Differentiated Supply Chain Strategy – Building Knowledge through Case Studies

Per Hilletofth

Logistics Research Group
School of Technology and Society
University of Skövde
P.O. Box 408, SE-541 28 Skövde, Sweden
E-mail: per.hilletofth@his.se

Abstract
Nowadays companies usually offer a wide range of products and services in various types of non-coherent business environments. It is becoming apparent that traditional ‘one-size-fits-all’ supply chain strategies does not support a wide range of products sold in a diversity of markets. Consequently, it becomes increasingly necessary to employ different manufacturing and delivery strategies concurrently in order to develop a differentiated supply chain strategy. This paper employs a descriptive multiple case study approach to illustrate how two companies has develop a differentiated supply chain strategy. Case study findings reveal that one efficient method to develop a differentiated supply chain strategy is to combine different manufacturing and delivery strategies into various supply chain solutions. By combining relatively few strategies it is possible to develop several differentiated supply chain solutions.

Key words: Supply chain management, strategy, differentiation, postponement.

Introduction
One of the more interesting debates in recent years concerning supply chain strategy has centered on the ability of the supply chain to be either “lean” (Womack and Jones, 1996) or “agile” (Goldman et al., 1995). The idea of lean manufacturing has been described by Womack et al. (1990), and later expanded into the wider concept of “lean thinking” by Womack and Jones (1996). The focus of lean thinking has essentially been on the reduction or elimination of waste, also known as muda (Christopher and Towill, 2001). The origins of the lean approach can be traced to the Toyota Production System (TPS) with its focus on the efficient use of resources through level scheduling (Ohno, 1988). Lean thinking, or leaness, from a supply chain perspective means “developing a value stream to eliminate all waste, including time, and to enable a level schedule” (Naylor et al., 1999). This could, for instance, involve reduction of inventories, reduction of lot-size, reduction of the supplier base, evaluating suppliers based on quality and delivery performance, establishing long-term contracts with suppliers, and elimination of paperwork (de Treville, 2004). It has been suggested that lean principles are applicable in markets where demand is relatively stable and therefore predictable, and where variety is low (Christopher, 2000).

In contrast, in those markets where demand is volatile and the customer requirement for variety is high, a much higher level of agility is required (Christopher, 2000). Agility is primarily concerned with responsiveness, and the ability to match supply and demand in volatile and unpredictable markets. Essentially, it is about being demand-driven rather than forecast-driven. Gunasekaran (1998) has defined agility as the ability to respond to market changes in a cost-efficient and profitable manner, while Christopher (2000) has defined agility as “a business-wide capability that embraces organizational structures, information...
systems, logistics processes and in particular, mindsets”. Thus, it could be argued that agility concerns the utilization of market knowledge and a responsive organization to exploit profitable opportunities in a volatile marketplace (Naylor et al., 1999). A key characteristic of an agile organization is flexibility (Christopher, 2000). Certainly, the origins of agility as a business concept lie partly in Flexible Manufacturing Systems (FMS), which through automation (i.e. reduced set-up times) try to enable rapid changeovers and, as a result, create responsiveness to changes in product mix and volume (Christopher and Towill, 2001). Later, this idea of manufacturing flexibility was extended into the wider business context by Nagel and Dove (1991), and the concept of agility as a supply chain paradigm was born. The focus of improvement efforts in the agile approach is on integrating the information flow across the supply chain with the objective of creating a market-responsive supply chain that responds quickly to unpredictable demands to minimize lost sales, forced markdowns and obsolescent inventory (Mason-Jones and Towill, 1999; van Hoek, 2000). A market-responsive supply chain emphasizes market mediation to a greater degree than the role of ensuring the efficient physical supply of the product (de Treville, 2004). This requires reduction of process and information lead-times throughout the supply chain (Mason-Jones and Towill, 1999). This could, for instance, involve coordinated planning, improved communication, and increasing access to demand information throughout the entire supply chain (de Treville, 2004).

Although lean and agile approaches are often discussed as opposing paradigms, they share a common objective: meeting customer demands at the least total cost (Goldsby et al., 2006). It is in terms of the characteristics of this demand and the basis of meeting customer demand that the two approaches differ (Goldsby and Garcia-Dastuage, 2003). Moreover, numerous researchers have suggested that the lean and agile approach can be integrated in a variety of ways to create so-called “leagile” strategies (e.g. Naylor et al., 1999; Childerhouse and Towill, 2000; Mason-Jones et al., 2000a; Mason-Jones et al., 2000b; van Hoek, 2000; Christopher and Towill, 2001; Stratton and Warburton, 2003; Mistry, 2005). Thus, it is not really a question of lean or agile, but rather the thoughtful selection and integration of suitable aspects of these paradigms appropriate to the specific supply chain strategy (Christopher et al., 2006).

