

Future drivers and trends influencing the outbound logistics development

*A cross-sectional study focusing on
the industrial aftermarket*

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Abstract

The main purpose of this thesis has been to explore and evaluate future drivers and trends within outbound logistics. In addition to this it was said that Synchron International AB, which assigned the study, should be able to use the findings to develop their products and services in a way that would satisfy future customer demand.

The thesis was mainly carried out in three steps. Firstly, an extensive theoretical framework was constructed which formed the base for the continuing study. The theoretical framework contributed to both opinions in the studied areas, which were further processed later on in the study, as well as it formed the interview material. Secondly, interviews were held with a selection of Synchron's customers which had experience from the studied areas. The results from the empirical study were then evaluated and summarized. Thirdly, the empirical and the theoretical results were analyzed and compared to form conclusions regarding the future of outbound logistics. These conclusions included recommendations for how Synchron and similar companies should adjust and prepare for this development.

The future of outbound logistics will be more complex in many aspects due to various reasons. The customers are expected to demand more customized product and service offerings as well as they will demand suppliers to take over responsibility for service and maintenance. Distribution strategies like direct deliveries, cross-docking and transport consolidation are expected to be used to a greater extent in the future, as one method to deal with challenging future demands.

The above mentioned issues, in combination with increased environmental pressures, will demand more from planning and management activities. This will in turn require further developed tools for planning and management, which are expected to be one of the main enablers for the future logistical development. These tools should also be able to increase the visibility throughout the entire supply chain, which is considered to become a crucial prerequisite in planning and forecasting processes in the future. It is important that companies like Synchron are aware of the expected enablers of the future logistical development, since it is within this area their customers will need assistance.

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1 Introduction

This chapter gives an introduction to this thesis including Synchron's initiatives behind the project. Furthermore the purpose of the thesis, the directives and the guidelines declared by Synchron are also found in this chapter.

1.1 Background

The supply of spare parts is a critical activity for several companies, especially for the ones in the construction and mining industry where downtime of production can be extremely costly. Planning and forecasting in relation to service and maintenance is also one of the most challenging logistical activities since it is difficult to estimate exactly when a machine will break down and what spare parts that will be needed. Companies use various methods to ensure the supply of spare parts, some more successful than others. No matter how these issues are managed, stockholding management and supply chain planning is vital in the aftermarket¹ industry in order to succeed and stay competitive.

Synchron has developed tools and services to help management in their work related to logistical issues like described above. Even though Synchron today have a competitive advantage towards the large business system developers in their niche, the competitors are catching up. It is therefore important that Synchron keeps developing their products and services if they want to be able to stay ahead of competitors and to keep their profile as a leading developer within their market segment.

The evidence is that the rate of change has accelerated to the point where the business models that have served us well in the past may no longer work today and will, almost certainly, not work at all tomorrow (Christopher, 2005). Benchmarking against competitors is not enough to stay ahead of competitors. The capability to identify new strategic patterns, to accurately assess their likely performance and to manage continuous transition, is becoming the leading edge model. To stay competitive you need to react proactive to changing customer demand and to be able to do this you need to know what the future will look like.

This report aims to pin down the future drivers and trends within outbound logistics, in the not too distant future. What will happen later than ten to fifteen years ahead is not only very difficult to predict but also of no greater interest for Synchron today. Synchron's closest challenge is to predict what their customers will demand within about five to ten years from now, and develop their products and services accordingly.

¹ The aftermarket is primary a market for service and maintenance, spare parts and add-on sales as a result of previous sales of industrial products (Laurelli et al., 2002). The aftermarket is a very important part to this thesis since Synchron has their core competence within this area.

1.2 Purpose

The purpose of this thesis is to explore and evaluate future drivers and trends within outbound logistics. Synchron should be able to use the findings to develop their products and services in a way that satisfies future customer demand.

1.3 Directives

Directives were at an early stage declared by Synchron when formulating the conditions for the oncoming work. The first directive was to only examine affects on outbound logistics. Secondly, the focus of the study was told to lie on Synchron's core competence and consequently should emphasize be put on business-to-business companies acting in the industrial aftermarket.

1.4 Guidelines

Synchron had opinions regarding the scope of the thesis as well as certain questions the thesis should try to answer. These questions were not definite but rather of guiding character and something that the conclusions should strive towards. These guidelines should also be taken into consideration when founding the basis of the thesis.

Numerous articles and reports have been published within the field of logistics management trying to predict the future of outbound logistics. Synchron wanted us to gather and interpret this theory, and analyze it together with information provided from a selection of their customers. The analysis was then expected to result in conclusions regarding the future business environment within outbound logistics. The goal was also for this information to conclude in recommendations concerning how Synchron and similar companies should develop their products and services in a way that would match future customer demand.

The following three main questions of issue for this thesis were identified:

1. What are the major trends and drivers that will affect outbound logistics within five to ten years?
2. How do Synchron's customers believe that they will be affected?
3. How should Synchron develop their products and services to meet future challenges and demands within outbound logistics?

2 Synchron International AB

This chapter gives a brief overview of Synchron International AB's business. The first part of this chapter holds general information about Synchron and the second part gives a description of their product and service offerings.

2.1 General information

Synchron International AB delivers software and services for global supply chain planning, fulfillment and supply. These solutions make global inventory, order and supply management processes effective as well as it optimizes the flow of goods throughout the entire supply chain. The product and service offerings are designed for multinational companies in the manufacturing, retail and distribution industries and major customers are Atlas Copco, Volvo Construction Equipment, Tetra Pak, Alfa Laval, Metso, Trelleborg and Electrolux.

Synchron was founded in the beginning of 1990 and was initially mostly active delivering products and services for supply chain planning. In 2005 Synchron merged with a company called Sync that was delivering products and services related to order fulfillment. The two companies' paths had been crossed repeatedly before they both realized the potential in merging their businesses together. The new formed company, Synchron International AB (further called Synchron), was now able to offer a much wider set of products and services and has also recently released their first software that combines the two previous companies' main product areas.

Offices are currently located in Stockholm, Malmö, London and Warszawa with headquarters in Stockholm. From august 2007 there will also be an office located in Chicago. At the moment there are 108 employees working at Synchron. The annual turnover for 2006 was 106 million SEK and the profit after taxes and financial incomes and expenses was 9.5 million SEK (Synchron annual financial report 2006). Synchron is mainly owned by four venture capital companies; b-business partners, 3i, Dendera and Investment AB Öresund, but also partly owned by employees at Synchron.

Synchron's product offerings can be grouped into two different main areas. The first area concerns supply chain planning. These customers can primarily be found within the aftermarket industry. The second area concerns global order, supply, price and master data management. Even though these two areas are separable they are often ordered and implemented together. This is the main reason why Synchron now has developed a combined platform for the two business areas. These two areas are, despite this fact, described separately below to provide a better understanding for Synchron's business solutions. Other services offered by Synchron, apart from the products described below, are consultation within supply chain processes and support to the product portfolio.

2.2 Supply Chain Planning

Synchron's product within this business area is called Supply Chain Planner (SCP). SCP's overall purpose is to provide accurate demand forecasts, optimized replenishment plans, realistic production plans and monitoring of flows of goods from one end of the supply chain to the other. Figure 1 illustrates one example for how SCP can be implemented in the supply chain. It should be mentioned though that the different functions of SCP are always customized to fit each implementation's prerequisites. The SCP product can be described in the following parts and supporting processes.

Strategic Modeling enables modeling of various logistics scenarios and the impact of changes to planning strategies, product segmentation, alternative suppliers etc. The impact of such change can be simulated and the results analyzed prior to implementation.

Demand Forecasting enables users to analyze complex demand patterns and improve forecast accuracy. The result enables enhanced stock management performance which lowers the logistics costs and improves service levels.

Replenishment Planning enables planning for long and short term replenishment. The tool optimizes inventory levels and automatically generates purchase and sales orders to actors in the supply chain.

Global Planning enables more effective stock holding management in complex multi-echelon supply chains. It assists in the decision making process when deciding where in the supply chain inventory should be held.

Production Planning enables improved performance by optimizing planning in companies' unique manufacturing environment. It creates schedules for plant and manpower, with consideration to availability of resources and material.

Monitor & Measure supports the above processes by monitoring cross-organizational processes, activities and assets, providing business critical measurements and generates real-time alerts when thresholds are passed and deviations from the plan occurs.

Master Data Management provides a single complete view over customers, suppliers and product lines across trading partners, communication channels and systems. It easily combines different ERP-systems² as it has pre-built interfaces for all major ERPs.

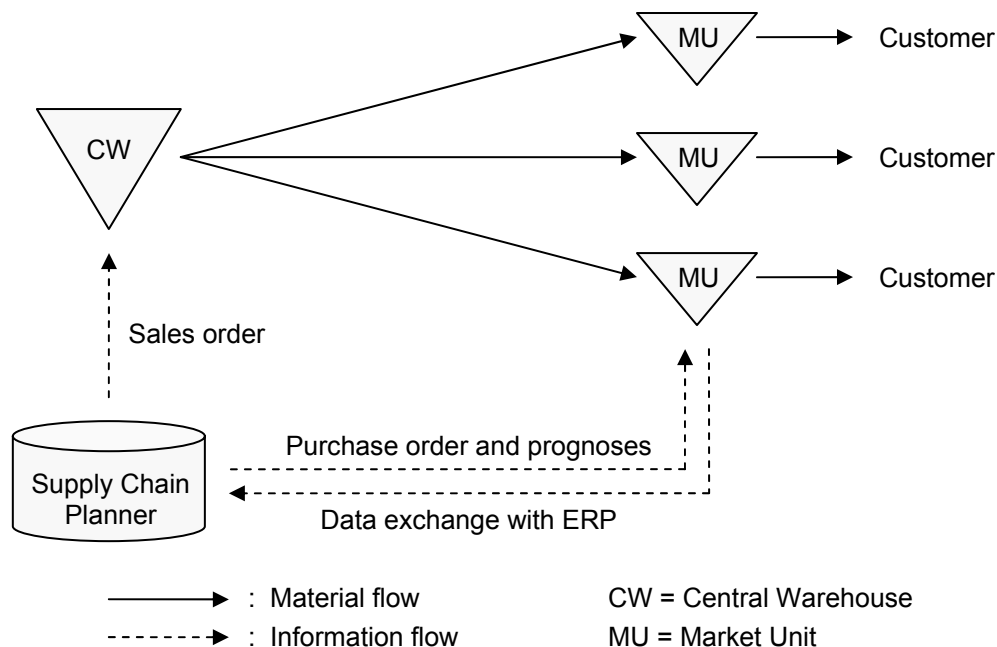


Figure 1 – Illustration of SCP functions in the Supply Chain

2.3 Global Order, Supply, Price and Master Data Management

These products concerns different areas of the execution part in the order process and handle master data. The general added value shared by all these products is an uncomplicated order process where all the necessary data is available to the user when needed. How the different products differ from each other is described below.

Global Order Management manages the global order fulfillment process, providing quick response on customers' requests. It enables multi-channel sales and multi-tier distribution channels as well as collaboration and visibility across the involved partners in the supply chain. The expected results are shortened delivery and cash-to-cash cycles, improved customer service enabling an agile and collaborative operation model.

² Enterprise Resource Planning systems (ERPs) integrate (or attempt to integrate) all data and processes of an organization into a unified system. A typical ERP system will use multiple components of computer software and hardware to achieve the integration. A key ingredient of most ERP systems is the use of a unified database to store data for the various system modules. (Wikipedia, 2007)

Global Supply Management manages the relationship with suppliers in the build-to-stock supply process. It includes management of the supply fulfillment process from order capture to invoicing and covers areas such as Vendor Managed Inventory³ and Self Billing⁴.

Global Price Management provides a tool for analyze, set and maintain pricing as well as it synchronizes new prices between customers different touch points. The result is correct and synchronized prices worldwide that are easy and quickly reachable for customers.

Master Data Management gather master data spread across multiple systems and databases. The result is consolidated data, easy manageable and automatically shared to affected applications when changes occur in the master data.

³ Vendor Managed Inventory (VMI) lets the supplier manage the supply of goods. The supplier is given the responsibility to make sure that there always is enough material in stock. There are different ways to set up a VMI but the fundamental idea is the same. (Aronsson et al., 2004)

⁴ Self Billing is when the buyer issues the invoice to himself e.g. according to the consumption levels he is taking out of a vendor managed inventory. (Wikipedia, 2007)

3 Frame of reference

This chapter holds all theory used when carrying out the empirical study, the analysis and when drawing the conclusions. The most recent theories are gathered from articles published in recognized and well acknowledged journals, but some information is also gathered from books.

The first part in this chapter out-lines the drivers and prerequisites predicted to impact the future logistical development. The second part describes how the logistical development will adjust and comply with these drivers and prerequisites. This categorization enables a full coverage of the area without describing how the different parts are linked together. This will instead be treated in chapter 4, Specification of the thesis and chapter 7, Analysis and conclusions.

Explanations and references regarding fundamental logistical terms and concepts can be found as footnotes. These terms and concepts are not central in the thesis, but are included to assure that the reader understand all the discussions taking place.

3.1 Drivers and prerequisites influencing future logistics

This part of the frame of reference will try to map out all possible drivers and prerequisites with potential to influence the future logistical development. These matters describe the driving forces pushing the development forward as well as the parameters to take into consideration when developing the business.

One of the directives from Synchron was that only effects on outbound logistics should be examined. This will of course delimit the content in this subchapter. To avoid missing any interesting unexpected connections we have nevertheless tried to be as all-embracing as possible, including drivers and prerequisites that at first sight might not seem to influence outbound logistics directly.

In the sections below are the main drivers and prerequisites described. These are categorized into the following topics; *Globalization, Increased competition and changing customer demand, Environmental issues, New Technology* and *Societal issues*. This categorization was decided after studying theory within the areas of interest and is believed to provide an easy readable and understandable frame of reference. Since the categories are often closely linked together, some areas might occur below several categories. Each area will however only be thoroughly examined once.

3.1.1 Globalization

Large multinational companies and brands now dominate most markets, and local companies are often acquired by larger organizations. Otherwise they are struggling hard to stay independent when these large organizations are spreading out (Christopher, 2005). Most markets will with high probability be dominated by global companies, at least in the foreseeable future (Bowersox et al., 2000; Christopher, 2005; Singh 2004). Stahre (2006) also agrees and believes that globalization and availability through the internet, along with other new communication channels, contributes to more globally spread out customers. The global market is more reachable than ever before and this have lead to increased competition as e.g. competent workforce and manufacturing resources are found everywhere around the globe today (Stahre, 2006).

Globalization of markets and competition is a well documented area in literature. It is not only mentioned as something that has already occurred but rather as a trend expected to continue to increase (Singh, 2004). Skjoett-Larsen (2000) defines the following driving forces behind changes in the logistical structures towards a more global market in Europe:

- Removal of trade and transport barriers
- Opening of new markets in Eastern Europe
- Acceptance of a single European currency
- Development of information technology and fast communication systems
- Emergence of pan-European logistics service providers, who offer fast, reliable and cost-efficient distribution in Europe

These drivers are as mentioned above specific for Europe, but the first, the second and the fourth bullet are also mentioned in a global perspective, by for example Singh (2004). He believes that removal of trade and transport barriers, opening of new markets and development of information technology and fast communication systems drives the globalization worldwide, not only in Europe.

Sourcing from and manufacturing in low-wage countries have also increased dramatically lately, partly with intent to decrease the manufacturing costs, but also to create availability on new markets (Stahre, 2006; Barry, 2004). There is however also trends counteracting the globalization. Discussions around this, together with other issues and aspects of the globalization, can be found in the three sections below.

Globalization of markets and competition

Companies expanding demand to penetrate new markets is according to Christopher (2005) and Stahre (2006) one important reason behind the trend towards globalization. Christopher also refers to the World Trade Organization (WTO), which states that the liberalization of international trade has had significant effect. Regardless of the explanation behind, Figure 2 confirm that the level of globalization has increased continuously over decades and does not show any sign to decrease within the nearest future. The growth in world trade has historically surpassed the average gross domestic product (GDP) by miles. In the extensive Supply Chain 2020 research at the Massachusetts Institute of Technology, Singh (2004) supports this. He draws the conclusion that the future holds even more global markets with increased competition as a result.

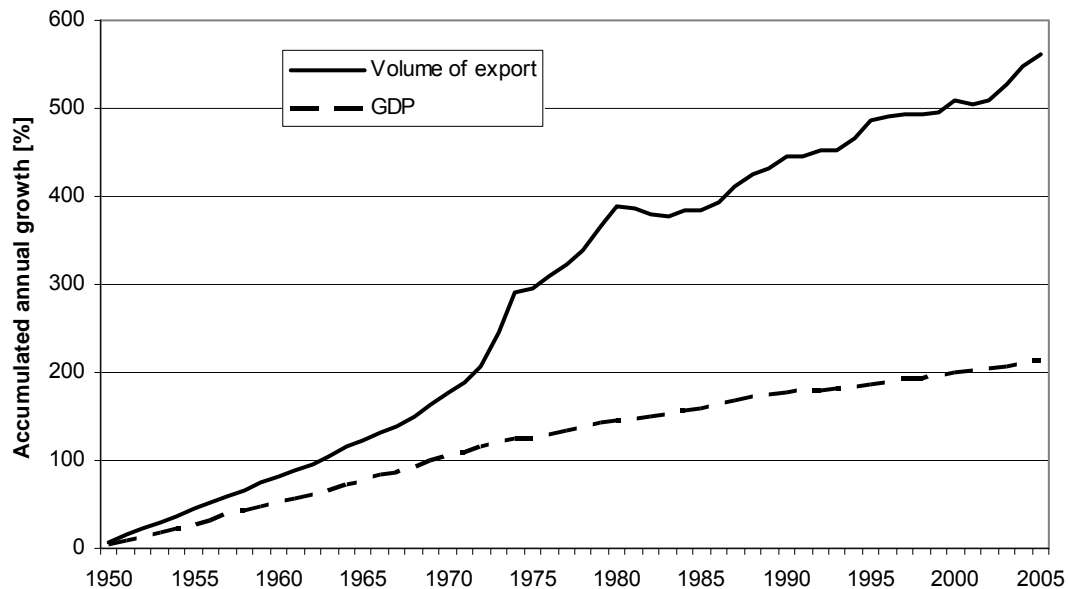


Figure 2 – The growth in world trade
Source: World Trade Organization (2007)

The manufacturing process has become more difficult to compete with lately (Christopher, 2005). Companies intensely focused on this area during the end of the 20th century, leading to cut manufacturing costs by e.g. outsourcing of production facilities in low-wage countries. However, Kempainen et al. (2003) claim that the power of production is expected to further decrease over the next decade, whereas purchasing and logistics are growing in importance compared to other functions.

Moving production and sourcing abroad have emerged into a new global environment including new challenges. The physical structure of the supply chain is more dispersed with more difficult and complex management as a result (Stahre, 2006). The most successful companies of this dynamic future seem to be found among companies with the highest dynamic capabilities (Abrahamsson et al., 2003). This means that strategic moves and actions for higher operational effectiveness are continuously made to keep in step with the changing business environment and to stay ahead of competition. Pressure is put on logistical matters to cope with these prerequisites, which demand that the logistical work is prioritized and focused on strategic flexibility (Abrahamsson et al., 2003). How companies cope with these new forms of competition is of course varying, some more successful than others, and there is not one best way as each company's environment is unique.

Another factor contributing to the global competition is the neutralization of competitive manufacturing resources and competent workforce (Stahre, 2006). Previously underdeveloped countries like China are developing fast, and have the privilege to hold well educated citizens as well as domestic access to cheap workforce. Even though China today primarily is seen as an opportunity for low cost production, it is predicted to become an extremely important market in the future, as billions of Chinese are getting closer to the western standards of living. The recent news regarding Volvo's acquisition of Nissan Diesel is an excellent example of this. Volvo's motive for the purchase is, apart from the interest in Nissan Diesel technology, described to be access to the Asian market, where Volvo is a rather small operator at the moment (Sandström, 2007).

Sourcing and production in low-wage countries

The two main reasons for outsourcing production to low-wage countries are, as mentioned above, to reduce manufacturing costs and to create accessibility to new markets (Stahre, 2006; Barry, 2004). Reduced expenses are also the reason why companies choose global sourcing alternatives prior to local ones.

To harvest benefits from economies of scale the global thinking have also lead to concepts such as focused factories⁵, which is expected to become even more wide spread in the future. These facts have lead to a changed supply chain structure. The trend has earlier been to shorten delivery cycles and to reduce delivery batch sizes according to JIT-practices⁶ which grew popular during the end of the 20th century (Christopher, 2005). Today however, companies are moving towards longer lead times and time between the deliveries which also entails larger delivery batches. Stahre (2006) also state that it is often common to combine far range and low frequent deliveries with local short range and high frequent deliveries. However, longer transportation distances and cultural differences between the buyer and seller often lead to more uncertain delivery lead times (Barry, 2004).

Companies have met these new challenges in different ways. New technologies have for example simplified information sharing which, if used in the right way, bring benefits in terms of improved inventory management, higher sales, and better understanding of demand (Kaipia et al., 2006). Lapide (2006) supports Kaipia et al. (2006) and explains how visibility in the supply chain helps its participants to manage it more effectively.

Drivers and prerequisites counteracting the trend towards globalization

When the scope of supply chain sources and markets are global, so is the risk. According to Barry (2004), globalization often results in the lowest overall cost of goods sold. But he claims that, the question is which economic cost factors to assign a higher level of risk associated with a global supply chain. Supply sources and customers may be beyond the reach of the buyer's laws and conventions. Bowersox et al. (2000) also mention the risk with global supply chains if not validated and managed in the right way, and predicts that e.g. the outsourcing trend will be slowed down due to some discovered highly failures of contract logistics relationships.

⁵ The idea behind focused factories is to achieve economies of scale by limiting the range and mix of products manufactured in a single location. The companies using the focused factories strategy rationalize their production, leading to fewer but larger factories. These remaining factories produce fewer products in volumes capable of satisfying perhaps the whole market. (Christopher, 2005)

⁶ The origins of JIT (Just In Time) can be found on the shop-floors of Japanese manufacturers and in particular at Toyota Motor Corporation's factories (Hines et al., 2004). The most important principles of JIT is to only have in stock what is needed and enhance the quality to zero faults. This is done by continuously improving and adjusting the operations and by avoiding all unnecessary activities e.g. waste from overproduction, waste of waiting time, transportation waste, inventory waste, processing waste, waste of motion and waste from product defects (Aronsson, 2004).

It is not only the increased risk with globalization that may slow the globalization process down. Singh (2004) highlight the possibility that in order to satisfy customer demand more quickly and efficiently, while at the same time heeding the environmental pressures for reducing the use of fuel in transport, will lead to a more local distributed manufacture. The environmental drivers and prerequisites will be further discussed in section 3.1.3.

Oil prices have also been raised dramatically over the last decade and environmental pressures from both customers and governments offset the globalization. These road bumps have apparently so far not been big enough as the trend continues, as shown earlier in Figure 2. The question is what will happen if the oil price is doubled, or tripled for that matter, or if new global laws increase taxes on transportation. Englezos (2006) believes that a continuous increase in the oil price will probably change supply chain network structures. Singh (2004) discusses the same subject and claims that, a creation of a non-fossil fuel based society would eliminate oil-shocks from the system and make it more stable. He further states that, reduced dependence on natural resources would make supply chains more robust and less prone to terrorism and world politics.

3.1.2 Increased competition and changing customer demand

Literature agrees that companies today act in a tougher competitive environment with, among other things, more demanding customers (e.g. Christopher, 2005; Singh, 2004; Stahre et al. 2006). As mentioned in the section 3.1.1 above, globalization is one of the main reasons for this, although there are other underlying causes. In this section will it be described why the competition has increased and why the customers' demands have changed. The discussion will also revolve around what factors these two main challenges can be derived in and what impact it has on outbound logistics.

When discussing these issues it is suitable to mention the term 'Competitive advantage'. To meet the increased competition you need to stay ahead of your competitors and to stay ahead of competitors you need to satisfy the customers demand. Christopher (2005) defines competitive advantage in the following way:

$$\text{Competitive advantage} = \text{Product excellence} * \text{Process excellence}$$

This definition suggests that to stay competitive it is as important to manage the business processes as it is to deliver great products. Among others Christopher (2005) claims that it in the past has been a focus on product excellence with the producers having the power to decide which products to offer the market, with no need for process excellence. The trend has now shifted and the market once ruled by the producers is now ruled by the customers, forcing supply chains to emphasize on the processes in order to stay competitive.

Commoditization and demanding customers

According to Christopher (2005) a major driver influencing the changing competitive environment is the trend towards commoditization in many markets. A commodity market is characterized by perceived product equality in the eyes of the end customer, resulting in a high preparedness to substitute one make of product for another. Christopher (2005) suggests that it is not only in consumer markets this trend can be noticed, but also in business-to-business and industrial markets. He further claims that in today's marketplace the order winning criteria is more likely to be service-based rather than product-based. It is no longer companies with strong brands and large advertising budgets that is the most successful. Apparently process excellence is gaining ground on expense of product excellence. Christopher (2005) does however make it clear that product or technical features are far from unimportant but rather taken for granted by the customer.

Stahre (2006) has similar opinions but also highlight a more specific discussion around the service elements. He claims that there is a trend that customers demand more from service elements such as delivery lead time and flexibility. Singh (2004) discusses the same matter and predicts that companies will have to place additional effort to satisfy more demanding customers, to stay competitive in the future. Though, he predicts that it is perhaps more important to be flexible and be able to customize the products and services to match a varying demand, rather than to be able to offer the same service to all customers. This discussion will continue in the section *Customization and Differentiation* below.

Shorter product life cycles have lead to more fast changing markets where market opportunities arise and disappear very quickly. Christopher (2005) and Singh (2004) both discuss these issues and claim that there is an evident quickening pace of product innovation in many markets and this makes markets more volatile than ever before. The quickening pace of product innovation partly depends on shorter product life cycles and that JIT-strategies are undertaken by the customers.

To stay competitive it is crucial to have a responsive supply chain characterized by rapidness and flexibility, so that arisen demand at fast changing markets can be satisfied before the opportunities disappear (Christopher, 2005; Singh, 2004; Stahre, 2006). This challenge can partly be managed by customizing the product offerings and by differentiating the customers. This is further discussed in the section below.

