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# **I Introduction to Postponement and E-commerce**

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*In this chapter, the reader will be introduced to the topics of postponement and e-commerce, their background and the associated problem discussion. This problem discussion will both narrow down the topic and be the ground for the purpose of the thesis, which will be presented at the end of the chapter.*

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## **I.1 Postponement and E-commerce: Background**

In today's world, customers have become increasingly demanding as they seek for more and more customized products. Therefore, companies have been forced to take action to stay competitive (ReVelle, 2002). A shift many of them made to counter shorter lead-times, and at the same time to neutralize high levels of uncertainty, was implementing postponement strategies (Harrisson & Skipworth, 2004). Although the concept of postponement itself is not new, as its practical application can be traced back in 1920, only from 1960s it started to appear in the academic literature (Pagh & Cooper, 1998). Numerous definitions explaining what postponement consists of can be found within the literature. According to John Gattorna (1998), postponement calls for a reconfiguration of the product and its design process, which eventually helps to counteract uncertainty factors paralyzing the supply chain. Another viable definition presents postponement as an action that delays an activity (or several) in the supply chain until the information about the market becomes available (Yang & Burns, 2003). The processes that are delayed must be crucial and they have to assume specific functionalities, features or identities (Gattorna, 1998). In other words, postponement occurs as soon as consumers become involved, directly or indirectly, into the design/manufacturing process. They consequently exert an influence onto the final product. It is important to stress the role information occupies, since it must be captured quickly and accurately in order to be beneficial (Gattorna, 1998). Hence, companies are forced to think beforehand which components will be modular, standard and customizable (Yang & Burns, 2003). The aim of implementing a postponement strategy for a company is to ensure a wide array of products is available to their customers, while allowing their costs to be kept as low as possible (Harrisson & Skipworth, 2004).

A very diverse base of companies have made use of postponement strategies to offset uncertainty: Hewlett-Pack (HP), Dell computer, Motorola, National bicycle industry company, Toyota, Zara or Benetton, just to mention a few (Yang & Burns, 2003). The undertaken changes that were needed to implement postponement strategies have inevitably engendered the re-engineering of their supply chains (Gattorna, 1998). The old Make-To-Stock (MTS) strategy, although widely spread, feels nowadays outdated since forecasts are becoming too complex (Yang & Burns, 2003). Thus, the production and the storage of finished goods generate important risks, such as stock-outs or obsolescence, which are too high to be born by companies (Yang & Burns, 2003).

While traditional companies were refreshing their utilization of postponement, e-commerce companies started to emerge at the beginning of the '90s. They have kept on growing quickly from 2000 to today (Schneider, 2011). The term e-commerce itself refers to any online commercial activity that focuses on commodity exchanges, this through electronic means (Qin, 2011). Amazon, eBay, Dell, just to mention a few, are companies that have exploited wisely opportunities the Internet had to offer (Schneider, 2011), as it is acknowledged the Internet has been responsible for marked changes within business operations and consumers habits (Reynolds, 2004). Narrowing down e-commerce to the Business-To-Consumer (B2C) sector, the market observed an increased in sales by 620%, namely going from \$50 billion in the year 2000 to \$360 billion in 2011 (Qin, 2011). This figures highlight

the importance the B2C market occupies for companies, underlining the fact that such a market cannot, not to say must not be sidelined by retailers and manufacturers. In addition, it emphasizes the rapid evolution the market went through, and it comforts the choice of investigating this very area.

## **1.2 Problem**

The main goal of postponement is to minimize the impacts of uncertainty, so that costs are kept as low as possible. Although it has been found that many researches address the numerous concepts of postponement through different angles (definitions, advantages vs. drawbacks, applicability), certain areas remain unexplored. The use made of postponement strategies, and this within e-commerce, is one area that has gained little attention in academic literature. It is therefore important to explore the employment of postponement in this field, and look at how previous literature relates to it.

Boone, Craighead, & Hanna (2007) are researchers, among others, who have investigated the various concepts of postponement and how companies should determine which type of postponement to apply. Their research presents a matrix, based on supply and demand uncertainty, which connects supply chain characteristics and postponement strategies. Their framework, however, does not guide companies concerning how to choose the most suitable level of postponement. For some supply chains, the authors concluded: *"Agile supply chains are high on both supply and demand uncertainty...all postponement strategies would appear to be appropriate in this situation. The problem then becomes which one is the most appropriate?"* (Boone *et al.*, 2007, p. 606). Skipworth & Harrison (2004) developed a theoretical framework that looks into whether Form Postponement, Make-To-Stock (MTS) or Make-To-Order (MTO) strategies must be applied. A major drawback of the framework was that it only focused on Form Postponement, therefore appearing as a framework not usable in order to help in choosing the appropriate postponement strategy. Yang, Burns, & Backhouse (2004) developed a framework that gives companies guidelines concerning what elements are to be considered before implementing a postponement strategy. Still, their framework also lacks guidelines to advise companies regarding which postponement strategy they should opt for. The only framework found that addressed this point thoroughly was created by Pagh & Cooper (1998). They incorporated several determinants meant to help traditional businesses determine the most suitable postponement strategy. Nevertheless, since their framework was developed 14 years ago, it seems relevant to explore whether or not their advocated determinants can also be applied to e-commerce companies.

The literature contains various researches that investigate the different postponement strategies. However, it seems to be missing guidelines in regards to how companies should select the strategy that suits them the best (Gattorna, 1998). This especially applies to e-commerce companies, as no studies addressing this very topic have been found.

### **I.3 Research Purpose**

With an increasing demand for customized products, companies have to adapt their supply chains in order to meet short lead-times and to prevent costs from increasing. On the one hand many studies have explored postponement for non-e-commerce companies, whereas on the other hand little attention has been paid concerning postponement and e-commerce companies.

**The purpose of this study is to explore (1) which factors determine whether e-commerce companies use postponement, and (2) which determinants are responsible for their strategy selection.**

By fulfilling this purpose, the authors hope to contribute to the academic literature by providing a framework e-commerce companies can use to determine which postponement strategy would suit them the best. Furthermore, the authors also hope to contribute by relating the existing literature on postponement to e-commerce. This contribution intends to approve, or disapprove, postponement applicability to e-commerce companies.