Naylor et al. (1999) created the term “leagile” to refer to hybrids of the lean and agile approaches. Based on this merged strategy, Christopher and Towill (2001) visualized three distinct lean-agile hybrids. The first is founded on the Pareto Rule, recognizing that 80% of a company’s revenue is generated from 20% of its products. It is suggested that the dominant 20% of the product assortment can be managed in a lean manner – given that demand is relatively stable for these items and that efficient replenishment is the appropriate objective – while the remaining 80% can be managed in an agile manner (Goldsby et al, 2006). The second lean-agile hybrid is founded on the principle of base and surplus demand, recognizing that most companies experience a base level of demand over the course of the year. It is suggested that the base demand can be managed in a lean manner while demand peaks over the course of peak seasons or heavy promotion periods can be managed in an agile manner (Goldsby et al, 2006). The third lean-agile hybrid is founded on the principle of postponement (Goldsby et al, 2006). Postponement means that certain supply chain activities (e.g. logistics and manufacturing activities) in the supply chain are postponed until customer orders are received (Pagh and Cooper, 1998). In other words, one decides which activities should be performed after orders are received and managed according to agile principles (i.e. responsive, order-driven and customized), and which activities should be performed before orders are received and managed according to lean principles (i.e. efficient, planned and standardized).

Nowadays companies usually offer a wide range of products and services in various types of non-coherent business environments. In this market situation it is not enough to employ a traditional ‘one-size-fits-all’ supply chain strategy, i.e. to use either a lean, agile or hybrid supply chain strategy (Shewchuck, 1998). Instead, it has become increasingly necessary to
employ different manufacturing and delivery strategies concurrently – i.e. develop a differentiated supply chain strategy – to satisfy differing customer needs in various types of markets. In this paper a descriptive multiple case study approach is used to illustrate how two case companies have developed differentiated supply chain strategies. The research objective is to provide an increased understanding of how different manufacturing strategies such as Make-To-Stock (MTS), Assemble-To-Order (ATO), Make-To-Order (MTO), and Engineering-To-Order (ETO) are used in contemporary manufacturing related supply chains. However, this paper will also investigate how these manufacturing strategies could be combined with different delivery strategies to truly differentiate the supply chain strategy.

The overall purpose of this paper is to contribute to the understanding of supply chain design and the main emphasis has been on producing descriptive results. The primary research approach consists of two case studies, which was considered an appropriate approach in order to tap in-depth data. The first case company (Alpha) is a Swedish manufacturer operating on an international basis in the enterprise telecommunications industry. This case is strengthened with another case study (Beta), concerning a Swedish manufacturer operating on an international basis in the appliance industry.

The remaining of this paper is structured as: Section 2, different supply chain strategies based on the concept of postponement is presented and discussed, Section 3 presents and discusses research approach and data collection, Section 4 presents case study findings which reveal that one efficient way to develop a differentiated supply chain strategy is to combine different manufacturing and delivery strategies into various supply chain solutions. In Section 5 the research findings is discussed. Finally research is concluded and further research avenues are proposed.

**Literature Review: Supply Chain Strategies**

There are no supply chain strategies that are applicable to all types of products and markets. Instead, the supply chain strategy needs to be tailored to match the specific demand characteristics of a product, product family or market (Christopher et al., 2006). In other words, different types of products or markets require different types of supply chain strategies. This implies that the sourcing, operation, and distribution strategies that constitute the supply chain strategy need to be appropriate to a specific product or market condition.

In recent years, the SCM literature has focused on the ability of the supply chain to satisfy different types of markets or business environments through the employment of different types of supply chain strategies (e.g. Childerhouse and Towill, 2000; Christopher and Towill, 2000; Fisher, 1997; Hilletofth and Hilmola, 2007; Mason-Jones et al., 2000a; Mason-Jones et al., 2000b; Naylor et al., 1999; Stratton and Warburton, 2003; Warburton and Stratton, 2002). This implies that the constraints of the market must be known in order to identify the best starting point for the development of an effective and efficient supply chain strategy. Only when the possibilities of the market are known and understood can an organization attempt to develop strategies that will meet the requirements of both efficiency and effectiveness (Christopher and Towill, 2001; Fisher, 1997).