Customization and differentiation

As it at the same time is a trend towards consolidation of buying power, with fewer but more demanding customers, it gets more important to differentiate these customers and to customize the product offerings to match the specific demands (Christopher, 2005). To begin with, companies have to realize that different customers value different things, and that it is crucial for the company to be flexible in their offerings (Stahre, 2006; Nilsson, 2006). Secondly, it might not be profitable or even possible to offer the same service to all customers (Christopher, 2005). Stahre (2006) highlight the importance for companies to differentiate the customers and he points out that both the product itself and the service elements can be customized. Further he states that differentiation strategies are feasible and can be successful for both inbound and outbound logistics.

Singh (2004) predicts that increased customization and differentiation is a prerequisite and will be necessary for success in the future. This partly because an increasingly volatile demand due to increased globalization. According to him, one reason is the changing population mix with race and cultural aspects to take into consideration. He predicts that more sophisticated customers, many in newly developed countries, will demand products customized to meet their needs.

Downward pressure on price and increased financial demand

According to Christopher (2005), the global competition with production and sourcing in low cost countries and more educated customers with increased price awareness, partly due to internet comparison, has lead to a general downward pressure on price.

The tougher competitive environment and the downward pressure on price, with squeezed margins as a result, drive company management to demand increased profitability and capital productivity from all parts of the organization (Christopher, 2005; Singh, 2004; Stahre, 2006). Increased financial demand has, according to Stahre (2006), led to operational rationalization and outsourcing in order to increase the capital productivity. Singh (2004) predicts that the increased financial demand will exert tremendous pressure on supply chains to become lean. He also predicts that the unrelenting pressure to drive down costs will continue to increase.

3.1.3 Environmental issues

Environmental problems have received increased attention during the last decade (Aronsson and Brodin, 2006) and organizations have become increasingly aware of the propensity for environmental pollution incidents within their supply network, to cost them in penalties, cleanup and consumer backlash (Simpson et al., 2007). Global climate change linked to a carbon-rich lifestyle threatens to eliminate various small island states, destabilize many countries and bring spillover effects that will rock even the richest (Gasper, 2007).

Environmental issues can impact on numerous logistical decisions throughout the supply chain such as facility location, the sourcing of raw materials and modal selection (Wu and Dunn, 1995). Transportation is one of the major sources of environmental problems (Aronsson and Brodin, 2006) and the most important source of environmental hazards in the logistics system (Wu and Dunn, 1995). In the European Union, fuel combustion in the transport sector stands for one fifth of the total green house gas emissions, one third of the total emissions of particulate matter and almost half of the emissions of tropospheric ozone precursors (Eurostat, 2007). Except for air pollution, transportation of goods, especially road freight, contributes to increased problems with congestions, accidents and noise (Eurostat, 2007).

Environmental issues have different impact on the supply chain in different parts of the world, both in terms of general importance but also in terms of different kinds of issues (Murphy and Poist, 2003). For example are road congestions a severe problem on Malta (Eurostat, 2007) whereas the absence of infra structure is a problem in some parts of Asia (Stahre, 2006). This sometimes makes it hard to draw conclusions that can be generalized and used worldwide.

Environmental pressures on the supply chain

Paquette (2005) distinguish four general sources for environmental pressures which supply chains must respond to. These are *regulations*, *consumer demands*, *ethical responsibility* and *recourse availability*. Other authors, e.g. Singh (2004) and Aronsson and Brodin (2006), have identified similar pressures but do not categorize them in the same way. Singh (2004) does not make any categorization at all and Aronsson and Brodin (2006) defines two main domains which can be elaborated for achieving environmental improvements. These are *the macro domain* (actions taken by governments and legislative authorities) and the *micro domain* (actions taken by companies). Paquette's model has been emphasized since it is the most suitable for the methodology used in the frame of reference. The four pressures in the model are described below and summarized in Figure 3.

- *Regulations*

Governments use a variety of regulatory instruments to help controlling the way supply chains' activities affects the environment. These instruments include environmental directives, taxes and fees, and liabilities.

- *Consumers and ethical responsibility*

According to the author, markets create powerful venues for change since a savvy consumer demands more value from products, including environmental performance. In this sense demands from consumers and the society drive fundamental characteristics of the supply chain, including environmental performance. In business-to-business markets, the pressure from consumers can be replaced with pressures from customers. In a logistical context these pressures can take forms of e.g. demands for environmental friendly transportation.

- *Resources*

An escalating global population and affluence create demand for more and more products. The corresponding rates of production inevitably place strains on the natural environments ability to supply resources and absorb wastes. Even if we will not literally run out of raw materials, the decreasing supply will drive up prices, which in turn will affect strategic supply chain decision-making.

Paquette (2005) further claims that, resource availability and regulatory pressures place physical, legal and economic constraints on supply chain management. Consumer demands and ethical responsibilities define desirable behavior in the market and within those constraints. As supply chains mature and environmental pressures become more diverse and demanding, Paquette (2005) believes that, technical and organizational innovation is needed in supply chain design and operation.

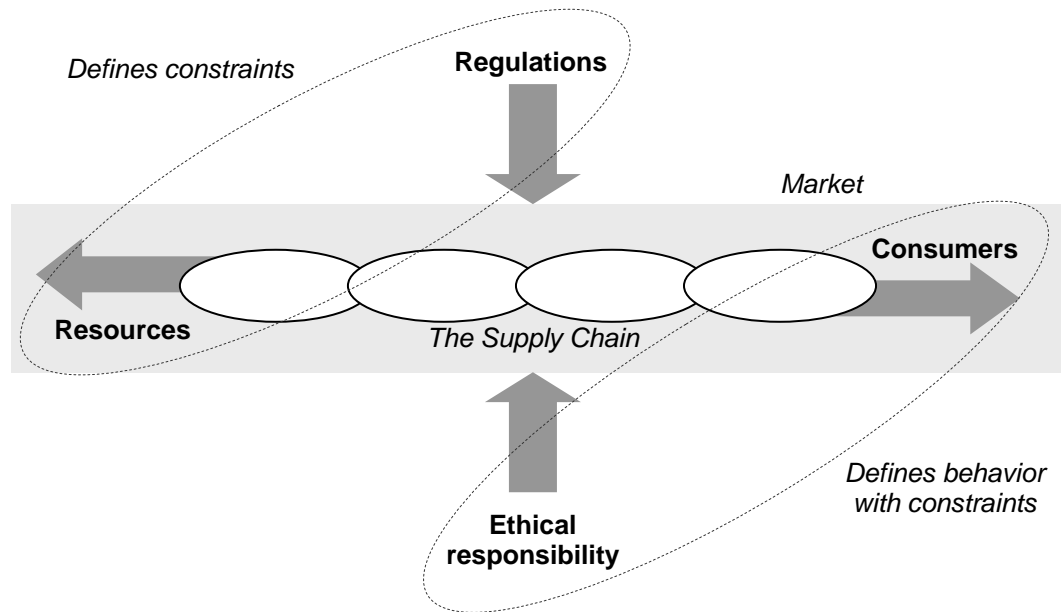


Figure 3 - Sources of environmental pressures affecting the supply chain

Source: Paquette 2005

General environmental impact on the supply chain

Singh (2004) have identified a number of environmental drivers and prerequisites predicted to impact supply chains before the year 2020. These drivers are ranked on the basis of occurrence of the topic in various publications, the likelihood of the prediction coming to fruition by year 2020 and the relevance of the prediction for future supply chains. They are also ordered in decreasing importance and the first three bullets below have the same importance. Singh (2004) believes that companies will be facing new challenges due to:

- Environmental replenishment needs and resource limitations
- Stricter requirements on recycling and remanufacturing
- Demands for safe waste management and stricter disposal regulations
- Creation of a hydrogen/non-fossil fuel based society
- A strained global ecosystem due to a growing population
- Stricter global environment and planetary management regulations
- Societal demands for superior environmental performance

Focus on product attributes

As above demonstrates, the authors believe that most of the environmental issues will revolve around the attributes of the product, e.g. recycling, remanufacturing and disposal issues. This will primarily affect the manufacturing processes, but increased demands for these issues will also affect the logistics system in terms of reverse logistics⁷ (Singh, 2004). Daugherty et al. (2003) states that, reverse logistics is one of the toughest supply chain challenges, and compares it to “walk at the opposite direction on a one way road”. Further the authors claim that, product returns in general average about six percent of a company’s sales, but in for example the aftermarket mobile industry, returns average from between 15 to 20 percent of the sales. According to the authors, the importance of a well functioning reverse logistics process and the possibility to gain competitive advantage has been realized in more and more companies recent years. This has lead to long-term relationships between actors, with emphasize on cooperation and even collaboration in the supply chain (Daugherty et al., 2003).

⁷ Reverse logistics is according to Ronald et al. (1999):

...the process of planning, implementing, and controlling the efficient, cost-effective flow of raw materials, in-process inventory, finished goods, and related information from the point of consumption to the point of origin for the purpose of recapturing value or proper disposal.

Focus on transportation

Much indicate that environmental issues will have increased importance in the future. The indications are agreed from the large world organizations, e.g. the United Nations and the European Union and the majority of the companies in Europe and the U.S. believe that the importance of environmental issues will increase in the future (Murphy and Poist, 2003).

The European Commission (2001) states in their White paper (European transport policy for 2010), that logistics can contribute to improved environment through:

- Contributing to modal shift (from road and air to other modes)
- Reducing the demand for transport (e.g. shorter transportation distances)
- Reducing the environmental impact of transport (e.g. improved vehicle utilization)

The European Union emphasizes that there is an absolute need for a decoupling between the increase in the GNP and in the total transportation volumes, since the transportation volumes have increased more than the GNP during the last 15 years (European Commission, 2001). The European Union politics will be developed in a way to facilitate these improvements and significant resources will for example be placed upon improving the prerequisites for rail road freight. These issues are discussed in both the original White Paper from 2001 but also in the follow up, published 2006.

Aronsson and Brodin (2006) states that the sustainability of the transport sector clearly requires a more comprehensive and integrated transport and environment policy approach, combining legislation and economic instruments in a transparent way, and across all transport modes. The authors further claim that there is a need for better integration of environmental concerns into transport policies and decision making. This type of integration has given a high political priority following the Treaty of Amsterdam (Eurostat, 2007), which supports Aronsson's and Brodin's (2006) discussion.

3.1.4 New Technology

The literature regarding new technology in the logistics area can be categorized into two main areas. The first area holds technology designed in particular to create value to logistics and supply chain activities. Most information regarding this revolves around different information and communication technology systems (ICT-systems) e.g. different ERP-systems and web-

based solutions. The theory also discusses new technology in relation to transportation and warehousing management, e.g. different kinds of load carriers and Radio Frequency Identification (RFID⁸), which have been a rather large topic of discussion lately. The second main area discussed in literature regards new technology in product development in general, which influence and can lead to changes in the logistical activities. These two areas are examined further below.

New technology designed for the supply chain

Appropriate information sharing is vital when creating transparency between organizations, but also between different departments within the organization and it enables improved stockholding management (Iskanius and Kilpala, 2006; Kaipia and Hartiala, 2006; Kemppainen and Vepsäläinen, 2003). Companies worldwide therefore annually invest over \$19 billion on information technology system solutions, according to an international Booz Allen Hamilton survey (Heckmann et al., 2003). Interesting results from the same survey shows that nearly half of the survey respondents are not satisfied with the result of the implementation. Opinions from Cresswell et al. (2005) concur with these results and claim that several Information Systems Development initiatives (ISD-initiatives) fail to deliver the expected benefits. They explain that the failure in nine times out of ten depends on social and organizational factors, thus not on technical failures, even if they also do occur occasionally.

Internet and new communication channels have nevertheless contributed to, and made the information sharing processes easier (Heckmann et al., 2003; Stahre, 2006). This does however not necessarily improve the supply chain's or a single company's logistical processes, only given that the information is available. Kaipia and Hartiala (2006) have in their study drawn the conclusion that only information that improves supply chain performance should be shared. Too much data is overwhelming and confusing in the decision-making process (Heckman et al. 2003). Demand information-sharing, given done in an

⁸ RFID is a technique to read and store information from a distance with small combined radio transmitters/receivers and memories called tags. The smallest cheapest and most common kinds of tags only have one unique number and can transmit of a distance up to a couple of decimeters. These tags are basically just a more easy readable kind of ordinary barcode. There are however also large tags with built in batteries with a transmitting distance of several hundred meters. These are e.g. used on containers in harbors and similar and are rather expensive. (Wikipedia, 2007)

appropriate matter, can however according to Kaipia and Hartiala (2006) make it possible to reduce costs by up to 35 percent and decrease inventory levels by 40-53 percent. Iskanius and Kilpala (2006) supports Kaipia and Hartiala's (2006) conclusions and claim that ICT has emerged as perhaps the most compelling enabler for supply chain integration, or as Kemppainen and Vepsäläinen (2003) puts it:

Inter-enterprise IT systems will be a prerequisite for success in the next decade and IT both enables and creates transparency.

However, according to Heckman et al. (2003), there is no way to optimize supply chain performance with technology alone. Irani (2001) agrees, and stresses the importance of following up the implementation of ICT solutions, as the difficulties in measuring benefits and costs are often the cause for uncertainty concerning the expected impact of the implementation. Another difficulty faced by companies when implementing ICT solutions is interface of the IT tool. Nilsson (2006) state that most IT tools are not developed for logisticians but for the IT people, and the understanding of logistics in the organizations as a valuable activity is rather limited.

The aftermarket has lately grown from a troublesome must into a prioritized area for many companies, where big profits are accessible (Agrawal et al., 2006). The authors continues, explaining how companies have started to realize the importance of providing spare parts and after-sales services, but that most could make far more money in the aftermarket than they do today. One reason behind the opportunities in the aftermarket is that it often is very difficult to manage and many actors often fail (Agrawal et al., 2006). The successful companies could therefore have large margins providing good profits if managed efficiently. An effective IT system is a prerequisite for the success according to Englezos (2006) and he states that:

...the companies that excel in the aftermarket are usually innovative companies. Companies that are on the edge of technology, that use modern IT system for all their supply chain functions usually also use the most innovative software solutions for service parts management, a necessary factor for a company's success in the area.

Spare parts forecasting is a difficult matter and differ on several points compared with traditional forecasting. Ghodrati and Kumar (2005) have in their case study appointed the importance of well planned spare part stocks, in order to satisfy customers. To do so, the machine or system operating environment should be taken into consideration when forecasting demand.

Until now, the discussion around new technology has concerned different ICT solutions. There is however other important developments that have improved different supply chain activities. Packaging, for example, plays an important role when improving the utilization of transport capacity (Klevås, 2005). The cost of distribution per transported unit can be decreased as well as the effect on the environment by more effective packing (Stahre, 2006). Klevås (2005) emphasize the importance of including the packing function in the product development with strong link to the logistics function, something which is quite unusual today.

Stahre (2006) refer to a comprehensive study concerning RFID when he draws the conclusion that the most important reason for implementing RFID is to increase the customer satisfaction. The study shows that RFID implementation is rather an organizational problem than a technical or economical problem. To gain from the advantages behind RFID all actors in the supply chain have to use the technology, hence is the implementation process time-consuming. Frazier et al. (2005) believes on the adoption of RFID technology and its attendant supply chain management techniques, after studying the impact of RFID on the supply chains in the grocery industry.

New technology in general that affect the supply chain

Time to market gets increasingly important as product life cycles are getting shorter (Christopher, 2005). According to Abrahamsson et al. (2003), short stock turnover time is for that reason important and is achievable through for example central management and strategic flexibility. The authors take Dells management policy as an outstanding example. With only 5-6 days of stock components Dell can be on the market with a new processor within a week, while most competitors have 50-60 days of components and finished goods in stock in their marketing channel.

Singh (2004) enhance this reasoning claiming that new technology in product development will not be the key competitive weapon, as new technology will be replicated in a very short period of time, and will therefore only provide a short lived advantage. Focus will instead lie on supply chain capabilities that are more difficult to replicate.

3.1.5 Societal issues

Except for all the drivers and prerequisites discussed so far, there are a few more issues mentioned in literature even though they are not that commonly discussed or mentioned. We have nevertheless, in an attempt to map out all possible factors with the potential to affect the logistical development, chosen to bring up these issues as well.

Singh (2004) talk about four macro factors that might impact the future design of supply chains. These four macro factors are:

- Increased pervasiveness of media
- Threat of war and terrorism
- Changing workforce requirements and increasing workforce diversity
- Growing readiness of ordinary citizens to engage in direct action

Singh (2004) believes that, as a result of its omnipresence, media has the power to rapidly disseminate information simultaneously to far flung areas of the world. This will impact the shaping and reaction of the consumers and the markets, eventually influencing the supply chain design and performance. The instability which the threat of war and terrorism causes will, according to Singh (2004), impact the formation of global alliances and adversely impact the supply chain reliability, performance and cost structure.

Further Singh (2004) believes that, changing workforce requirements and increasing workforce diversity will pressure all company practices and processes to make them more people friendly and interactive. The growing readiness of ordinary citizens to engage in direct action will impact the manufacturing and supplier selection, since any problem along the supply chain regarding any inappropriate action, e.g. child labor or meager salaries in third world countries, will not be overlooked.

3.2 Expected logistical development

Leading opinions concerning the expected logistical development point towards that the main changes will revolve around the corner stones of the supply chain management concept (Bowersox et al., 2000; Christopher, 2005). Criteria for success is predicted to be increased collaboration and long term relationships, increased visibility, focus on customer demands, to mention a few (Bowersox et al., 2000; Christopher, 2005; Singh, 2004). This sub-chapter will try to pin down the most in literature evident and probable changes that will take place within 5 to 10 years from now. The discussion from section 3.1 will also be continued and we will, from studied theory, try to predict how the observed drivers and prerequisites will influence the outbound logistics development and what development and trends this will result in.

Christopher (2005) presents Figure 4 below in his book 'Logistics and Supply Chain Management'. In broad out-lines the figure describes how the view of logistics has changed from the past till where we are heading, and it might come in handy and makes it easier when trying to visualize the big picture. Christopher (2005) suggests that we have moved from a supplier driven environment with mass production and mass marketing to a more market-driven environment with mass customization and one-to-one marketing.

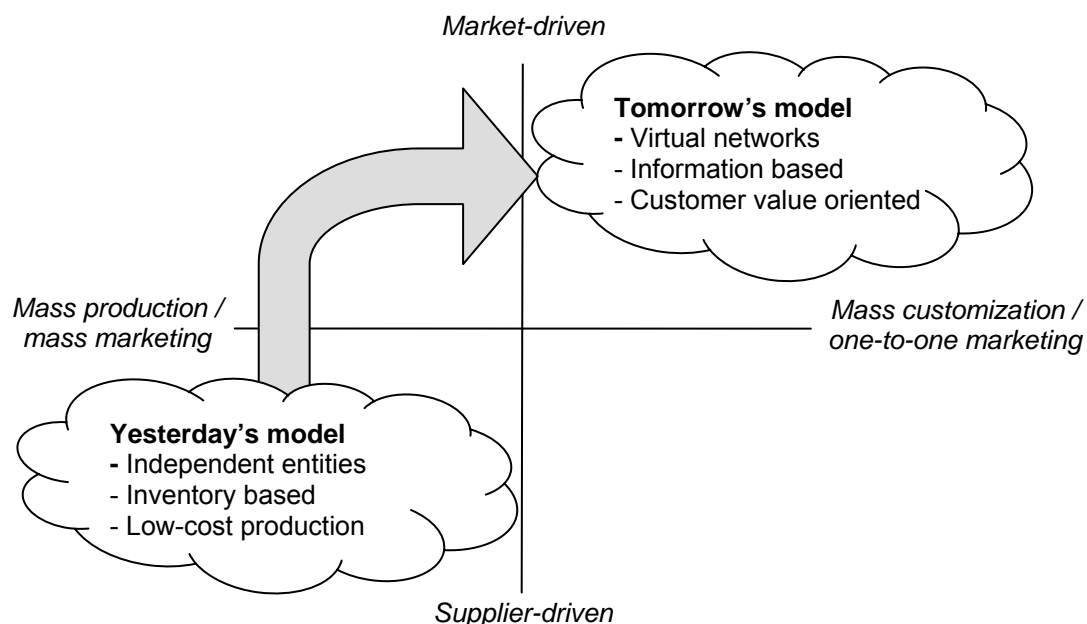


Figure 4 - The past and future model's of SCM

Source: Christopher (2005)

3.2.1 Continued trend towards supply chain integration

One of the cornerstones in the supply chain management concept is integration, internal as well as external (Christopher, 2005). To be able to increase the integration a number of factors have to be managed and taken into consideration. These factors, influencing the trend towards increased supply chain integration, will be described below.

Trust, collaboration and relationships

According to Singh (2004), the key word for all companies doing business in this increasingly anonymous business environment, will be trust. He claims that companies' brands in that sense will be important since buyers will look to names they trust, even for products not previously offered by that vendor. Other authors do not to the same extent directly highlight the aspects of trust, but rather an increased importance of closer relationships and collaboration in the supply chain.

Bowersox et al. (2000) mention trust as an important element, but they see it more as a prerequisite for increased collaboration in the supply chain. The authors claim that, developing collaborative behavior has been the subject of substantial discussion, but that these behaviors are not well defined. The authors further predict that this trend will continue and that there in the average firm are lots to be done. They also discuss the concept of collaborative management, which describes the ability to jointly develop supply chain plans to best serve end-customer. Collaborative Planning, Replenishment and Forecasting initiatives (CPRF-initiatives) do, if leading to improved forecasting, enhance the supply chain performance at the same time it lowers the costs (Bowersox et al., 2000).

According to Christopher (2005), there is a growing recognition that the way to sustained profitability goes through the building of long term relationships with selected customers. He claims that several companies' past focus was of transactional orientation, with volume and market share as key factors for success, whereas today customer retention is a key measurement. He further claims that, one of the drivers for improved customer retention is the delivery of superior customer service which confirms the connection between logistics and customer retention.

Organizational change, virtual integration and outsourcing

According to Christopher (2005), companies have only recently come to challenge the primacy of functions in the organizational structure. Traditionally the business has been organized around functions and those functions have, according to Christopher (2005), provided a convenient mechanism for the allocation of resources and served us well in the past. However, he claims that in today's turbulent business environment questions are increasingly being asked about the ability of such organizations to respond rapidly to the fast-changing needs of the market. It is now suggested that emphasis should be shifted and instead be placed upon core processes that create value for customers. According to Christopher (2005), these processes are cross-functional, more market-facing and more likely to be team-based.

These self-directed work teams are, according to Bowersox et al (2000), increasingly the solution for significant breakthroughs in efficiency in today's business environment. In contrast to Christopher (2005) claim Bowersox et al. (2000) that the trend towards process orientation is rather old. Yet, they share the opinion that process orientation will be an important ingredient to sustained or increased competitiveness. Bowersox et al. (2000) claim that, while purchasing, production, logistics and marketing has been integrated within their individual processes, there has been less progress integrating between these areas. Further the authors believe that there must be a substantial advancement of process integration with external supply chain partners, particularly with service providers.

Singh (2004) predicts that, the supply chain of the future will be a loose supply network system of multiple buyers and sellers with the links activated only when there is a real demand. This prediction supports the belief that outsourcing will increase and Singh (2004) also believe that companies in greater extent will focus on their core competencies and only retain those skills or competencies that make its products and services unique and competitive. In his own word he says that:

“Companies will move from an organization-centric environment to a multi-supplier-services environment due to outsourcing of activities enabled by superior network connectivity.”

According to Christopher (2005), the conventional business model has always been that companies succeed or fail on the basis of their own resources and competencies. He further claims that, as the trend towards outsourcing has increased, there has come a realization that the competitive vehicle is no longer the individual firm but rather the supply chain of which that firm is a member. Whereas once a single firm might encompass almost the whole supply chain, today that is no longer the case. Christopher (2005) states that:

“Today the company finds itself a member of an ‘extended enterprise’. This extended enterprise is in reality a complex network of specialist providers of recourses and competencies.”

Finally Christopher (2005) predicts that the most successful companies will be those that are best able to utilize the recourses and competencies of other partners across the network.

Bowersox et al. (2000) are on the same track as Christopher (2005) and state that, firms historically have tried to reduce supply chain conflict by owning consecutive levels in the business process. He provides the example of Henry Ford’s original strategy using ownership to achieve vertical supply chain integration and that his dream was full ownership and management of the entire value chain. Ford’s rubber plantations, ships, and foundries converted raw iron ore to a finished car in seven days. However, Bowersox et al. (2000) claim that this type of vertical integration is not feasible today. It would imply tremendous investments and an extremely complex organizational structure. They therefore believe that, firms must harness the expertise and synergy of external supply chain partners to achieve success. By doing this the firm overcomes the financial barriers of ownership while retaining many of the benefits. Bowersox et al. (2000) further discuss that, while many manufacturing and retail firms traditionally have worked with third party logistic providers to handle physical movements of products, there is a growing trend to outsource knowledge processes as well. According to Bowersox et al. (2000), the benefits of outsourcing in order to focus on core competencies will continue to drive firms from vertical to virtual integration. The authors expect this trend to continue but that the expansion will be slowed due to a number of discovered severe failures of contract logistics relationships.

Singh (2004) highlight the possibility that there can be a decrease in outsourcing due to the pressure on businesses to be efficient and agile due to the compression of cycle time, shorter life cycles, lower costs and superior quality. This may, according to Singh (2004) lead to,

more local distribution and manufacturing and that companies install owned manufacturing bases in different regions, as a link with the locals and for control and feedback. The opinion that there will be a decrease in outsourcing is contrary to the general belief, but an interesting aspect.

Information sharing

According to Christopher (2005), logistics and supply chain management have conventionally been forecast-driven rather than demand-driven. In other words, the focus has been to look ahead over a planning horizon using forecasting and then build up inventory against uncertainties. Though, Christopher (2005) states that, in a more volatile and turbulent environment it is harder to predict future demand and the risk of over- or under-stocking increases. He believes that, the challenge today and in the future, is to enable supply chains to become demand-driven as a result of better visibility of real demand.

Bowersox et al. (2000) believe that, a substantial increase in information sharing is critical to enhanced supply chain integration and performance. Further they claim that, the shift from information hoarding to information sharing currently is dependent upon technology and that the ease of use and low cost of the internet primarily are driving the change. Bowersox et al. (2000) see a trend that managers in a greater extent are learning to share information although some still believe that forecasts, sales, inventories, costs, and promotional or development plans, will comprise their organization's competitive position. The authors also believe that the scope of shared information expands as trust is established. The information sharing process initially concerns sharing of tactical data, such as short-term forecasts and inventory availability, to facilitate resource planning and product flow. Once the benefits of tactical sharing are realized, Bowersox et al. (2000) believe that, firms tend to become more open to share sensitive information of costs, product development plans, and promotional schedules.