### **I.4 Structure**

The structure of this report is as follows: section two will contain the frame of reference, while section three will present the methodology. In section four, the empirical data will be discussed, while section five will comprise the analysis of the empirical data and its connections with the theories. Eventually, while the end of section five will present a discussion concerning the findings, section six will portray a conclusion holding contributions and future research suggestions.

## 2 Frame Of Reference

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*In this chapter, the authors will present the relevant theories to the purpose of the research. The first part will concern postponement, its definitions and its employ. The second part will present an important framework to the thesis, and the third part will highlight the importance of the decoupling point. The fourth part will introduce e-commerce, its definition, its nature and its logistics perspective. Eventually, a synthesis of all presented theories will be provided, from which the Research Questions will be developed.*

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### 2.1 Strategies and Definitions of Postponement

The postponement strategy has been defined as “*a dimension of sequence and timing based on the concept of substitutability, subsequently maintaining the opportunity of interchangeability and irreversibility*” (Yang, Yang, & Wijngaard, 2007, p. 972), as well as “*moving its point of differentiation further downstream*” (Davila & Wouters, 2007, p. 2246). Yet, another definition exists: “*Postponement is a strategy to intentionally delay activities, rather than starting them with incomplete information about the actual market demands*” (Yang, Burns, & Backhouse, 2005, p. 992). For this study, the definition of Yang *et al.* (2005) is taken as the main definition. This definition is easy to understand, while focusing on the most important aspect of postponement, which is the fact that some activities are intentionally delayed to a later point in time.

The strength of the postponement strategy resides in the change/postponement of sequence of activities (Yang *et al.* 2007), as the “*risk and uncertainty costs are tied to the differentiation (form, place and time) of goods*”(Yang *et al.* 2007 p.2076). These costs can be reduced or eliminated due to the postponement of differencing activities until customer commitments have been obtained (Yang *et al.* 2007). The choice to delay activities, rather than proceeding without sufficient information, enables companies to be more flexible in where and how to design, produce, and distribute their products (Yang *et al.* 2004).

Within the literature, several benefits linked with the employment of postponement are argued: lower inventory, less stock-outs or costs of obsolete products are some of the advantages postponement has to offer (Yang *et al.* 2004). However, challenges and drawbacks are also present: increased needs for coordination within the supply chain (Pagh & Cooper, 1998), increased costs of logistics (Pagh & Cooper, 1998) or the risk of degradation of quality and cannibalism due to standardization of product components (Yang *et al.* 2004). Benefits and drawbacks differ depending on which postponement strategy a company chooses to apply. In the following sections, those different types of postponement will be discussed.

#### 2.1.1 Full Postponement

The full postponement, defined by Gattorna (1998, p. 80) “*refers to making the decoupling point earlier in the process*”, meaning that few steps of the design process will be performed under uncertainty and forecasting. At the same time, it decreases the necessary stock of semi-finished goods. For this postponement strategy to be successful, the processes have to be designed in such a manner that less differentiating steps can be performed prior to the decoupling point (Pagh & Cooper, 1998; Gattorna, 1998). This will increase the forecast accuracy, which is a key success driver for the full postponement strategy to be profitable. The steps after the decoupling point have to be performed in a flexible and fast way, so that the customer is served quickly. It is also important that customer orders are captured correctly, as they initiate the steps after the decoupling point. An order that is captured incorrectly/incompletely will lead to a product that does not fulfill the customers’ expectations (Pagh & Cooper, 1998; Gattorna, 1998).

### **2.1.2 Logistics Postponement**

The definitions of the logistics postponement vary. In some articles, the logistic postponement refers to the movement of finished goods (Yang *et al.* 2007). In other articles, it is referred as semi-finished goods only (Gattorna, 1998), where the last differentiating stages are performed at the warehouse/distribution center (DC). Gattorna (1998) refers to stages such as labeling, packaging and assembly. Those delayed processes allow a product to be centrally stored and customized according to local market specificities when a customer order is received. According to Pagh & Cooper (1998), manufacturing processes are based on speculation, and logistics processes are customer-order initiated.

This strategy also allows companies to store inventory at a centralized and strategic location. Hence, inventory is reduced as well as available in the right place, at the right time (Yang *et al.* 2004). In addition, this centralization can also improve customer responsiveness (Yang *et al.* 2004). Some companies applying logistics postponement choose to store the inventory upstream in the supply chain. Usually, it is done at the manufacturer's warehouse, consequently shipped straight from the manufacturer to the customer (Yang *et al.* 2007; Davila & Wouters, 2007; Pagh & Cooper, 1998). Opportunities offered by the logistics postponement lie in the movement of the final product (Yang *et al.* 2007).

The logistics postponement can help companies improve their on-time deliveries of complete orders, have reliable and shorter lead times, introduce new products faster, reduce inventory costs, and stabilize transportation costs (Pagh & Cooper, 1998). However, companies must ensure that the entities performing the postponed steps have the adequate knowledge and capabilities. Besides, the postponement of those steps must not lead to degradation. A drawback the logistics postponement has is that the shipping costs may increase as the products are shipped in smaller quantities, using faster modes in order to decrease lead-time (Pagh & Cooper, 1998).

### **2.1.3 Manufacturing Postponement**

The manufacturing postponement focuses on designing the products, so that they are kept undifferentiated for as long as possible (Yang *et al.* 2007; Davila & Wouters, 2007; Yang *et al.* 2004; Skipworth & Harrison, 2004; Gattorna, 1998). This decreases inventory since components can be used for multiple products (Yang *et al.* 2007; Skipworth & Harrison, 2004). Concerned processes can be labeling, packaging, assembly or manufacturing (Davila & Wouters, 2007; Skipworth & Harrison, 2004; Pagh & Cooper, 1998). The manufacturing process is re-designed to allow processes not differentiating the product, and based on forecasts, to be completed prior to the customer order decoupling point (CODP). The processes that differentiate the product are placed after the CODP, and they are customer-order initiated. For instance, Benetton placed the dyeing process of its clothes after the knitting process, allowing a more accurate demand of colors (Gattorna, 1998).