A number of classification schemes have been proposed in the literature to guide the choice of supply chain strategy (e.g. Fisher 1997; Christopher, 2000; Christopher et al., 2006; Mason-Jones et al., 2000a). Christopher et al. (2006) discuss a classification model consisting of the following three parameters:

- Type of products (standard or special);
- Type of demand (stable or volatile); and
- Replenishment lead-times (short or long).
Special product refers to a product with low volume and erratic demand, a short life cycle, or a high level of customization. In contrast, standard product refers to a product with a more stable demand, longer life cycle, or with no or limited, customization. Christopher et al. (2006) argue that replenishment lead-time has to be included in any useful taxonomy for supply chain strategy selection, due to its critical impact on responsiveness, and since globalization tends to extend these lead-times. Moreover, they argue that since predictability and type of product tend to be related, that is, standard products are more predictable, it is possible to simplify the taxonomy into only two dimensions: predictability and replenishment lead-times. Figure 2-7 shows the resulting matrix and the four suggested supply chain strategies.

As can be noted, the matrix suggests that there are four possible generic supply chain strategies. Firstly, when demand is predictable and replenishment lead-times are short, a lean continuous replenishment strategy is appropriate. In contrast, when demand is unpredictable and replenishment lead-times are long, a leagile supply chain strategy is appropriate. As mentioned earlier, postponement is one way to realize leagile supply chain strategies and this topic is further elaborated below. Moreover, when lead-times are long and demand is predictable, a lean supply chain strategy is appropriate, for example, make and source ahead of demand in the most efficient way. Finally, when demand is unpredictable and lead-times are short, an agile supply chain strategy, based on rapid response, is required. In addition, Christopher et al. (2006) argue that within each cell of the matrix, the tactics adopted can also be influenced by whether the product is “standard” or “special”. For example, in the postponement cell for a special product, we may postpone manufacturing, but for a standard product, it could be better to postpone distribution (Pagh and Cooper, 1998).

Postponement Strategies
The concept of postponement was first introduced by Alderson in 1950 (Alderson, 1950), who noted that postponement can change the differentiation of products (form, identity and inventory location) to as late a time as possible, and thus improve the efficiency of a distribution system. Later, these ideas were expanded by Bucklin (see, e.g. Bucklin, 1965; Bucklin, 1966). The foundation of postponement is that risk and uncertainty costs are linked to the differentiation of products that occurs during the activities in the supply chain (Bucklin,
1965). Furthermore, these costs can be reduced, or fully eliminated, by postponing certain activities (e.g. logistics and manufacturing activities) in the supply chain until customer orders are received (Pagh and Cooper, 1998). In other words, one decides which activities should be performed after orders are received and managed according to agile principles (i.e. responsive, order-driven and customized), and which activities should be performed before orders are received and managed according to lean principles (i.e. efficient, planned and standardized). This implies that companies can finalize/customize the product in accordance with specific customer preferences (van Hoek, 2001; Yang et al., 2004) and at the same time achieve cost-efficiency. Thus, postponement can help firms achieve mass customization (Feitzinger and Lee, 1997; van Hoek et al., 1998; van Hoek et al., 1999).

Postponement increases the firm’s ability to fine tune products to specific customer wishes (Hoek et al., 1998). Furthermore, it significantly reduces inventory carrying, warehousing and obsolescence costs (van Hoek et al., 1998). However, it should be noted that postponement may lead to smaller sized shipments over longer distances (van Hoek, 2001). Consequently, postponement is often more relevant when products are more sensitive to inventory than transportation costs (e.g. higher value added products with large product variety). Moreover, lead-time constraints in the supply chain could limit the possibility of performing postponed activities while still assuring delivery according to customer required lead-time (Bucklin, 1965; van Hoek, 1998; van Hoek, 2001).

Postponement strategies can be applied to form, time and place (Hoek et al., 1998). Form postponement (or manufacturing postponement) means that companies delay production, assembly, or even design until after customer orders have been received (Bowersox and Closs 1996). Time and place (or logistics postponement) means that the forward movement of products is delayed as long as possible in the chain of operations, and that products are kept in storage at central locations in the distribution chain (Bowersox and Closs 1996). Industry has increased the use of postponement principles in recent years. Numerous European industrial companies are currently implementing postponed supply chain systems (Hoek et al., 1998). These systems combine the three types of postponement: the customization of products is delayed until products are ordered (form postponement), the distribution of products is delayed as long as possible (time postponement), and products are stored at central locations (place postponement). The concepts of logistics and manufacturing postponement are described in more detail below.