Singh (2004) believes that before 2020 products and machines will communicate with each other in real time, and trading partners will therefore know products exact location at every point in the supply chain. This will, according to himself lead to, a decreased need for decoupling and reduced inventory levels. He also claims that there is a trend to slowly move away from buffering using inventory, to use a mix of inventory, flexibility and time. This trend is predicted to continue mostly because of the significant rise in information availability. According to Singh (2004), this will make companies transfer to an information rich space, which will allow improved management to lower inventory levels.

Drivers counteracting supply chain integration

Even though the general belief is that the supply chain integration will continue, some authors believe that this trend can not continue forever and that there is a limit for how far the supply chain concept can be driven. Singh (2004) highlight opinions claiming that supply chains will never be able to function as a harmonious discipline due to the tension and complexity inherent to the system. The discussion ends in the conclusion that organizations will not share critical information with everyone and will still be driven by their own profit goals, rather than profit sharing across the supply chain.

3.2.2 Continued trend towards customers' markets

As mentioned in section 3.1, suppliers did earlier have more freedom to do as they pleased, partly due to less extensive competition and by the power of owning resources. Christopher (2005) claims that, the power nowadays has not only moved towards the customer, but rather to the end consumer. What ones was a seller's market has today become a buyer's market.

Bowersox et al. (2000) have the same opinion, but also explain how difficult it often is to define and provide meaningful product and service offerings to enhance end-customer value. The authors claim that there are three different perspectives regarding end-customer value that companies, at least, have to take into consideration and fully understand. These three perspectives are:

- *Economic value*

Economic value employs economies of scale in operations to generate efficiency. Two operational initiatives are mentioned to create economical value, product profitability and lowest total landed cost. Product service is also important in the sense that the logistics of merchandising must be efficient. The take-away of economical value is low price demanded by the end-customer.

- *Market value*

The market value perspective refers to effectiveness of channel relationships. It is focused on economies with scope to achieve product service positioning. The take-away of market value by the end-customer is assortment and convenience.

- *Relevancy value*

The relevancy value perspective has arisen lately and concerns doing those things that make a real difference in the way business customers work and end consumers live. The take-away of relevancy value is business and lifestyle accommodation of the end-customer.

The challenge of the 21st century is, according to Bowersox et al. (2000), that relevancy will increasingly take precedence over economic and market value. This put new demands on the supply chain, which now needs to withhold constant state of dynamic change and adaptation (Christopher, 2005). The expected impacts on the supply chain due to this are many and of different weight depending on different authors' opinions. These opinions are summarized in the four sections below.

Customer segmentation and customization of products and services

As described earlier, the competition is expected to increase to a great extent because of the trend towards globalization. This will in turn contribute to a continued trend towards customization and differentiation (Christopher, 2005). Companies will not be able to treat all customers in the same way to stay competitive, both from a cost as well as from a competitive perspective (Stahre, 2006). The most important customers should be offered excellent service and customization of the products and service offerings. However, it is important to have in mind that some customers do not demand the same services and are not willing to pay for it (Stahre, 2006). For many customers, operation features like cycle time compression, exact point time delivery performance and perfect order to delivery, may be the prime drivers for supplier acceptability. In contrast, other customers may not be willing to shoulder the cost of day-to-day six-sigma⁹ support (Bowersox et al., 2000).

⁹ The Six Sigma route to quality control emerged in the 1980s as Motorola searched for a robust quantitative approach to drive variability out of their manufacturing process and thus guarantee the reliability of their products. The term sigma is used in statistics to measure variation from the mean and the higher value of sigma the smaller is the probability that something falls outside the standard deviation. In manufacturing the value two sigma means that it is a 4.56 percent probability of a defect, whereas six sigma implies that there is a 0.00034 percent probability of a defect. The term 'Six Sigma' is however today largely symbolic. (Christopher, 2005)

The companies will, according to Stahre (2006), have to classify customers according to their importance and demands. This implies that comprehensive and detailed customer segmentation and differentiation in depth of cooperation, service and pricing towards different customer segments and certain customers are made. The demands on advanced IT systems to comprehend this information, accessible and easy understandable for all users, will be excessive (Holmqvist and Pessi, 2006).

It is not only the technical means between different companies and departments that have to be in order, but also that the logistics and the sales functions understands each other (Stahre, 2006). The sales personnel need to understand the cost for logistical services, and set prices according to delivery frequency and logistical customization settlements, not just on sales volume (Stahre, 2006).

It is not only customization of logistical services that will affect the future logistical development. Customers will also demand more customized products for the price of mass produced equivalencies, the main reason behind the phenomenon of mass customization (Da Silveira et al., 2001). Singh (2004) claims that, highly customized mass produced products require a flexible and agile supply chain which is able to manage extreme variability.

Increased focus on customer service and closer customer relationships

Firms are increasingly starting to realize the importance of creating closer relationships with key customers (Bowersox et al., 2000). Intimate relationships enable firms to generate unique and profitable product and service offerings for their preferred customers. Singh (2004) continues this discussion predicting manufacturers in greater extent to become total service providers and build long term relationship with their customers, to service their total package of needs based around a manufactured product. Value will be built into the service since it is more difficult to copy and steal a service from competitors, compared to a physical product (Singh, 2004). Further Singh (2004) believes that post sales support through the entire life of the product included in the product offering will become more usual in the future.

The supply chain of the future must be designed for agility¹⁰ rather than cost as key driver, to be able to cope with the arisen customer-centric market and to get closer to the customers (Christopher, 2005). It can be expected that the consumers will be in direct contact with the creators of the product or service, to involve real consumer value already in the developing phase (Singh, 2004). If the end-customers purchase behavior is understood, it is most likely that supply chain based relationships will have great potential to result in unique logistical solutions that are simultaneously effective, efficient and relevant (Bowersox et al., 2000). Bowersox et al. (2000) describes ten mega-trends of future supply chains and estimate closeness to customers to be the most advanced of these mega-trends. The following quotation can be found in Bowersox et al. (2000), which summarize their and other mentioned authors' opinions quite well:

Leading firms increasingly recognize that success hinges on establishing intimate relationships with key customers. Intimate relationships enable firms to generate unique and profitable product/service offerings for their preferred customers.

Differentiation and consolidation of product flow

Results from Stahre's (2006) research project show that differentiation and consolidation of product flows increase cost efficiency and delivery service in terms of shorter lead times and coordinated deliveries. Parallel delivery paths, both through and pass the retailer, enables more effective stockholding policies optimized for the entire supply chain, and not just isolated for respective part of the supply chain (Stahre, 2006).

To improve logistical efficiency operational innovations such as multi-customer transportation consolidation, cross-docking¹¹ and mixing in-transit have to be adopted (Bowersox et al., 2000; Stahre, 2006). Suppliers have to prepare for enhanced customer

¹⁰ Christopher (2005) describe agility as the ability of a company to meet changing demands and respond quickly to changes both in terms of volume change and variety change. The causes of the changing demand can be such things as shorter product and technology life cycles, competitive pressures that that force more frequent product changes and that customer demands a greater variety of the products (Christopher, 2005; Ramasesh et al., 2001).

¹¹ Cross-docking is basically the direct flow of goods from the receiving area to the shipping area in the warehouse with a minimum dwell time and as little handling and storage in between as possible (Apte et al., 2000). Cross-docking is a way to reduce inventory-holding costs. In essence, inventory is then replaced with information. Cross-docking is also a way to consolidate shipments to achieve truckload quantities (Koster and Warffemius, 2005).

demands for complete and consolidated deliveries, a trend that is currently slowed down by larger order batches from distant suppliers (Stahre, 2006). There is also a trend towards converged deliveries from different suppliers to decrease the number of deliveries and to improve utilization of transports (Stahre, 2006).

Increased demands on effective and flexible supply chains

According to Singh (2004), there will be a greater pressure on supply chain efficiency due to shorter product life cycles as a result of technological advancement and increased competition. This means, according to the authors, that it will be extremely critical to success of any supply chain to manage the matching of supply and demand from introduction to obsolescence.

To be able to efficiently develop, manufacture and distribute products with short life cycles, Christopher (2005) believes that, the spotted trend with moving away from push-strategies to pull-strategies will increase. The push mentality seeks to optimize operations through level scheduling and long planning horizons whereas in the demand-pull philosophy ideally nothing is sourced or moved until there is a demand for it. Obviously the push mentality will not work in fast changing markets as products' lifecycles are getting shorter and the demand to continuously develop new products is increasing (Christopher, 2005).

3.2.3 New financial measurements

The increased demand on profitability and capital productivity, discussed in section 3.1.2 above, will certainly affect the expected logistical development. Singh (2004) predicts that the increased financial demand will exert tremendous pressure on supply chains to become lean. He also predicts that the unrelenting pressure to drive down costs will continue to increase.

To cope with these financial demands managers have, according to Bowersox et al. (2000), started to question the Key Performance Indicators (KPIs) used in the past, and become sufficiently aware of the limitations of Generally Accepted Accounting Procedures (GAAP). They are now willing to spend significant resources on managerial accounting methods such as activity-based costing. According to Bowersox et al. (2000), these methods improve the understanding of the dynamics of integrating internal and external functional activities. Further, they also provide the metrics managers need to support strategic and tactical decisions.

Bowersox et al. (2000) further claim that, this trend has long been recognized as particularly relevant for operational managers but that it is now also gaining attention from senior management. The authors also believe that this trend is likely to take off now when supply chain management concepts are receiving increased acceptance by the financial community. According to Bowersox et al. (2000), increased implementation of Economic Value Added (EVA) measurements have a potential to relate customer sales and profitability based on exact costing of ordering practices and delivery expectations. This opens possibilities to modify supply chain practices. For example can managers work with customers individually to develop new routines that simplify and streamline order placement, resulting on better services as well as lower costs.

3.2.4 Greening logistical processes

Several authors point out the importance of “greening” logistical processes, both in terms of compelling to laws and restrictions, but also to gain competitive advantage by satisfying customers’ demands and expectations (Lee and Rhee, 2006; Paquette, 2005; Skjoett-Larsen, 2000). Lee and Rhee (2006) have observed trends that companies’ environmental strategies have changed and that there are an increased focus on environmental issues and implementation of proactive strategies. Mohan Das Gandhi et al. (2006) stress the importance for companies to undertake environmentally sustainable strategies, and he has also seen tendencies in that direction. However, economic development still seems to be prioritized before environmental protection.

Skjoett-Larsen (2000) believe that a growing problem with traffic congestion, an increase in green taxes and restrictions on truck traffic, may lead to a comeback for inter-modal transport forms such as car-railway and car-railway-ship. He also believes that demands for a reduction in carbon dioxide may limit the globalization and lead to more local production and distribution. These beliefs are also, as discussed earlier, expressed by Singh (2004). Skjoett-Larsen (2000) further believes that, as a result of increased transport duties and traffic congestion in Europe, regional distribution centers may again prove advantageous.

Singh (2004) presents a package of measures companies will have to undertake. He believes that significant infrastructure changes will be established to focus on 3 R’s - Recycling, Reclamation and Remanufacturing. Further, reverse logistics is predicted become an integral part of the supply chain decisions and product disassembly for reuse, remanufacturing and

recycling will impact the design, manufacturing technology, supplier selection and product traceability, thru the life of the product. Finally he states that, societal demands for superior environmental performance will put pressure on supply chain design to supply products that are environmentally friendly in their production, delivery, usage, and disposal. This will, according to Singh (2004) affect the production technologies and hence the partners, choice of raw materials, delivery mode etc.

3.2.5 Supply chain education

According to Bowersox et al. (2000), the logistics process will remain human centric in the foreseeable future. However, they claim that effective management of logistics processes is complicated by the fact that over ninety percent of all logistical work takes place outside the vision of any supervisor. The authors give the example of a truck driver:

“An unsupervised truck driver performs almost all the value created by moving a product from a shipping location to a customer destination. Truck drivers, in fact, may spend more time face-to-face with key customer representatives than any other company employee. The truck driver may not even be an employee of the firm that is making the shipment to the customer.”

Bowersox et al. (2000) believes that it is a critical need in areas like these for employees to understand supply chain dynamics and understand how information based tools can be used to develop and implement effective strategies. Further the authors claim that many managers have enlightened the trend and the need for knowledge based training, but that they find it difficult to find time and appropriate methods to efficiently train employees. Finally the authors state, that it is not to be forgotten that it is also a need to build knowledge capabilities of key managers as well.

3.2.6 Centralization and changes in logistical structures

To be able to cope with the market dynamics driven by e.g. globalization and increased customer demand Abrahamsson et al. (2003) and Stahre (2006) believes that it is a need for centralization of the logistics. Abrahamsson et al. (2003) have defined the concept of *Logistic Platforms*, which include that logistics should support and drive new market strategies, not only react to operational demands from current strategies and customer demands. The concept holds two domains of centralization; centralization of the physical structure and centralization of management and decision making. According to Stahre (2006) the latter of these types is in general the most important for companies to focus on. Benefits from physical centralization are more dependent on the specific situation.

Stahre (2006) claim that, all the trends presented above point at a need for centralization of the logistics, but at the same time are the increased complexity a complicating circumstance. He further states that, centralization makes it possible to standardize the operative work. Also, competence and learning effects can be gathered to implement sourcing strategies as direct deliveries, cross-docking, merge-in-transit and consignment stock, faster and on broader front.

Singh (2004) also believe that there will be changes in the logistical structures. He believes that we are likely to see a more local, distributed manufacture taking hold, in order to satisfy customer demand more quickly and efficiently, while at the same time heeding the environmental pressures for reducing the use of fuel in transport. This will, according to Singh (2004), require more efforts for coordination across the distributed units and the lead time and transportation costs need to be lowered. The majority of the manufacturing will be made closer to the point of consumption with postponement¹² as a result.

¹² According to Christopher (2005) postponement refers to the process by which the commitment of a product to its final form or location is delayed for as long as possible. When decisions on the final configuration or pack have to be made ahead of demand there is a risk that the products that are available are not the ones the customer wants. The longer the products can remain generic the greater probability that the right product is at the right place. Postponement may not always be feasible in terms of late configuration, but there may be scope for spatial postponement through holding inventory in just a few locations with the ability to ship the product rapidly to the location required when an order is received.

4 Specification of the thesis

This chapter opens with a clarification of the purpose. The purpose is analyzed and broken down into smaller phrases, in order to make it more specific and easy to manage. Afterwards are the theories found in the frame of reference discussed and a number of main areas of interest are identified. In the last section is a number of research questions identified which are examined later on in the empirical study and in the analysis.

4.1 Purpose clarification

The introduction of this thesis highlighted the importance for Synchron to stay ahead of its competitors and to be able to develop appropriate and desirable products and services. The purpose of this thesis is, as described earlier, to...

*...explore and evaluate future drivers and trends within outbound logistics.
Synchron should be able to use the findings to develop their products and services
in a way that satisfies future customer demand.*

The most important expressions in the purpose that need further explanation are written in bold type. Even though these expressions are well recognized and established we believe that an explanation is necessary to clarify their definition in this thesis. It should also be mentioned that challenges associated with the drivers and trends also will be examined since these are the challenges that Synchron hopefully can help their customers with.

“explore and evaluate”

A comprehensive literature research was conducted that pinned down the areas of interest as well as it laid ground for the interviews. This is what is meant by *explore*. The literature research generated a framework that clarified the subject of the thesis, and also narrowed it down to a manageable number of more specified areas. These areas were then further explored when the interviews were conducted. This information, both from the literature research and from the interviews, was then *evaluated* in the analysis part of the thesis. The information from the different sources was compared and its credibility and probability were determined in the evaluating part.

“drivers and trends”

Drivers relates to underlying causes and prerequisites that will affect outbound logistics in one way or another. Some of the mentioned drivers might seem to have a weak association with outbound logistics, but is brought up anyway to generate an overall perspective that covers all possible aspects of interest. Companies will act differently on these drivers but some trends can usually be spotted. Several companies have for example lately prioritized various logistical matters to cope with the growing pressure to keep expenses as low as possible. This is only one example, but it illustrates what we mean by trends and how they depend on the underlying drivers.

“outbound logistics”

All logistical activities that are carried out after the production phase are included in the definition of outbound logistics. These logistical activities refer to distributing goods to and back from customers, scheduling and material handling. The definition is not only applicable to consumer products, business to business products are also included and are also of most interest for this thesis, since the majority of Synchron’s customers operates in this market.

“satisfies future customer demand”

Working primarily with the target to improve customers supply chains, with support of their product portfolio, Synchron has to always stay up to date with changing customer demand. In order to do so, it is not enough to only do what the customer demand when the customer demands it. Synchron must be foresighted so they can develop their products and services in advance to when the actual demand occurs. Otherwise there will be a gap between what the customers demand and what Synchron can offer at that time. Also, if Synchron can offer a solution before the customer realizes its potential this will significantly contribute to enhanced competitiveness. This is what we refer to when discussing “satisfy future customer demands”. Also, in this thesis, the future primarily refers to the relatively nearby future within five to ten years ahead.

4.2 The areas of interest

We knew in advance that all theories treated in the frame of reference would not be used later on when specifying the thesis. Some issues had to be delimited simply because of the time constraint, whereas others would be delimited due to lack of relevance. Below, the frame of reference is narrowed down into a number of areas of interest. This discussion is then concluded in several more specific research questions, which this thesis will try to answer. The discussion will also result in certain issues related to each research question that will be included in the research. The issues are presented below each research question with the purpose to clarify and specify the research questions. This also lay ground for the qualitative interview guide as well as it provides an indication of the opinions regarding the question found in theory. The categorization will be the same as in the frame of reference, beginning with *Drivers and prerequisites influencing future logistics* and ending with *Expected logistical development*.

4.2.1 Drivers and prerequisites influencing future logistics

Below are all the drivers and prerequisites presented in the frame of reference discussed and it will be motivated why some areas are emphasized in the continuing work, whereas others will be delimited. A summary can be found in the end of this subchapter which clarify and summarize the areas of interest within the section *Drivers and prerequisites influencing future logistics*.

Globalization

When discussing the trend towards globalization, sourcing and production in low cost countries were specifically examined by especially Stahre (2006) and Barry (2004). The issues concerning sourcing will not be studied further since no indication has been found that this will significantly impact outbound logistical activities. Production in low cost countries and concepts such as focused factories will though be included in the continuing work since this affect outbound logistics through warehousing and distribution of finished products. In relation to global production were also the underlying drivers discussed. Stahre (2006) and Barry (2004) agreed upon that the main drivers behind global production are to gain access to new markets and to lower the costs. Stahre believed gaining access to new markets to be the most important driver. Drivers behind the globalization trend in general will also be briefly examined since it can be interesting to see what prerequisites that are believed to have greatest influence on companies' decisions when globalizing the business. Opinions from Skjoett-Larsen (2000) and Singh (2004) concluded in that the main drivers behind the globalization are removal of trade and transport barriers, opening of new markets and development of information technology and fast communication systems.

There were also challenges mentioned in relation to the trend toward globalization. For example did Christopher (2005) claim that increased globalization lead to increased competition and Stahre (2006) claimed that spread out customers and a dispersed physical structure lead to more complicated and complex management. Bowersox et al. (2000), Christopher (2005) and Singh (2004) agreed that the trend towards globalization will continue in the foreseeable future but drivers that would counteract this development were also brought up.

The following research question has been identified from the discussion above:

♦ **What are the main drivers behind the globalization, how will the trend evolve and what challenges will this imply for outbound logistics?**

- Drivers behind the globalization in general
 - Removal of trade and transport barriers
 - Opening of new markets
 - Development of information technology and fast communication systems
- Drivers behind global production
 - Lower costs
 - Access to new markets

Increased competition and changing customer demand

There is a general belief that companies world wide will experience increased competition and changing customer demand, much because of the trend towards globalization. This is suggested by e.g. Christopher (2005) and Singh (2004). Customers will demand more from suppliers, in terms of enhanced service (e.g. shorter lead times) and flexible service (e.g. varying lead time). This will in turn lead to the companies need to focus on their processes in order to stay competitive. In addition to this do Christopher (2005) and Singh (2004) believe that there will be a demand for a responsive supply chain due to a quickening pace of product innovation in many markets. It was however hard to find specific opinions supporting a quickening pace of product innovation in the industrial markets. Most examples are given from consumer markets, such as the market for personal computers. Due to this will less emphasize be put on this matter since it is in the industrial business-to-business market Synchron has their core competence.

Christopher (2005), Singh (2004) and Stahre (2006) claim that the global competition together with general price awareness has lead to a downward pressure on price, with squeezed margins and increased financial demands as a result. This increased financial demand is not specific for outbound logistical activities, but rather something that all logistical functions will have to adapt to. The increased financial demand is not a driver or

prerequisite which is primarily discussed or specifically highlighted in literature. It rather seems to be a consequence of the increased competition. It will therefore not be thoroughly explored in the continuing work.

The following research questions have been identified from the discussion above:

♦ **What will be the main challenges for outbound logistics, due to increased competition?**

- More demanding customers
 - Product excellence vs. Process excellence
- Increased financial demand
- Downward pressure on price

♦ **What will be the main challenges for outbound logistics due to changing customer demand?**

- Increased demand (i.e. shorter lead time)
- Varying demand (i.e. varying lead time)
- Responsive demand (shorter product life cycles)

Environmental issues

Even though some authors, e.g. Aronsson and Brodin (2006), show that proactive environmental changes can lead to increased competitiveness and at the same time lower costs, other well known authors i.e. Bowersox et al. (2000) and Christopher (2005) do not mention these issues at all when discussing the major drivers for future logistical development. It is hard to find out whether this is because these issues are too new, and therefore not that thoroughly examined, or simply because that the issues are seen as insignificant in relation to the major ones.

Nevertheless, the environmental aspects do affect outbound logistical activities since it places constraints in terms of various regulations and customer demands. However, the main pressures related to outbound logistics seems to be of regulatory character. This is suggested from researchers such as Aronsson and Brodin (2006) and Wu and Dunn (1995), as well as large organizations such as the European Union and the UN. There is little indicating that

resource limitations and ethical responsibility influence outbound logistics significantly. According to Singh (2004), these pressures are more closely related to sourcing and manufacturing and emphasis will therefore be put on regulations and customer demands. The discussion above is summarized in Figure 5 below where the width of the pointers represents the relative importance of the pressure. The regulations and the customer demands primarily consist of issues concerning pollution from transportation and aspects concerning remanufacturing and recycling. Issues regarding for example disposal regulations of hazardous substances are a concern for product development and manufacturing and is therefore delimited in the continuing work.

The following research question has been identified from the discussion above:

- ♦ **What sources of environmental pressures will be the most challenging in the future?**

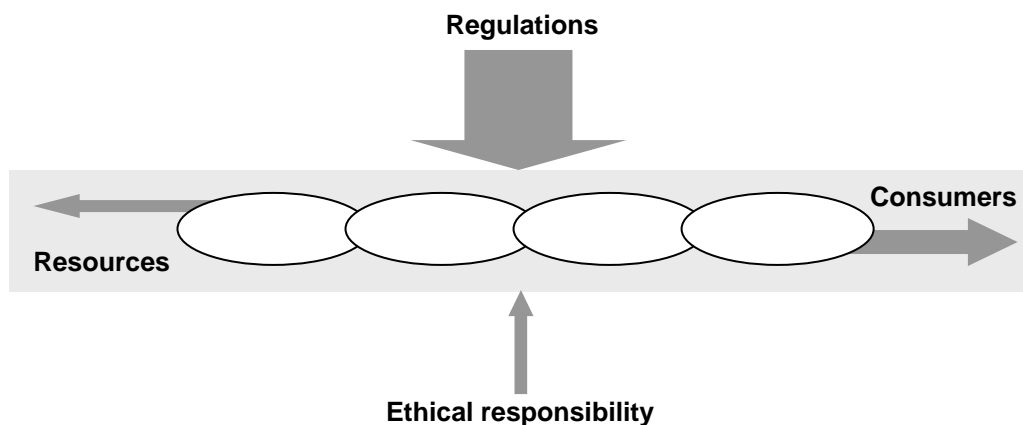


Figure 5 - Environmental pressures on outbound logistics

New technology

Issues concerning new technology, especially ICT systems, will definitely be relevant for the continuing work. One reason for this is that Synchron today have their key business in this area but also because new technology doubtless has impact on outbound logistical activities. The focus will lay on new technology designed for the supply chain i.e. ICT-systems and RFID, since these technologies seem to have the greatest impact on outbound logistical activities. Issues related to ICT-systems are e.g. discussed by Kaipia and Hartiala (2006) and Heckman et al. (2003).

In relation to this discussion Singh (2004) predicts that there will be improved possibilities and a demand for real time tracking of products and goods. These aspects have also been included in the continuing work. The quickening pace of product innovation influencing outbound logistics will, as discussed earlier, only be briefly examined. This is also the case for the development of load carriers, discussed by e.g. Klevås (2005), since the importance regarding these issues were not that widely stressed in literature.

The following research question has been identified from the discussion above:

♦ **What kinds of new technology will be the main drivers for future outbound logistics development?**

- Information and Communication Technology (ICT)
- Real time tracking
- Radio Frequency Identification (RFID)

Societal issues

Societal issues e.g. pervasiveness of media and threat of war of terrorism discussed by Singh (2004), were not widely discussed in literature, and it was hard to find direct connections and explanations for how this would affect outbound logistics. Obviously, threat of war and terrorism will influence the logistical activities if a company is doing business in regions sensitive to this threat. Nevertheless, is it difficult to estimate the probability of this to happen and several circumstances are influencing. Also, no indications were found that any of this will act as a main driver or prerequisite for future logistical development. These issues are therefore delimited from the continuing work.

Summary of Drivers and prerequisites influencing future logistics

When performing the literature research most of the discussions regarding drivers and prerequisites behind future logistical development, seemed to revolve around globalization and the fact that this has led to increased competition and changing customer demand. Other issues found in literature and discussed in the frame of reference, e.g. new technology and environmental issues are presented more as enablers or constraints that companies in one way or another have to deal with. The increased competition and the changing customer demand seem to be the origin to the majority of the main issues concerning the expected logistical development. In other words, the main objectives seem to be to, satisfy or exceed customer

demand in the most efficient way possible. When doing this, other issues such as new technology, environmental issues and societal issues, opens possibilities but also places constraints. The societal issues were however delimited. Figure 6 below summarizes the discussion above.

