather than sharing data of all SKU's or discussion over all products. During this study four major events were found which are used to collaborate with the retailers. The list of events found in this research will not be conclusive, as there could be more events. This way of working can be explained by the trade-off between the amount of time invested in collaboration by both parties versus the mutual gains. The mutual gains are bigger during special events because on shelf availability is at risk. By sharing information and decision synchronization during these special events the mutual goal, on shelf availability, can be optimized. Supply chain collaboration is found to positively impact supply chain performance. However, the amount of time and resources invested in this collaboration is seen as a big inhibitor of supply chain collaboration. Focussing on key events is a first step from transaction management towards a more collaborative relationship. If there will be moved towards collaborative process management the life cycle stages can be used to describe the challenges of each stage.

The elements of supply chain collaboration

In this research there was made use of the seven supply chain collaboration elements developed by Cao et al. (2010) complemented by the inhibitors and enablers of Barratt (2004). During the interviews all elements have been point of discussion. Three of the seven elements were central in each interview. First, goal congruence between the supplier and retailer was important. Because both parties had the main goal of on shelf availability there was a mutual goal which brings both parties closer to each other. Second, there was the element regarding the sharing of information. The sharing of information was seen as an important way to improve the supply chain performance. Information sharing was done at special events and the type of information shared was different dependent on the event. The third central element in each interview was the synchronization of decisions depending on the event.

The other elements, incentive alignment, resource sharing, collaborative communication, and joint knowledge creation, were also mentioned during the interviews. However, it seemed that incentive alignment was not used that often between the companies what could be an opportunity to explore. The other two elements, resource sharing and joint knowledge creation were only done when joint projects were started. These projects were initiated to get more efficiency. However, this in turn results in the synchronization of decisions and sharing of information. Also collaborative communication is needed to achieve above mentioned elements and can be seen as a prerequisite.

Power-balance

In this research it was found that the retailers are quite willing to collaborate with the supplier. This is not in line with previous research which found that retailers in fast moving consumer good business are naturally reluctant to share information with suppliers (Weele, 2010). There could be a difference between intrinsic and extrinsic motivation when collaborating with supply chain partners. Intrinsic motivation is doing something because it is inherently interesting or enjoyable while extrinsic motivation refers to do something because it leads to a separable outcome (Ryan & Deci, 2000). It is interesting to see if companies work together to improve the total supply chain performance or if they do it because it could be beneficial for them only. From interviews can be concluded that the focal company is an important supplier for the retailers. Because the supplier has this position both parties have power resulting in an equal relationship, it is possible this relationship is different with smaller suppliers where the retailer has more power. Therefore, the power-balance between suppliers and retailers should be taken into account when doing research into supply chain collaboration. When the power is divided equally, the two parties will behave more like partners what is good for collaboration.

6. Conclusion

In this chapter conclusions from this research are presented. In paragraph 6.1 the conclusions of the results of this study are discussed. This is followed by the theoretical and managerial implications in paragraphs 6.2 and 6.3, respectively. Paragraph 6.4 presents the limitations and possibilities for future research.

6.1 Conclusion

The aim of this study was to identify the difference in supply chain collaboration during the different stages in the product life cycle. This is researched by conducting interviews within the focal company and with the customers of the focal company in order to answer the following research question:

"What is the relationship between supply chain collaboration and supply chain performance and what is the role of the product life cycle stage?"

In literature was found supply chain collaboration positively impacts supply chain performance and this is also found during the interviews. During each life cycle stage the supplier focuses on output, in the form of high customer service, which results in on shelf availability. This is the main mutual goal of the supplier and retailer. In the introduction and growth stage the focus of the supplier is also on flexibility, which will shift towards a focus on efficiency during the maturity and decline stage. The distinction between financial and non-financial outcomes was also made during this research. In this research, non-financial outcomes such as relationship quality, alignment of goals, sharing of resources, and joint knowledge creation, were seen as the most important factors of supply chain collaboration. When these elements are in place, there can be worked towards efficiency gains in the total supply chain, a financial outcome. Supply chain collaboration will lead to a better relationship between supplier and retailer which is a form of non-financial supply chain performance. This better relationship will eventually result in an increase in financial performance because there is collaborated more. It is not clear if this motivation is driven intrinsically or extrinsically.

It was expected that the influence and implementation of the elements of supply chain collaboration would differ depending on the life cycle stage of a product. Expectations were that the amount and depth of supply chain collaboration is more important in the introduction and growth stage of the product life cycle. This was expected because in these stages the uncertainty of product success and demand variation will be higher compared to the maturity stage. This is consistent with the findings of Småros (2003) who describes that new product introduction requires a closer collaboration between supplier and retailer.

This research showed that supply chain collaboration is not segmented on the product life cycle stages, but around special events at the focal company. Special events are new product introductions, promotions, out of stock, and delisting of products. These special events occur in every stage of the product life cycle; however the content of collaboration is different depending on the event. The level of collaboration in the form of communication, information sharing, and decision synchronization is higher when special events occur compared to daily business. Both parties have higher incentives and more to lose during these special events. Daily business is quite predictable and will have little impact on the performance of the supply chain. Mainly the up- and down swings in order levels, caused by special events, will be a challenge for the supply chain performance as a whole.

Closer collaboration and information sharing between retailers and supplier can reduce the impact of the swings and the size of the swings.

Therefore, the amount and depth of supply chain collaboration is not dependent on the life cycle stage. The content what is discussed during each stage will differ depending on the events which can occur during each life cycle stage.

These special events can be linked to the life cycle stages. New product introductions only take place in the introduction stage and delisting only take place in the decline stage. The information sharing element during introduction consists of the week of introduction at the retailer, number of stores the new product will be listed, shelf size, initial order volume, and actual sales data of the first weeks. Sharing of actual sales data can be used to upscale production to maximize the service level and to prevent out of stock.

This completely differs from the kind of information shared during delisting of products. During the delisting it is important how many products are currently in the pipeline of the retailer. The amount of stock will be used to determine the latest production date of the old product and when the new product will be ordered. By doing this the high service level can be remained, while the amount of obsoletes is being minimalized.

Promotions are done during the growth and maturity stage of the product life cycle. It was expected that the variability of demand in the maturity stage was little because a steady base demand has been created. However, heavy promotion is done in the maturity stage, which causes high demand variability. Therefore, information sharing and decision synchronization on promotional volumes is very important in the maturity stage of the product life cycle. Retailer and supplier plan promotions and promotion volumes together and during promotion information about sales is shared. When doing promotions the supply performance focus is completely on output, a 100% delivery rate. However, during the maturity life cycle stage the focus will also be on a high level of efficiency, because these products have high volume and can bring high margin for both parties.

Expected was that in the growth stage of the product life cycle supply chain collaboration would be very important. This was expected because there is a high level of uncertainty whether the product becomes successful or not. Collaboration plays an important role during the growth stage; however uncertainty of the successfulness of a product is not the only reason. In the growth stage, promotions are the main factor of variability in demand. The product is pushed towards the consumers by heavy marketing and a lot of promotion actions. During the growth stage supply chain performance is focused on output and flexibility. During the first twelve weeks after a product is introduced, the main goal is to prevent out of stock and serve the market as good as possible.

Out of stocks mainly occur due to production problems. When this happens the amount of stock available at the supplier will be divided over the retailers. During these events, information about the stock level at distribution centres and stores from retailers is shared. This information is used by the supplier to mitigate the amount of out of stocks on store level by dividing the inventory as good as possible over the retailers.