**Logistics Postponement**

Traditionally, products are stored close to customers and distributed through a decentralized distribution system, including international, national, and local inventories. The purpose of logistics postponement is to maintain a full-line of anticipatory inventory at one or a few strategic locations (Bowersox and Closs 1996), that is, postpone inventory location upstream in the supply chain to the latest possible point (Bucklin, 1965). This means that the forward movement of products is delayed as long as possible in the chain of operations and products are kept in storage at central locations in the distribution chain (Figure 2-2). In other words, the Customer Order Point (COP) is moved upstream the supply chain. The COP is the point in the supply chain where the customer order penetrates and that distinguishes forecast and order-driven activities, that is, where real demand penetrates upstream the supply chain, or where the strategic inventory is stored (Ericsson, 2003).
The major reason to postpone logistics operation downstream the supply chain is cost-reduction (Yang et al., 2004). Logistics postponement allows a company to delay deciding where inventory should be finally located, thus significantly reducing the risk of wrong time and place utility of products (Bowersox et al., 1993). Further benefits of logistics postponement are reduced inventory levels in the supply chain as well as improved customer responsiveness (Yang et al., 2004).

**Manufacturing Postponement**

Based on forecasts and speculations, companies traditionally perform all manufacturing activities – including design, sourcing, manufacturing, assembly, packaging and labeling – before they have received any customer order (Zinn and Bowersox, 1988). Depending on whether the company employs logistics postponement, these products are either stored at local or central warehouses.

The purpose of manufacturing postponement is to retain the product in a neutral and non-committed status as long as possible in the manufacturing process (Bowersox and Closs 1996), that is, postpone differentiation of form to latest possible point (Bucklin, 1965). This means that companies delay sourcing, production, assembly, or even design until after customer orders have been received (Figure 2-3). This allows firms to separate the customization of products from the primary manufacturing of standard products or generic modules (van Hoek et al., 1998). This separation frees primary manufacturing to focus more on large economical runs (i.e. leanness), while secondary or final manufacturing can be focused on responding to customer needs (i.e. responsiveness). Consequently, this postponed manufacturing system simultaneously enhances customer service and efficiency (van Hoek et al., 1998).
Postponed manufacturing has several advantages (van Hoek, 1998). Firstly, inventory can be held at a generic level resulting in fewer stock-keeping variants and hence less inventory in total. Secondly, because the inventory is generic, its flexibility is greater, given that the same components, modules or platforms can be embodied in a variety of end products. Thirdly, forecasting is easier at the generic level than at the level of the finished item. Finally, the ability to customize products locally means that a higher level of variety may be offered at a lower total cost, enabling strategies of “mass-customization” to be pursued.

In order for manufacturing postponement to succeed, a reliable supplier network that can supply parts and services is necessary (Feitzinger and Lee, 1997). Furthermore, it is important to consider product families and explore the commonality/modularity of products and processes to find generic modules or platforms that can be embodied in a variety of end products (Zinn, 1990). However, it is important to note that too much standardization can reduce product differentiation, leading to a cannibalization effect (Swaminathan, 2001).

As can be noted, the application of postponement in manufacturing is a logical extension of implementing logistics postponement while postponement in sourcing and design are logical extension of implementing manufacturing postponement (Battezzati and Magnani, 2000). This means that the scope of postponement has expanded from logistics through manufacturing to the entire supply chain (Yang et al., 2004). Postponement can occur along the entire supply chain, from design to final distribution. It can be applied to a minor or a major share of the activities in the supply chain. Companies should first consider every postponement opportunity along the supply chain and then balance the trade-offs not from an individualistic perspective but from a supply chain perspective (Yang et al, 2004).

Research Approach and Data Collection
In this paper it was considered that an inductive approach was the most appropriate research strategy since the aim was to enhance current knowledge of differentiated supply chain strategies by investigating described logistics systems used by companies in a qualitative manner (Eriksson and Wiedersheim, 1999). Moreover, due to the context-bound nature of the studied phenomenon, case studies would be an appropriate method (Bonoma, 1985). Thus,
this paper employs a descriptive embedded multiple case study (Yin, 1994). The first case company (Alpha) is a Swedish manufacturer operating on international basis in the enterprise telecommunications industry. This case is strengthened with another case study (Beta), concerning a Swedish manufacturer operating on international basis in the appliance industry.

One advantage with case studies is the possibility to combine several data collection techniques (Yin, 1994). In this paper empirical data was collected from various sources to enhance understanding by examining the research object from several perspectives. Data collection techniques incorporated in this study was interviews, documents and workshops. Both the case studies are based mainly on data gained from in-depth interviews with key persons representing middle management in the case companies. In addition, a number of internal (i.e. annual reports and technical reports) and external documents (i.e. industry reports) were included to get information on both the industries and the case companies’ backgrounds. Moreover, a number of workshops including both major customers and the case company were used as data collection techniques in the first case study. The collected data has been analyzed primarily by applying the principles of pattern-matching and explanation-building (Yin, 1994).