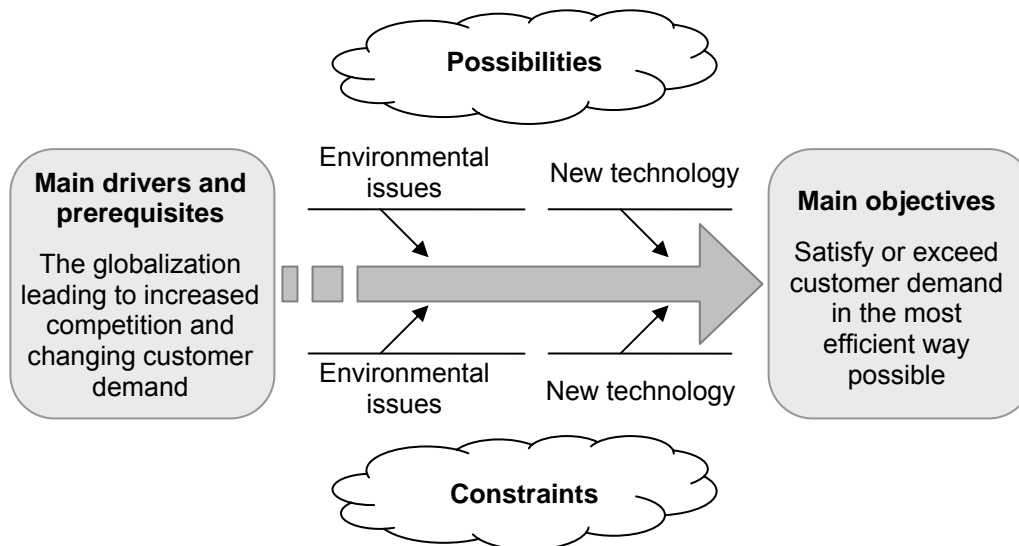


Figure 6 - Summary of Drivers and prerequisites influencing future logistics

4.2.2 Expected logistical development

In order to achieve the main objectives of satisfying customer demand in the most efficient possible way, companies need to continue to develop and improve outbound logistical activities. This will in a longer perspective contribute to sustained or even increased competitiveness and profitability. This discussion is summarized in Figure 7 below. In the following sections will the subjects from section 3.2, *Expected logistical development*, be discussed and it will, as in section 4.2.1, *Drivers and prerequisites influencing future logistics*, be motivated why some areas are emphasized in the continuing work, whereas others will be delimited.

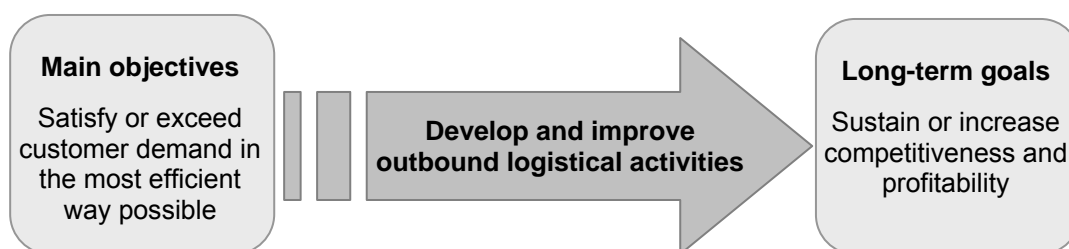


Figure 7 - Connection between the main objectives and the long-term goals

Collaboration, information sharing and new technology

The theory suggests that the focus on collaboration in the supply chain will continue to grow. Hence, will trust in the supply chain partners also have to increase. This is agreed by e.g. Bowersox et al. (2000) and Singh (2004). There is according to Bowersox et al. (2000) a trend for companies to be more open, when it comes to sharing sensitive information and Collaborative Planning Replenishment and Forecasting-initiatives can enhance the supply chain performance at the same time it lowers the costs.

Information sharing is, according to e.g. Christopher (2005), vital in the future in order to create a demand driven supply chain, with better visibility of real demand. Bowersox et al. (2000) agree and claim that this in turn will put pressure upon new technology that can enable the information sharing once trust is established between the partners. New information technology have already today enabled better information availability throughout the supply chain, with improved warehouse management and reduced inventory levels and better stock availability as results. This is also supported in the arguments stressing the importance of creating an agile supply chain with a demand-pull philosophy.

In addition to this Bowersox et al. (2000) discuss information sharing on different levels and claim that the information sharing process initially concerns sharing of tactical data, such as short-term forecasts and inventory availability, to facilitate resource planning and product flow. Once the benefits of tactical sharing are realized firms tend to become more open to share sensitive information of costs, product development plans, and promotional schedules.

The following research questions have been identified from the discussion above:

- ◆ **How will the trend considering collaboration and trust in the supply chain evolve?**
 - What activities
 - Planning
 - Replenishment
 - Forecasting
 - Information sharing
 - Tactical
 - Strategic
- ◆ **Will information sharing increase and what requirements will this put on new technology?**
 - Gathering
 - Mediate

Process orientation, outsourcing and complex networks

Bowersox et al. (2000) and Christopher (2005) agree that process orientation should be a focused area to stay competitive in the future. This includes internal processes, e.g. between the sales and the logistical departments, as well as external processes between supply chain partners. Process orientation is highlighted as a rather big issue in all-embracing books and articles and has therefore been included in the continuing work.

Most authors, e.g. Bowersox et al. (2000) and Christopher (2005) believe that the trend towards outsourcing will continue, creating more complex networks, even though Singh (2004) highlight opinions believing the contrary. Nevertheless, supply chain integration is generally expected to increase, with new challenges as a result. The opinions raised regarding drivers counteracting supply chain integration are mostly opinions from single authors. These opinions are also concerning supply chain integration development at a very high level, which

most supply chains are not even close to today. Hence, these opinions will not be further investigated.

The following research questions have been identified from the discussion above:

- ♦ **How will the trend towards process orientation evolve, and what challenges will this imply for outbound logistics?**
 - Internal
 - External
- ♦ **How will the trend towards outsourcing develop and what challenges will this imply for outbound logistics?**
 - Outsourcing development
 - What activities and to what extent

Focus on satisfying the customers

Customers have much due to increased competition been able to take over the bargain power from the suppliers and companies have therefore been forced to adjust to customers demand to a greater extent than before. These opinions are especially highlighted by Christopher (2005). According to e.g. Bowersox et al. (2000) and Stahre (2006), the customers must be treated differently when it comes to both service and product offering and this is predicted to be a significant challenge for outbound logistics. New challenges include e.g. different delivery standards for different customers and postponement of product configuration.

Increased global competition has forced companies to create customer value in other ways than just in product attributes. Singh (2004) highlight that the focus is often put on services offered beside the product, with the purpose of creating a closer relationship with customers and to make unique offerings that are more difficult to copy than a single product. These services often regard product maintenance including spare parts distribution, which is described as a major challenge for outbound logistics.

The following research question has been identified from the discussion above:

♦ **What will be the primary changes in the customer demand and what challenges will this imply for outbound logistics?**

- Customization
 - Product
 - Service
- Customer relations
 - Intentions
 - Challenges
- Unique service offerings

New financial measurements

New financial measurements might seem difficult to link specifically to outbound logistics, but is indeed an important aspect. Outbound logistics is closely linked to customer relations, both when it comes to customer value in the delivery process but also when it comes to gathering information about important KPIs. These KPIs should according to Bowersox et al. (2000) measure real customer value and will be of increasing importance for companies when coping with customers demand. These issues were not widely highlighted in recent research and emphasis will therefore not be put on these matters even though they will be shallowly examined.

The following research question has been identified from the discussion above:

♦ **How will the development regarding KPIs related to outbound logistics evolve in the future?**

Greening the supply chain

Several authors highlight the importance of greening supply chains. Pressure is expected to increase from both regulations and customers leading to changes in distribution networks, with new challenges for outbound logistics as a result. Skjoett-Larsen (2000) believe that a growing problem with traffic congestion and an increase in green taxes and restrictions on truck traffic, may lead to a comeback for inter-modal transport forms such as car-railway and car-railway-ship. He also believes that, demands for a reduction in CO₂ may limit the globalization and lead to more local production and distribution. Similar opinions are also highlighted by Singh (2004) and the European Commission (2001). Skjoett-Larsen (2000) further believes that, as a result of increased transport duties and traffic congestion in Europe, regional distribution centers may again prove advantageous.

The transportation and warehousing issues regarding recycling and remanufacturing were especially highlighted by Singh (2004) and will be covered in the continuing work. He believes that reverse logistics is predicted become an integral part of the supply chain decisions and product disassembly for reuse, remanufacturing and recycling will impact several outbound logistical activities. Environmental issues regarding product development and manufacturing processes will however be delimited since they do not seem to primarily affect outbound logistical processes.

Transportation will in general be the most examined matter within this area. The environmental aspects are, as also mentioned in section 4.2.1, *Drivers and prerequisites influencing future logistics*, not that widely discussed by more well known authors. This contributes to that the area will not be of highest priority, even though it will be examined.

The following research question has been identified from the discussion above:

- ◆ **How will outbound logistics adapt to increased environmental pressures and what challenges will this imply?**
 - Modal shift
 - Remanufacturing and recycling
 - Decreased globalization

Centralization, consolidation and alternative flow of goods

Apart from centralization of the product flow, Abrahamsson et al. (2003) and Stahre (2006) are discussing centralization of management and decision-making to e.g. enable standardized operations, which can result in an overall improvement in logistics performance. For example may centralized management and decision-making lead to an awareness of the importance of logistics. This will in turn lead to larger logistical investments concerning for example new technology. The concept of centralized management and decision-making are not widely discussed in theory and when it is, it is usually mentioned as an enabler to succeed in other strategic developments of e.g. customization and differentiation. We will however examine if these tendencies can be found among the companies investigated in the empirical study, and examine their perspective in the matter.

Centralized logistics facilitate the use of alternative ways of product flow e.g. direct deliveries and cross-docking. These strategies can, according to Bowersox et al. (2000) and Stahre (2006), lead to increased cost effectiveness and simultaneously increase customer satisfaction by e.g. enabling shorter, more precise lead times and complete and consolidated deliveries. This trend is also believed to continue according to several authors.

Centralized logistics does also according to Stahre (2006) facilitate transport consolidation which enhances the utilization in transports with lower costs of transportation and less negative effects on the environment as a result. This will however increase the requirements on the planning process and on advanced supporting information systems, which needs to be in place before the development can continue.

The following research questions have been identified from the discussion above:

- ◆ **Will the logistical structures increase in complexity and what challenges will this imply for outbound logistics?**
 - Centralized logistics
 - Physical structure
 - Management and decision-making

- ♦ **Will there be changes from the traditional flow of goods into new distribution strategies, and what challenges will this imply for outbound logistics?**
 - Direct deliveries
 - Cross-docking
- ♦ **Will there be increased consolidation in transportation and what challenges will this imply for outbound logistics?**
 - Underlying causes

Supply chain education

Supply chain education, which is discussed in section 3.2.5, will be delimited even though it might be an interesting and important area to investigate. We have chosen not to examine this due to a combination of lack of time and relevance for outbound logistics. Also, this area is not widely discussed in literature, which probably suggests that it is of minor importance in comparison with other more widely discussed trends.

Summary of expected logistical development

Most of the expected developments mentioned above are, with some exceptions, related to changing customer demand. Figure 7, found in the beginning of this section, has been developed with more detailed information regarding what future demands that are expected. Figure 8 below shows the result which is a simplified summary of the discussion above with the purpose to demonstrate a simplified version of the result. The main objectives referred to in Figure 8 demand a certain development as well as supporting activities in order to reach the desirable goals.

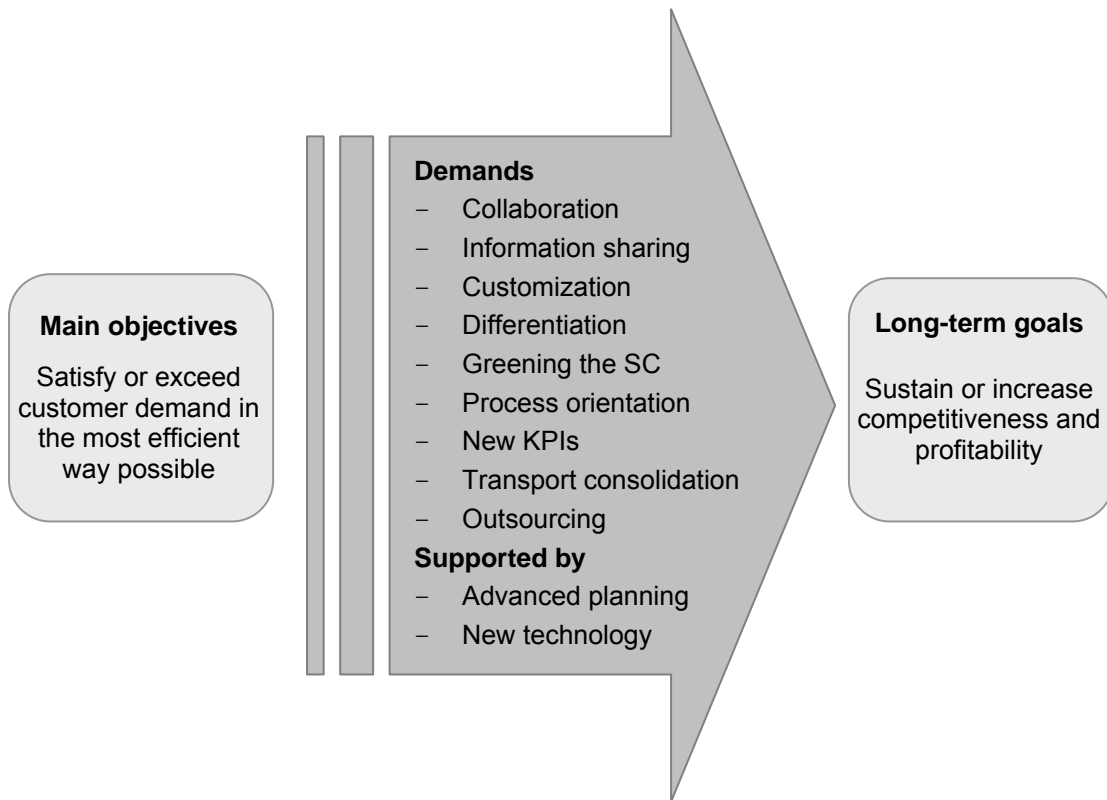


Figure 8 – Summary of expected logistical development

4.3 Research questions

The questions identified in section 4.2 are presented below and categorized into six different areas. These are *globalization and increased competition*, *changing customer demand*, *supply chain integration*, *complex networks*, *new technology* and *environmental issues*.

The questions below the topic *globalization and increased competition* concern overall issues concerning the trend towards globalization and the increased competition and what major challenges these trends will lead to.

The questions below the topic *changing customer demand*, all concern the actions predicted to be initiated in order to satisfy the future customer demand. These questions will also try to outline which elements this changing demand will consist of. The question concerning alternative flows of goods was categorized below this topic since it seems that the main driver for using alternative flow of goods is to satisfy customer demand.

The topic *supply chain integration* holds the questions regarding collaboration, trust and process orientation. To go from functional orientation to process orientation will require integration between the functions within the company, but also between organizations. This is the reason why this question is treated here.

Questions that can be related to the complexity in the logistical structure relation have formed the topic *complex networks*. The first question within this area relates to centralization of logistics. Outsourcing will naturally influence, and probably also increase the complexity in different networks. The question regarding transport consolidation is included here since it will require a lot of communication and synchronization between the actors, which will lead to a complex communication network.

The questions below the topic *new technology* will outline what kinds of new technology that is predicted to play a major role in the future, but also what requirements the increased information sharing will put on new technology.

The last topic, *environmental issues*, holds the questions regarding drivers and trends for outbound logistics to become more environmentally friendly. The underlying causes and the challenges associated with various environmental issues will be investigated here.

Globalization and increased competition

- ◆ **What are the main drivers behind the globalization, how will the trend evolve and what challenges will this imply for outbound logistics?**
- ◆ **What will be the main challenges for outbound logistics, due to increased competition?**

Changing customer demand

- ◆ **What will be the main challenges for outbound logistics due to changing customer demand?**
- ◆ **What will be the primary changes in the customer demand and what challenges will this imply for outbound logistics?**
- ◆ **Will there be changes from the traditional flow of goods into new distribution strategies, and what challenges will this imply for outbound logistics?**

- ◆ **How will the development regarding KPIs related to outbound logistics evolve in the future?**

Supply chain integration

- ◆ **How will the trend considering collaboration and trust in the supply chain evolve?**
- ◆ **How will the trend towards process orientation evolve, and what challenges will this imply for outbound logistics?**

Complex networks

- ◆ **Will the logistical structures increase in complexity and what challenges will this imply for outbound logistics?**
- ◆ **How will the trend towards outsourcing develop and what challenges will this imply for outbound logistics?**
- ◆ **Will there be increased consolidation in transportation and what challenges will this imply for outbound logistics?**

New technology

- ◆ **What kinds of new technology will be the main drivers for future outbound logistics development?**
- ◆ **Will information sharing increase and what requirements will this put on new technology?**

Environmental issues

- ◆ **What sources of environmental pressures will be the most challenging in the future?**
- ◆ **How will outbound logistics adapt to increased environmental pressures and what challenges will this imply?**

5 Methodology

This chapter describes the structure of this thesis and the methods used to gather, interpret and analyze the data necessary for answering the research questions found in section 4.3 above. Discussions and critics regarding the chosen methods are also found in the end of this chapter.

5.1 *Course of action*

The path towards the goal of this study is presented in Figure 9. This path was determined at an early stage of the study, even though some deviation has occurred during the way. However, the course of action presented in Figure 9 provides a representative image of how the work has been structured and in what order the different steps have been carried out.

The work is divided into three main domains; *Theory*, *Analysis* and *Empirical Studies*. The theory domain consists of all activities concerning the gathering of data from literature, whereas the empirical studies consist of all activities related to data gathering from empirical sources. The analysis domain consists of all activities that combine both theoretical and empirical elements.

A more detailed description of the content in each box in Figure 9 is found further down below. The figure also describes what and how the steps are connected to each other. The boxes connected with a dashed pointer do not have as strong connection as those with ordinary pointers. The activities in the boxes with dashed frames symbolizes that they are complementary activities.

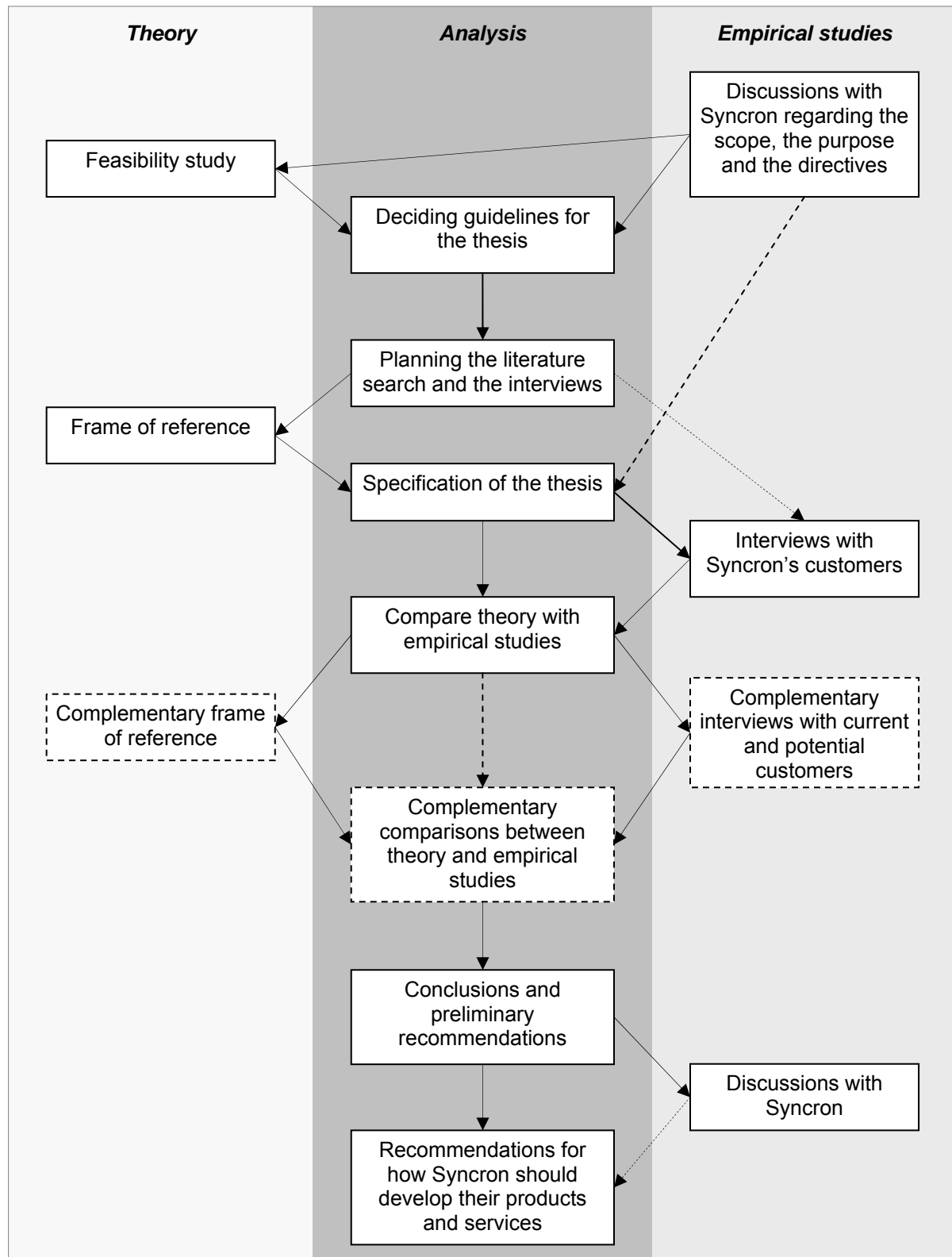
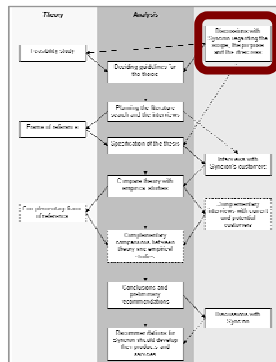


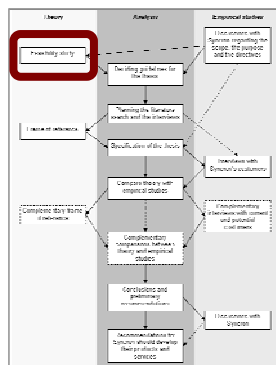
Figure 9 – Course of action

5.1.1 Discussions with Synchron regarding the scope, the purpose and the directives



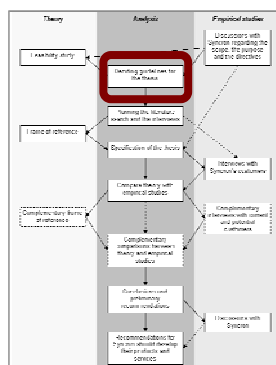
The study began with discussions with Synchron regarding the scope, the purpose, the initial directives and the desirable findings of the thesis. Preliminary wide-ranging delimitations were also made to avoid unnecessary work at an early stage of the working process. One directive was to only study outbound logistics since it is in this field Synchron have their core competence today. Hence, logistical issues concerning e.g. sourcing and production were delimited.

5.1.2 Feasibility study



To get ideas and insight in the out-lined problem area a brief feasibility study was carried out. The intention at this stage was to get the theoretical point of view to validate that the scope and the purpose of the thesis was not only based on Synchron's and our understanding of the subject. This feasibility study was not a study in the sense that a certain documented method was used. It was rather a way to get a brief insight in the problem area by scanning all-embracing literature.

5.1.3 Deciding guidelines for the thesis

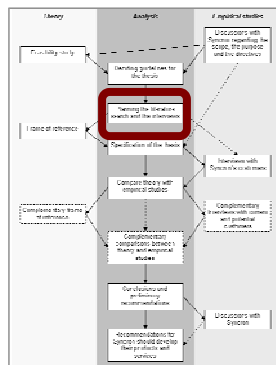


Based on the feasibility study and the initial discussions with Syncron, additional guidelines for the study were decided. These guidelines laid ground for the continuing theoretical and empirical studies. The alignment and the delimitations, as well as the additional directives of the study, were also determined at this stage. The alignment of the study is discussed in section 5.2.1, and the delimitations and the additional directives are discussed below.

After the feasibility study it was realized that the initial directives were not enough to narrow down the problem area to make it manageable with concern to the given time frame. It was therefore necessary to do additional delimitations. To limit the literature search we decided, in consent with Synchron, to only study journals published between 2000 and 2007.

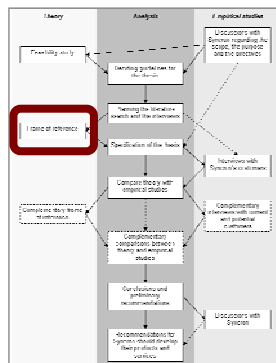
According to the alignment of this study it felt reasonable to emphasize on recent researches since older forecasts in general are less reliable as the try to predict a distant future in proportion to when the research was carried out. Considering the lack of time, Synchron also directed us to focus on business areas within in their core competence.

5.1.4 Planning the literature search and the interviews



When the guidelines were set and a well defined scope was formulated, the work with the frame of reference and the interview material began. But before starting with the actual work, everything had to be carefully planned. The first issue to consider was what kind of approach to use and the second issue was to decide which methods to use that would suit the approach and the alignment. A description of these matters can be found in sections 5.2.2. and 5.2.3.

5.1.5 Frame of reference



An extensive theoretical research had to be performed to make it possible to outline interesting problem areas and to design the interview material. The purpose of the frame of reference was to map out the majority of the published opinions in relation to the subject. The frame of reference was then used when specifying the thesis and when designing the interview material. The methodology concerning this is discussed further in section 5.1.7.

The guidelines and the feasibility study made it possible to out-line preliminary main areas which the frame of reference was believed to revolve around. These main areas were then complemented after having performed a more comprehensive literature research. The research started with studying a selected number of well recognized books in the area. The information in these books was then complemented by studying comprehensive all-embracing articles. Once the interesting areas were out-lined more specific and detailed literature was studied. This literature primarily consisted of articles published in well recognized journals. This is further discussed in the section below.

Selection of the references

A number of journals, with relevance for this thesis subject and available through the online databases at Linköpings University Library, were selected to be included in the literature search. The selected journals were:

- European Journal of Information Systems
- International Journal of Logistics: Research & Applications
- The International Journal of Logistics Management
- International Journal of Physical Distribution and Logistics Management
- Journal of Business Logistics
- Supply Chain Management: An International Journal

The number of articles studied was narrowed down by limiting the search to issues published no earlier than the year 2000. The conclusion was drawn that recent articles are of greater interest than older ones when studying the future, since forecasts tend to be more accurate the closer future one tries to predict. Several articles were sorted out due to lack of relevance for the subject. This initial filtering process was carried out through scanning of the articles titles and abstracts.