During the interviews these events were point of discussion. It was found that each product life cycle stage brings challenges. Therefore, it is not very helpful to separate supply chain collaboration dependent on the life cycle stage at first. When setting up collaboration it is better to focus on the key events per stage to achieve quick wins. Each key event requires a different way of collaborating and therefore mutual goals should be clear for both parties. On shelf availability of products is important in the retail market because both parties only earn money when products are on the shelves. This could be the motivator for both parties to collaborate and this mutual goal should be clear for both parties. These events cause fluctuations in the volume of demand which results in challenges for the total supply chain. Because of these challenges they should be managed on a collaborative event basis (Whipple & Russell, 2007). When collaboration processes are in place around key events there should be looked into collaborative process management. By doing this there can be looked into methods to collaborate over the whole product portfolio and the life cycle stages could be used as a differentiator.

6.2 Theoretical implications

The main purpose of this study was to explore the phenomenon supply chain collaboration and its impact on supply chain performance depending on the life cycle stage of a product. This explorative behaviour of this research was to gain in-depth knowledge and to really understand the concept of supply chain collaboration. Most literature describes the financial benefits of supply chain collaboration, which could be linked to the extrinsic motivation of collaborating. It seems the financial benefits are an outcome of supply chain collaboration and literature lacks to address the conditions needed for supply chain collaboration.

Therefore, this study focuses on the elements of supply chain collaboration developed by Cao et al. (2010). These elements are used to explore what these elements entail in the context of different departments within a company. This is done in order to understand how supply chain collaboration is implemented in a company. This research has shown that the content of the elements can vary depending events that can occur in the life cycle stage of a product, what is also described in paragraph 6.1. This can be used to build a method for selecting the right approach to collaborate depending on the life cycle stage and event that occurs.

Secondly, the elements of supply chain collaboration have been linked to the four product life cycle stages. This to determine the difference in these elements in the different life cycle stages, which was never done in research before. The research described for example what kind of information should be shared between parties during a new product introduction compared to a delisting of a product. This means that the elements described by Cao et al. (2010) are differing depending on the event that occurs.

Thirdly, this research explores the relationship between supply chain collaboration and supply chain performance. This exploration used the measures developed by Beamon (1999) and complemented this with the difference in financial and non-financial outcomes developed by Gunasekaran and Tirtiroglu (2001). A shift in focus from flexibility in the introduction and growth stage towards efficiency in the maturity and decline stage has been found, which corresponds to a shift from a non-financial focus in the introduction and growth stage to a financial focus in the maturity and decline stage. This is also in line with Fisher (1997) who made a distinction between functional and innovative products. Innovative products can be seen as the products in the introduction and growth stage and need an agile supply chain that can respond to the changing environment. The products in the maturity and decline stage can be seen as the functional products that need a lean supply chain with long runs and high efficiency. This also has implications for the way of collaborating with partners. When the focus is on flexibility there needs to be for example timely accurate information. When efficiency is important the right numbers need to be in the promotion plan, this way long production runs can be done.

Finally, this research extends the research regarding supply chain collaboration typologies done by Whipple & Russell (2007). A deeper insight is given into the type II collaboration typology: collaborative event management. While Whipple & Russell (2007) only describe new product introductions and promotions, this research also treats delisting and out of stock situations as special events.

6.3 Managerial implications

The findings from this study can be used in an organizational context. This research has been conducted in the fast moving consumer goods business and is especially useful for this kind of business. The life cycle stages of products in this kind of business evolve very fast from introduction towards maturity, which makes it necessary to exchange the right information and to develop shared plans fast. The findings from this study can be used by supply chain managers to identify which challenges can occur in which product life cycle stage. These challenges can have a negative impact on the supply chain performance and supply chain collaboration can help to mitigate the impact of these challenges.

The challenges found in this study occur during special events (new product introductions, promotions, out of stocks, and delisting). During each event different information is required and decisions need to be synchronized on different aspects between supply chain partners. The list of challenges found in this research is not comprehensive but can be used as a starting point for managers to identify the specific challenges for their company.

There are identified steps that need to be done to set up the supply chain collaboration structure. At this moment, a lot of the information flows through account management towards the customer and the other way around. This makes the information flow slow and sometimes important knowledge is left with the wrong people in both organisations. Therefore, by working together with the biggest customers on supply chain level, benefits can be created for the supply chain as a whole.

1. Responsibilities

All actors need to be identified who have a stake when setting up a supply chain collaboration process. By doing this the responsibilities of each person can be identified and allocated. Al functions that are found at the focal company are described in Table 9.

Function	Responsibility
Order management	Customer service: capturing of orders, invoicing and issue resolution
Demand planning	Works closely with sales team and customer engagement
Customer engagement	Supply chain relationship with customers: joint KPI's, event planning, escalation of service issues etc. Also has a close relationship with the wider supply chain in order to be on top of anything what may impact the customer.
Logistics	Has day-to-day contact with the 3PL and manages the output from this party.
Account management	Has the contact with the customer on a commercial level.
Supply chain manager	Has the contact on strategic level with the supply chain manager of the retailer.

Table 9 - Supply chain functions

2. Structure

There needs to be developed a communication structure. This way the right management and operational levels can be aligned. For example, the supply chain manager from the focal company needs to have a direct contact with the supply chain manager of the retailer and has scheduled meetings periodically. The demand planner of the focal company has direct contact with the person in charge of replenishment at the retailer. Examples are given in Table 10, 11 and 12.

	Supply chain manager		
Retailer	Contact	Content	Frequency
1 (name)	(Name of supply chain manager)	Strategic level: Define the direction for next years	2 times a year
2 (name)	(Name of supply chain manager)		

Table 10 – example 1 communication matrix

	Demand planning manager		
Retailer	Contact	Content	Frequency
1 (name)	(name of flow manager and replenishment manager)	Optimisation of processes, finding ways how to achieve better supply chain performance by working together (joint forecasting for example)	Four times a year
2 (name)	(name of flow manager and replenishment manager)		

Table 11 – example 2 communication matrix

	Demand planner (name)		
Retailer	Contact	Content	Frequency
1 (name)	(name of replenisher)	Replenishment of new products, promotions, delisting, and out of stocks. Looking at the implementation of joint forecasting	4 times a year, face to face. Contact via telephone or mail when events occur.
2 (name)	(name of replenisher)		

Table 12 – example 3 communication matrix

3. Operational tasks

During the research it is found that reoccurring events bring challenges to the supply chain of the focal company. The prediction of base demand is seen as a day-to-day activity and no collaboration is done on these kinds of products. However, when events occur interviews showed that demand planners want to have information from replenishment personnel at the retailer. These events can be plotted on each life cycle stage and also communication structures should be made for these events.

A template has been developed that can be used to give guidance during special events. First, supply chain departments should identify the challenges that could occur. These can be placed in the column of the table. There can be identified in which product life cycle stage these could occur (Figure 7).

Life cycle stage/ event	Introduction	Growth	Maturity	Decline
New product introduction				
Out of stock				
Promotion				
Delisting				

Figure 7 - Challenges per stage

After specifying the challenges, the managers need to focus on the content of each element developed by Cao et al. (2010). For example, the kind of information that needs to be shared or the way incentives need to be aligned to get the best results for the entire supply chain.

The four events that were found during this research have been worked out in Figure (8). This should be done for every event that could bring difficulties towards the supply chain. By doing this, a proactive way of scanning risks is developed. When each element is worked out there can be zoomed into each of the elements. An example of information sharing when introducing a new product is given in Table 13.

Owners and timelines can be linked to the actions that are described in Figure 8. This should be worked out for each stage and element (Table 13). This should become a repeatable process between the supplier and retailer. When a new introduction will be done there will be decided which product is used as reference product. This is a shared decision between the supplier and retailer, who will benefit both of this synchronization. This will reduce the amount of supply chain risk of out of stocks or obsoletes, which will negatively influence the on shelf availability.