**Case Study findings**

**Case: Manufacturer Alpha**

Case company *Alpha* is a Swedish manufacturer operating on international basis in the enterprise telecommunications industry. Their supply chain is displayed in Figure 4. The customer box in the figure can be separated into sales partners, resellers and end-users. Alpha conduct business with sales partners and some resellers, sales partners conduct business with resellers and end-users and resellers conduct business with end-users. Likewise the supplier box can be separated into several tiers of suppliers.

Alpha’s supply chain strategy is to “manage what matters”, i.e. focus on managing those areas of the supply chain where they can add value. Thus, Alpha has chosen to outsource manufacturing, assembly, warehousing and distribution in order to reduce costs and maximize performance. They regard robust supplier management – to monitor and manage supplier performance – as an important issue to maximize the advantages from outsourcing. Additionally, it is very important to continuously examine opportunities for increased collaboration with key suppliers, i.e. suppliers that can help Alpha improve its supply chain costs, supply chain processes and customer service.

![Figure 4. Alpha’s Supply Chain and Strategies](image-url)
As can be noted in Figure 4, Alpha utilizes two types of supply chain strategies. For standard products with short customer required lead-time Alpha employ a Deliver-To-Order (DTO) strategy. This implies that they, based on forecasts and speculations, perform all supply chain operations – including sourcing, manufacturing, assembly, packaging and labeling – before they have received any customers order and focus on efficiency (i.e. planned and standardized). On the contrary, for customized and more complex products and applications Alpha employ an Assemble-To-Order (ATO) strategy. This implies that the production processes are decoupled from the assembly/distribution processes, or in other words assembly and distribution activities are postponed until customer order are received. This separation allows customer order to be managed with rapid lead-times assuming that the appropriate sub-units are held in stock. The customer order point (COP) is the point at which the supply chain processes are decoupled. Activities perform after order are received (downstream the COP) are focused on responsiveness (i.e. order-driven and customized) whilst activities perform before order are received (upstream the COP) are focused on efficiency (i.e. planned and standardized).

The case company regards customer service and effective management of the supply chain operations as the two most important issues to be successful in the market. There are several factors driving the focus on customer service and effective management of supply chain operations. Firstly, the case company recently changed their channel strategy from direct channels (own market units) to indirect and independent channels (sales partners and resellers) and this require a change in the way customer are served and the supply chain managed. Secondly, the case company’s move towards e-business has provided new pressures to the supply chain through new methods of order handling and increased customer service levels, such as shorter order confirmation and lead-times and improved delivery service. Thirdly, the case company’s product strategy is to sell a wide range of own labeled and OEM products to customers, implying that the supply chain needs to be designed to handle a wide and diverse range of products. Fourthly, the case company’s vision is to capture a significant share of the high growth mobile enterprise market by building and selling a portfolio of mobile enterprise products. Alpha’s supply chain plays a crucial part to facilitate the achievement of this vision. Finally, costs must be reduced for Alpha to protect its margins and profitability in light of an ever-more-competitive enterprise communications market.

Alpha has identified six major issues to deliver competitive customer service. Firstly, the most important aspect of supply is to be reliable, implying that the focus of supply is on building and maintaining the trust of customers. Secondly, customers prefer a single contact point that handles all their needs including product advice, ordering and queries. Thus, the case company has the same point of contact for all products and errands. Thirdly, there must be immediate answers/acknowledgements to question and strong customer communication and responsiveness. Fourthly, customers need to know the status of their orders throughout the order process, i.e. good visibility of order and delivery processes. Fifthly, customers need a simple service offering that is competitive, easily understood and can be communicated to end-users quickly. Alpha has created “fast track functions” or standard product configurations that can be more easily and quickly ordered and delivered to customers. Finally, the most frequent and significant feedback that the case company receives from customers is the need to shorten lead-times. Additionally, there is a need to harmonies lead-times across Alpha’s product range in order that customer orders with multiple products can be delivered in full, within short lead-times.

Moreover, the case company has identified four major issues to effectively manage their supply chain operations. Firstly, customer requirement are uncertain and can never be forecasted accurately. Thus, the supply chain needs to be designed in a flexible way to meet changing demand patterns and customer requirements. Secondly, inventory is a necessary part
of achieving flexibility in the supply chain. However, inventory needs to be managed actively to ensure that inventory levels and content are optimal to achieve a balance between excellent customer service and at the same time high inventory turns. Thirdly, price competition is increasing as new lower margin products are introduced and the existing product range faces increased competition. Consequently, the costs of all supply chain operations needs to be competitive. Finally, supplier management is a key activity since the case company not performs any physical operations in-house.