There are three formalized approaches to the manufacturing postponement: (1) standardization, (2) modular design, and (3) process restructuring. The standardization is done in the design stage of the products, designing them in a manner that makes components be the same for multiple products (Davila & Wouters, 2007; Yang *et al.* 2004). However, too much standardization reduces product differentiation, and finally leads to cannibalism (Yang *et al.* 2004). The modular design has two forms: modularity in design and modularity in production. The modularity in design relates to the boundaries of a product and its components, which are designed in such a way interdependencies among features and tasks are avoided between specific components design (Yang *et al.* 2004). It means that a change in one component does not impact or/and require changes in other components (Yang *et al.* 2004).



The modularity in production concerns complicated products, developed and designed at different sites, and brought together later to create the complete system (Yang *et al.* 2004). This means designing a production system made of sub-processes, which can be performed concurrently or/and in a different sequential order (Yang *et al.* 2004). The process restructuring aims at moving the differentiation activities to a later stage (Davila & Wouters, 2007).

The application of the manufacturing postponement has increased with the use of third-party logistics (TPLs) providers. The TPL can perform diverse postponed steps, such as labeling, assembly, packaging or light manufacturing, at a competitive price and quality (Pagh & Cooper, 1998). Its application, however, increases coordination needs. A tradeoff exists between lower inventory cost, and the cost of increased coordination (Pagh & Cooper, 1998). The customer order process does also increase in terms of costs and complexity, and there can be a loss of economies of scale (Yang *et al.* 2004; Pagh & Cooper, 1998). The upside, on the other hand, is that product variety increases. There will be less inventory, saving costs and simplifying inventory planning and management (Pagh & Cooper, 1998).

#### **2.1.4 Full Speculation**

The full speculation is the opposite of postponement of any form (full, logistics or manufacturing). The full speculation strategy can, in one way, be compared to a MTS production strategy. In this strategy, all manufacturing operations are performed without any involvement from the customer (Pagh & Cooper, 1998). The product is distributed in a decentralized way, often in large volumes. Therefore, those large volumes allow using economies of scale, this at several points in the supply chain (Pagh & Cooper, 1998). Additionally, the products will be stored closer to the customer, which can be considered advantageous as lead-time to customer decreases. However, this can also be considered as a disadvantage since it increases the investment in inventory and warehousing space. Finally, this can also lead to obsolete products, or a need to ship products between warehouses (Pagh & Cooper, 1998). For this strategy, the CODP is at the very end of the supply chain, and no customization is possible.

## 2.2 Pagh and Cooper's Framework

Pagh & Cooper (1998) fostered that three components affect the way a postponement strategy should be structured and adopted: the product, the market and demand, and the manufacturing and logistics system. The framework is presented visually in figure 2.2. and below each of the three components will be discussed in more details.

The concept of the profile analysis						
Some important P/S- decision determinants			Generic P/S-strategies			
			The full speculation strategy	The manufacturing postponement	The logistics postponement strategy	The full postponement strategy
P r o d u c t	Life cycle	Stage	Introduction	Growth	Maturation	Mat/Decline
		Volume	Low/Med	Med/High	Med/High	Low/Med
		Cost/service strategy	Service	←————→		Cost
	Product characteristics	Product type	Standard	←————→		Customized
		Product range	Narrow	←————→		Wide
	Value	Value profile	Initial stages	←————→		Final stages
		Monetary density	Low	Low	High	High
		Relative delivery time	Short	←————→		Long
	Market and demand	Delivery frequency	High	←————→		Med/low
		Uncertainty of demand	Low	←————→		High
Economies of scale		Large	Small	Large	Small	
Manufacturing & logistics	Special capabilities	Yes	No	Yes	No	

Figure 1 The concept of the Profile Analysis source: Pagh & Cooper, 1998

### 2.2.1 The product Features

Within the product category, there are three subcategories that Pagh & Cooper (1998) mention, namely the product life cycle (PLC), the product characteristics and the value. In this part, each of them will be discussed in more details.

#### The Product Life Cycle

The life cycle of a product highly matters when applying a postponement strategy, as needs evolve all along the four distinct stages composing the product life cycle; introduction, growth, maturation and decline. For instance, in the introduction stage, a speculation strategy will be more adequate. As demand uncertainty is high, it leaves little room for the use of postponement. In addition, volumes need to be taken into consideration. For instance, the manufacturing postponement strategy must be prioritized when products are of high volumes. However, the full speculation strategy and the full postponement strategy are advised for products of low volume. Also, the strategy focus needs to be aligned given the postponement strategy: whereas particular attention to customer service must be paid into the first two stages, then operations aimed at reducing costs must be envisaged for the two remaining stages.

## **The Product Characteristics**

The product characteristics exert a non-negligible influence on the choice of a postponement strategy. The authors of the framework have divided them into 2 subcategories: product range and product type. Standardized product, combined with narrow product range will benefit from the speculation strategy, whereas customized product and wide product range must take advantage of the full postponement strategy.

## **The Value**

Value profile and monetary density are two important components of the determinant product characteristics. The monetary density represents the ratio between dollar-value of a product and its weight/volume. It is acknowledged products of a high value are quite expensive to store, while remaining easy to move. Therefore, companies must postpone as far as possible the final logistics operations. The contrary applies to products of low value, which tend to be inexpensive to store, but expensive to transport. The value profile of a product refers to when and how the product value occurs between the manufacturing and the logistics operations. It is wise to postpone all operations that produce value as far as possible in the design process.

### **2.2.2 The Market and Demand**

The determinant market and demand is characterized by three subcategories: the relative delivery time, the delivery frequency and the demand uncertainty level. The three subcategories will be discussed below.

#### **The Relative Delivery Time and Frequency**

The relative delivery time represents the average delivery time to customers in proportion to the average time for the manufacturing and the delivery process. It has to be closely connected to the delivery frequency, which represents the average delivery frequency to customers in proportion to the average manufacturing and delivery cycle time for the same product.

#### **The Uncertainty Level**

The level of demand uncertainty must also be put forward. Products are either functional or innovative (Fisher, 1997), having respectively a low demand uncertainty with a long life cycle, or a high demand uncertainty with a short life cycle.

### **2.2.3 Manufacturing and Logistics**

The determinant manufacturing and logistics system is composed of two subcategories: the economies of scale and the special capabilities. In this part, each of them will be discussed in more details.

#### **The Economies of Scale**

The economies of scale refer to actions taken in order to benefit from either small or large economies of scale. For instance, it is worth highlighting a small use of economies of scale

is to be made for the full postponement strategy, whereas the contrary applies in case of a speculation strategy.