Life cycle: Introduction	Event: New product introduction (Doritos Roulette)	Responsibility: Demand planner (name) Retailer X: (name replenisher)
Information sharing		
Timing	**Content**	**Information**
20 weeks before introduction	Week of introduction	Week 36
12 weeks before introduction	Reference product	Doritos jacked rebel
12 weeks before introduction	amount of stores/DC	800/4
12 weeks before introduction	Shelf size	10 bags (1 CV)
5 weeks before introduction	Pipeline fill	35% n-3, 35% n-2, (30%) n-1
2 weeks before introduction	Code activated	Yes

Table 13 - example template

Another example, when doing a promotion this can occur in the growth, maturity, or decline stage. When promotion is done in the growth stage there is no promotion done before. Therefore, old promotions should be analysed with a product that is similar to the product, what is called the reference product. This reference product should be decided on together with the supplier and the retailer, otherwise the plans will not match. Also the week of promotion must be decided together and in which weeks products need to be delivered at the distribution centre. During promotions it could be useful to share the scanner data to see if the promotion goes according to plan or if there are big deviations. This could be useful for tracking the current performance of the promotion but also to send automatic promotional volume towards retailers. When there is flexibility at the plants this information could also be used to make adjustments to production plans. When doing this kind of joint activities there can also be looked at a kind of incentive alignment what is currently not really used at the focal company. This is one example of how the template should be used in an organization.

If trust grows and processes are standardized when events occur there could be looked if this could be rolled out towards more products. This could become an implementation of collaborative process management segmented on the life cycles. Therefore, the segmentation of supply chain collaboration on life cycles can also be used when the process is rolled out not only for events but for the whole product portfolio. Using this segmentation, products can be put in four groups and there can be chosen on which products special attention is given.

Product life cycle stage it can occur	Supply chain collaboration element / event	Information sharing	Goal congruence	Decision synchronization	Incentive alignment	Resource sharing	Collaborative communication	Joint knowledge creation
Introduction	**New product introduction**	- Week of introduction - Number of stores - Number of products in shelf. - Initial sales figures from first weeks	- On shelf availability - Success of a new product which can bring new sales volume.	- Reference product: used for pipeline fill and for replenishment.	- Discount rates when certain amount of rotation is reached. - Discount if sales figures are shared	- Systems to see stock level data - Systems to see sales figures - Systems to see production volume and stock levels.	- Call a few weeks before introduction if retailers have the new code activated in their systems.	- Develop shared marketing mechanisms to make the product a success.
Introduction Growth Maturity Decline	**Out of stocks**	- Timely information regarding the possibility of out of stocks beforehand. - Sharing of stock levels at distribution centres - Sharing of stock levels at stores	- Try to maximize the on shelf availability at all stores.	- Develop a quotation plan based on the needs of each retailer. This to serve each retailer in the best way possible. Be transparant about the situation - Maybe use a differerent product to fill the empty shelves.	- Discounts could be given to retailers if they put a different product on the shelf which is available at the supplier.	- Developing ways to improve forecasting to reduce the chance of a out of stock situation.	- Timely communication regarding the possibility of out of stocks beforehand.	- Develop ways to reduce the amount of out of stock situations. - Develop policies how to effecively distribute the available stock at over all stores.
Growth Maturity Decline	**Promotion**	- # Promotional volume - Scanner data of the promotion - Weeks of pipeline fill	- Make the promotion a success (discount for the retailer, volume uplift for supplier)	- Week of promotion and what kind of promotion - When the pipeline fill take place - Amount of promotional volume	- Discount rate for promotional volume - Extra discount when retailers order the amount as stated in the original plan	- Sharing data and knowledge regarding old promotions - A vendor managed inventory solution for promotional volume	- Discussion regarding promotional volume and which week to start - Also contact with the supply chain department of the retailer	- Developing of a shared plan regarding the promtional volume
Decline	**Delisting**	- Amount of products in the pipeline (distribution centers and stores) - Week of delisting	- Delivering the products to the end consumers	- Week of mutation - Amount of products needed to keep on shelf availability without having to much obsoletes	- Discount when retailers delist the product and list the new product in the week that was agreed - Share risk of osboletes in the total supply chain	- Replenisher of the retailer and demand planners of the supplier need to share knowledge with each other.	- Discussion with the replenisher to determine last production date and volume - Discussion regarding the week of delisting	- Replenisher of the retailer and demand planners of the supplier need to share knowledge with each other.

Figure 8 - Actions per stage

6.4 Limitations and future research directions

This research has been conducted to explore the concept of supply chain collaboration and to gain in depth knowledge on the influence of supply chain collaboration on supply chain performance. This knowledge has been gained by performing a case study at one supplier in the fast moving consumer goods business. The first limitation of this study is that only data is gathered from one supplier what makes results less generalizable. More explorative data should be collected, in the form of case studies, in order to see if these findings are consistent in the total fast moving consumer goods industry. After performing multiple case studies results can be generalized for the total industry.

The seven elements developed by Cao et al. (2010) have been explored during this research to identify their impact on supply chain performance. Some of the elements, such as collaborative communication, joint knowledge creation, and resource sharing, are more suitable for qualitative research because in depth knowledge should be gained how this is done. Quantitative research could be conducted on the elements incentive alignment and information sharing. This could be analyses regarding the frequency and content of data, and for example analysis on different incentives and their influence on supply chain performance. By doing quantitative studies on these elements there can be measured what kind of information or incentive has a positive impact on supply chain performance. Quantitative analysis could also be performed on special events instead of focusing on the life cycle stage of a product.

The research has been done on a dyadic level, which means that also the point of view of the retailer is taken into account. However, other players in the total supply chain could have an influence on supply chain performance as well. This could be for example the suppliers of the focal company or plant adherence. To be more precise, future research should make use of a network approach, which means all players from a supply chain are taken into account.

Finally, it appears that supply chain collaboration based on events is the most optimal form of collaboration, comparing benefits versus costs at this moment. However, the list of events is incomplete and further research should focus on other key events which challenge supply chain performance. Also, more research should be done in order to find the best way to implement this kind of collaboration. Current research only addresses the benefits and importance of supply chain collaboration; however no cost effective way of implementing has been described by research.

References

Andraski, J. (2003). CPFR emerges as the next movement in supply chain management. Collaborative planning, forecasting, and replenishment–How to create a supply chain advantage, American Management Association, New York, 56-70.

Angeles, R., & Nath, R. (2001). Partner congruence in electronic data interchange (EDI)-enabled relationships. Journal of Business Logistics, 22(2), 109-127.Chicago

Bala, M., & Kumar, D. (2011). Supply chain performance attributes for the fast moving consumer goods industry. Journal of Transport and Supply Chain Management, 5(1), 23-38.

Barratt, M. (2003). Positioning the role of collaborative planning in grocery supply chains. International Journal of Logistics Management, The, 14(2), 53-66.

Barratt, M. (2004). Understanding the meaning of collaboration in the supply chain. Supply Chain Management: an international journal, 9(1), 30-42.

Barratt, M. and Oliveira, A. 2001), ``Exploring the experiences of collaborative planning initiatives,'' International Journal of Physical Distribution & Logistics Management, Vol. 31 No. 4, pp. 266-89.

Barratt, M. (2004). Unveiling enablers and inhibitors of collaborative planning. International Journal of Logistics Management, The, 15(1), 73-90. Chicago

Beamon, B. M. (1999). Measuring supply chain performance. International Journal of Operations & Production Management, 19(3), 275-292.

Blumberg, B., Cooper, D. R., & Schindler, P. S. (2011). Business research methods. McGraw-Hill Higher Education.

Bowersox, Donald J. and David C. Closs (1996), Logistical Management: The Integrated Supply Chain Process, McGraw-Hill Series in Marketing, New York: The McGraw-Hill Companies.