Lately, Alpha has sensed that there exists a need to further differentiate their supply chain strategy, since customer preferences regarding customer service differ significantly across markets and between customers. To satisfy all major customer with differing preferences require several supply chain solutions, i.e. a differentiated supply chain strategy. Thus, Alpha recently has initiated a project to identify the possibilities to further differentiate their supply chain strategy by utilizing and combining different manufacturing and delivery strategies concurrently.

So far, Alpha has developed a segmentation model based on geographical location, type of product and type of customer. Moreover, Alpha has identified several supply chain solutions they could offer to the differing customers/products segments through a number of workshops including both major customers and the case company. Basically they identified that one additional manufacturing strategy can be applied (Figure 5). For standard products with high/medium customer required lead-time and limited internal processing a Source-To-Order strategy could be beneficial.

Additionally, Alpha during the workshops identified that these manufacturing strategies could be combined with different delivery strategies to create various differentiated supply chain solutions (Figure 6). This implies that that one efficient way to develop a differentiated supply chain strategy could be to combine different supply and delivery methods into various supply chain solutions. By combining relatively few strategies it is possible to develop several differentiated supply chain solutions.
Finally, several supply chain issues have been identified. For example the customers tend to stock-keeping same articles that Alpha are stock-keeping leading to unnecessary inventory in the supply chain and increased demand variability (often standard products ordered in high volumes periodically). Highlighted issues in order to realize a differentiated supply chain strategy are increased supply chain collaboration and demand and inventory visibility. Moreover, different supply chain solutions have different cost-to-serve. Thus, Alpha has to implement differentiated service prices. It is not clear how to realize this in practice. Because this study has shown interesting results it presumably will be enlarged to include all major customers.

Case: Manufacturer Beta

Case company Beta is a Swedish manufacturer operating on international basis in the appliance industry. Their supply chain is displayed in Figure 7. The customer box in the figure can be separated into retailers and end-users. Beta conduct business with retailers while retailers conduct business with end-users. Likewise the supplier box can be separated into several tiers of suppliers. Beta has chosen to perform all manufacturing, assembly, warehousing and distribution operations in-house.

Manufacturer Beta is working in an increasingly competitive industry characterized by intense competition, increased global product standardization, and shorter product life cycles. To survive in this new environment companies need to create a truly consumer-driven organization by focusing on consumer-oriented product development (to create an efficient and effective product flow), branding (to develop a strong global brand) and supply materials and products on demand (to create an efficient and effective demand flow, SCM).

The single most important factor to supply materials and products on demand is keeping the end-user and retailer needs in focus, it is therefore vital that the total supply chain, both production and distribution, is managed in a competitive way. To a large extent, success depends on whether the case company and their supply chain are as good as or better than the competitors. This requires supply chain collaboration, first internally then with the retailers and suppliers.
Manufacturer Beta’s SCM has three major aims. Firstly, it aims to make sure that they deliver on time, as the first priority, however, it is also important to reduce unnecessary time which leads to Deliver On Time - In Less Time. Secondly, it is supposed to contribute significantly towards improving value creation. For example, it aims to increase sales by making products available on time and to decrease costs and waste in the supply chain. Finally, innovation is critical to the success of new products, without new features based on consumer needs they will not be in a position to succeed in the market. However, innovation should not only be restricted to the products, it should also be applied to customer service since the case company offer retailers products and service. Their SCM can be separated into two sub-processes, i.e. supply chain design and supply chain operation, and focuses on meeting end-users needs while minimizing both the capital tied up in operations and the cost required to fulfill customer demand. In other words, their SCM concerns development and management of supply chains. Below the supply chain design part of SCM will be described in more detail.

The supply chain design step is a planning activity consisting of three steps, firstly the case company identify how their end-users via retailers would like to acquire their products (i.e. understand the market they serve). This is achieved through consumer insight where major information that can affect their service to the retailers is collected. Retailers have a number of characteristics that need to be considered before deciding how to serve them, such as:

- **Product Range**: which products does the retailer purchase?
- **Lead-Times**: which lead-times does the retailer require for the demanded products?
- **Sales Channel**: can the retailer be grouped together with other retailers into a sales channel that describe their approach to business to business and in turn affect demand patterns?
- **Delivery Location**: where does the retailer want us to deliver the demanded products?
- **Volumes**: how much of the demanded product does the retailer purchase?
- **Shared Data and Collaboration**: is the retailer willing and able to share data and collaborate?