### The Special Capabilities

The special capabilities concerns any specific/unique knowledge/capability a company may possess, which would significantly influence the way manufacturing and logistics are handled. For instance, the Coca-Cola Company possesses the undisclosed recipe for its famous soft drink, therefore shaping specifically how both the manufacturing process and the logistics are completed.

## 2.3 Postponement and The Customer Order Decoupling Point

The customer order decoupling point (CODP) is where the forecast-driven-production, based on speculations, is separated from the customer-order-driven production (Wang, Lin, & Liu, 2010). The CODP position is defined for each product based on the companies' need to be productive or flexible (Rudberg & Wikner, 2004). By positioning the CODP further down in the supply chain, the emphasis is put on effective productivity to lower costs, as it is the competitive priority. When the CODP is placed upstream, a higher degree of flexibility can be achieved (Rudberg & Wikner, 2004).

There are four main classifications of where the CODP point is positioned, as shown in figure 2 In the Make-To-Stock (MTS), the CODP point is almost at the end of the Supply chain, while at the Engineer-to-order (ETO), it is at the very beginning. The Make-To-Order (MTO) and Assemble-To-Order (ATO) are in between (Wang *et al.* 2010).

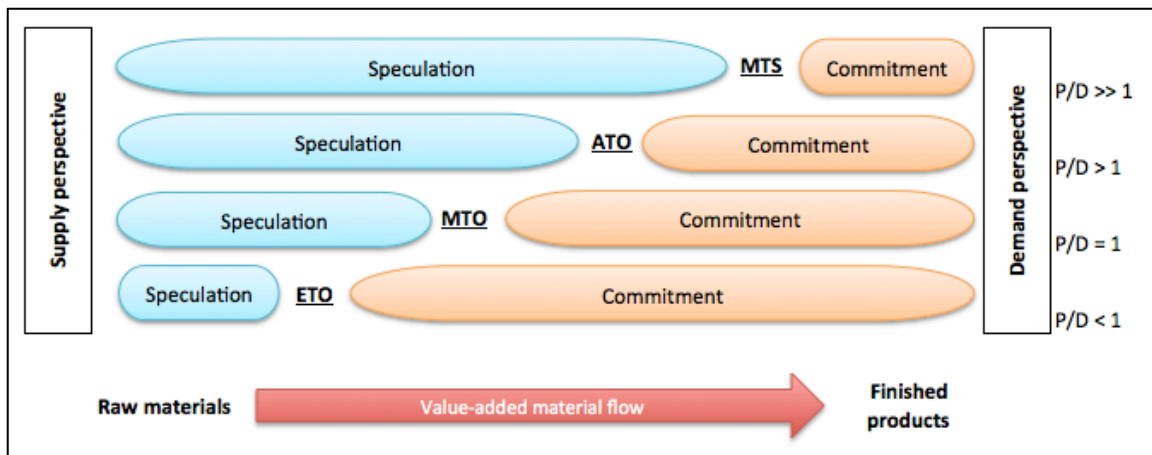


Figure 2 Customer Order Decoupling Point Source: Rudberg and Wikner 2004

The role of postponement in the CODP can be viewed in figure 3, which Yang and Burns adapted from Lampel & Mintzberg (1996) (Yang & Burns, 2003). The figure divides the speculation and postponement activities as well as the standardization and customization activities. The activities in blue color is standardized and those in orange are customized, as more information is available. With postponement, the decoupling point is moved closer to the end-user in order to increase the supply chains efficiency and effectiveness. There is, however, still a challenge for firms to find the optimal balance of standardization of upstream activities and postponement of downstream activities until demand is known (Yang and Burns, 2003).

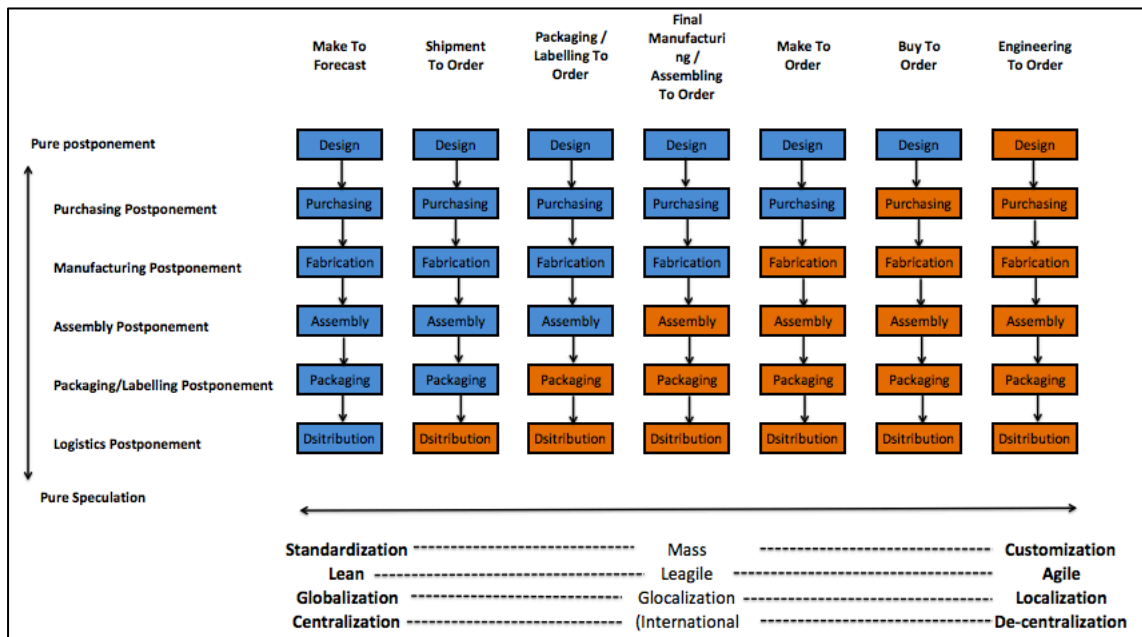


Figure 3 Customer Order Decoupling Point and Postponement Source: Yang and Burns 2003

## 2.4 E-commerce and Distribution Channels

### 2.4.1 Definition and Nature of E-commerce

Within the literature, electronic commerce (e-commerce) and electronic business (e-business) are sometimes used interchangeably. However, there are distinct differences between the two concepts. E-commerce is defined as “*all electronic mediated information exchange between an organization and its external stakeholders*” (Chaffey, 2002, p. 5). This includes the “*process of buying, selling, or exchanging products, services, or information via computer networks*” (Turban, King, David, McKey, & Lee, 2010, p. 760). E-business has a much wider definition: “*all electronically mediated information exchange, both within an organization and with external stakeholders supporting the range of business processes.*” (Chaffey, 2002, p. 8). This includes the adaptation of information communication technology (ICT) into the companies business operations, and potentially a redesign of business processes around ICT’s (Chaffey, 2002).