In addition to these journals were different article databases scanned by searching articles with predefined search strings. The result was narrowed down by only studying articles no older than 2000, like before. The databases scanned were Emerald¹³ and Business Source Premier¹⁴. A few examples of the search strings used on these databases are; ‘Supply Chain Trends’, ‘Logistical Trends’, ‘Future Logistics’, ‘Supply Chain Drivers’ and ‘Logistical Drivers’.

Articles, research papers and publications from the Massachusetts Institute of Technology project *Supply Chain 2020*, were also included in the literature search. The Supply Chain

¹³ <http://www.bibl.liu.se/databas/default.asp>

¹⁴ <http://www.bibl.liu.se/databas/default.asp>

Results from the Swedish government financed project *Innovative Information-driven Logistical Development* (ELOG II) were also included in this study. ELOG II is a cooperative research between three prominent technological institutes (LiTH, CTH, LTH) in the south of Sweden and the report describes the current situation in the logistical development.

```

graph TD
    subgraph Ideation
        A[Feasibility study] --> B[I date of reference]
    end
    subgraph Analysis
        C[Learning the literature on entrepreneurship] --> D[Planification of the business]
        D --> E[Competition's advantages and disadvantages]
        E --> F[Competition's disadvantages]
        F --> G[Our vision and our positioning]
        G --> H[Recommendations for supporters]
    end
    subgraph Implementation
        I[If required to elaborate] --> J[Location]
        J --> K[Investment with financial and personnel resources]
        K --> L[Location with investors]
    end
    B -.-> C
    D -.-> I
    L -.-> A
    L -.-> C