Secondly, they have to understand their capabilities to serve the retailers (i.e. the market) regarding their production and delivery system capabilities to produce according to demand. This includes the capability of the suppliers to supply the production system, it is also important to appreciate the capability of the distribution system to deliver the output from the factories (i.e. production system). Finally, when those steps have been completed the case company can design various approaches to serve the end-users via the retailers, commonly referred to as supply chain solutions. They may even have more than one solution for each retailer, for example in the case of supplying both their own labeled products and the retailers branded products (also known as OEM products or ‘private labels’).

A supply chain solution is a combination of a supply method (manufacturing strategy) reflecting the production system capabilities, and a delivery method (delivery strategy) reflecting the delivery system capabilities. Combining a supply method and a delivery method into a specific supply chain solution creates freedom of choice while at the same time maintaining the efficiency of operations in the production and delivery system, Figure 8 illustrates some possible combinations.
One applied supply chain solution within the case company combines the supply method MTS with the delivery method self collect. This implies that the case company produces in advance according to a demand plan and stock-keeping until the retailer collects the goods themselves from one of their factories or Regional Distribution Centers (RDC). Self-collection needs to be implemented carefully to maintain loading efficiency in the RDCs. Another employed supply chain solution combines the supply method MTO with the delivery method factory direct. This solution is used when retailers order a number of weeks in advance, which enables the case company to produce and deliver to a specified date and time. Orders are normally in the form of full truckloads dispatched direct from the factory to a retailer (i.e. deliver method factory direct). Another utilized supply chain solution combines the supply method MTS with the delivery method home delivery. This solution implies that the case company on the retailers request physical bypass of their distribution network and deliver direct to the consumer’s home. This delivery method is normally combined with other services such as installation and removal of old products. One more applied supply chain solution combines the supply method VMI with the delivery method factory direct. This implies that the case company is responsible for the inventory of their products within the retailer’s warehouses i.e. responsible for calculation of delivery dates and quantities. Deliveries are normally in the form of full truckloads dispatched direct from the factory to a retailer (i.e. deliver method factory direct). It is an advanced supply chain solution that involves a great deal of close partnering and collaboration, including total sharing of data and regular communication.

Each supply chain solution has different cost implications for the case company and the retailer. One solution might be more expensive for them, but cheaper for the retailer and vice versa. It is also important to appreciate the cost to serve for a particular retailer when judging its profitability.

**Discussion**

Globalization has made supply chain design and operation a more complex task, since it provides additional management challenges and new practices in which supply chains are designed and managed. Firstly, globalization allows firms to exploit economies of scale (i.e. specialization, standardization and centralization) by manufacturing and delivering volumes worldwide. Globalization has also made markets more complex and fragmented, due to increased competition, increased demand variability, increased product variety, more
customized products, and shortening product life cycles. Consequently, one important issue in developing and managing international supply chains is to increase responsiveness to customer needs while simultaneously achieving cost-efficiency through specialization, standardization and centralization.

One proposed strategy for dealing with the increased demand variability, increased product variety and customization (i.e. fragmented and complex markets), which also exploit the advantages of globalization, is postponement. Indeed, postponement of certain supply chain activities until orders are received (e.g. switch from MTS environment to ATO) will enable companies to create a cost-efficient and responsive supply chain. However, one type of postponement strategy is certainly not the best option for all markets. Instead, companies need to employ different manufacturing and delivery strategies concurrently (i.e. develop a differentiated supply chain strategy) to satisfy differing customer needs in various types of non-coherent business environments. Additionally, it has been highlighted elsewhere that reason for differentiated supply chain strategy could arise from uncertainty and different political system (Strategic Direction, 2006).

This research has shown that different manufacturing and delivery strategies need to be used concurrently in international manufacturing related supply chains to be successful in the market. Case company Alpha seems to decide either to select MTS or ATO approach whilst case company Beta seems to decide either to select MTS or MTO approach. Moreover, this research has shown that one efficient method to develop a differentiated supply chain strategy is to combine different manufacturing and delivery strategies into various supply chain solutions. By combining relatively few strategies one could develop several differentiated solutions. The development, requirements and opportunities of a differentiated supply chain strategy is discussed in more detail below.

**Development of a Differentiated Supply Chain Strategy**

This research shows that a differentiated supply chain strategy basically can be developed through the following four steps:

1. Developing a segmentation model,
2. Understanding the market we serve,
3. Understanding the capabilities to serve the market,
4. Developing necessary supply chain solutions.