E-commerce can be divided in multiple subsections: Business-To-Business (B2B), Business-To-Consumer (B2C), Business-To-Government (B2G) as well as internal business interactions (Helms, Ahmadi, Jih, & Etkin, 2008). Within this study, the focus will be upon the B2C e-commerce, as this business has to provide customized products to a large amount of individual customers, and therefore an application of postponement can be envisaged at some level.

E-commerce has changed the way businesses are structured, while revolutionizing the way goods are processed, sold and distributed (Eno Transportation Foundation, Inc, 1999)). When e-commerce was first introduced, new companies focusing only on “dot com” businesses emerged. However, many of them did not survive for long, due to different difficulties: the technology was not developed enough, the loading times for webpages were too long, and not enough customer adapted into this new way of consuming. A major factor, responsible for the bankruptcy and end of early dot com companies, was poor logistics management. Companies had focused on developing attractive web sites, but they did not develop operations management capable of carrying out businesses (Van Hoek, 2001; Simchi-Levi & Simchi-Levi, 2002).

## 2.4.2 E-commerce Distribution

In the new era of electronic commerce, the distribution channel has been re-organized. In the traditional distribution channel, there are supplier, distributor, retailer and customers, creating value (Gallaugh, 2002). However, with the new way of doing business, the distribution channel has taken new forms, eliminating one or more organizations in the distribution channel, namely disintermediation (Gallaugh, 2002; Turban *et al.* 2010; Yannis, 2001). With the disintermediation, organizations such as the distributor or the retailer can be cut out, hence saving cost for the supplier/manufacturer. Figure 2.4.3.1 shows an example of the new distribution channel. When disintermediation occurs, organizations have to ensure that the value created by eliminating organizations equals, or exceeds the value that was previously provided by the intermediaries (Gallaugh, 2002). If the value of the new distribution channel does not fulfill the old value, there will be a value gap. This can unfortunately lead to failure. In the case of value decreasing due to a disintermediation, the e-commerce organization needs to re-intermediate new or old organizations that will fill the value gap (Turban *et al.*, 2010). E-commerce organizations can be categorized based on which distribution channel they use, there are five distinct categories according to Turban *et al.* 2010: (1) direct marketing by mail-order retailers that go online; (2) direct marketing by manufacturers; (3) Pure-play e-tailers; (4) click-and-mortar retailers; and (5) internet (online) malls.

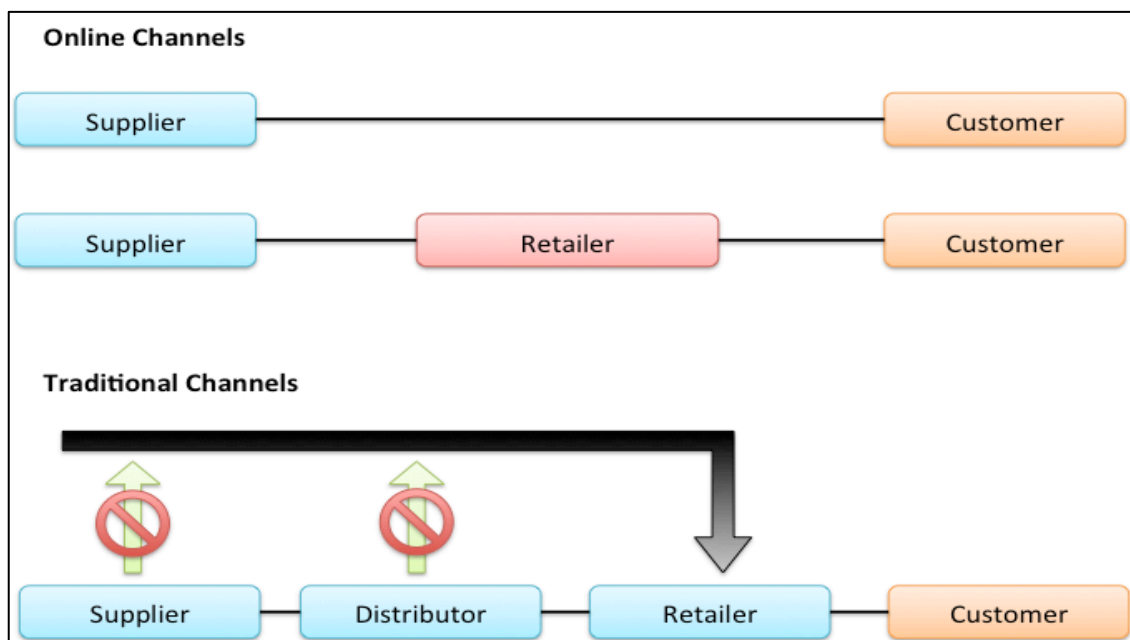


Figure 4 Distribution channels for E-commerce Source: Turban et al. 2010

**Direct marketing by mail-order retailers that go online:** are e-commerce that leave out the intermediaries, such as wholesalers or retail distributors. The manufacturer connects directly with the customer and receives the details of the orders. They may have physical stores, but they are mainly direct marketing distribution channels.

**Direct sales/marketing by manufacturers:** are manufacturers that take the opportunity to get closer to their customers and to be able to apply a high degree of customization, this throughout a high customer involvement. These companies sell directly from their sites, but also from their stores and via retailers.

**Pure-play e-tailers:** are firms that do not have a physical sales channel, hence sales are performed over the Internet. The lack of presence in physical sales channels is due to spe-

cialization (niche) of products, which makes it impossible for the firm to keep inventory of products at each location given the small customer base.

**Click-and-mortar retailers:** have developed from two types of organizations: (1) physical sales channels that expand their operations into the online market from mortar-only; and (2) successful online sales companies that expand their operations into the physical market from click-only. They sell from both their physical stores and online web stores.