```

The flowchart illustrates the process of developing a business plan, organized into three main stages: Ideation, Analysis, and Implementation. The Ideation stage includes 'Feasibility study' and 'I date of reference'. The Analysis stage includes 'Learning the literature on entrepreneurship', 'Planification of the business', 'Competition's advantages and disadvantages', 'Competition's disadvantages', 'Our vision and our positioning', and 'Recommendations for supporters'. The Implementation stage includes 'If required to elaborate', 'Location', 'Investment with financial and personnel resources', and 'Location with investors'. Arrows indicate the flow from Ideation to Analysis to Implementation, with feedback loops from Implementation back to Ideation and Analysis.

```

graph LR
    subgraph Ideas
        A[Priority only]
        B[State of evidence]
    end
    subgraph Analysis
        C[Sampling guidelines for the research]
        D[Testing the literature search and the precision]
        E[Plan details of flow charts]
        F[Conceptual clarity with integrity of issues]
        G[Linguistic translation (compare research theory and empirical issues)]
        H[Get feedback and gathering recommendations]
        I[Recommendation to Services to consider the research project with serious action]
    end
    subgraph Results [If significant results]
        J[Location with Services regarding the State of evidence and the research]
        K[Harvesting with Services to consider]
        L[Collaborative research with potential of evidence]
        M[Location with Services]
    end
    A -.-> C
    B -.-> C
    C --> D
    D --> E
    E --> F
    F --> G
    G --> H
    H --> I
    I --> J
    I --> K
    I --> L
    I --> M
    style K stroke:#f00,stroke-width:2px
  
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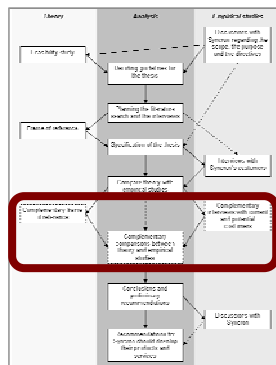
The flowchart illustrates the research methodology, organized into three main stages: Theory, Analysis, and Conceptualisation of findings.

- Theory:**
 - 1 variable chain
 - Pattern of indicators
 - Complex many trace indicators
- Analysis:**
 - Dividing indicators for the first
 - Plotting the indicator matrix and the hierarchy
 - Indicator matrix with three
 - Complex many trace indicators (highlighted in a red box)
 - Complex many trace indicators with three and four levels
 - Identified and grouped interconnectedness
 - Recommendations to improve the indicator matrix
- Conceptualisation of findings:**
 - The relation with theory regarding the variable chain. The proposed model for the three levels
 - Comparison with VINCOS & GEMOS
 - Comparison with other indicators
 - Comparison with previous indicators
 - Final output with graphs

Arrows indicate the flow of the methodology, showing the progression from Theory to Analysis to Conceptualisation of findings.

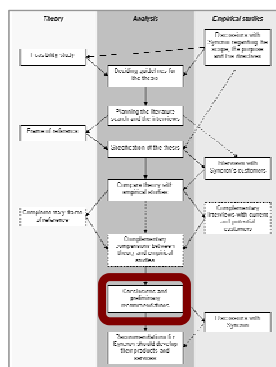
When the interviews were completed and the gathered data interpreted and compiled, the work with the analysis began. The opinions from theory were compared with opinions from the empirical study and both similarities and differences were spotted. The converging as well as the diverging opinions were discussed and commented. The reasons for the diverging opinions were then investigated as thoroughly as possible to ensure that reliable conclusions were drawn.

5.1.9 Complementary frame of reference, interviews and analysis



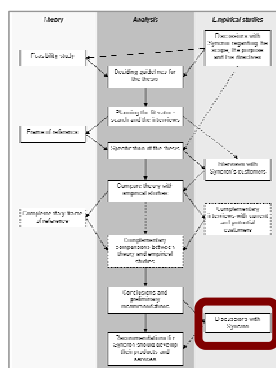
When planning the course of action it was expected that a complementary data gathering would be necessary after the first analysis had been carried out. This was expected to be necessary if e.g. new aspects appeared during the interviews that were not treated in the frame of reference, or if some answers from the interviews were hard to interpret. Slighter adjustments were made in the frame of reference but there were no need for any complementary interviews.

5.1.10 Conclusions and preliminary recommendations



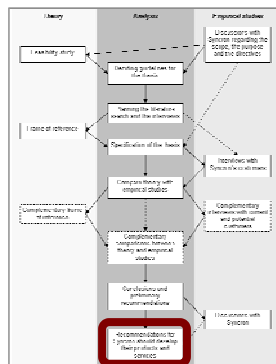
Based on the result from the analysis, conclusions were drawn that to begin with answered each research question separately. These conclusions were then analyzed and evaluated in relation to each other and grouped together and categorized into the three different domains; Drivers, Trends and Enablers. This compiled evaluation made it possible to answer the first part of the purpose as well as it laid ground for the preliminary recommendations.

5.1.11 Discussions with Synchron



When the preliminary recommendations were set, discussions were held with the supervisors at Synchron. The purpose with these discussions was to get Synchron's opinions regarding the conclusions and the preliminary recommendations. These opinions were then used as input when formulating the definite recommendations. This hopefully resulted in more relevant and feasible recommendations, with higher probability to be useful and taken into consideration.

5.1.12 Recommendations for how Synchron should develop their products and services



When the discussions were completed and the preliminary recommendations adjusted, a number of definite recommendations were formulated. These recommendations consist of guidelines for how we believe Synchron and similar companies should develop their products and services in line with the expected future development and in order to match future customer demand and be able to stay competitive.

5.2 Methods and supportive theories used in the thesis

This subchapter describes the methods that have been used in this thesis and the theories supporting these chosen methods. In the first section below is the alignment of the study discussed and after this is the approach of the thesis treated. This subchapter also describes the methods used when performing the empirical study.

5.2.1 The alignment of the study

According to Lekvall and Wahlbin (2001) the alignment of a study tells us what kind of conclusions we can expect to draw. It is therefore necessary to at an early stage decide the alignment, in order to assure that appropriate methods are used which enable the fulfillment of the purpose. Lekvall and Wahlbin (2001) classify studies in four different alignments; *explorative, descriptive, declarative and predictive*. A report which's purpose is to forecast what will probably occur if given conditions exists, is said to have a predictive alignment. A report which's purpose is to declare how different factors affect each other, when together causing an observed state, is called declarative. According to the definitions above and the purpose presented in section 1.2, it is apparent that this report both has a predictive and a declarative alignment.

5.2.2 The approach of a thesis

As mentioned above, the alignment of the research decides what kinds of conclusions we can expect to draw from the results. The approach on the other hand, tells us how we technically will proceed, to be able to draw these conclusions (Lekvall and Wahlbin, 2001). According to the authors the approach has three dimensions. These are presented below and summarized in

Figure 10. The definitions below are rather simplified and the question regarding whether a study is e.g. qualitative or quantitative will be answered in different ways depending on who you ask (Tashakkori, 1998). However, Lekvall and Wahlbin (2001), Tashakkori (1998) and Björklund and Paulsson (2003) share similar opinions and their definitions are presented below.

- *Dimension 1 – Case study, cross-sectional study or study over time*

When studying individual research objects in depth, without attempt to draw conclusions about larger groups, the study is said to be a *case study*. A study have *cross-sectional* character when several research objects are studied and compared with purpose to draw conclusions from entire groups or segments of a market. *Study over time* is when one or a few quantitative expressed variables are studied during a specified time frame, with purpose to seek changes in various patterns.

- *Dimension 2 – Qualitative or quantitative data*

The second dimension tells us what kind of data that is used in the study. Simplified, *quantitative* data is data that can, whereas *qualitative* data can not, be codified in a meaningful way and analyzed as numbers.

- *Dimension 3 – Primary or secondary data*

The third dimension which has to be considered is to what extent *primary* and *secondary* data is to be used in the study. Primary data is data collected by the researcher and secondary data is data found in literature, articles and databases.

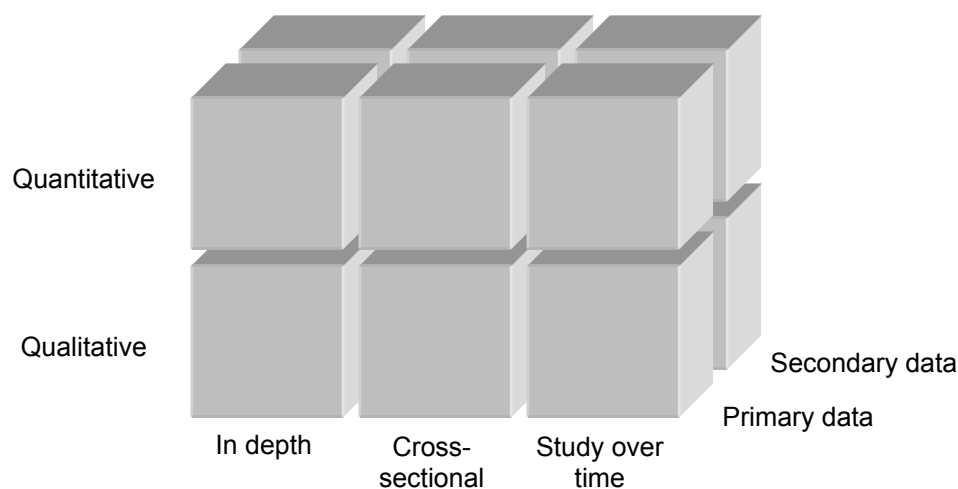


Figure 10 – The three dimensions of the approach

The approach in this thesis

The majority of the data used in the frame of reference have cross-sectional character, and even though in depth studies will be used, conclusions will not be drawn from isolated cases. For the interviews will a selection of objects be analyzed and compared with theory and we expect to be able to draw conclusion from a whole segment of a market. Hence, the first dimension of this thesis is cross-sectional.

With consideration to the purpose of the thesis, which has a predictive character, it could have been interesting to do a study over time. However, this approach was considered to be too time consuming since we only had 20 weeks to perform the study. Another aspect is that 20 weeks, in this case, is not enough time to draw interesting conclusions from a study over time.

The frame of reference exclusively consists of quantitative and qualitative secondary data, and our empirical studies are not used in the frame of reference. Interviews have also been carried out which means that this study also include primary data. The interview material was designed in a way that made it possible to draw both qualitative and quantitative conclusions.

The discussion above makes it apparent that the second dimension of the approach is both qualitative and quantitative and that the third dimension is both primary and secondary. These conclusions are summarized and illustrated in Figure 11 below.

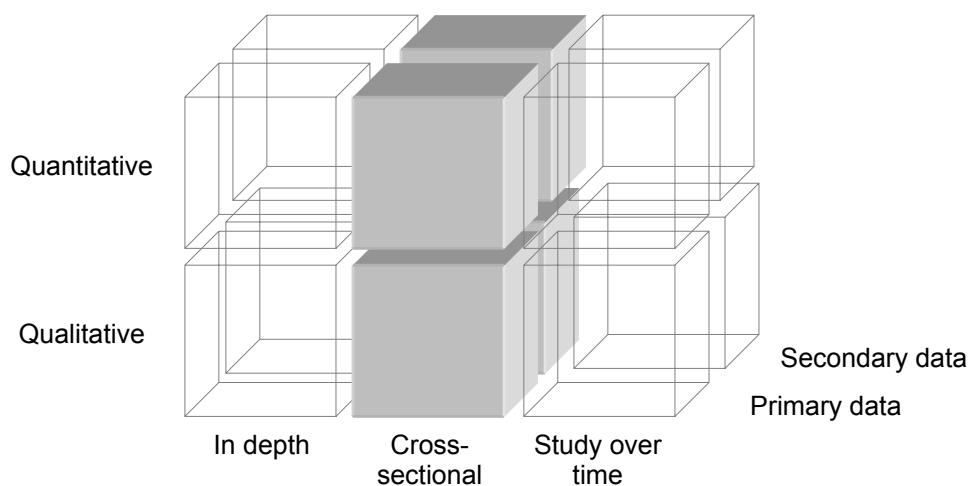


Figure 11 – The approach of the thesis

5.2.3 Mixed methods

When studying Figure 11 above, the approach seems somewhat ambiguous. This is however not unusual and it is common practice to use so called *mixed methods* for the approach of the study (Lekvall and Wahlbin, 2001). Mangan et al. (2004) highlight the possibilities and advantages using mixed methods for logistics research. The authors claim that, a mixed methods approach in logistics research yield greater insights than would have been the case if a single research methodology had been employed. These opinions guided us in our choice to use a mixed methods strategy.

There are a number of different kinds of mixed methods that can be used. The first step when specifying the mixed method is however to determine the purpose of using the method. Sydenstricker (1997) claim that there are five major purposes for mixed method evaluations:

- *Triangulation*, tests the consistency of the findings through different instruments.
- *Complimentary*, clarifies and illustrates results from one method using another one.
- *Development*, results from one method shapes subsequent methods or steps in the research process.
- *Initiation*, stimulates new research questions or challenges results obtained through one method.
- *Expansion*, provides richness and detail to the study exploring specific features of each method.

Our purpose for using a mixed method was to test the consistency and cross-validate the data gathered from the different methods. Hence, the purpose with the mixed method approach was to triangulate the gathered data.

According to Creswell (2003), there are a few criteria to consider when choosing a mixed method strategy. These are presented and described below.

- *Implementation sequence*

This refers to the order or sequence in which the qualitative and quantitative data collection is performed. The data collection can be performed in two different phases (sequentially) or all at the same time (concurrently).

- *Priority*

This refers to what kind of data (qualitative or quantitative) that is the most important in the study. The priority can be equal or skewed towards either qualitative or quantitative data. The priority depends on the interest of the researcher, the audience of the study and what the investigator seeks to emphasize in the study.

- *Integration*

This describes when the qualitative and quantitative data is combined. The integration could occur in the actual data collection, the data interpretation, the analysis, or a combination of places. Integration can also occur at several of the stages presented above.

- *Theoretical perspective*

A final factor to consider is whether a larger theoretical perspective guides the entire design of the study. This perspective may be one from the social sciences or from an advocacy or participatory lens (e.g. gender, race or class).

Decisions of the four criteria will lead to the choice of a mixed method. In this study were the qualitative and the quantitative data gathered in the same phase and the implementation sequence is therefore obviously concurrent. It could have been interesting to use a sequential method when gathering the quantitative data. However, the time frame did not allow such an approach.

Further, the priority of this study was decided to lay on the qualitative data. Even though it could have been useful to design the research in a way that made it possible to draw important conclusions from both the qualitative and the quantitative data, the time frame again had to be taken into consideration. The nature of the thesis, including rather complicated issues and questionings, was also believed to require a qualitative approach. However, even though the qualitative analysis was decided to be prioritized, it was ascertained that the approach still would make it possible to cross-validate and confirm the findings from the two types of data.

The quantitative and the qualitative data were decided to be integrated in the interpretation phase. This in order to make it possible to, at an early stage, observe either convergence or divergence of the findings. Finally, we could not find any reasons for, or any motivation why, this thesis should have any certain overall theoretical perspective.

When making all these standpoints it was realized that they were in line with one of the most common and accepted mixed methods, by Creswell (2003) called, *Concurrent Triangulation Strategy*. The discussion above is summarized in Table 1 and Figure 12 below. Table 1 provides a summary of the elements in our mixed method where the shaded fields represent the choices. Figure 12, provides a visual complement for how the different types of data interact.

Table 1 - Contents in the mixed method (Source: Creswell, 2003)

<i>Implementation</i>	<i>Priority</i>	<i>Integration</i>	<i>Theoretical Perspective</i>
No Sequence Concurrent	Equal	At Data Collection	Explicit
Sequential – Quantitative first	Quantitative	At Data Analysis	
Sequential – Qualitative first	Qualitative	At Data Interpretation	Implicit
		With Some Combination	

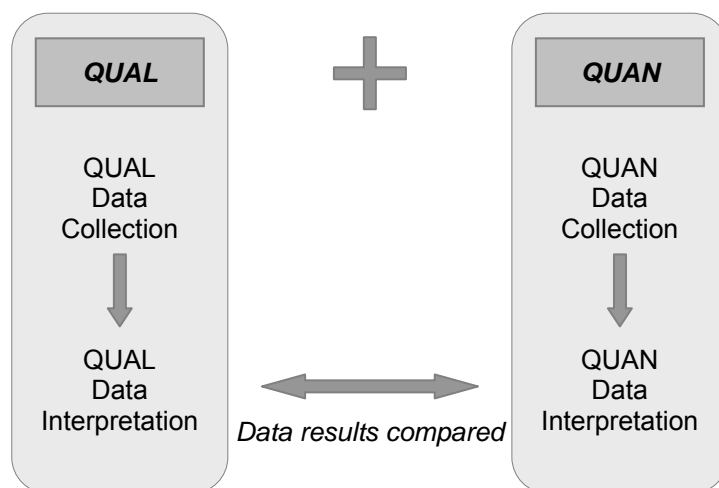


Figure 12 - The Concurrent Triangulation Strategy

Source: Creswell (2003)

5.2.4 Methods used for the empirical study

In the section below will the methods used in relation to the empirical study be described and discussed. The first section below describes different ways to communicate with the respondents and the two following sections describe what kinds of questions that have been asked to the respondents. The last two sections describe the methods used when deciding the selection of companies and respondents.

Ways to communicate with the respondent

Interviews can be made in several ways using different methods such as questionnaires, telephone interviews, face-to-face interviews and interviews over the internet (Lekvall and Wahlbin, 2001). Different methods are more or less suitable depending on the situation (Lekvall and Wahlbin, 2001). Questionnaires, for example, have the advantage to enable analysis of large selections but there are limitations when it comes to what kinds of questions that can be asked. A brief overview of some advantages and disadvantages of different interview methods are presented in Table 2 below.

Table 2 - Characteristics of interview methods (Source: Lekvall and Wahlbin, 2001)

Characteristic	Questionnaire	Telephone interview	Face-to-face interview	Internet interview
Cost per interview	LOW	QUITE LOW	OFTEN HIGH Except with interviews in own facilities	QUITE LOW
Speed	OFTEN LOW	HIGH	QUITE HIGH Especially interviews in own surroundings	HIGH
Possibility for "dynamic" questions	NONE	QUITE GOOD	GOOD	LIMITED
Limitations in question technique	LARGE	SOME	NONE	FEW Possibility for animations etc.
Control of who is answering	OFTEN BAD	GOOD	GOOD	LIMITED

We have chosen to combine face-to-face interviews with questionnaires. To begin with were an extensive qualitative face-to-face interview carried out and after this was a short questionnaire completed by the respondent. The plan was to use telephone interviews for the complementary interviews, but since no such interviews were needed this matter will not be further discussed. The face-to-face interviews made it possible to draw qualitative conclusions and the questionnaires enabled quantitative analysis. As described in section 5.2.3, these two methods also complemented each other and the results were compared and cross-validated.

The most important advantages with face-to-face interviews are the almost unlimited options to design the questions and the possibility to carry out extensive and comprehensive interviews (Lekvall and Wahlbin, 2001). This together with other factors such as the absence of limitations in question technique (see Table 2), were the main reasons why this method was used.

Before the interviews were carried out one pilot-interview were performed with a representative employee at Synchron. The purpose with this was to try out the interview material and if needed make slighter adjustments. To safeguard ourselves we also expected to, if needed, use one of the companies as a pilot company. This was however not needed since the quality of the first interviews was satisfactory. All the interviews were recorded to make it easier to interpret and analyze the collected data.

The questions in the face-to-face interview

According to Lekvall and Wahlbin (2001), face-to-face interviews can take many forms. They can be strongly structured with clearly formulated questions, exactly defined answer alternatives and detailed instructions for the coding. In other situations it is suitable with completely unstructured interviews, where the interviewer and the respondent together discuss a subject, and where no kind of preparation is possible. In those cases is it usual that the interviewer discuss broad areas with more specific prepared follow up questions. These questions are asked only if the respondent does not answerer these spontaneously when answering the broader questions. In this study is unstructured face-to-face interviews used to avoid affecting the respondents in their way to answer the questions.

The questions were formulated in a way that made it possible for all respondents to answer all the questions, independently of department and company belonging. If different questions would have been asked to different people it would have been hard to draw reliable and valid general conclusions.

The interview guide used was based on the research questions identified in chapter 4, *Specification of the thesis*. Some questions were asked straight out whereas others had to be divided into a couple of shorter questions. In section 4.2, *The areas of interest*, certain issues related to each research question was presented below the question. These were used as follow up questions during the interviews if the respondent did not discuss these issues when the broader question was asked. Since the interview guide looks more or less like a summary of the research questions we have chosen not to include it in an appendix. 42

The questions in the questionnaire

As mentioned in section 5.2.3 the quantitative data was not supposed to be the primary source from where the conclusions should be drawn. This did of course affect the way the questionnaire was built up. The most interesting case would have been to use a larger number of respondents for the questionnaires than for the face-to-face interviews. This together with close ended multiple choice questions would have enabled comprehensive and complicated analysis such as regression-, cluster- and factor analysis. This would probably have lead to highly interesting and useful conclusions.

We were however not able to do this and there were mainly two reasons for this. To begin with it would have been hard to find suitable respondents likely to be able to answer the questions. Secondly was the purpose of the quantitative data not to discover additional findings and with the time constraint influencing the decision was taken not to use any additional respondents.

With a limited number of respondents it was not interesting to formulate close ended multiple choice questions, since results from the analysis would not have reached a satisfying level of significance. We therefore decided to use close ended questions with the answering alternatives 'yes', 'no' and 'do not know'. For the same reason as for only using one kind of interview guide, the same questionnaire was used for all the respondents. The questionnaire together with a summary of the result can be found in appendix 1.

The method for selecting the respondents

There are two main types of methods when selecting the sample of the respondents. These are *probability selection* and *non-probability selection*, and the biggest difference is the possibility to quantitatively assess the error the method causes (Lekvall and Wahlbin, 2001).

In some studies is it not interesting to estimate the error caused from the chosen selection method but rather to make sure that the selection gets a composition which in a satisfying way is able to answer the questions of issue. One example when this is the case is when a deeper analysis of a smaller number of research objects is made (Lekvall and Wahlbin, 2001). This is a kind of non-probability selection and is called *assessment selection* and was the method chosen for this research.

When making an assessment selection the size of the selection is decided with consideration to e.g. the purpose, the alignment and the scope of the study. Usually relatively small selections from a few up to ten research objects are used (Lekvall and Wahlbin, 2001).

The size and alignment of the selection

To obtain desirable information from a company it is necessary to turn to the right person in the organization. It is also important to have in mind that different people in the same company have different views of the situation depending on their personal opinions, interests and knowledge et cetera (Lekvall and Wahlbin, 2001). It can therefore be necessary to interview employees from different parts of the organization to get a balanced image of the situation (Lekvall and Wahlbin, 2001).

In line with the discussion above it was chosen to focus on five different companies and three different departments. The selected companies consisted of five current customers to Synchron. The original plan was to also include potential customers, but this could, for various reasons, not be organized. The selected companies were *BT Industries*, *Sandvik Mining and Construction*, *Scania*, *Tetrapak* and *Volvo Construction Equipment*. This sample was based on recommendations from Synchron which considered these companies to be some of their most important current and future customers and which also would constitute a representative selection for the study.

The three chosen departments were *Logistics, Marketing and Sales* and *Information Technology and Information Systems*, and one representative from each department and company was interviewed. The selection of the departments was made based on the relevance for Synchron's business. A list over the interviewed respondents can be found in the last chapter of this report below the topic *Interviewees*.

5.3 Model of analysis

To be able to carry out an efficient and structured analysis of the collected data, a model of analysis were developed before the actual analysis took place. This describes how the data from different sources are interpreted and analysed and how the findings from these procedures were compared and evaluated. The model is illustrated in Figure 13 - Model of analysis and is also further described below.

5.3.1 Data interpretation

The frame of reference brought up the relevant theory for the purpose of the thesis. This information was then evaluated in the specification of the thesis where opinions from different authors was compared and evaluated depending on relevance to the purpose and the guidelines of the thesis. This led to that some areas were delimited from the continuing work whereas some were concluded into research questions. These research questions formed the base for the interview material, as well as they led to conclusions regarding the opinions found in literature.

Before the result from the interviews was compared with the concluding opinions from the frame of reference, it was analysed to form separate conclusions from Synchron's customers. This process is described and summarized in chapter 6, *Results from the empirical study*. In this chapter are the answers from the face-to-face interviews and the questionnaires for each research question summarized and compared separately. When obvious patterns were spotted in the way the respondents answered the question, this formed a concurring opinion. If several opinions contradicted the general belief, the answers were further investigated to discover whether there were any obvious reasons behind the deviation, e.g. that different companies in different situations had different opinions. If the deviation could be explained these opinions formed a conclusion with complementary explanations. In those cases the opinions were too ambiguous and hard to explain it lead to that these specific areas was delimited from the continuing work.

5.3.2 Analysis

The first part of the analysis consisted of a comparison between the concluding opinions from theory and the concluding opinions from the empirical study. This procedure was carried out for each research question separately and presented in chapter 7, *Analysis and conclusions*. When the opinions concurred they were categorized as a straight forward result predicted to most likely fruition within five to ten years. In those cases the opinions disagreed the underlying causes were investigated. One reason behind the diverging opinions could e.g. be that the customers' opinions were narrow and industry specific whereas the opinions from theory were wide-ranging and more applicable on other industry segments. When this was the case these opinions anyway lead to a conclusion included in the continuing work. No conclusions were drawn when no obvious explanation could be found behind the differing opinions.

5.3.3 Conclusions

When all the data were compared and analyzed, the result from this process lead to conclusions regarding what the probable future drivers and trends will be. To begin with were separate conclusions drawn regarding each research question and these can be found in chapter 7 in sections below each research question. These conclusions were then compared, evaluated and grouped together into a number of main areas and domains that is found in section 8. This categorization were decided by which issues that were most frequently discussed in literature and in the empirical study, and to what extent these issues were believed to affect the outbound logistical development.

5.3.4 Recommendations

The next step was to analyze the conclusions and try to estimate if and how they will affect Synchron's business and if it was possible to give recommendations for how Synchron and similar companies should prepare for these future changes. If a connection was identified it lead to a preliminary recommendation, otherwise the conclusion were not further investigated. This conclusion was however still included in the result since it could still contribute to the answering of the purpose of the thesis. When the preliminary recommendations were set, discussions with selected Synchron employees were performed to examine how feasible the recommendations were believed to be. The result from this discussion was used as input when defining the final recommendations.

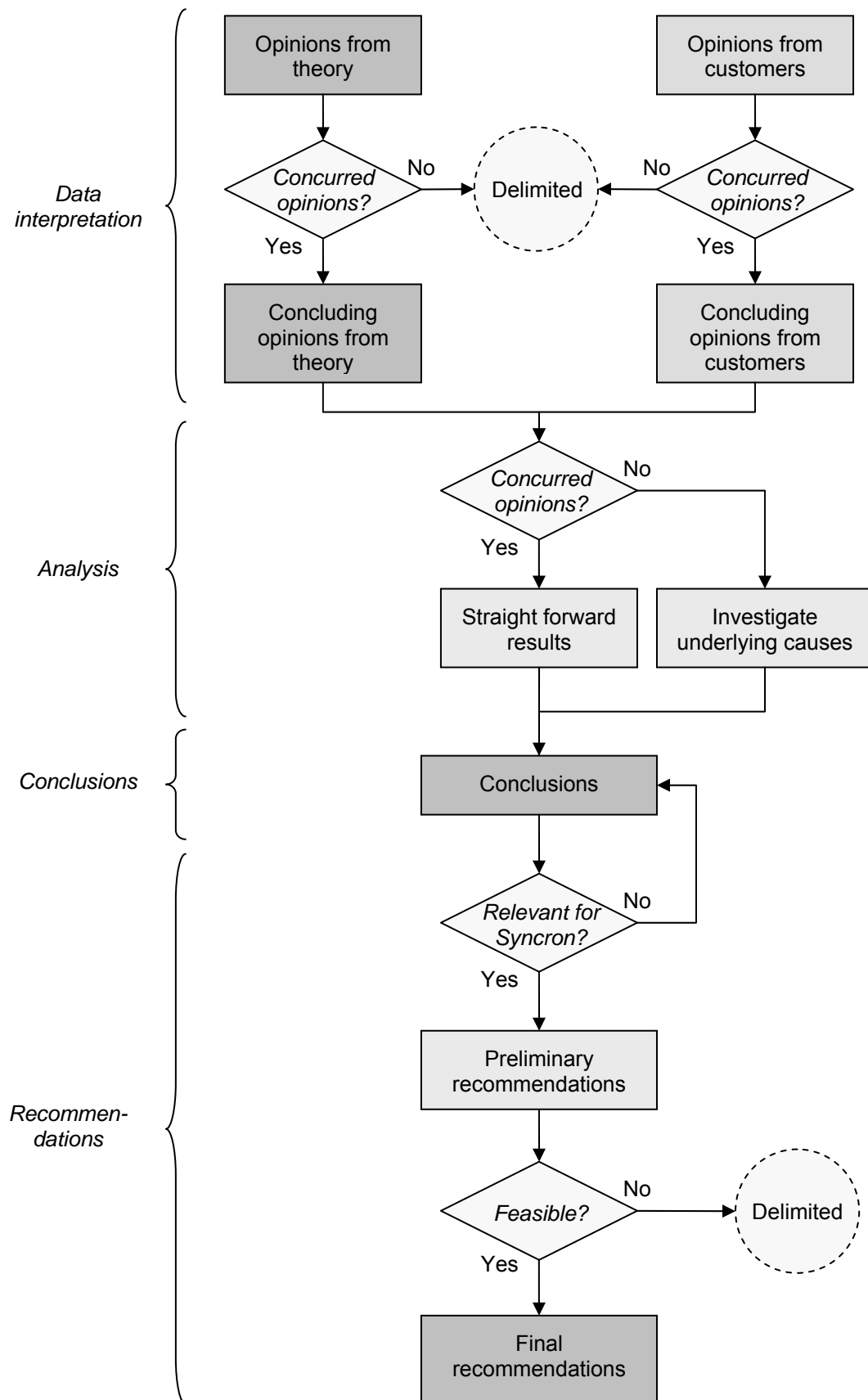


Figure 13 - Model of analysis

5.4 Problems and limitations with chosen methods

In the sections below are the problems and limitations with the chosen methods for the data collection discussed. The discussion will primarily revolve around how valid and reliable the information is and from what possible sources the inaccurate information might come.

5.4.1 Validity

Depending on how well a chosen method really measures the characteristics intended, it is said to be more or less valid (Björklund and Paulsson, 2003; Lekvall and Wahlbin, 2001). The validity of a study is difficult to define and it is often done on a more or less subjective base (Lekwall and Wahlbin, 2001). According to Björklund and Paulsson (2003), the validity of a study can be increased by using different perspectives and by formulating clear and non-slanted questions.

The purpose with this study was primarily to outline the main issues influencing the future logistical development, not specific and detailed issues that only would have slighter influence. To ascertain that this would be the case we first studied all-embracing books and articles outlining these main issues. These opinions were gathered from several parts of the world to assure that they were more or less independent. In the second phase these main issues were summarized and compiled and from this compilation could the most frequently treated areas be outlined. Within these areas where then more specific and detailed literature studied. This approach hopefully contributed to that valid theory was studied.

As described in section 5.2.4 employees from three different departments from each company were interviewed. This provided different perspectives from the areas discussed. The interview material was also tested before the real interviews were carried out. This test consisted of a pilot interview with a representative employee from Synchron. After this all the questions in the interview guide and the questionnaire discussed were discussed. This was made in order to make sure that the questions were formulated in a clear way and to minimize the risk for misunderstandings. These precautions contributed to a higher overall validity.

There were no problems with making the respondents understand how to answer the questions but there can however be critics raised concerning how valid the answers really are. The way the interview material was constructed with open ended questions and wide-ranging areas required knowledgeable respondents, both regarding the areas of interest and their company and its plans for the future. It can, in relation to this, be hard to determine whether the answers

consist of knowledge from a well read person or if it is just wild speculations from someone that do not really have any opinion. The fact that all the questions were thoroughly discussed during the interview and often complemented with more specific follow up questions made it easier for us to spot uncertainties in the respondents' answers. In addition to this it can be mentioned that all the respondents were rather highly ranked employees with good knowledge concerning both the areas of interest and their company's plans for the future. Only in one case did obvious problems occur with a respondent that had difficulties in answering the questions. All these issues were then also taken into consideration in the interpretation phase.

5.4.2 Reliability

According to Lekvall and Wahlbin (2001) and Patel and Davidsson (2003), the reliability of a study can be measured as the ability to resist influences of various coincidences in the interview situation. This can for example be changing characteristics of the respondents or issues related to the interview situation.

The reliability of the primary data

When carrying out the interviews, precautions must be taken to assure that the information has a satisfactory level of reliability. Lekvall and Wahlbin (2001) divide the reliability into *changing characteristics of the individual* (e.g. health, tiredness, motivation and stress) and *factors bound to the interview situation* (e.g. the interaction with the interviewer and distractions in the interview environment).

To increase the reliability of interviews Patel and Davidsson (2003) recommend that an additional interviewer takes notes and that the interviews are recorded. This makes it possible to verify and analyze the answers afterwards. To increase the reliability of the questionnaire, it must be ascertained that the respondents understand the questions in same way the author of the questionnaire does (Patel and Davidsson, 2003). It is therefore important with clear instructions, logical layout and formulations that cannot be misunderstood. To assure this the authors recommend testing the questions in the questionnaire on representative individuals.

The face-to-face interviews were always carried out by two persons and the interviews were also recorded. The interview material including instructions, layout and formulations of the questions were also, as described above, discussed with representative staff from Synchron. These precautions improved the reliability of the study.

The majority of the respondents seemed to enjoy the interviews and was more than happy to share their opinions. Only in a few cases could tiredness or lack of motivation be spotted. In other words were the reliability connected to the changing characteristics of the respondent satisfying. No other major issues related to the interview situation that could possibly have affected the reliability in a negative way were noticed.

The reliability of the secondary data

The reliability of the secondary data used is difficult to affect directly. One thing that can be done is to make sure that used literature itself has high reliability. The literature used in this study is published by respected publishers that will contribute to a high overall reliability of the study. When carrying out the literature research several different sources of information has been used to get a balanced image of the situation which in turn is believed to have increased the reliability. In some areas this has however been difficult because lack of relevant information. This might have affected the reliability in a negative way but this fact has also been taken into consideration when analyzing the data.

6 Results from the empirical study

This chapter holds the result from the interviews and the questionnaires. Each research question is treated separately in the same order they were presented in the specification of the thesis as well as treated during the interviews. The concurred opinions from this empirical study are then compared with opinions from theory in the analysis found in chapter 7.

6.1 Globalization and increased competition

- ◆ **What are the main drivers behind the globalization, how will the trend evolve and what challenges will this imply for outbound logistics?**

The respondents believe that the major reasons for global production primarily are to gain access to new markets and secondarily to lower the costs. There are two main views regarding access to new markets. Firstly, several respondents claim that production and assembly abroad simply is a prerequisite to act on some markets due to laws and regulations. Secondly, the customers' demands place constraints on lead time and other service elements. The suppliers therefore have to be located near the customers to be able to offer high performance delivery and after sales services.

The reason why the respondents estimated access to new markets to be more important than to lower the costs depended on characteristics of their products. Most of these products are expensive, complex and of high quality, and the money the company saves on production costs are believed to be absorbed by e.g. problems with poor quality and troubles in finding competent workforce. The reason to move production abroad to lower the costs should however not be underestimated. More or less all the respondents mentioned this aspect and even though the most important reason for global production is to be located near the customer, lower costs come as a consequence due to e.g. shorter transportation distances. Aspects such as economies of scale were also mentioned when the respondents gave reasons for locating manufacturing units abroad.

The main drivers behind the globalization trend in general are believed to be economies of scale and increased accessibility of products and spare parts. Access to new technology makes it easier to turn to more geographically and culturally spread out customers. The increased accessibility also makes the customers more aware of the suppliers and their products and service offerings. Low costs for transportation and removal of trade and transport barriers were also mentioned as main drivers behind the globalization. All the respondents answering the questionnaire believed that their company's globalization process will continue and twelve out of fourteen believed that their companies manufacturing facilities' will spread out more globally in the future.

The opinions regarding what the major challenges for outbound logistics will be due to increased globalization, varied from respondent to respondent, but a few main areas were brought up more frequently than others. To begin with were the complexity in the logistical structures believed to increase and that this in turn will demand more complex management and planning. Demands on shorter lead times and enhanced service were considered most challenging much because of increasing distances to the customers, both geographically and culturally. To be able to face this challenge was increased visibility expected to be necessary in the supply chain with e.g. increased access to real time information. Erik Mattsson from Sandvik Mining and Construction put it this way:

“There are several actors involved and it will therefore become important to hold everything together and to obtain visibility throughout the supply chain. It will also get increasingly important to enable continuous measurements in real time.”

Several respondents also believed that the transportation cost will increase significantly in the future and that this in turn will demand more from planning. A result from this was believed to be an increased share of direct deliveries and transport consolidation. Environmental issues were also brought up by the respondents in relation to challenges with increased globalization. The respondents believed that increased environmental pressures will lead to less transportation and that there will have to be more local production and distribution in the future. This will decrease the transportation distances and in turn lead to less transportation.

♦ What will be the main challenges for outbound logistics, due to increased competition?

More or less all the respondents believed that the market increasingly will be controlled by the customers in the future. Mentioned reasons for this were consolidation of buying power when customers get fewer and bigger, and increased competition in general due to the globalization. These opinions could also be spotted in the questionnaire even though the respondents were slightly more restrictive when the question was brought to its head. Nine out of fourteen believed that the customers bargain power will increase in the future, two believed the contrary and three respondents did not take any standpoint to the question.

The opinion from the respondents were that it will be an increased focus on process excellence and according to the questionnaire ten out of thirteen believed that their companies even will lay more focus to reach process excellence than to reach product excellence.

However, the majority of the respondents made clear that the product and the process go hand in hand. To be able to act on the market at all, the company needs to offer a first-class product. The increased focus on process excellence was believed to be driven by the customers' demands for the suppliers to become total service providers. The respondents also claimed that they wanted to take over service and maintenance activities from the customers since the margins are higher in this segment in relation to the actual products. It was also considered that it would enhance their competitiveness.

The question whether the financial demands on outbound logistical activities will change in the future was answered in several different ways. Most of the respondents believed that the financial demands would increase but they did not believe that outbound logistics will face any major challenges due to this. A few respondents even believed that the financial demands will decrease in the future. According to the questionnaire, eleven out of twelve respondents believe that the financial demands on outbound logistical activities will increase in the future.

Most of the respondents believe that there will be an increased pressure on price, but that this not necessarily will lead to lower prices. The reason for this is that the respondents claim that their company acts in a premium quality segment where price is not the main order winning criteria. They are therefore not believed to face any significant challenges due to a downward pressure on price. The respondents also believed that it gets harder for their customers to pressure the price on the actual product when the product offering also include a number of add-on services. In the questionnaire nine out of thirteen respondents claimed that there will be an increased downward pressure on price on their products in the future, four respondents believed the contrary.

The major challenges for outbound logistics due to increased competition were believed to revolve around the aftermarket and the fact that the customers will demand the suppliers to take over responsibility for service and maintenance and activities in relation to this. Availability was also highlighted to become a critical issue in the future. If the suppliers offer insufficient availability the customers will turn to competitors. Increased visibility and more supply chain management initiatives were also believed to have to increase in the future but at the same considered challenging. Some respondents also considered the requirements on more flexible and inventive transport solutions in order to lower costs at the same time enhancing service levels, to be challenging.

6.2 *Changing customer demand*

♦ **What will be the main challenges for outbound logistics due to changing customer demand?**

The respondents believe that the customers increasingly will demand the suppliers to take over responsibility concerning activities not directly related to the customer's core activities. The customers want to be able to focus on their core activities not to allocate resources on managing e.g. service and maintenance. The customers want to buy a function or a solution instead of buying a product. Instead of buying a drill customers want to buy hours of drilling and instead of buying an excavator customers want to buy hours of digging. More responsibility is therefore predicted to be shifted to the suppliers and the customers will not accept expensive machines to stand still. In relation to this some respondents also claimed that the customers often are very bad at planning the maintenance activities and they will therefore value that these activities are taken care of by someone else.

In the questionnaire more than half of the respondents believed that there will be an evident change in the customer demand in the future. The major challenges for outbound logistics are predicted to be to manage the increased responsibility of e.g. service and maintenance in a cost effective way. More efforts therefore need to be put on planning and forecasting activities.

When the question regarding a demand for shorter lead times was raised, almost all the respondents believed that this demand will increase but that the demand for flexibility will be even greater. The respondents believed that all products cannot be managed in the same way. It has to be instant availability on some products whereas it obviously is too expensive to have all offered products in stock. Customers are believed to accept longer lead times on certain products but will in turn demand that the lead times are more precise. The products therefore need to be more differentiated in terms of lead time. This is also supported by the result from the questionnaire where thirteen out of fourteen believed that customers will demand shorter lead times in the future whereas all respondents believe that customers will demand more flexible delivery services.