Firstly, the company needs to identify what kind of parameters that affect the selection of the most appropriate supply chain strategy and then develop a segmentation model based on these. This segmentation model could first be developed based on company knowledge and later altered according to customer requirements. Example of possible segmentation parameters are geographical location, type of customer and type of product. For example, the company could develop a market/customer segmentation model by first distinguish the major geographical location where they conduct their business. After that the company could cluster similar customer and/or products into customer/product segments within each of the geographical locations. Similar customer/products imply comparable demand and supply characteristics. Secondly, the company needs to identify what kind of supply chain solutions their customers prefer? In other words, identify how their customers would like to acquire products from them within the identified customer/product segments. The customers perhaps prefer “one-size fit all” supply chain strategy that handle all products in a similar way, or different solutions depending on segmentation category. For example, standards products supplied and delivered according to one whilst customized products are supplied and delivered according to another.
In this step collaboration with marketing is crucial since they possess the knowledge on how customer needs are identified and how customer value is created. Thirdly, the company needs to find out what kind of supply chain solutions they can provide, both existing and possible. In other words, identify their capabilities to serve the customers, i.e. the market, which implies definition of their production system and delivery system capabilities. Finally, the company needs to find out what kind of supply chain solutions they should provide to satisfy all major customer/product segments, and to what price. To satisfy all customers it could be necessary to develop a number of solutions in each customer/product segment. However, each solution could be used in several segmentation categories. The development of differentiated supply chains solutions is one way to make sure that highly varying needs of local and differing markets are meet at the same time as the achievement of economies of scale through centralization and standardization.

Requirements for a Differentiated Supply Chain Strategy

This research has highlighted several requirements for utilization of different manufacturing and delivery strategies concurrently in international supply chains. Firstly, the requirement of supply chain collaboration is in this case even higher than normally since a differentiated supply chain strategy will involve more supply chain partners. Both the case studies have highlighted supply chain collaboration as a major issue in developing a differentiated supply chain strategy. Secondly, there is a need to developed differentiated service prices based on the solutions differing cost-to-serve. As highlighted in this paper this is not an easy task and has to be researched further. Finally, more integrated information systems are needed along with decision support tools. Both the case studies in this paper shows that demand and inventory visibility along the supply chain are important and this require some type of integration between the supply chain partners information systems.

Opportunities of a Differentiated Supply Chain Strategy

This research has also highlighted several opportunities of a differentiated supply chain strategy. Current theories concerning selection of appropriate supply chain strategies seem to neglect the possibility to compete through logistics in a more comprehensive way. Following the tradition, marketing sets the strategy (what to sell, where to sell, how to sell) and SCM execute this strategy. In other words, SCM build up appropriate supply chain capabilities and advantages according to the marketing strategy. However, as end-users wish for more customized products likewise they could prefer more customized supply chain solutions and perhaps be willing to pay more for this. Additionally, there is a trend towards commoditization in many industries, resulting in customers perceive little difference between products. This implies that brand loyalty dwindles and competition through logistics (i.e. customer service) becomes a major determinant of success. This implies that companies in order to stay competitive must enhance customer value by making the product worth more in the eyes of the consumer by adding value to the core product through inclusion of customer desired customer service. When developing differentiated supply chain solutions companies not only looks for efficiencies, i.e. how can we achieve a lower cost per item, but also on effectiveness, i.e. are we distributing products at a profit-maxing price. Revenue generation, not cost, is the key driver and the main goal is to develop customer-oriented supply chains. This requires closer integration with marketing since they possess the knowledge on how customer needs are identified and how customer value is created. Logisticians need to be involved in the product development process and when future products are developed supply chain design should be address in parallel since this in an equally important topic.
Conclusions

This paper has shown that companies in order to satisfy differing customer needs in various types of non-coherent business environments needs to develop a differentiated supply chain strategy. One efficient way to develop a differentiated supply chain strategy is to combine different manufacturing and delivery strategies into various supply chain solutions. By combining relatively few strategies one could develop several differentiated supply chain solutions. Moreover, this paper highlights requirements to realize a differentiated supply chain strategy, such as extended supply chain collaboration, differentiated service prices based on differing cost-to-serve, and integrated information systems and decision support tools.

An interesting aspect for further research would be to study the delivery performance and customer satisfaction before and after implementing a differentiated supply chain strategy. Furthermore, this research has shown there are several requirements of a differentiated supply chain strategy and these have to be further investigated. Firstly, a differentiated supply chain strategy require more and improved supply chain collaboration due to the fact that a differentiated supply chain strategy will involve more supply chain partners. The realizing of improved and increased supply chain collaboration in differentiated supply chains has to be studied further. Moreover the requirement of more integrated information systems and advanced decision support tools has to be studied further.

References