Bowersox, D.J., Closs, D.J. and Stank, T.P. (2003), "How to master cross-enterprise collaboration", Supply Chain Management Review, Vol. 7 No. 4, pp. 18-27.

Bullinger, H. J., Kühner, M., & Van Hoof, A. (2002). Analysing supply chain performance using a balanced measurement method. International Journal of Production Research, 40(15), 3533-3543.

Cao, M., Vonderembse, M. A., Zhang, Q., & Ragu-Nathan, T. S. (2010). Supply chain collaboration: conceptualisation and instrument development. International Journal of Production Research, 48(22), 6613-6635.

Caridi, M., Cigolini*, R., & De Marco, D. (2005). Improving supply-chain collaboration by linking intelligent agents to CPFR. International Journal of Production Research, 43(20), 4191-4218.

Chan, F. T. (2003). Performance measurement in a supply chain. The International Journal of Advanced Manufacturing Technology, 21(7), 534-548. Chicago

Chandy, Rajesh K. and Gerard J. Tellis (1998), "Organizing forRadical Product Innovation: The Overlooked Role of Willingness to Cannibalize," Journal of Marketing Research, 35 (November), 474–87.

Christopher, M. (2004). Creating resilient supply chains. Logistics Europe, 11, 18-19.

Clemons, E.K. and Row, M.C. (1992), “Information Technology and Industrial Cooperation:

The Changing Economics of Coordination and Ownership”, Journal of Management

Information Systems, Vol. 9, No. 2, pp. 9-28.

Coase, R. H. (1937). The nature of the firm. economica, 4(16), 386-405.

Cooper, M.C., Ellram, L.M., Gardner, J.T. and Hanks, A.M. (1997b), “Meshing multiple alliances”, International Journal of Business Logistics, Vol. 18 No. 1, pp. 67-89.

Cox, W. E. (1967). Product life cycles as marketing models. Journal of Business, 375-384.

Crum, C., & Palmatier, G. E. (2004). DEMAND COLLABORATION: WHAT'S HOLDING US BACK?. SUPPLY CHAIN MANAGEMENT REVIEW, V. 8, NO. 1 (JAN./FEB. 2004), P. 54-61: ILL.

Dahlman, C. J. (1979). The problem of externality. Journal of law and economics, 141-162.

Dawson, C. (2002). Practical research methods: a user-friendly guide to mastering research techniques and projects. How To Books Ltd.

Devaraj, S., Krajewski, L., & Wei, J. C. (2007). Impact of eBusiness technologies on operational performance: the role of production information integration in the supply chain. Journal of Operations Management, 25(6), 1199-1216.

Diehn, D. (2001). Seven steps to build a successful collaborative forecasting process. The Journal of Business Forecasting Methods & Systems, 19(4), 23.

Dodgson, M., & Rothwell, R. (Eds.). (1994). The handbook of industrial innovation. Aldershot: Edward Elgar.

Dong, Y. and Xu, K. (2002), “A supply chain model of vendor managed inventory”, Transportation Research Part E, Vol. 38 No. 2, pp. 75-95.

Eisenhardt, K. M. (1989). Agency theory: An assessment and review. Academy of management review, 14(1), 57-74.

Ellram, L. M., & Cooper, M. C. (1990). Supply chain management, partnership, and the shipper-third party relationship. International Journal of Logistics Management, The, 1(2), 1-10.

Ellram, L.M. and Edis, O.R.V. (1996), “A case study of successful partnering implementation”, International Journal of Purchasing and Materials Management, Vol. 32 No. 4, pp. 20-8.

Fisher, M. L. (1997). What is the right supply chain for your product?. Harvard business review, 75, 105-117.

Frantz, M. (1999). CPFR pace picks up, Consumer Goods. www. consumer goods. com/archive/JanFeb99.

Girard, G. 1999), ``How can we collaborate? Let me count the ways'', The Report on Supply Chain Management, November, AMR Research Inc., Boston, MA.

Goffin, K., Lemke, F., & Szwejczewski, M. (2006). An exploratory study of ‘close’supplier–manufacturer relationships. Journal of operations management, 24(2), 189-209.

Golicic, S.L., Foggin, J.H. and Mentzer, J.T. (2003), “Relationship magnitude and its role in interorganizational relationship structure”, Journal of Business Logistics, Vol. 24 No. 1, pp. 57-75.

Gosain, S., Malhotra, A., & El Sawy, O. A. (2004). Coordinating for flexibility in e-business supply chains. Journal of Management Information Systems, 21(3), 7-45.

Gunasekaran, A., Patel, C., & Tirtiroglu, E. (2001). Performance measures and metrics in a supply chain environment. International journal of operations & production Management, 21(1/2), 71-87.

Gunasekaran, A., Patel, C., & McGaughey, R. E. (2004). A framework for supply chain performance measurement. International journal of production economics, 87(3), 333-347.

Hammond, J. H., Obermeyer, W. R., & Raman, A. (1994). Making supply meet demand in an uncertain world. Graduate School of Business Administration, Harvard University.

Holmström, J., Främling, K., Kaipia, R., & Saranen, J. (2002). Collaborative planning forecasting and replenishment: new solutions needed for mass collaboration. Supply Chain Management: An International Journal, 7(3), 136-145.

Horvath, L. (2001). Collaboration: the key to value creation in supply chain management. Supply Chain Management: An International Journal, 6(5), 205-207.

Ireland, R., & Bruce, R. (2000). CPFR: only the beginning of collaboration. Supply Chain Management Review, 4(4), 80-88.

Kampstra, R. P., Ashayeri, J., & Gattorna, J. L. (2006). Realities of supply chain collaboration. The International Journal of Logistics Management, 17(3), 312-330.

KJR Consulting. CPFR Baseline Study—Manufacturer Profile. Grocery Manufacturers of America (2002)

Klepper, S. (1996). Entry, exit, growth, and innovation over the product life cycle. The American economic review, 562-583.

Kumar, P. and Kumar, M. (2003), "Vendor managed inventory in retail industry", White Paper, Tata Consultancy Services.

Kulp, S. C., Lee, H. L., & Ofek, E. (2004). Manufacturer benefits from information integration with retail customers. Management science, 50(4), 431-444.

Lambert, D. M., & Cooper, M. C. (2000). Issues in supply chain management. Industrial marketing management, 29(1), 65-83.

Lambert, D. M., Robeson, J. F., & Stock, J. R. (1978). An appraisal of the integrated physical distribution management concept. International Journal of Physical Distribution & Logistics Management, 9(1), 74-88.

Lambert, D.M. (2006), Supply Chain Management: Processes, Partnerships, Performance, 2nd ed., Supply Chain Management Institute, Sarasota, FL, Chapter 10, pp. 167-96.

Lapide, L. (1999). Collaborating in the e-commerce age. Supply Chain Management Review, 54(7), 15-17.

Laumans B. (2014) The Advantage Group Report

Lee, H. L., Padmanabhan, V., & Whang, S. (1997). The bullwhip effect in supply chains1. Sloan management review, 38(3), 93-102.

Lee, H.L. (2004), "The triple A supply chain", Harvard Business Review, Vol. 82 No. 10, pp. 102-12.

Lejeune, M. A., & Yakova, N. (2005). On characterizing the 4 C's in supply chain management. Journal of Operations Management, 23(1), 81-100.

Mabert, V. A., & Venkataramanan, M. A. (1998). Special Research Focus on Supply Chain Linkages: Challenges for Design and Management in the 21st Century*. Decision Sciences, 29(3), 537-552.

Malhotra, A., Gosain, S., & Sawy, O. A. E. (2005). Absorptive capacity configurations in supply chains: gearing for partner-enabled market knowledge creation. MIS quarterly, 145-187.

Malone, T. W., & Crowston, K. (1994). The interdisciplinary study of coordination. ACM Computing Surveys (CSUR), 26(1), 87-119.