**Internet (online) malls:** contains a large number of independent storefronts that operate together in some way, either simply by “referring directories” where the customer is redirected to the specific storefront once clicked. It can also be more collaborative, where the customer can place an order at the shared service site.

### 2.4.3 E-commerce Order Fulfillment

In the e-commerce business, it is important for companies to be able to live up to their promises, therefore an effective order fulfillment strategy is necessary. The different strategies vary in the literature, i.e. drop shipping, mail order shopping, national distribution. The different strategies have pros and cons, and it is important to evaluate which one suits the product the best. For this paper, the authors have decided to discuss five terms of fulfillment, mentioned by Langley, Coyle, Gibson, Novack, & Bardi (2008) as well as by Ricker & Kalakota (1999), (1) Distribution delivery centers; (2) Partner fulfillment operations; (3) Dedicated fulfillment centers; (4) Third party logistics fulfillment centers; and (5) Build to order.

#### Fulfillment strategies

**Distribution delivery centers:** This approach allows the customer to place an order, either over the phone or over the Internet, and then pick it up at the closest store. This approach has high inventory costs, as companies need to keep a constant level of available products at each distribution center. However, shipping costs can be reduced as the items can be shipped together with store deliveries, and the customer performs the “last mile” by collecting it at the store.

**Partner Fulfillment operations:** In this approach, the partners of the e-commerce organization handle the inventory and distribution of goods. The e-commerce organization has no inventory, no product brands and no shops, therefore saving costs on physical assets. However, packages delivered at the customers’ homes become rapidly costly, and also it may be hard to manage partner relationships.

**Dedicated fulfillment centers:** Online retailers, such as Dell and Amazon, use today this approach. It is a good approach for low margin products as delivery costs are reduced and delivery times that are given to the customers are more accurate. There are, however, trade offs, (1) “*Low or unpredictable sales volumes*” (Ricker & Kalakota, 1999, p. 65), leading to high inventory-carrying costs. (2) “*High up front investment*” (Ricker & Kalakota, 1999, p. 65), the cost of the warehouse set up or major systems modifications, it can increase complexity but also reduce the long-term cost of operations. (3) “*Decreased flexibility*” (Ricker & Kalakota, 1999, p. 65) companies are restricted to the existing infrastructure and may have problems to be flexible.

**Third-party fulfillment centers:** A third party handles the warehousing, which can be thought of as “virtual warehouses”. This is particularly advised when companies have a high fluctuation in demand. It also provides the skills and expertise that the companies may not own, and can lease based on need. Drawbacks are the lack of national fulfillment com-

panies able to support a wide range of products, and also the pressuring demand for shorter delivery times, which forces to implement more distribution centers closer to the customer.

**Build-to-order:** It is an emerging fulfillment center strategy, which requires synchronization and management of the entire materials flow. It requires focusing less on fixed costs, and instead maximizing the throughput. Alter the flow of materials upstream is needed in a quick and proactive way since product mix and demand is affected by the demand and the requirements that are specific downstream in the process. Such a model implies a high level of collaboration within the distribution channel, in order to try to prevent costs from increasing and have the materials available at any time.

## 2.5 Synthesis - Research Model

The concept of postponement, undisputedly not new, has been thoroughly studied in recent years. However, authors in this research have provided few frameworks that are at companies' disposal, when the question in regards to "How to select a postponement strategy?" comes into play. In addition, the emergence of Internet and the e-commerce at the beginning of the 21<sup>st</sup> century has provided room for opportunities. Retailers and manufacturers can now bypass intermediaries that form traditional distribution channels, consequently allowing them to be closer to their customers.

In order to understand the relation between postponement and e-commerce, the determinants from Pagh and Cooper's (1998) framework will be used as a basis, combined with a new section "e-commerce". These determinants will then be put into relation with the different postponement strategies that exist to understand how each of them influence the postponement strategy choice.

	Product	Market and Demand	Manufacturing and logistics system	E-commerce Specificities
Full Postponement				
Logistics Postponement				
Manufacturing Postponement				
Full speculation				

Table 1 Synthesis/ Research Model

## 2.6 Research Questions

Earlier, the framework of Pagh and Cooper (1998) was presented, in this framework some determinants for the choice of postponement strategy were presented. These determinants were however developed with the regular offline business in mind. Therefore it is im-



portant to put them into relation with e-commerce. Therefore four research questions are developed to deal with this aspect.

The product, presented in the framework has three major determinants, PLC, value and product characteristics. These can be combined in different ways, suggesting whether a postponement strategy is suitable and, if so, which strategy to select.

**RQ 1: How do product features influence the choice of postponement strategy for e-commerce companies?**

The market and demand is another section in the framework, with a focus on the uncertainty of demand, and delivery frequency and time. The three determinants can interact in different ways, and thereby suggest whether a postponement strategy is appropriate, and if so, which strategy should be selected.

**RQ 2: How do market and demand characteristics influence the choice of postponement strategy for e-commerce companies?**

The manufacturing and logistics systems characteristics are a third section of the framework, comprising economies of scale and special capabilities. These two determinants, through different combinations, can suggest whether a postponement strategy is appropriate, and if so, which strategy should be selected.

**RQ 3: How do manufacturing and logistics systems characteristics influence the choice of postponement strategy for e-commerce companies?**

The focus on this research is to understand if some e-commerce characteristics exist, and how they, if found, influence the postponement strategy selection.

**RQ 4: What e-commerce specificities influence the choice of postponement strategy for e-commerce companies?**

## 3 Methodology

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*In this chapter, the reader will be provided with the methodological choices the authors made, their impact on the research, and how they were applied. First, the research approach will be discussed, then the research method presented, shortly followed by the data collection, analysis process, and evaluation of the research.*

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### 3.1 Research Approach

In order to be able to answer the research purpose and the research questions, the authors of this study first needed a research approach. Two main approaches exist, namely inductive or deductive. Nevertheless, a combination of the two was used in this paper. The inductive approach focuses on building theory (Saunders, Lewis, & Thornhill, 2007). This means data are used to build the theories, which later on can be tested in other research settings. The deductive approach, on the other hand, focuses on testing existing theory (Saunders *et al.* 2007). A mixed approach enables an approach that uses previous theories, while uncovering new theories that have not yet been identified. Perry (1998, p. 789) states, “*Pure induction might prevent the researcher from benefiting from existing theory, just as pure deduction might prevent the development of new and useful theory*”. The mixed approach was useful since the goal was to understand what determined if a company uses a postponement strategy, and what determined the strategy used. In previous researches, researchers looked at postponement and its employ, but it was in a context prior to the rapid development and expansion of e-commerce.