The opinions regarding the length of the product life cycles, and how these will evolve in the future, disagreed quite a lot, even within the same company. Some believed the product life cycles to shorten in the future whereas other believed them to increase. It was concluded that a products life cycle to a great extent depends on the products preferences such as technology content, and it is therefore difficult to give a general opinion in the matter.

♦ What will be the primary changes in the customer demand and what challenges will this imply for outbound logistics?

The respondents mentioned several actions which are needed in order to adapt to changes in customer demand and the general opinion was that more efforts need to be put on outbound logistical activities. Several respondents mentioned that it will become increasingly important to understand customer demands in order to be able to deliver on time. The need for certain spare parts should e.g. be estimated in advance which in turn will demand increased tracking of sold machines. There was in other words an expressed need for a more proactive approach in the forecasting process instead of only reacting on appeared demand and historical data. Information regarding what parts that historically has been worn out and what the total runtimes are was also brought out as an important input in the forecasting process. If all this is carried out in a satisfying way it will allow longer lead times, since the spare parts can be shipped in advance of a breakdown of a machine. Some respondents also claimed that it is difficult to explain to the customers what the services related to logistical activities actually cost. New tools must therefore be developed which in an easy manageable way calculate and explain the cost of additional services.

Customization is in general expected to increase in the future, both when it comes to products and services. It is however not expected to increase in all segments. More standardized products have to complement the customized ones as not all customers are willing to pay the price for customization. One of the respondents believed his company would move towards more standardized products and use customization as a sales pitch. It should however be mentioned that this company almost exclusively produces highly customized products today.

The result from the questionnaire showed that eleven out of fourteen respondents believed that their companies will face new challenges within outbound logistics due to increased customization of products, two did not agree. All respondents believed that their companies will face new challenges within outbound logistics due to increased customization of services. The general belief was that it will be necessary to manage the customization process in the future in order to stay competitive.

All respondents agreed that there will be a continued development towards closer customer relations. All fourteen respondents believed that their company will put considerably more efforts to enhance their customer relations. The interviews gave somewhat more specific opinions regarding what is important when creating closer relationships. These specific opinions are however not that relevant for this study since they only represent a single respondent's belief and do not answer any of our research questions. It can be concluded though that it is a general belief that some customers might be difficult to create closer relationships with mainly because of two reasons. Firstly, the customers may be afraid that the supplier might try to start a competing business and they are therefore hesitating sharing the amount of information a close relationship often demands. Secondly, the customers may not want to be too depending on a single supplier. They want to have the possibility to switch suppliers and this might be difficult when a close relationship is created.

Several different types of challenges in relation to this research question were discussed. The most challenging issue seemed to be to gain control over the increasingly complex distribution process, including difficulties with managing a diversified flow of goods, maintaining guaranteed service levels towards customers and providing a homogeneous face towards customers globally. To provide a homogenous face towards the customers were considered a challenge since customers are found all around the globe today, and the geographical and cultural differences increase continuously. It were also mentioned by several respondents that to be able to succeed with the above discussed challenges it will be increasingly important to have an overall view of all logistical activities and to gain visibility throughout the entire distribution process.

♦ **Will there be changes from the traditional flow of goods into new distribution strategies, and what challenges will this imply for outbound logistics?**

In order to decrease the number of times goods are handled, and to minimize the total transportation distance of each product, the respondents believed that there will be less stock holding points vertically in the future. The flow of goods will be more centralized, with the lead time as only reason to keep regional and local warehouses. Most respondents believed that direct deliveries will be more common in the future. Both when it comes to deliver directly to customers, not passing the local sales company, but also when it comes to deliver e.g. spare parts directly from the manufacturer to the customer. The later solution will demand that the supplier can be trusted to deliver the company's least required quality, in order not to lose trust from the customers. Direct deliveries enables better control over the distribution process, less handling points of finished goods and creates a closer relation to the end customer. Some respondents also mentioned that increased direct deliveries will put greater demands on an effective order handling process in the factory since they would have to handle several more orders with smaller order volumes. Different cross-docking solutions are also expected to increase in the future. Some respondents were however not completely familiar with the expression.

There are according to the respondents several challenges for outbound logistics due to the expected development discussed above. The collaboration between all partners in the supply chain needs to be further developed, especially the relationship with the suppliers. The process of linking functions together is believed to be very difficult and time consuming. To succeed with this difficult task, further developed systems that can manage the activities and the information necessary, will be required. It is also considered important to gain the partners trust in the system to be able to carry out the activities as intended. Some retailers are e.g. said not to be willing to let go of the stock management of their own inventory.

◆ **How will the development regarding KPIs related to outbound logistics evolve in the future?**

The respondents believed that the number of KPIs not necessarily will increase in the future and that perhaps too many KPIs are already used today. What is believed to be necessary though is to develop new KPIs that measure real end customer demand and what the customers really value. In addition to this they need to know how to use the collected information and it is also important to pass the information on to all involved actors in the supply chain. This will significantly increase the visibility.

“Key performance will need to be adjusted to what is important to the customers.”

These words were stated by Erik Mattsson from Sandvik Mining and Construction and similar opinions could be spotted among several other respondents. In relation to this it was e.g. mentioned that it does not matter if the central warehouse has excellent availability if the customers can not get their products over the counter at the regional warehouse. It was also mentioned that it is important not to measure too much since it is overwhelming with too much information and it is at the same time a waste of resources.

Another aspect in relation to KPIs mentioned by some respondents were the issue regarding what happens with orders that are not available over the counter, so called back order recovery. These orders can be critical to the customers and should therefore not be forgotten and it is important to find appropriate KPIs for these measurements.

6.3 Supply chain integration

◆ **How will the trend considering collaboration and trust in the supply chain evolve?**

All respondents taking a standpoint in the matter believed that collaboration and trust in the supply chain will and have to increase in the future. Mentioned benefits with increased collaboration were expressed to be enhanced and more stable customer service and lock-up with important customers. Even though collaboration and trust is believed to increase, the majority of the respondents also expressed skepticism and several issues that would slow down the process were also mentioned. Jonas Rönnebratt from Volvo Construction Equipment put it this way:

“If you would have asked me five years ago I would probably have believed that everyone will end up being best friends. This will probably never happen, but if there is a long term mutual dependence, the collaboration will increase.”

To begin with it was stated that more collaboration and trust leads to longer and more intimate relationships but these are not always wanted. Other fears were that selfishness, driven by short-term economical interests, could lead to collapsed relationships which in turn will have devastating financial consequences.

Prerequisites for a functioning relationship were expressed to be a mutual need for collaboration and a currently satisfactory relationship. All eleven respondents taking a standpoint in the questionnaire believed that their company will try to increase the collaboration with their supply chain partners in the future. When specifying the question did the respondents in general believe that planning, replenishment and forecasting initiatives will increase, but the standpoints were slightly more restrictive compared to when the question were asked in more general terms.

The information sharing is believed to increase but the respondents also believe that this sharing primarily will be of operational and tactical character. This information is easier to mediate and the purpose of doing it is clearer. When it comes to strategic information the respondents believe that this information is harder to share partly because companies are afraid that the information will be passed on to competitors. Several respondents believe this kind of information sharing will increase but there were also respondents uncertain regarding the development in the matter. The respondents did in general seem to be slightly confused when discussing the issue regarding information sharing on different levels.

◆ **How will the trend towards process orientation evolve, and what challenges will this imply for outbound logistics?**

All respondents taking a standpoint believed that process orientation will increase both internally and externally. This was observed during the interviews but also in the result from the questionnaire. The respondents also claimed that they already today are working in that direction. There were mainly three mentioned challenges with increasing the process orientation. To begin with the respondents believed that the visibility will have to increase and that this in turn will require everyone to share information and be honest with each other. The second challenge was predicted to be to get everyone to work in the same direction and

realize the benefits for the whole process, instead of optimizing their own sub process or function. Finally, in order not to lose contact with the end customer, establishment of trust between the partners was believed to be necessary.

Other thoughts in relation to the mentioned challenges were that there will be a need for real time information through the entire supply chain and that increased demand for railroad transportation will make it harder to create functioning processes. Some respondents also believed that there will be a challenge in overcoming boundaries in some markets caused by e.g. laws and customs. These respondents expressed a need for generic standardized processes that work for all these specific situations.

6.4 Complex networks

♦ Will the logistical structures increase in complexity and what challenges will this imply for outbound logistics?

There is a strong belief that the complexity in the logistical structures will increase in the future and this will lead to significant challenges in terms of managing the supply chain. The result from the questionnaire enhanced and supported the answers from the interviews since twelve out of fourteen respondents believed the logistical structures to increase in complexity in the future.

In order to decrease the number of times goods are handled, and to minimize to total transportation distance for each product, the respondents believed that there will be less stock holding points vertically in the future. The inventory will be more centralized, with short lead time as only reason to keep regional and local warehouses. Some respondents also mentioned that this was likely to be the development if no environmental issues would be taken into consideration. Different solutions were also believed to be applied to different markets since the prerequisites differ.

When the question was raised concerning the trend towards a centralization of the physical structure of the distribution network, several respondents believed that this trend will continue. Some of the respondents believed that their company probably will not centralize more in terms of the physical structure, but these companies were already quite long gone in this process. The result from the questionnaire shows that eight respondents answered yes, three no and two did not know, whether their company would have a more centralized physical structure of the logistical activities in the future.

The opinions regarding the matter of centralizing the management and decision-making in the distribution network were more straight forward. All respondents expected a development in that direction according to the questionnaire. Several respondents also claimed that this matter was even more important than to centralize the physical structure, but it was also believed to be more challenging. It demands intensive communication and access to information from all parts of the supply chain. The respondents also claimed that it will be important to understand and listen to the last parts of the distribution channel to understand real customer demand and value. Since all decisions regarding the flow of goods will be managed centrally, the respondents believed that it will be critical that this planning is managed in a satisfactory way to make sure that the trust from the retailers is not lost. This is considered to be the biggest challenge, both in terms of managing the flow of goods and to keep inventory at the right places in the distribution network. The respondents also believed that centralized management and decision-making will demand dynamic information and communication systems that can simplify these issues for the individual and at the same time can manage a rather complex environment.

♦ **How will the trend towards outsourcing develop and what challenges will this imply for outbound logistics?**

The opinions concerning outsourcing are greatly diversified. When the respondents answered the question in the questionnaire whether they believed that their company will outsource more logistical activities in the future, four answered yes, six no and four did not take any standpoint. The varying opinions between the respondents were also apparent during the interviews. What could be concluded was that core competences will be kept in-house, whereas there was a bigger readiness to outsource more standardized activities. The same goes with activities that lie within an outsourcing company's area of expertise, if they can do it better, the bigger willingness to outsource the activity. Steven Schwartz from BT Europe put it this way:

“When you talk about the transportation in and out and filling up full truck loads, DHL have the expertise in that. We have the expertise in what happens in the factory and planning the outbound distribution. Together we can take each others expertise and build the best solution.”

The mentioned challenges in relation to outsourcing were also quite scattered. The importance of gaining control over the activity internally before outsourcing it was mentioned as one challenge. If a problem is outsourced, the result is often only increased costs. The complexity in controlling the whole process when several activities are outsourced was also mentioned as a challenge. It was believed to be important to have some sort of control tower monitoring and keeping full control over the entire delivery process, including the outsourced activities.

♦ **Will there be increased consolidation in transportation and what challenges will this imply for outbound logistics?**

All respondents taking standpoint in the questionnaire believed that their company will use more consolidation in the outbound transportation process in the future. The same opinions appeared during the interviews and the underlying enablers were believed to be the improved technical systems that have made the consolidation process easier. The underlying reason were said to be that companies want to achieve more cost effective and environmentally friendly ways of transportation. The challenges mentioned associated with consolidation of transportation were mainly related to the planning process which is considered to be very difficult to manage. Another challenge mentioned was to find suitable companies to collaborate with.

6.5 New technology

♦ **What kinds of new technology will be the main drivers for future outbound logistics development?**

Most of the discussions in relation to this research question revolved around technology designed to increase the visibility and the transparency in the supply chain. In relation to increased transparency and visibility several respondents mentioned development and improvements of ERP-systems that will enable synchronization of the actors in the whole supply chain.

The majority of the respondents expressed a need for technology that will make it possible to obtain more accurate information, preferably real time. This type of information is especially desired for tracking of goods. Several respondents also discussed RFID in relation to real-time tracking of goods, which were somewhat confusing since RFID are not a technology that can gather and mediate information real-time. It does however facilitate gathering and mediation

of more time accurate information even though it is not per definition real-time. Most of the respondents also seemed to suggest this, but a few were most likely not completely familiar with the technology and therefore jumped to the conclusion that it is a technology useful for real time information.

Other respondents expressed skepticism towards the RFID technology and several respondents claimed that the technology were too expensive. They believed some other technology, e.g. GPS, to take over before the price will fall enough to make it interesting to implement RFID-technology in wide range. Some respondents did however believe RFID to be a major driver for future logistical development.

Several respondents believed telematics or “talking machines” to become a major driver for future logistical development. They believed that this technology will be integrated in the products so e.g. an excavator automatically sends a signal when a part is about to break. Today, a break down of a machine often comes without previous notification. A mechanic needs to be contacted and spare parts needs to be ordered if they are not already in stock. The result can be weeks or even months of downtime before the machine is back running. The respondents believed that extended and more sophisticated use of telematics can contribute to a decrease of these scenarios occurring in the future. This would decrease the share of emergency orders and consequently lower the costs at the same time it enhances service and uptime for the customer. The respondents also believed that this technology can be integrated with web-based solutions making the warning signals go directly to the people responsible for maintenance and repair. This would further improve the cost efficiency. However, when discussing the time frame most of the respondents believed it will take around ten years before this technology will be widely used and implemented in the products.

In general were new technology not seen as a major driver for logistical development, but rather an enabler to satisfy or exceed customers’ demands. However, ten out of eleven respondents taking standpoint on the issue in the questionnaire, believed implementation of new technology to be a prerequisite for future outbound logistical development.

◆ **Will information sharing increase and what requirements will this put on new technology?**

The opinions agreed that information sharing will increase in the future and that this will put tough requirements on new technology. As discussed above is telematics believed to be used in a further extent in the future. This will put requirement on the gathering of data, and in general the respondents believe that there will be a demand for more accurate and real-time information. This is e.g. believed to put new requirements on technology that can gather and mediate accurate point-of-sales data, but RFID is also mentioned as an enabler to facilitate gathering of more accurate and real-time information.

However, most of the discussion in relation to this question revolved around mediation of already gathered data. The majority of the respondents believed that new requirements will be put on technology that can highlight interesting information from a big volume of existing data. This will require sophisticated interpretation and analyze tools combined with logical designed and easy manageable interfaces. Apart from this, several respondents believed that there will be requirements to mediate information using web-based applications e.g. obtaining the information gathered with telematics. This would be an easy and convenient way to mediate the information for all the actors involved.

6.6 Environmental issues

◆ **What sources of environmental pressures will be the most challenging in the future?**

According to the results from the questionnaire all of the following sources of environmental pressure on outbound logistics will significantly increase in the future; regulations, resources availability, ethical responsibility and consumer demands. All of the respondents, apart from a few, believe that this will be the development. However, the result from the interviews clearly showed that it is primarily different regulations that will stand for the biggest pressure in the future. The other sources of environmental pressure were also believed to become more evident in the future, compared to today, but not in comparison to regulations. The cost factor was said to be more important, both to their company but also to the customers, than the environmental impact. Several of the respondents also claimed that the environmental issues are more important in consumer markets compared to in the business to business industry.

The ethical responsibility and the customer demand was also said to be more important in relation to the actual product and the manufacturing process compared to the transportation of the product. Not much was said regarding resource availability since it is primarily oil that is the resource worth mentioning in relation to transportation, and this was not seen as an issue that will affect the transport industry remarkably within five to ten years. Taxes on transportation and fuel surcharges were primarily expected to increase within the nearest future.

♦ **How will outbound logistics adapt to increased environmental pressures and what challenges will this imply?**

It was primarily mentioned by many of the respondents that the transportation distances in general needs to be shortened. Strategies such as direct deliveries and local production are examples of ways to achieve this, according to the respondents. The matter is also very closely linked to the question whether the globalization process will decrease in the future because of the environmental pressures. The result from the questionnaire showed that eight respondents believed that this will be the case, two believed the contrary and four did not know. It should be mentioned though that the question was asked with local production and distribution as an example of decreased globalization. This result was however supported in the result from the interviews where e.g. Magnus Titus from Sandvik Mining and Construction stated:

“The globalization will not decrease, just take new forms. Their will be more local logistics and production but still a global market.”

Air freight is believed to decrease in the future since it will be too expensive due to increased taxes and fees. The planning process will become even more important as a result of this, including requirements for earlier notification of real demand. The same challenges were mentioned when discussing sea freight. The respondent did however believe that sea freight will be more common in the future because of the low price and it being an environmental friendly alternative. Train transportation is expected to increase in the future but the train infrastructure in Europe has to improve considerably before it can compete with truck transportation. The result from the questionnaire indicated that there will be a modal shift in transportation due to environmental pressure, eleven compared to one believed so and two respondents did not know.

Several respondents had difficulties to relate questions regarding remanufacturing and recycling to their company. The general opinion was however that these matters will grow in importance in the future, mostly because companies will be forced to, rather than doing it from a profitability perspective. This is also expected to create new challenges from the logistical perspective since the return flow will need to be coordinated with the distribution flow. According to the result from the questionnaire, ten out of fourteen believed that new challenges will be faced due to this and only one believed the contrary.

7 Analysis and conclusions

This chapter holds the analysis and the conclusions which consist of a comparison and an evaluation of the opinions gathered in the empirical study and the theoretical framework. The analysis follows the same categorization of the investigated areas as before and is carried out as described in the model of analysis in section 5.3. Conclusions are drawn and presented after each research area.

7.1 *Globalization and increased competition*

♦ **What are the main drivers behind the globalization, how will the trend evolve and what challenges will this imply for outbound logistics?**

The empirical study showed that the main reason for global production is access and closeness to new markets. The secondary reason was to lower the costs. This was agreed upon by e.g. Stahre (2006) that in section 3.1.1, *Globalization*, depicted the main reasons for global production to be to lower the costs and to gain access to new markets.

Main drivers behind the globalization in general are, according to the empirical study, possibilities for economies of scale and the easiness to turn to geographically and culturally spread out customers. This is believed to be facilitated by development of information technology and removal of trade and transport barriers. The theory agreed around three main drivers behind the trend towards globalization and these were; removal of trade and transport barriers, opening of new markets and development of information technology and fast communication systems. This is described in section 3.1.1, *Globalization*, by e.g. Sing (2004). The empirical study and the theory mention similar factors, even though they differ in some areas. Both believe that the globalization trend will continue. The market will in the foreseeable future be dominated by big global actors and the companies production facilities are believed to spread out more globally in the future. The theory discusses the concept of focused factories but this matter was never mentioned during the interviews. Even when questions regarding this were asked straight out, the respondents did not believe these issues to have significant impact on their industry segment in the future.

Theory highlighted a few major challenges for outbound logistics due to increased globalization. To begin with will the physical structure be more dispersed in the future, and this will, according to Stahre (2006), lead to difficult and complex management. According to Barry (2004), longer transportation distances and cultural differences also lead to uncertain delivery lead times. He also stresses the importance of estimating risks, and that there are several risks that increase when a company goes global. Environmental issues were finally according to Singh (2004) believed to constitute a challenge for outbound logistics in the future.

The result from the empirical study showed that the complexity in logistical structures will increase and that this will demand complicated and complex planning and management. This is in line with the opinions from theory. Issues regarding difficulties in managing increased geographic and cultural differences, and at the same time enhance customer service, were also believed to be a challenge. These opinions concurred when comparing the results from theory and the empirical study. In addition to this, opinions from the empirical study emphasized the importance to gain visibility in the supply chain. It was also stressed that the environmental pressures will increase which e.g. is believed to affect the price of transportation. The challenges to cope with environmental issues were also discussed in literature even though it was not believed to be the most significant challenge. Increased risks with e.g. production abroad and the importance of estimating these risks were something that was brought up in literature, but not mentioned as a major challenge in the empirical study. One explanation can be that several of the companies interviewed have well functioning manufacturing facilities abroad already today and therefore do not estimate these risks to be that severe. Also, risk management is perhaps more critical when it comes to inbound logistics and sourcing, especially when you do not own and control the facilities yourself.

Another issue that was brought up in the empirical study, which was not mentioned in theory, was that the cost of transportation will increase and that this will imply great challenges for outbound logistics. It will for example demand more advanced and complex planning. Several of the respondents' companies' products are heavy and bulky and a slight increase in the transportation cost will therefore affect the overall cost significantly. Contrary, a company producing light weight, compact and expensive consumer products might not find a slight increase in the transportation cost as challenging. This is probably one reason why this aspect is not emphasized in literature. Another reason can be that the opinions regarding the price on transportation simply differ between the respondents and opinions from theory.

♦ What will be the main challenges for outbound logistics, due to increased competition?

Opinions agreed that increased competition will lead to a market increasingly controlled by the customers. The customers will demand more and it will at the same time become harder for the suppliers to stand out in the crowd. The results from literature and the empirical study agree that companies will have to focus on process or service related attributes of the products in order to stay competitive. These issues are discussed in section 3.1.2, *Increased*

competition and changing customer demand, and section 6.2, *Changing customer demand*. Theory also believes that increased competition will lead to commoditization in many markets. These opinions were not that widely-held among the respondents even though tendencies in this direction were noticed.

In section 3.1.2 Christopher (2005), Singh (2004) and Stahre (2006) all highlighted that financial demands on logistical activities will increase in the future, and that this will affect the companies' businesses in several different ways. It will e.g. put pressure on supply chains to become lean and increase the demands for capital productivity. This was for example predicted to lead to increased outsourcing. The opinions from the respondents regarding this issue were varying and no concluding standpoint was noticed. The respondents believing the financial demand to would increase did however not believe that it would affect outbound logistics significantly.

In relation to this discussion was a general downward pressure on price expected, according to Christopher (2005) in section 3.1.2. The global competition with production and sourcing in low cost countries and more educated customers with increased price awareness is believed to lead to a price pressure. Most of the respondents in the empirical study believed that there will be an increased pressure on price, but that this not necessarily will lead to a lower price. The reason for this is that the respondents claim that their companies act in a premium quality segment, where they do not compete with price and therefore will not face any significant challenges due to a downward pressure on price.

The challenges mentioned in relation to increased competition derived from the empirical study revolved around satisfying more demanding customers and that this in turn will demand a focus on process excellence. The customers are predicted to demand the suppliers to take over service and maintenance as well as they will demand more inventive and flexible transportation solutions etc. Availability is predicted to be a key factor to stay competitive in the future and this will demand increased visibility and more supply chain management initiatives. This will in turn imply other challenges.

Conclusions regarding globalization and increased competition

The main drivers behind global production are access to new markets and lower costs. The major drivers behind the globalization in general are removal of trade and transport barriers and development of information technology and fast communication systems. The globalization trend will continue and companies manufacturing facilities will spread out more globally in the future.

A more dispersed and complex physical structure will lead to difficult and complex management and planning. Longer transportation distances and cultural differences will make it harder to sustain and increase the customer service. Managing increased environmental pressures will also be challenging for outbound logistics. It is uncertain whether and to what extent the cost of transportation will increase, but if it does it will imply great challenges for Synchron's customers.

The market will increasingly be controlled by the customers and this will in turn require more from logistical processes. It is uncertain whether the financial demand on logistical activities will increase and even if it does it will probably not be a major challenge. It is also uncertain whether there will be a downward pressure on price and even if it does, Synchron's customers believe that they can manage such a situation. The major challenges in relation to increased competition will revolve around improving the processes in order to be able to offer the customers superior delivery service and to facilitate the suppliers to take over service and maintenance activities and manage these in a cost effective and competitive way.

7.2 Changing customer demand

The analysis of the first two research questions below will be carried out simultaneously since the areas under discussion are very closely related.

- ◆ **What will be the main challenges for outbound logistics due to changing customer demand?**
- ◆ **What will be the primary changes in the customer demand and what challenges will this imply for outbound logistics?**

The customer demand is changing and the suppliers are forced to adjust to these demands, even more today than before. The difficulty for the supplier is often both to adjust to the demands but also to understand them and what the customers actually value. The understanding part is important since it is often expensive to provide these different offerings.

For this reason can not all customers be offered the same services and it is therefore important to understand what is valued by different customers. The analysis below will try to determine how the customers demand will look in the future and what this will imply for outbound logistics.

Companies in general want to focus on their core activities and leave as many of the other activities for others to handle. Christopher (2005) and Stahre (2006) mentions this in section 3.1.2, *Increased competition and changing customer demand*, mostly in general terms of unique service offerings which are customized for individual customer needs. The result from the empirical study also highlight the importance of supplying these add on services to the customers, but it also provides more industry specific opinions in the matter. The maintenance of products is in the future expected to in a greater extent be carried out by the supplier. It will not be accepted that an expensive machine stands still for too long. Service and maintenance are instead expected to quickly be handled by the supplier. An underlying cause that will push this development forward is that customers often lack competence in planning and managing service and maintenance activities. The suppliers believe they can manage these matters better. The challenge for outbound logistics related to this matter is to manage these activities in a cost effective way with maintained service level. Much effort must therefore be put on planning these activities, which also demands the right tools to simplify and enable the best planning possible.

The demands on lead time are expected to increase, both when it comes to shorten lead times but also regarding a more flexible approach to lead time. It was stressed that products and customers have to be differentiated in terms of lead time. This argument is supported both in the result from the empirical study and by Sing (2004) and Stahre (2006). The demand for shorter lead times is expected to increase in the future but it is believed to be even more important with precise lead times. Several respondents e.g. claimed that some customers can accept longer lead times for certain products, as long as they are delivered on time. The importance of differentiating products and customers in terms of lead time is also mentioned. Some products may e.g. need to be available within 24 hours, whereas lead time of several weeks might be enough for other products. This will determine if products shall be stocked near the customer in local warehouses or further away in regional or central warehouses.

As briefly mentioned above it is important for the supplier to objectively understand customer demand and perceived value. The discussion above regarded what the customer value in terms of product attributes and services. The other matter related to customer demand is to know when the demand occurs. This area was mainly mentioned in the empirical study in relation to spare parts and maintenance, in section 6.2, *Changing customer demand*. If the demand for vital spare parts could be predicted with advanced tracking and forecasting systems, the supply of spare parts could be planned more effectively. Parts could be stocked further back in the distribution network with less volatile demand pattern as a result. This would in turn lead to reduced capital formation, particularly in the local warehouses.

The opinions regarding the length of product life cycles and how these will evolve in the future vary a lot. The theory available in the area mainly regards consumer products and the empirical result tells us that the opinions differ. No further conclusions can and will therefore be drawn. The matter would require a much deeper study of different product categories in order to be able to draw any interesting and reliable conclusions.

Customization of products and services are expected to increase in the future according to all sources of information in this thesis. These issues are discussed in sections 3.1.2 and 3.2.2 in the frame of reference. The result from the empirical study shows that even though customization of products are expected to increase in general, some products are expected to become even more standardized compared to today. The purpose with this is to keep the price low because not all customers are willing to pay for the customization process. The differentiation matter apparently returns and is brought up in relation to the customization aspect as well. Customization of services is believed to be even more important and this is greatly due to that the suppliers see customization of services as an opportunity to create a closer relationship with the customers. This opinion is shared by both the empirical result and by Christopher (2005) and Stahre (2006). If a close relation is established, it is less likely for the customer to change supplier. This is also one reason mentioned why customers not always are interested to get too close to the supplier. Another reason is that the customer might be afraid that the supplier will start a competitive business if too much information is shared. It should be mentioned though that customers are also often interested in and see opportunity with closer relationships with suppliers.

Challenges associated with the discussion above are not widely mentioned in literature. Most opinions are found in the empirical result, which makes it difficult to draw definite conclusions. The opinions are mentioned in literature though, not just always specifically related to the discussion above. Hence, the opinions are still believed to have a satisfactory level of reliability. The most frequently mentioned challenge was however to maintain control over the increasingly complex distribution process. To uphold service levels and at the same time manage an increasingly diversified flow of goods will put serious demands on outbound logistical processes. This is mentioned in the empirical result in section 6.2, *Changing customer demand*, but Abrahamsson (2003) and Stahre (2006) also bring up the matter in section 3.1.1, *Globalization*. Another mentioned challenge was to provide a homogeneous face towards global customers and to offer the same prices and service levels to all markets, independently of geographical position. Visibility through the entire distribution process, both including the logistical activities and the stockholding points and levels, is also believed to be necessary to succeed.

♦ **Will there be changes from the traditional flow of goods into new distribution strategies, and what challenges will this imply for outbound logistics?**

Several respondents mentioned that there most likely will be less stock holding point in the future and a more centralized flow of goods. These matters are further discussed in section 7.4, *Complex networks* below and will therefore not be further mentioned here. Direct deliveries was however one issue that was widely discussed in relation to this research question. The matter was discussed more in general terms by e.g. Sing (2004) and Stahre (2006) in section 3.2.6, *Centralization and changes in logistical structures*. The opinions from the empirical study are more specific since they are often related to the respondents' respective company. The opinions are however pretty much the same; Direct deliveries are expected to increase, both from the manufacturer to end customers but also from the manufacturer's supplier to end customers and local warehouses. The latter alternative is primarily related to spare parts supply. Direct deliveries are also believed to facilitate a closer relationship with end customers, since there are no intermediary actors blocking the transparency.

Cross-docking is another distribution strategy which is expected to increase in the future. The matter is mentioned in section 3.2.2, *Continued trend towards customers' markets* by Bowersox et al. (2000) and Stahre (2006), and the opinions agree. The empirical result is perhaps not as straight forward but respondents familiar with the concept agreed with the theory.