Mason, Jennifer. (2002). Qualitative researching. Sage.

Matthew B. Miles, & A. Michael Huberman. (1994). Qualitative data analysis: An expanded sourcebook. Sage.

McCarthy, T. M., & Golicic, S. L. (2001). Implementing collaborative forecasting to improve supply chain performance. International Journal of Physical Distribution & Logistics Management, 32(6), 431-454.

Mentzer, J.T., DeWitt, W., Keebler, J.S., Min, S., Nix, N.W., Smith, C.D. and Zacharia, Z.G. (2001), "What is supply chain management?", in Mentzer, J.T. (Ed.), Supply Chain Management, Sage, Thousand Oaks, CA, pp. 5-62.

Milgrom, P., & Roberts, J. (1994). Economics, organization and management/P. Milgrom, J. Roberts.

Min, S., Roath, A. S., Daugherty, P. J., Genchev, S. E., Chen, H., Arndt, A. D., & Glenn Richey, R. (2005). Supply chain collaboration: what's happening?. The international journal of logistics management, 16(2), 237-256.

Montoya-Torres, J. R., & Ortiz-Vargas, D. A. (2014). Collaboration and information sharing in dyadic supply chains: A literature review over the period 2000–2012. Estudios Gerenciales, 30(133), 343-354.

Parthasarathy, R. 2009. Key ingredients: assure consumer safety and effective compliance with food supply chain standards. APICS. 19(5):40-43.

Parks, L. (2001). Wal-Mart gets onboard early with collaborative planning. Drug Store News, 23(2), 14.

Pauwels, K., Silva-Risso, J., Srinivasan, S., & Hanssens, D. M. (2004). New products, sales promotions, and firm value: The case of the automobile industry. Journal of marketing, 68(4), 142-156.

PepsiCo. (2014). Retrieved from http://www.pepsico.nl

Potkamp, J. (2014) Commercial director PepsiCo at Next Interns Day

Pramatari, K. (2007). Collaborative supply chain practices and evolving technological approaches. Supply chain management: an International Journal, 12(3), 210-220.

Ramesh, A., Banwet, D. K., & Shankar, R. (2008). Modelling the enablers of supply chain collaboration. International Journal of Logistics Systems and Management, 4(6), 617-633.

Randolph, J. J. (2009). A guide to writing the dissertation literature review. Practical Assessment, Research & Evaluation, 14(13), 2.

Ryan, R. M., & Deci, E. L. (2000). Intrinsic and extrinsic motivations: Classic definitions and new directions. Contemporary educational psychology, 25(1), 54-67.

Sahay, B. S. (2003). Supply chain collaboration: the key to value creation. Work study, 52(2), 76-83.

Schell, C. (1992). The value of the case study as a research strategy. Manchester, UK: University of Manchester, Manchester Business School, 1-15.

Simatupang, T. M., & Sridharan, R. (2005). An integrative framework for supply chain collaboration. The International Journal of Logistics Management, 16(2), 257-274.

Simatupang, T. M., & Sridharan, R. (2008). Design for supply chain collaboration. Business Process Management Journal, 14(3), 401-418.

Småros, J. (2007). Forecasting collaboration in the European grocery sector: Observations from a case study. Journal of Operations Management, 25(3), 702-716.

Spekman, R. E., Kamauff Jr, J. W., & Myhr, N. (1998). An empirical investigation into supply chain management: a perspective on partnerships. Supply Chain Management: An International Journal, 3(2), 53-67.

Suleski, J. 2001), ``Beyond CPFR: retail collaboration comes of age'', The Report on Retail Business, April, AMR Research Inc., Boston, MA.

Terra Technology (2014), "Forecasting benchmark study" retrieved from (18-02-2015): https://www.terratechnology.com/key-findings/

Treacy, M., & Wiersema, F. (1993). Customer intimacy and other value disciplines. Harvard business review, 71(1), 84-93.

Tyan, J. and Wee, H.M. (2003), "Vendor managed inventory: a survey of the Taiwanese grocery industry", Journal of Purchasing & Supply Management, Vol. 9 No. 1, pp. 11-18.

van Aken, J., Berends, H., & Van der Bij, H. (2012). Problem solving in organizations: A methodological handbook for business and management students. Cambridge University Press.

Vergin, R.C. and Barr, K. (1999), "Building competitiveness in grocery supply chain through continuous replenishment planning: insights from the field", Industrial Marketing Management, Vol. 28 No. 2, pp. 145-53.

Vereecke, A., & Muylle, S. (2005). Performance improvement through supply chain collaboration: conventional wisdom versus empirical findings. Paper provided by Ghent University, Faculty of Economics and Business Administration, (05/291).

Verwaal, E., & Hesselmans, M. (2004). Drivers of Supply Network Governance:: An Explorative Study of the Dutch Chemical Industry. European Management Journal, 22(4), 442-451.

Waller, M., Johnson, E.M. and Davis, T. (1999), "Vendor managed inventory in the retail supply chain", Journal of Business Logistics, Vol. 20 No. 1, pp. 183-203.

Weele van, A.J. (2010), Purchasing and Supply Chain Management, 5th ed., Thomson Learning, Stamford, CT.

Williamson, O., E., (1975), "Markets and Hierarchies: Analysis and Antitrust Implications",

Williamson, O.E. (1985), "The Economic Institutions of Capitalism", Free Press, New York.

Wisner, J. D., & Tan, K. C. (2000). Supply Chain M anagement and Its Impact on Purchasing. Journal of Supply Chain Management, 36(3), 33-42.

Wong, C., Skipworth, H., Godsell, J., & Achimugu, N. (2012). Towards a theory of supply chain alignment enablers: a systematic literature review. Supply Chain Management: An International Journal, 17(4), 419-437.

Xu, K., Dong, Y. and Evers, P.Y. (2001), "Towards better coordination of the supply chain", Transportation research part E, Logistics and Transportation Review, Vol. 37 No. 1, pp. 35-54.

Zhao, X., Huo, B., Flynn, B. B., & Yeung, J. H. Y. (2008). The impact of power and relationship commitment on the integration between manufacturers and customers in a supply chain. Journal of Operations Management, 26(3), 368-388.

Appendix 1: TAG group report

Supply chain performance

	2014					2013		2012	
	Net Fav.[1]	Rank[2] (of 17)	NET FAV. Gap Vs. Avg.	NET FAV. Gap to #1	TOP REPORTED COMPANY	Net Fav.[1]	Rank[2] (of 17)	Net Fav.[1]	Rank[2] (of 17)
Supply Chain Management	53	4	20	-33	Cce Retail	36	7	23	8
Aligns with our key supply chain performance metrics	54	4	27	-29	Cce Retail	48	7	43	5
Delivers orders at the date and time requested.	45	5	12	-28	Cce Retail	-13	16	1	17
Delivers accurate orders	19	11	-13	-78	Cce Retail	10	13	-13	15
Delivers complete orders/high % fill rate	33	8	10	-49	Cce Retail, Heineken	-6	13	-20	16
Has order cycle times that consistently meet our needs	58	4	25	-32	Cce Retail	70	4	45	4
Proactive in implementing practices and processes that improve total supply chain efficiency	56	6	23	-29	Cce Retail, Heineken	85	3	34	6
Proactively works with us on forecasting to prevent out-of-stocks	69	3	37	-15	Cce Retail	**	**	**	**
Has built strong relationships with retail supply chain teams	89	3	40	-8	Cce Retail	57	6	70	3
Customer Service / Support	39	6	9	-31	Heineken	37	5	37	5
Provides timely, proactive communication about order status, adjustments, and changes	44	7	10	-34	Cce Retail	39	7	34	7
Provides easy to reach, responsive customer support service	82	4	31	-12	Cce Retail	53	5	48	5
Has efficient invoicing and accounting processes	-7	14	-12	-83	Heineken	18	7	27	5