Explanatory studies are used when the aim is to “*establish casual relationships between variables...the focus here is on studying a situation or a problem in order to explain the relationship between variables*” (Saunders *et al.* 2007 p. 134). This is appropriate since the research regards what determines whether a company applies postponement, and what the relationship is between different determinants and postponement. Also, the authors of this study wish to explore the connections between the different determinants and the different types of postponement strategies.

A qualitative research was the most appropriate for the research purpose since this approach offered an in-depth understanding of the phenomenon. This was needed in order to understand the determinants and their relationships to both the choice of postponement and the different strategies. A quantitative approach would limit the understanding, even though a larger sample size could be used and the result would be more generalizable. The qualitative research focuses on “*uncover and understand a phenomenon about which little is known*” (Ghauri & Gronhaug, 2005 p. 110-111), as well as on its meanings (Collins & Hussey, 2003). This provides a better understanding of the underlying motivations, values and attitudes of the phenomenon.

#### 3.1.1 Case Study

Saunders *et al.* 2007 suggest that the case study approach is appropriate when the research questions concern a “*why, how or what*” question (Saunders *et al.* 2007 p.139). This is particularly true if the aim is to “*gain a rich understanding of the context of the research and the processes being enacted*” (Saunders *et al.* 2007 p. 139). This was of importance as the aim of this research was to understand how the different determinants influenced the choice of a postponement strategy for e-commerce companies. A multiple case design was applied, as the aim was to understand the reasons behind the choices of postponement strategy. This is one of the advantages of multiple-case design as it allowed the researchers of this study to compare data from different organizations. This provided them with more data within the subject, and the ability to draw more general conclusions, in comparison to one single case.

The multiple case design was useful to be able to compare whether the findings in the first case and so on could be verified within the next case (Saunders *et al.* 2007).

For this case study, the authors did not make any differentiation between companies that had virtual or physical supply chains, as long as the selected companies would operate on the e-commerce B2C sector. The authors used a holistic view, which is meant not to look at different departments, but rather to concentrate on the organization as a whole.

### **3.1.2 Selection of Study Objects**

In order to provide a valuable research, authors must carefully decide the targeted population that will contribute to their investigation (Ghauri & Gronhaug, 2005). Selected cases must correspond with the theoretical framework developed in the research (Ghauri & Gronhaug, 2005). As previously stated in this research, this meant selected cases had to be companies that were operating on the e-commerce, compulsorily on the B2C sector.

The authors made the decision to select companies that would significantly differ in terms of their size, the number of customers they are likely to serve and the level of customization they offered. The study of distinct types of businesses, which operated on the B2C e-commerce sector, aimed at providing a research that covered a panel of companies as large and representative as possible.

Once companies had been identified, the next step consisted in contacting the adequate person within their organizations. The respondents had to be capable of providing meaningful and accurate information in regards to the area the authors wished to investigate. Here, the strategic point resided in finding the right person, and not necessarily the highest one in the hierarchy (Ghauri & Gronhaug, 2005). Therefore, in the authors' research case, this was reflected through the selection of respondents evolving exclusively within the purchasing/supply chain management of the e-commerce area.

Since various industries can actually use and apply postponement strategies, the authors of this study decided to concentrate their study on the clothing industry. This meant all the cases investigated in this research were companies that distributed garments (though some also perform a part of the manufacturing process) over the Internet. Such a decision was meant to maintain consistency, and to envisage transferability of the study.

## **3.2 Interview guide**

### **3.2.1 Interviews**

Interviews were used as the mean of collecting data since this was a good way to collect qualitative data, which allowed the researchers to ask more in-depth questions compared to questionnaires (Ghauri & Gronhaug, 2005). The in-depth responses also provided the researcher with a more accurate picture of the respondent's behavior, feelings or position (Ghauri & Gronhaug, 2005; Collins & Hussey, 2003). Interviews can be conducted through phone, online media, or in person (Ghauri & Gronhaug, 2005; Sekaran, 2003). For this research, the aim was to conduct interviews in person, however when this was not possible, one of the other alternatives had to be considered, such as phone or email.

There are advantages and disadvantages of the different methods of doing the interviews. With interviews done in person, the interviewers had the advantage of being able to adapt questions, to clarify doubts and to pick up on non-verbal cues (Sekaran, 2003). The main disadvantage was the geographical restriction that face-to-face interviews entailed between interviewers and interviewee (Sekaran, 2003). Another disadvantage was the removal of an-

onymity that occurred when the respondent and the interviewers met in person (Sekaran, 2003). This meant that the selected study objects had to be within reachable distance, for the face-to-face interviews to be performed. When phone interviews were performed, the main advantage was the removal of the/or extended geographical limitation (Sekaran, 2003). The interviewee was also more anonymous, and may have felt more comfortable with this set up. Phone calls in general are also easier to terminate, as the interviewee can hang up at any time. Nevertheless, this problem did not occur as the interviewers had contacted the interviewee prior to the interview. For one case, the email approach was used, due to the respondents' request and its limited availability. This allowed one more case to be collected. Email communication does not replace verbal communication since it is much harder to elaborate on or clarify meanings of words and contexts. However, the selected respondent kindly provided the authors of this study with thorough answers. The authors were even encouraged not to hesitate to email back for clarifications, when it was necessary.

There are three types of interview forms: structured, semi-structured and unstructured (Saunders *et al.* 2007 ; Collins & Hussey, 2003). The structured interview has the advantage of asking respondents the exact same questions in the same manner, hence it is easier for the researchers to compare and analyze data afterward (Saunders *et al.* 2007; Sekaran, 2003). The unstructured interview allows researchers to go in different directions with the respondents, and to be able to uncover areas that may, or may not, be of importance to them (Saunders *et al.* 2007). For this research, the researchers wished to understand if the determinants developed by Pagh and Cooper were still valid. Thus, in this case, a structured interview could have been applied, and qualitative data on the subject be collected. However, the authors also wished to understand if there were other determinants not mentioned in the literature, which argued for the unstructured approach. Because of those two wishes, a semi-structured interview approach was applied, hence giving the authors the chance to collect data on the already established determinants, but also to be able to identify new ones.