These distribution strategies are believed to put further pressure on creating closer relationships with supply chain partners. They will also require further developed IT-systems that can manage a complex and dynamic environment, which these strategies imply. These opinions are mostly mentioned in the empirical result, but similar opinions are mentioned in the theory in other contexts, e.g. in section 3.1.4, *New Technology*.

♦ **How will the development regarding KPIs related to outbound logistics evolve in the future?**

The development of KPIs related to outbound logistics will continue in the future both according to the empirical result and the theory. This will not necessarily lead to more KPIs to the number but rather to more sophisticated KPIs. These will be developed to measure what the customers really value and what their perceived service levels actually are. The opinions agree both in theory and the empirical result, see Bowersox (2004) in section 3.2.3, *New financial measurements*, and section 6.2, *Changing customer demand*. It is mentioned that it is important to measure what the customer really value, e.g. over the counter availability instead of service levels in the central warehouses. Several respondents also mentioned the importance of not having too many KPIs since it is difficult to handle too much information. It is also considered important not to only measure fulfilled orders, but also track what happens to those orders not delivered in time, i.e. back order recovery. The last two matters mentioned are only discussed in the empirical result but can still be considered reliable since they are quite specific issues, which are difficult to find information about in theory. Several of the respondents also have a lot of experience working with these questions of issue.

Conclusions regarding changing customer demand

Customers will demand that service and maintenance is carried out by the supplier in order for the customers to be able to focus on their core activities and competences. Customers will demand quick response and will not accept that their machines stands still for any long time.

It is in relation to this also expected to be a demand for more advanced tracking and forecasting systems which are able to predict future demand further in advance and more accurately than today's systems.

It will be increasingly important to understand and make an objective assessment regarding what the customers really value. Customers are expected to demand shorter, and even more important, precise lead times. It will also be important to differentiate customers and products according to varying demands on lead time. The demand for customized products and services will without hesitation increase. There will however simultaneously be a demand for more standardized products. Hence, products and services have to be more differentiated in terms of customization too.

It is a big challenge to control the future distribution process which will be more dynamic than today. It is predicted to be difficult but important to;

- uphold demanded service levels towards customers
- uphold a homogeneous face towards customers globally
- uphold good visibility through the entire distribution process

Direct deliveries between different supply chain partners are expected to increase in the future. Collaboration between supply chain partners must also increase in order to succeed, and the suppliers will strive to create closer relationships with the customers. Cross-docking strategies are also expected to become more common in the future. Both cross-docking and direct delivery strategies will make the environment more complex and require further developed tools for planning and management of the flow of goods. The tools referred to are primarily IT-systems.

There is a demand for more sophisticated and further developed KPIs in the future that measure real customer value. The KPIs should be limited to the number, only presenting what is important, including back order recovery.

It was not possible to conclude a straight forward opinion whether product life cycles will be shorter or not. The theory believes so but the answers from the respondents were too varying to make it possible to draw any reliable conclusions.

7.3 Supply chain integration

♦ **How will the trend considering collaboration and trust in the supply chain evolve?**

The opinions in the empirical study agreed that collaboration and trust in the supply chain will and has to increase if companies should be able to stay competitive in the future. The importance of establishing trust and increase collaboration in the supply chain, and that it in the average firm is a lot to be done, was highlighted by Bowersox et al. (2000), Christopher (2005) and Singh (2004) in section 3.2.1, *Continued trend towards supply chain integration*. Activities where collaborative initiatives successfully can be implemented are planning, replenishment and forecasting. The opinions from theory and the empirical study agree that there will be increased collaboration within these areas in the supply chain.

In section 3.2.1 Bowersox et al. (2000) highlight the importance of sharing information with other supply chain partners to increase the visibility in the supply chain. This will facilitate a better understanding for real demand and e.g. lead to improved forecasting and reduced inventory levels. The theory also believes that the information sharing will increase both on a tactical level, including sharing information regarding short-term forecasts and inventory availability, but also on a strategic level including sharing information in relation to e.g. product development plans and promotional schedules. However, tactical information sharing is believed to be easier and more widely put into practice compared to strategic information sharing.

The result from the empirical study found in section 6.3 also show that the information sharing will increase but the respondents believe that this sharing will primary be of operational and tactical character. This information is easier to mediate and the purpose of the information sharing is clearer. When it comes to strategic information the respondents believe that this information is harder to share, partly because they are afraid that the information will be passed on to competitors. Several respondents believe that this type of information sharing will increase but there were also respondents that were doubtful.

The opinions agree that the trend towards supply chain integration will continue. The question is how fast and to what extent these changes will occur. Several respondents participating in the empirical study expressed skepticism regarding to what extent they are willing to collaborate with and trust in other supply chain partners. It was mentioned that increased

collaboration and trust leads to longer and more intimate relationships, something which is not always wanted. Other fears were that selfishness, driven by short-term financial interests can lead to collapsed relationships, which in turn will have devastating financial consequences on the companies' businesses. Similar counteracting forces that can slow down the integration process are briefly mentioned in literature. It is however hard to draw definite conclusions regarding how fast and to what extent the supply chain integration process will develop.

♦ **How will the trend towards process orientation evolve, and what challenges will this imply for outbound logistics?**

In section 3.2.1, *Continued trend towards supply chain integration*, Bowersox et al. (2000) and Christopher (2005) claim that process orientation should be a focused area in order to stay competitive in the future. This includes internal processes, e.g. between the sales and the logistical departments, as well as external processes between supply chain partners. Process orientation is believed to enable the organization to rapidly respond to the fast-changing needs of the market, and emphasis should be placed upon core processes that create value for customers. Theory also claim that, while purchasing, production, logistics and marketing have been integrated within their individual processes, there has been less progress integrating between these areas. It is believed that there have to be a substantial advancement of process integration with external supply chain partners, particularly with service providers.

The opinions from the empirical study in section 6.3 concur with theory and the trend towards process orientation is believed to continue. Several respondents also claimed that they continuously work in this direction already today. This supports the opinions from theory claiming that there has been progress in the issue, especially when it comes to internal integration. The respondents also mentioned challenges in relation to increasing the process orientation. To begin with the visibility in the supply chain has to increase. This will in turn require that all partners share information and are honest with each other. Another expressed challenge was to get everyone to work in the same direction and to avoid sub-optimization. These aspects were also discussed regarding trust and collaboration. Finally, several respondents emphasized the importance not to lose contact with the end customer and believed this to demand more in terms of trust in other supply chain partners.

Opinions from theory and the empirical study agree that the trend towards process orientation will increase in the future. The theory does however seem to distinguish more benefits and fewer challenges in putting this into practice, compared to what Synchron's customers do. It is however difficult to estimate in what extent increased process orientation will influence outbound logistics. It is also difficult to explain why the opinions from the theory and the empirical study differ. One reason can be that the respondents do not believe that the process orientation strategy will change significantly the next coming five to ten years, and that these changes therefore will have no major impact on outbound logistics.

Conclusions regarding supply chain integration

There will be more trust and collaboration between the supply chain partners in the future. The information sharing will also increase but firms will be more open to share tactical information than to share strategic information. It is however difficult to estimate how fast and to what extent this part of the supply chain integration will increase.

The trend towards process orientation will increase both internally and externally in the future. Several companies claim that they work in this direction already today but they see challenges in increasing the visibility in the supply chain and to enhance the trust in supply chain partners. It is also considered a challenge not to lose contact with the end customer when these changes are implemented. However, the opinions differ between theory and the results from the empirical study when it comes to what impact increased process orientation will have on outbound logistical activities. The theory distinguishes more benefits and fewer challenges in putting this into practice compared to what Synchron's customers do.

7.4 Complex networks

♦ Will the logistical structures increase in complexity and what challenges will this imply for outbound logistics?

The logistical structure is, according to both the theory and the empirical study, believed to increase in complexity in the future. These opinions are found in section 6.4, *Complex networks* and section 3.2.2, *Continued trend towards customers' markets* and are expressed by e.g. Stahre (2006). One contributing factor to the increased complexity is the development towards a more diversified flow of goods. To cope with this challenge the structure of the supply chain is expected to become more centralized, both in terms of the physical structure but also when it comes to management and decision-making. The empirical study shows that

it is most important to develop centralized management and decision-making but it is at the same time more challenging to succeed with. It is e.g. critical to gain trust from all partners in the supply chain in order for them to let go of the control of certain activities. The biggest challenge was therefore pointed out to be to handle the central management in a satisfying way. The importance of paying attention to the end customer's needs is also mentioned as a challenge in relation to centralized management and decision-making, since this competence is usually found locally at e.g. the sales companies.

According to the empirical result in section 6.4, information has to be shared more fluently than today in order to succeed with centralized management and decision-making. This demands that supply chain partners are willing to share information and that they are provided with the right tools for doing so. The requirements on information and communication systems are therefore expected to increase so that a more dynamic environment can be managed. These quite specific opinions were not mentioned in theory probably to a great extent because they are related to the respondents' current environment.

♦ **How will the trend towards outsourcing develop and what challenges will this imply for outbound logistics?**

Bowersox et al. (2000) and Christopher (2005) believe that the outsourcing trend will continue and this to a great deal because companies want to be able to focus on their core competencies. This is discussed in section 3.2.1, *Continued trend towards supply chain integration*. The result from the empirical study is not as straight forward. The majority of the respondents believed that they would not outsource more activities in the future compared to today. Some respondents did however claim the contrary and a few did not know. The opinions regarding what activities to outsource also varied. One agreed opinion was however that core activities would be kept in-house whereas other activities could be outsourced. There were also some shared opinions regarding e.g. what to take into consideration when outsourcing, but these will not be further analyzed since they are not directly associated with the research questions or the purpose of this thesis.

◆ **Will there be increased consolidation in transportation and what challenges will this imply for outbound logistics?**

The opinions concurred regarding transport consolidation. Both authors such as Bowersox et al. (2000) and Stahre (2006), and respondents in the empirical survey believed that there will be increased consolidation in transportation. The underlying causes mentioned were economics of scale and to decrease the environmental effect caused by pollution from transportation. Transport consolidation is considered challenging and difficult to deal with though. The planning process is complicated and difficult and will demand improved technical systems for planning. Improvements have already been done during the recent years but there are still lots to be done. It was also considered a major challenge to find suitable partners to collaborate with.

Conclusion regarding complex networks

The logistical structure is expected to increase in complexity in the future. The physical structure is believed to become more centralized but the centralization of management and decision-making is however believed to be even more important. In order to succeed with the centralization of management and decision-making is it considered challenging and important to;

- Manage the process well not to lose trust from the supply chain partners, which would be devastating for the centralization strategy.
- Pay attention to the end customers needs.
- Enable information sharing in a smooth way, both in terms of developing the right tools and when it comes to getting all partners in the supply chain to share the necessary information.

No reliable conclusions, apart from that core activities should be kept in-house, can be drawn regarding outsourcing because of the differing opinions. To be able to do so deeper analyses of more specific activities have to be conducted, to find out what the trend is concerning each activity.

Consolidation in transportation is expected to increase in the future. The planning process is considered difficult and will demand further developed supporting information and planning systems and tools. It is also considered challenging to find suitable partners to collaborate with.

7.5 *New technology*

♦ **What kinds of new technology will be the main drivers for future outbound logistics development?**

Opinions from Bowersox et al. (2000) and Christopher (2005) found in section 3.2.1, *Continued trend towards supply chain integration*, and 3.1.4, *New Technology*, concur with the opinions from the empirical result regarding that it will be increasingly important with new technology which enables increased visibility in the supply chain. In relation to this, the theory primarily discusses different kinds of ICT-solutions mainly ERP-systems and web-based solutions. The opinions from the empirical study agree and also highlight that extended use of different ICT-solutions will be an important ingredient in the future logistical development.

However, the empirical study shows that the main objective is to find new technology that can facilitate gathering and mediation of more time accurate information. RFID was mentioned as one possible enabler for this but several respondents also expressed skepticism toward RFID and claimed that other technologies for example GPS are more suitable for real time tracking. The opinions regarding RFID in literature are varying and most studies are industry specific and highlight prerequisites and possible benefits for these certain environments. Opinions in relation to this can be found in section 3.1.4, *New Technology*. It was therefore difficult to outline general standpoints regarding the importance of RFID in relation to the future logistical development in the business segment Synchron has their core competence. The opinions in the empirical study were also varying but the common denominator was that all technologies enabling increased visibility and real time tracking was predicted to be important in the future.

Another aspect that appeared during the empirical study found in section 6.5, *New technology*, was the future potential with telematics. Several respondents brought up this matter and ranked technology to be one of the most important drivers for the future logistical development. Telematics is believed to facilitate accurate forecasting and efficient inventory management. The share of emergency orders will decrease and the costs will consequently decrease at the same time service and uptime is enhanced.

The respondents also believed that this technology can be integrated with various web-based solutions making information go directly to the people responsible for service and maintenance. This would further improve the cost efficiency. The biggest question mark concerning telematics is to predict how long it will take before the technology will be used in wide range.

Some opinions in relation to telematics are found in section 3.2.1, *Continued trend towards supply chain integration*. The word 'telematics' is however not used but Singh (2004) mention that products in the future will communicate with each other in real time. Even when searching for complementary information regarding the subject, it is hard to find any specific opinions. This is however not that surprising since the use of telematics, in the way the respondents explain it, obviously has minor potential in most other industry segments. If e.g. an ordinary car breaks down it is not critical to instantly replace that spare part. The owner can take the bus or borrow a car from a friend and the financial backlash is almost non-existing compared to when e.g. an excavator breaks down. The issue with telematics is therefore, despite the absence of opinions in literature, considered to be highly interesting for this thesis.

In relation to new technology the theory briefly discussed development of load carriers. These discussions never occurred during the interviews. One reason for this is probably that many of the respondents companies' products, e.g. Scania's trucks, are transported directly onto other trucks or on train cars. This makes the need for load carriers less important. The issue could however be relevant for transportation of spare parts, but the respondents did not believe development of load carriers to be a major driver for the future logistical development. Theory did, as mentioned above, discuss the issue but did not either withhold it as a main issue.

♦ **Will information sharing increase and what requirements will this put on new technology?**

The opinions agreed that information sharing will increase in the future and that this will put tough requirements on new technology. When discussing the gathering of data, both theory in section 3.2.1, *Continued trend towards supply chain integration*, and opinions from the empirical study, highlighted that there will be increased demands for more time accurate information, preferably real time. RFID was also discussed in relation to the gathering of data, but as explained above it was hard to draw straight forward conclusions regarding this.

In general was the actual data gathering not seen as a problem, rather that too much available information is overwhelming and that this makes it hard to highlight the data that is actually interesting.

Most of the discussions regarding what requirements increased information sharing will put on new technology revolved around the mediation of information. Both Nilsson (2006) in section 3.1.4 and opinions from the empirical study claimed that requirement will be put on technology that can filter away the irrelevant information from the interesting information. The opinions also concurred that ones this information was highlighted, well developed interfaces would be required that can mediate and present this information in an easy to understandable and logical way. This mediation was also believed to be facilitated with increased use of various web-based solutions.

Conclusions regarding new technology

In general will technology that creates visibility in the supply chain and is able to manage real time information, drive the future logistical development forward. These technologies will primarily consist of different ICT-solutions e.g. ERP-systems and web-based solutions. RFID is widely discussed both in recent research and in the empirical study. It is however hard to draw straight forward conclusions in the matter since the opinions are varying and often industry specific.

Telematics will most certainly be used to a further extent in the future within the industry segment where Synchron have their core competence. This will facilitate more accurate forecasting and in turn lower costs and increased service levels. It is however uncertain when this technology will reach its breakthrough.

General requirements will be put on new technology that can enable gathering and mediation of real time information. The gathering can be facilitated with telematics or RFID. The most critical issues regarding information sharing will however revolve around the mediation of information. To begin with, the technology has to be able to mediate real time information. New requirements will also be put on technology that can highlight interesting information from a large quantity of existing data. This will require sophisticated interpretation and analyze tools combined with logical designed and easy to use interfaces. Web-based solutions are believed to be further developed and used when e.g. mediating the information gathered with telematics.

7.6 *Environmental issues*

♦ **What sources of environmental pressures will be the most challenging in the future?**

Both opinions from Singh (2004) and Paquette (2005) found in section 3.1.3, *Environmental issues*, and opinions from the empirical study concur that it is primarily environmental pressures of regulatory character that will affect outbound logistics in the future. The theory does not believe that resource limitations and ethical responsibility will influence outbound logistics significantly. This argument is supported in the empirical result and the underlying cause is explained to be that it is more important to keep the costs low than to be able to offer an environmentally friendly delivery. The ethical responsibility in relation to environmental issues is considered more important when selling consumer products. Regarding resource availability, oil is the main natural resource that could affect outbound logistics significantly. It is however not expected to do so in the nearest future. Taxes on transportation and fuel surcharges are believed to increase and will therefore need to be taken into consideration but this is related to the pressure coming from regulations and not from resource availability. The empirical result did however indicate that all mentioned sources of environmental pressures; regulations, resource availability, ethical responsibility and consumer demands will increase in the future but not necessarily to any greater extent. Some of these environmental pressures were also considered more important in relation to the actual product and the manufacturing process. These aspects will however not be further examined since they are not primarily related to outbound logistics.

♦ **How will outbound logistics adapt to increased environmental pressures and what challenges will this imply?**

Supply chains are expected to have to adjust to increased environmental pressures. One way to do this is by decreasing the need for transportation by e.g. decreasing the transportation distances. This is mentioned both by Skjoett-Larsen (2000) and Singh (2004) in section 3.2.4, *Greening logistical processes* and in the result from the empirical study in section 6.6, *Environmental issues*. The globalization process is not believed to decrease because of this, but rather forced to take new forms with more local production and direct deliveries.

Remanufacturing and recycling are also expected to increase and become more important in the future. The empirical result share Singh's (2004) opinions regarding the underlying causes, which are believed to primarily consist of various regulations, but also of demands from customers. Reverse logistics activities will therefore have to be given more attention in the future and the matter is also considered difficult to deal with.

A shift towards more environmentally friendly modes of transportation is expected in the future. Skjoett-Larsen (2000) is one author that discusses the matter and expects taxes on certain modes of transportation to be raised, forcing companies to use less air and road freight and more train and sea freight. The empirical result is more specific and suggests that air freight will decrease in the future because of raised taxes and especially sea freight is expected to increase because of the low cost and it being environmental friendly. Train transportation is also expected to increase but not considerably before the train infrastructure improves. The opinions are however fairly similar and expect further pressure on the planning of outbound logistical activities. When the price on air freight increases it will constitute an additional driver to avoid rush orders since these are often carried out by air. The longer and more uncertain lead times, when e.g. transporting by sea, will however demand more advanced tracking and forecasting systems.

Conclusions regarding environmental issues

Regulations, resource availability, ethical responsibility and consumer demands are all expected to a further extent put environmental pressure on outbound logistics in the future. Even though they are all expected to increase, it is only regulations that actually are expected to put any serious pressure within the nearest future. These opinions are found both in theory and in the result from the empirical study.

The transportation distances will be forced to decrease in the future. As a result is local production and direct deliveries expected to become more common. Reverse logistics is also believed to become more common in the future due to an increased pressure for remanufacturing and recycling. Air freight is expected to decrease, much because of increased taxes, and sea and train freight is due to the relatively low cost and that fact that it is an environmental friendly alternative, expected to increase. These matters will demand improved planning and forecasting and are considered difficult to deal with.

8 Summary of the conclusions

In the previous chapter conclusions were drawn from each research area separately. In this chapter these conclusions are summarized, evaluated and grouped together into a more logical manner. The result is a model highlighting the main drivers, enablers and trends predicted to influence the future outbound logistics development.

The discussion in this chapter is be more skewed towards Synchron's customers and the logistical environment they are operating in. General recommendations for how companies like Synchron should act according to the expected development are also mentioned.

8.1 Model of the summarization

Six main areas have been identified in relation to the mentioned *Drivers*, *Enablers* and *Trends*. These areas are presented in Figure 14 below. The drivers to the left contain the driving forces pushing the development forward and deciding what critical parameters that needs to be taken into consideration. The trends, on the right hand side in the figure, hold the main outbound logistical trends predicted to dominate the business segment where the majority of Synchron's customers are acting. These trends are shaped by the prerequisites determined by the drivers. The enablers found in the middle constitute the enabling or facilitating factors that will be necessary if companies should be able to adjust to the drivers and focus on the trends. It is within this area companies like Synchron can assist their customers and the recommendations are therefore derived from the enablers.

More or less all of the areas affect each other in one way or another since each area contains several different elements. They have however not been placed in any order of precedence vertically. The following subchapters will more thoroughly explain what each of these areas consists of.

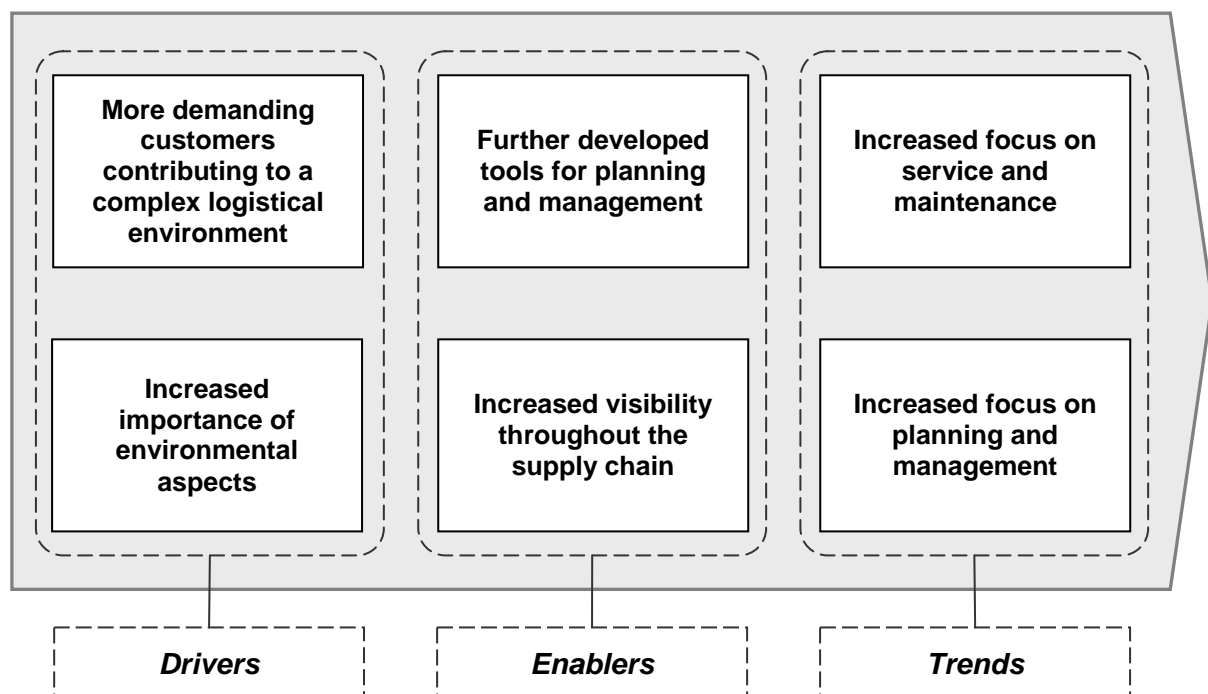


Figure 14 - Summary of conclusions

8.2 Drivers

The main drivers influencing the future outbound logistics development are predicted to be more demanding customers contributing to a complex logistical environment and increased importance of environmental aspects. The conclusions drawn regarding this are described below.

8.2.1 More demanding customers contributing to a complex logistical environment

From the analysis and the conclusions above have several issues been mentioned predicted to contribute to the development towards a more complex logistical environment. To meet customer demands and to increase the cost efficiency new and alternative distribution flows will have to be managed. Direct deliveries, cross-docking, transport consolidation and reverse logistics are examples of issues that have been mentioned as important and challenging. These are believed to be difficult matters to deal with both in terms of collaborating with different supply chain partners, but perhaps most regarding planning and management.

More specific customer demands are also expected to increase the logistical complexity. Demands on lead time, customization of products and especially customization of logistics related services, enhance the importance of managing the logistical activities effectively. In addition to this will differentiation of customers in relation to various aspects demand more from planning and management.

8.2.2 Increased importance of environmental aspects

Environmental issues will certainly affect the future logistical development and contribute to that new parameters have to be taken into consideration. Even if the environmental aspects alone not will be the primary driver for the logistical development, it will together with aspects of the globalization and increased competition, contribute to changed prerequisites.

When during the interviews discussing the major challenges in relation to the trend towards globalization, a surprisingly large number of the respondents brought up environmental issues as a main challenge. Similar aspects were also highlighted in relation to distribution strategies e.g. transport consolidation, and were believed to contribute to increased complexity in the planning process. In relation to issues regarding the globalization were also the transportation distances examined and increased environmental pressures were believed to contribute to more local manufacturing and distribution closer to the market. The fact that environmental aspects were frequently discussed in relation to several areas classified it as one of the most important drivers for the future logistical development.

When the environmental aspects specifically were examined it was concluded that the major pressure and driver will be of regulatory character. Changes in taxes and fees were believed to contribute to a modal shift and lead to an increased share of sea and train freight and a decreased share of air freight. This was also believed to affect the complexity in the planning process because of longer lead times and infrastructure limitations. Reverse logistics is also predicted to be an area where more efforts have to be placed in order to make this flow effective. This will be an additional parameter to take into consideration in the planning and management process and will contribute to increased complexity.

8.3 Trends

The main trends in the business segment where the majority of Synchron's customers act, is predicted to be increased focus on service and maintenance and increased focus on planning and management. These two trends are described below including several more specific areas associated with these matters.

8.3.1 Increased focus on service and maintenance

Synchron's customers will not sell products in the future, they will sell solutions. Instead of selling a drill, Sandvik will be selling number of meters drilled or hours of drilling. Instead of selling an excavator, Volvo will be selling cubic meters of removed soil and gravel or hours of digging. The customers will demand the suppliers to take over service and maintenance enabling them to focus on their core competencies. At the same time the suppliers see potential in becoming total service providers as it gives a competitive advantage and a possibility to increase the profitability.

The fact that the responsibility for service and maintenance is shifted to the suppliers and the fact that the customers demands on performance will increase, make these issues critical. The suppliers need to be able to offer instant availability and maximize the uptime and simultaneously carry out these activities in a cost efficient way. Results from this study conclude that planning and forecasting activities in relation to this will be critical in the future and one enabler for this is predicted to be extended use of telematics. In general will the visibility have to increase to enable that real demand can be spotted earlier and more accurately.

8.3.2 Increased focus on planning and management

The logistical environment is getting more complex and increased focus must therefore be put on planning and managing logistical activities in order for these to be carried out efficiently. It is not only important to improve planning and management of service and maintenance activities, but also to plan and manage the flow of goods and the inventory management of the main products. The difficulties related to planning and managing various matters have been emphasized both in literature and by the respondents. Issues predicted to require much from planning and management are for example customization and customer differentiation, an increasingly dispersed and complex physical structure because of the globalization, increased importance of reverse logistics and extended use of transport consolidation, cross-docking and direct deliveries. It is therefore obvious that companies will have to focus more on planning and management of logistical activities in order to cope with new challenges due to the changing logistical environment. One of several possible ways to deal with the increased complexity is centralization of the management and decision making. This enables more standardized routines which improves the management and the possibility to provide a homogeneous face towards the customers.

8.4 Enablers

The main enablers predicted to facilitate the above described trends, are further developed tools for planning and management and increased visibility throughout the supply chain. The enablers suggest what Synchron's customers should do to adjust to the prerequisites shaped by the drivers and the trends. It is as mentioned earlier within this area Synchron's products and services can assist. Some aspects for how companies like Synchron should act to the expected development are also mentioned in the following sections.

8.4.1 Further developed tools for planning and management

It has earlier been stated that the complexity in logistical structures will increase and that advanced planning and management will be required. This study shows that there are several challenges in order to be successful in these matters, and there is an expressed need for enablers that can facilitate these changes.

It was in the analysis concluded that there is a need for further developed tools that can highlight interesting information from a large quantity of existing data. Increased shares of direct deliveries, cross-docking, transport consolidation and reverse logistics will also demand sophisticated tools that facilitate efficient planning and management of the flow of goods. In addition to this increased customization and differentiation will complicate planning and management of outbound logistical activities. Synchron's customers will face significant challenges due to all the above mentioned issues and will most likely need assistance from external partners. Companies like Synchron should therefore make sure to keep developing tools that can facilitate and manage the above mentioned issues.

Increased demand for real time information and extended use of telematics will imply challenges in a new dimension and there will be a need for more sophisticated analyze tools, to meet these challenges. There is also an expressed need for more logical designed and easy to use interfaces that all users, independently of background, should be able to navigate in. These tools are expected to be provided by companies like Synchron.

The development of different ICT-solutions, such as ERP-systems and web-based solutions, is expected to be the main enabler when developing these new tools for planning and management. This will hopefully increase the visibility in the supply chain which in turn will lead to favorable prerequisites for planning and management processes.

8.4.2 Increased visibility throughout the supply chain

Increased visibility has in general terms been mentioned widely both in literature and in the empirical study and is believed to be a crucial prerequisite in the planning and management process in the future. Further developed tools for planning and management will enhance the visibility throughout the supply chain, but there are also prerequisites for these tools to reach its maximum potential. The basic prerequisite is that there is information available to analyze and that there are tools that can gather and mediate this information.

This study shows that the information sharing between supply chain partners will increase, especially on a tactical level. It was also concluded that there will be an increased focus on visualizing end customer demand throughout the entire supply chain. Mentioned enablers for this were more sophisticated KPIs, a continued trend towards process orientation and improved supply chain integration. Companies like Synchron is expected to be able to provide tools that facilitate and manage the use of more end customer centric KPIs.

When discussing enablers for increased visibility on a more technical level, the main discussion revolved around extended use of telematics and different ICT-solutions. RFID was also mentioned in this context as a possible facilitator for increased visibility. Telematics and RFID will enable the gathering of real time and accurate information, whereas different ICT-solutions such as ERP-systems and web-based solutions will enable the mediation of the information. This information will constitute a new input in the forecasting process which can become more proactive and not just rely on historical data. The forecasting tools provided by companies like Synchron will need to be further developed and improved, in order for them to be able to use this new information in an effective and efficient way.

9 References

All references used in this thesis, including the respondents from the interviews, are found in alphabetic order in this chapter.

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Appendix 1: Result from the questionnaire

Drivers and trends within outbound logistics			
Please answer the questions by ticking the 'yes' or 'no' box like indicated in the instruction questions below. When the words " future " or " will " is used in the questions, we refer to the next coming five to ten years. It is important to have in mind that we would like to know what you believe , not only what you know. You should therefore be able to answer all the questions below.	Yes	No	Do not know
Personal information			
Name:	-	-	-
Instruction questions			
Is this a survey?	x		
Is this typed in red?		x	
General issues			
Will your company's globalization process, in general, increase?	14	0	0
Will your company's manufacturing facilities spread out more globally, compared to today?	12	2	0
Will the competitive environment in your market segment be more challenging in the future, compared to today?	13	1	0
Will the customers bargain power increase in the future, compared to today?	9	2	3
Will your company in general focus more on process (service) excellence than product excellence?	10	3	1
Will the financial demands on logistical activities increase in the future? (e.g. demands for higher capital productivity)	13	1	0
Will there be an increased downward pressure on price on your products in the future?	9	4	1
Changing customer demands			
Will there be an evident change in customers' demands in the future, compared to today?	8	2	4
Will customers demand more in terms of delivery services in the future? (e.g. shorter delivery lead time)	13	1	0
Will customers demand more flexible and varying delivery services in the future? (e.g. variable delivery lead time)	14	0	0
Will your company face new challenges within outbound logistics, due to the following changes in customers' demands:	-	-	-
Customization of products?	11	2	1
Customization of services?	14	0	0
Will your company put considerably more efforts to enhance customer relations? (e.g. longer and/or closer relationships)	14	0	0
Will your company implement any new KPI's (Key Performance Indicators) related to outbound logistics?	9	1	4

	Yes	No	Do not know
Supply chain integration			
Will your company try to increase collaboration with other supply chain partners?	12	0	2
If yes, in what of the following areas:	-	-	-
Planning?	9	1	4
Replenishment?	9	2	3
Forecasting?	11	1	2
Information sharing in general?	12	0	2
Will your company move from functional orientation and work more towards process orientation internally? (i.e. within the company)	12	0	2
Will your company move from functional orientation and work more towards process orientation externally? (i.e. between companies)	11	0	3
Complex networks			
Will the logistical structures in general increase in complexity in the future?	12	2	0
Will your company adapt a more centralized physical structure of the logistical activities? (e.g. centralized inventory)	9	3	2
Will your company adapt more centralized logistics regarding management and decision making? (e.g. standardized activities)	14	0	0
Will your company outsource more outbound logistical activities in the future?	4	6	4
Will your company have more consolidation in the outbound transportation process in the future compared to today?	11	0	3
New technology			
Will implementation of new technology be a prerequisite for future outbound logistical development?	11	1	2
Environmental issues			
Will the following sources of environmental pressure affect outbound logistics significantly more in the future compared to today:	-	-	-
Regulations? (Taxes, fees, banning of hazardous substances etc.)	10	2	2
Resources availability?	10	1	3
Ethical responsibility?	11	0	3
Consumers demands?	12	0	2
Will increased environmental pressures lead to decreased globalization in the future? (e.g. more local production/distribution)	8	2	4
Will outbound logistics management face new challenges due to increased demand for remanufacturing and recycling, compared to today?	10	1	3
Will increased environmental pressures lead to a modal shift in transportation? (e.g. from truck to train or sea freight?)	11	1	2