Appendix 2: Frequency diagram /Output Kolmogorov-Smirnov test / SPSS

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.008	1	.008	.055	.815[b]
	Residual	27.243	197	.138		
	Total	27.251	198			

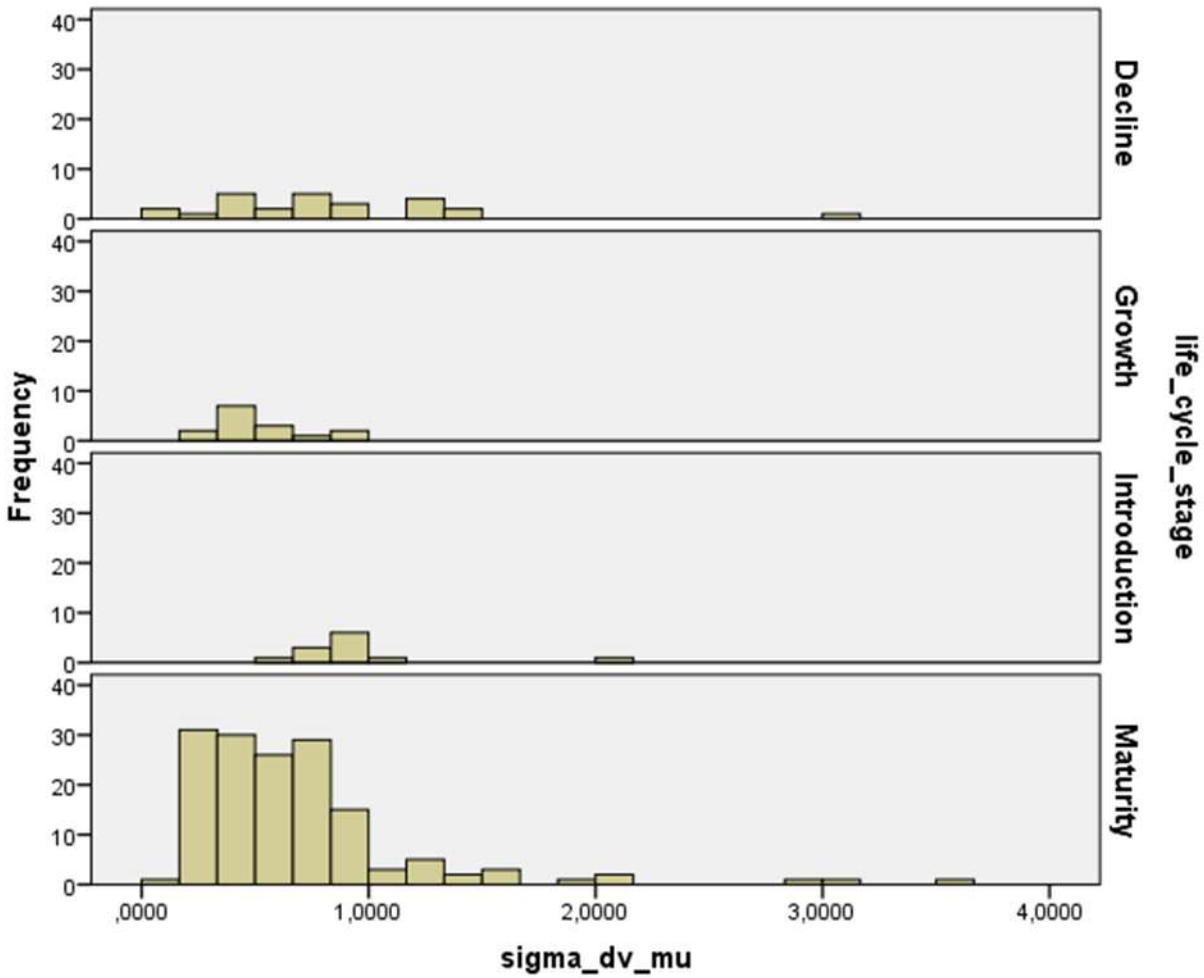
a. Dependent Variable: sigma_dv_mu

b. Predictors: (Constant), cycle_num

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.624	.158		3.956	.000
	cycle_num	.012	.052	.017	.235	.815

a. Dependent Variable: sigma_dv_mu


Frequency
40
30
20
10
0
Decline
Growth
Introduction
Maturity
life_cycle_stage
,0000
1,0000
2,0000
3,0000
4,0000
sigma_dv_mu

Group	Introduction	%	cum %	Growth	%	cum %	Introduction vs Growth	Maturity	%	cum %	Introduction vs Maturity	Growth vs Maturity	Maturity vs Decline	Decline	%	cum %	Introduction vs Decline	Growth vs Decline
1	0	0%	0%	0	0%	0%	0%	1	1%	1%	1%	1%	8%	2	8%	8%	8%	8%
2	0	0%	0%	1	7%	7%	7%	7	5%	6%	6%	1%	3%	0	0%	8%	8%	2%
3	0	0%	0%	1	7%	13%	13%	24	17%	22%	22%	9%	10%	1	4%	13%	13%	1%
4	0	0%	0%	5	33%	47%	47%	18	12%	34%	34%	12%	14%	2	8%	21%	21%	26%
5	0	0%	0%	2	13%	60%	60%	12	8%	43%	43%	17%	9%	3	13%	33%	33%	27%
6	0	0%	0%	1	7%	67%	67%	11	8%	50%	50%	16%	13%	1	4%	38%	38%	29%
7	1	9%	9%	2	13%	80%	71%	15	10%	61%	52%	19%	19%	1	4%	42%	33%	38%
8	3	27%	36%	0	0%	80%	44%	19	13%	74%	37%	6%	24%	2	8%	50%	14%	30%
9	0	0%	36%	1	7%	87%	50%	10	7%	81%	44%	6%	18%	3	13%	63%	26%	24%
10	4	36%	73%	1	7%	93%	21%	12	8%	89%	16%	4%	14%	3	13%	75%	2%	18%
11	2	18%	91%	1	7%	100%	9%	3	2%	91%	0%	9%	16%	0	0%	75%	16%	25%
12	0	0%	91%	0	0%	100%	9%	1	1%	92%	1%	8%	17%	0	0%	75%	16%	25%
13	1	9%	100%	0	0%	100%	0%	2	1%	93%	7%	7%	18%	0	0%	75%	25%	25%
14	0	0%	100%	0	0%	100%	0%	1	1%	94%	6%	6%	6%	3	13%	88%	13%	13%
15	0	0%	100%	0	0%	100%	0%	4	3%	97%	3%	3%	5%	1	4%	92%	8%	8%
16	0	0%	100%	0	0%	100%	0%	1	1%	97%	3%	3%	6%	0	0%	92%	8%	8%
17	0	0%	100%	0	0%	100%	0%	0	0%	97%	3%	3%	3%	2	8%	100%	0%	0%
18	0	0%	100%	0	0%	100%	0%	2	1%	99%	1%	1%	1%	0	0%	100%	0%	0%
19	0	0%	100%	0	0%	100%	0%	2	1%	100%	0%	0%	0%	0	0%	100%	0%	0%
significant op 5%							yes				yes	no	no				no	yes
significant op 10%							yes				yes	no	no				yes	yes
Total	11			15				145						24				
Critical value 5%	41%			35%				11%						28%				
Critical value 10%	37%			32%				10%						25%				

Group	Introduction	%	cum %	Growth	%	cum %	Introduction vs Growth	Maturity	%	cum %	Introduction vs Maturity	Growth vs Maturity	Maturity vs Decline	Decline	%	cum %	Introduction vs Decline	Growth vs Decline
1	0	0%	0%	1	7%	7%	7%	8	6%	6%	6%	1%	3%	2	8%	8%	8%	2%
3	0	0%	0%	6	40%	47%	47%	42	29%	34%	34%	12%	14%	3	13%	21%	21%	26%
5	0	0%	0%	3	20%	67%	67%	23	16%	50%	50%	16%	13%	4	17%	38%	38%	29%
7	4	36%	36%	2	13%	80%	44%	34	23%	74%	37%	6%	24%	3	13%	50%	14%	30%
9	4	36%	73%	2	13%	93%	21%	22	15%	89%	16%	4%	14%	6	25%	75%	2%	18%
11	2	18%	91%	1	7%	100%	9%	4	3%	92%	1%	8%	17%	0	0%	75%	16%	25%
13	1	9%	100%	0	0%	100%	0%	3	2%	94%	6%	6%	6%	3	13%	88%	13%	13%
15	0	0%	100%	0	0%	100%	0%	5	3%	97%	3%	3%	6%	1	4%	92%	8%	8%
17	0	0%	100%	0	0%	100%	0%	2	1%	99%	1%	1%	1%	2	8%	100%	0%	0%
19	0	0%	100%	0	0%	100%	0%	2	1%	100%	0%	0%	0%	0	0%	100%	0%	0%
significant op 5%							yes				yes	no	no				no	no
significant op 10%							yes				yes	no	no				Yes	no
Total	11			15				145						24				
Critical value 5%	41%			35%				11%						28%				
Critical value 10%	37%			32%				10%						25%				

Appendix 3: Summary interviews per element

Information sharing (information based culture / communication & information sharing)	
Function	**Explanation**
Commercialization	*Rotation figures can be shared from new product introductions if asked by the supplier.*
Marketing	*(not discussed, no direct contact with the retailer)*
Category management	*Much information is shared from the suppliers' side because a category vision is made for the retailers. This plan describes how the category as a whole will grow and the market leader (supplier) will also grow automatically. Information is shared on occasion with special events such as new product introductions or joint projects.*
Customer service manager	*Depends on the retailer, different levels of maturity. When some events occur, inventory levels of DC's can be shared. At some retailers information can be collected regarding promotions, after a few hour of promotion. When promotion volumes are going harder than expected production schedules can be switched at some plants. If production cannot be switched, inventory levels of the DC can be shared to divide the products as good as possible to keep on shelf availability as high as possible.* *When new products are introduced the account manager gives a reference product what triggers replenishment at the retailer, sometimes the retailer chooses the reference product themselves.* *Occasionally when products are account exclusive data is shared regarding daily sales per store. (actual sales)* *Retailers are quite willing to share information if a need can be given.*
Account manager retailer 1	*When doing a promotion a plan is shared eight weeks beforehand by the supplier. Four weeks before the promotion this plan is send back to the supplier and volume is discussed between the two parties.*
Account manager retailer 2	*Promotion volumes are shared beforehand. New product introductions volumes and pipelines fills are shared sporadic but there is no clear process in place.* *There is the ambition to do more joint forecasting but this is not in place at this moment.*
Demand planner nuts	*Depends on the retailer, they have different maturity levels. (same information as planner cereals) Information is shared based around events. (new product introductions, delisting, out of stocks)*
Demand planner cereals	*Retailers have different maturity levels regarding information sharing. One retailer is giving estimates of*

	demand four weeks beforehand; other retailers are only sending orders. Promotion plans are shared between account management and the retailers. *In special events such as promotions, new product introductions or delisting data is shared. This is information regarding actual sales or the amount of inventory in the pipeline. Information is also shared by the supplier regarding new codes and mutation moments to probe if retailers have the new code in their system.*

Table 14 - Information sharing element

Goal congruence (board to board dialogue / mutual dependency / common goals and objectives)	
Function	**Explanation**
Commercialization	*Retailers want to sell as much products, we as supplier also. This means on shelf availability is really important and this goal is congruent.*
Marketing	*Sometimes there are joint projects to make a new product really successful. The two parties want to make the product big and have the same goal.*
Category management	*The goal of the supplier is aligned with the goal of the retailer. The main goal is growth of the total category. The philosophy behind this is when tot category grows as a whole the market leader in this category will also grow automatically.*
Customer service manager	*Thinks these goals are quite aligned. The key performance indicator is 99% + delivery and when promotions are done 100% delivery. So both parties are aligned towards the goal of on shelf availability.*
Account manager retailer 1	*We need them and vice versa because on shelf availability is most important for both players. This is also because the supplier is a big player in the market.* *There are shared key performance indicators described in the year contract and both players need to comply with these indicators. The alignment of these goals has been put sharper in this year's contract, which has been a good step. However, the supplier must invest much time in this and the retailer has limited time so this could be a point of improvement.*
Account manager retailer 2	*Internal goal is to remain market share, this will be of no interest of the retailer. The retailer wants to see the category grow as a whole. However, when the category is growing the biggest player is also growing automatically. Private label can be a problem; however a private label can only exist next to an A-brand.*
Demand planner nuts	*On shelf availability is both important for the retailer as the supplier. Forecast accuracy is important for the demand*

	planner, however a good forecast can also ensure a good service to customer what is good for a retailer.
Demand planner cereals	*On shelf availability is most important for a retailer. For the supplier the revenue is the most important however on shelf availability is needed to earn money so the goals are aligned. In the introduction and decline stage there is a really good alignment. In the core assortment it is different because we have 99% delivery contract so we need to deliver. (the retailer cares less)*

Table 15 – Goal congruence element

Decision synchronization (joint promotions processes / understanding the role of VMI)	
Function	**Explanation**
Commercialization	*Promotions are developed together, sometimes with new products there are also made synchronized decisions when they are account exclusive.*
Marketing	*There are joint projects to make a new product really successful. The two parties want to make the product big and have the same goal.*
Category management	*Both parties present their plans to each other and see if joint projects can be done to achieve those goals. The supplier checks the goals of the retailer and aligns with these. The retailer wants to keep control of the category.* *With an account exclusive product there is more decision synchronization regarding the volume of the product because inventory is for one specific client.*
Customer service manager	*Depends on the retailer. Discount rates are often settled after the promotion is done, however sometimes this is done beforehand. This could create a forward buy effect. If this happens a discussion is created if the retailer will be delivered and for what price.* *Sometimes a shared plan is made for promotion volume based on old promotions.* *The supplier wants to go to joint forecasting, however time needs to be invested from both parties. Also the demand planners need to create the skills to discuss this content with the retailers.*
Account manager retailer 1	*The plan which is made before promotion is developed together. The promotion volume is a result of discussion between account management and the retailer.* *With new product introductions initial volumes are discussed with each other and the weighted distribution. (numbers of stores)*
Account manager retailer 2	*The supplier wants to go to joint forecast. Plans regarding promotions are developed separate from each other. Both plans*

	are compared to evaluate the numbers and make the plan final.
Demand planner nuts	*Promotion plans are synchronized between account management and the retailers.*
Demand planner cereals	*Depends on the retailer, at one retailer with a new product introduction there is asked how many the pipeline fill will be. At other retailers there are not strict processes but the supplier wants to build these relationships.*

Table 16 – Decision synchronisation element

Incentive alignment (share of costs, risks, and benefits among supply chain partners)	
Function	**Explanation**
Commercialization	*The 'best before date' ratio is different for account exclusive products, because all products are for one specific retailer.*
Marketing	*(no clear idea)*
Category management	*The first reaction is "you can take the pain". However when the two parties discuss issues there can be made a solution that works for both of the parties. The sharing of costs and risks does not take place very often only with specific projects.*
Customer service manager	*No clear rules on paper, however the only way we can send an invoice towards the retailers is by sending the products. The retailer can also make money by selling the products towards customers* *The sharing of data should be increased regarding: DC inventory levels, amount of promotion volume, actual sales with promotions, inventory levels after promotions. This information is convenient to reduce the amount of obsoletes while maintaining the service level.* *The ratio of 'best before date' time is different for account exclusives.*
Account manager retailer 1	*There are given incentives by the supplier when retailers comply with goals stated in the year's contract.*
Account manager retailer 2	*Risk on 'best before date' is shared sometimes and the risk of a product is also intertwined with the price of a product. (most of the time on account exclusives)*
Demand planner nuts	*Only the 'best before date' ratio is different for account exclusive products, because all products are for one specific retailer.*
Demand planner cereals	*Only the 'best before date' ratio is different for account exclusive products, because all products are for one specific retailer.*

Table 17 – Incentive alignment element

Resource sharing (Customer implants)	
Function	**Explanation**
Commercialization	*Not done often only when specific new product project are launched for account exclusive products.*
Marketing	*(no clear idea)*
Category management	*Category management is an objective consultant to evaluate the category and find ways to make it grow. Category management facilitates for the retailer because they cannot check all categories themselves. Therefor they appoint the market leaders in the market to do that work for them. This can be seen as a way of resource sharing.*
Customer service manager	*Is not really used only when shared projects are done to increase efficiency throughout the chain.*
Account manager retailer 1	*The retailer has thousands of SKU's and cannot check all categories. They appoint the market leader of the category to maintain the category and make it grow. This can be seen as a form of resource sharing.*
Account manager retailer 2	*Not really done from the retailer side. The supplier facilitates a lot by developing a category vision for the retailers.*
Demand planner nuts	*Retailers take the time for shared projects. (example given below)*
Demand planner cereals	*The retailers take time to develop shared projects and also invest time in this. Category management from the supplier facilitates a lot for the retailers.* *One person who developed a system to send daily information regarding demand from the retailer can be consulted by the supplier.*

Table 18 – Resource sharing element

Collaborative communication (communication & information sharing / openness / behavioral related enablers)	
Function	**Explanation**
Commercialization	*Good communication between the retailer and suppliers. This is because the supplier is a big player in the market what balances the relationship.*
Marketing	*Only when there are joint projects in the introduction of a new product.*
Category management	*Monthly meetings with retailers regarding the performance of the total category. There will be discussed what goes well and ways to let the category grow. This contact goes both ways but information comes from the supplier.*
Customer service manager	*Daily communication from two sides*
Account manager retailer 1	*Daily communication from two sides*
Account manager	*Daily communication from two sides*

retailer 2	
Demand planner nuts	*Communication takes place on special events described below.*
Demand planner cereals	*Communication between the demand planners and logistic personnel takes place when special events occur. (promotions, delisting, new product introductions, out of stocks, quotation) Mostly the contact is from one direction from the supplier towards the retailer.*

Table 19 – Collaborative communication element

Joint knowledge creation (individual chemistry / Joint training)	
Function	**Explanation**
Commercialization	*Only when new products are introduced and sometimes with efficiency projects.*
Marketing	*(no clear idea)*
Category management	*Category management develops a category vision. This vision is shared with the retailers and is adjusted to the special needs of the retailer. This is done together with the retailer to align the vision with strategic goals of the specific retailer.*
Customer service manager	*Not really the creation of a new product, but there is discussed how to put it into the market. Also joined improvement projects are done.*
Account manager retailer 1	*An account exclusive is an example of a joint effort. There will be discussed with the retailer and supplier how this product can be made successful. Mutual benefits need to be discussed but there is good relationship between the two parties. The supplier is a 'preferred supplier' from the retailer which makes more possible.*
Account manager retailer 2	*Periodically there is checked the performance of a period. In these meetings there is checked what the drivers were causing the good or bad performance. This information is used to make enhancements at both parties.*
Demand planner nuts	*Same example as given below*
Demand planner cereals	*The demand forecasting specialist from the retailer can be consulted to get new knowledge of daily demand information which is send each day. This is one example of joint knowledge creation and the supplier wishes to develop this further with the retailer.*

Table 20 – Joint knowledge creation element

Appendix 4: Template of interviews

Basic questions:

- Age
- Working experience
- Function within PepsiCo
- Knowledge of the content: (supply chain collaboration)

Introduction of the content of the interview: (dependent on knowledge level)

- Description of supply chain collaboration:
    - 2 parties working together to achieve win-win situations
    - Supply chain performance: Efficiency, output, flexibility

- Description of the product life cycle:
    - Introduction, growth, maturity, decline

Department, function and internal collaboration (supply chain performance):

- Main goals of department/function (strategic objectives)
    - Resources, Flexibility, and Output
    - Financial vs. non-financial
    - Regarding customer collaboration
- KPI's (how often reported)
- With which departments do you collaborate internally?
    - Cross-functional teams: which departments?
    - What is the content of the collaboration:
        - Joint problem solving
        - Mutual understanding
        - Joint planning
        - Information sharing:
            - Relevant, accurate, sufficient, timely

External supply chain collaboration:

- Who is your contact within the retailer (function/departments)
- How frequent is the contact?
- What is the content?
- Is collaborated an if on what content:
    - Joint problem solving
    - Mutual understanding
    - Joint planning
    - Information sharing:
        - Relevant, accurate, sufficient, timely
        - Where do you use it for?
    - Examples of joint projects? (customer specific products?)
        - Collaboration slippage (done what was agreed?)

Enablers/inhibitors:

- Feeling of importance of PepsiCo for retailer?
    - Sufficient time and resources?
    - How is the contact? (partners or transactional)
        - Honesty about problems?
        - Do you trust the party you are talking with?
            - Information accurate or even given?
- Differing trading strategies:
    - Do you see problems of 5 vs. 6 or 7 days a week trading? How?
- Relationships:
    - Mutual interdependency
    - openness
    - trust
    - honesty
    - individual chemistry between both partners
    - the frequency of interaction
    - commitment
- Information:
    - information sharing
    - availability
    - completeness
    - reliability
- Organizational structure

- Questions regarding supply chain collaboration (supplier collaboration)
    - What is the content of your work?
        - With whom do you work together within the company?
            - Department, content, frequency, in what way
        - With whom do you work together outside the company?
            - Departments, content, frequency, in what way
    - If supply chain collaboration occurs what do you exchange?

Elements of supply chain collaboration are they used?

Information sharing	- Is information shared, what kind? - Is it real-time or what is the timing? - What is the quality of the information? - Is the information used? Why not?
Goal congruence	- What are your objectives? - Are they in line with the objectives of partners? - Is there agreed on objectives with partners? (shared KPI's, shared goals?)
Decision synchronization	- Are decisions synchronized with partners? - Joint planning? (inventory replenishment, order placement and order delivery?)
Incentive alignment	- Are costs risk and benefits shared among supply chain partners? - Share gains and losses? How? Shared kpi's?
Resource sharing	- Are resources shared among partners? - Financial and non-financial investments (time, money, training, technology)
Collaborative communication	- What is the frequency of contact with the partner? - What is the direction and mode of contact? (open, frequent, balanced, two-way, multilevel)
Joint knowledge creation	- Do you develop shared knowledge? (better understanding of and response to the market and competitive environment by working together) exploration (NPD's, new knowledge) vs. exploitation (apply knowledge)

Different life cycle stages

(get in depth knowledge of every stage and ask about the possible differences of elements/enablers/ inhibitors/ supply chain performance in every stage)

- Do activities differ dependent on the stage a product is in the life cycle?
  - New introduced products
  - Growing products
  - Maturity products
  - Decline products

Do you see areas where collaboration could be improved what has an impact on supply chain performance?

Thank the person for the interview and ask if the person has some options to think about regarding supply chain collaboration