In order to minimize data corruption, the interviewers made some important choices. For instance, before the questions were sent to the interviewees, the interviewers wrote them down and performed a small pilot test. This was done to ensure the clarity of the questions, so misinterpretations could be avoided, or questions having double meaning and multiple questions in one. It was also done in order to minimize biased questions that are filled with the interviewers own perceptions, since this can affect the interviewees' responses (Sekaran, 2003). Also, to minimize misunderstandings and clarifying uncertainties, the information was repeated and/or elaborated on through follow-up questions (Sekaran, 2003). Lastly, when the interviewees gave vague answers, the interviewers tried to break the concerned question into several smaller ones. It was done so that the interviewees would provide the researches with as much as knowledge about the subject he had. Then, the interviewers' task was pick the adequate information from the interaction created (Sekaran, 2003).

### **3.2.2 Development of Interview Questions**

In order to be able to fulfill the purpose, the research questions were developed. The four questions were the basis for the interview questions, see appendix A for questions.

RQ 1: How do product features influence the postponement strategy for e-commerce companies? This first research question was the basis for questions under the heading product, which was developed to deal with the different aspects of the product. These questions included how it was differentiated between products in the different stages of the

life cycle, how the products were sourced (high or low volumes) and the degree of customization applied.

RQ 2: How do Market and Demand characteristics influence the postponement strategy for e-commerce companies? The second research question was the basis for one question regarding market and forecasts. However, some other information related to this research question was also gathered under the distribution section.

RQ 3: How do Manufacturing and logistics systems characteristics influence the postponement strategy for e-commerce companies? The third research question was reflected in the questions regarding special capabilities and economies of scale. However, some other information related to this research question was also gathered under the distribution section.

RQ 4: What E-commerce specificities influence the postponement strategy for e-commerce companies? This fourth research question was dealt with in the additional determinants question. In this section, the authors asked for determinants that were specific to the company.

### 3.3 Data Collection

A research requires collecting primary data or secondary data. For this research, the authors collected primary data throughout interviews. Four Swedish retailers, active in the e-commerce environment were chosen as cases, and the interviews were performed. The choice of method was based on the company respondent's preference, since all of the contacted companies were within travel distance for the authors. For each company, the authors looked for interviewing the most suitable respondent. The respondents had different positions. Each interview lasted between 30 and approximately 60 minutes. The one in person was a bit longer, namely 80 minutes. However, time was spent with an in-depth discussion, and the environment was more relaxed. After the interviews were performed, the authors made a transcript of them and then summarized the answers, which was emailed to the respondent. This was done to give the respondent the opportunity to correct possible misunderstandings, and to clarify matters that seemed unclear. In table 2, the interview respondent, time and date is summarized.

Company	Respondents position	Date of interview	Interview Method	Duration of interview
Company A	Supply chain manager	10 April 2012	Face-to-face	1.20 min
Company B	Founder/business developer/financial director	11 April 2012	By Email	N/A
Company C	Responsible for the E-commerce store and physical store	12 April 2012	Phone	30 min
Company D	Purchasing manager	19 April 2012	Phone	45 min

Table 2 Interview Summary

### **3.4 Analysis Process**

The analysis process in a qualitative study can either be done in a qualitative or quantitative manner. A quantitative analysis process means that the qualitative data is transformed into quantitative data and then analyzed, which was not done for this study. Problems related to qualitative data analysis is that the data is collected from so few “observations”, in this case interviews, but at the same time information for each of the cases is very thorough (Ghauri, Gronhaug, & Kristianslund, 1995). Another difficulty is to differentiate between relevant data and irrelevant, as well as the fact that the analysis and the collection of data are often done simultaneously (Ghauri *et al.* 1995).

The analysis in this report was done in a number of steps. First, the authors listen to the voice recordings from the interviews. The interviews were later transcribed to word, and compared to the notes taken at the time of the interview. Once this was completed, the transcripts were used to categorize the data into categories based on the research questions. The data was later reduced, and only relevant data was presented in the empirical data section, with the categorized data under the right category. When this was done, the empirical data was analyzed with the help of the theories presented in the frame of reference. Each section of the analysis concerns a distinct data category, which makes it easier to understand the data, as well as its relation with the theories.

### **3.5 Evaluation**

#### **3.5.1 Reliability**

Reliability refers to the consistency and the quality of a measure that is employed (Bryman & Bell, 2007). Therefore, the reliability of any study depends on the information that is gathered from the respondents, since it forms the empirical data that the authors use to provide their analysis and conclusion.

In order to ensure reliability, the authors of this study made sure the respondents were explained at first what areas the interviews would explore. Moreover, they also ensured the right people from the right departments were interviewed. The interview guides were provided to the respondents beforehand, so that they could take time to be prepared. Misunderstandings could then be cleared prior to the start, or even during the interview.

All interviews were conducted in English since all respondents were fluent in English, although their first language was Swedish. However, as one of two authors of this study was Swedish, it eased the interview processes as any misunderstanding, or unclear questions, could be cleared up throughout a quick explanation in Swedish.

#### **3.5.2 Credibility – Internal Validity**

Credibility refers to internal validity (Bryman & Bell, 2007). However, validity, whether it is internal or external, is referred to as the integrity of the conclusion(s) that are drawn from a piece of research (Welman, Kruger, & Michell, 2005).

In order to assure credibility, the interviews were at first recorded on a recording device. Secondly, they were transcribed to ensure no important and/or useful information would be missed out, or sidelined. This “three-step” process for gathering data, namely conduct the interview, listen to the recorded version and then transcribe it, has ensured the researchers would not omit valuable information.

### **3.5.3 Transferability – External Validity**

Transferability refers to external validity (Bryman & Bell, 2007). It is defined as to what extent the findings can be generalized to particular persons, names and times (Ghauri & Gronhaug, 2005).

In order to ensure transferability, the authors of this research must stress the importance of the context this study was conducted in: clothing “e-tailers” were selected for the study. Therefore, conclusions presented and analysis drawn can solely be generalized to businesses that operate on the same sector (B2C sector, e-commerce, clothes retailing).

Furthermore, this research was first and foremost based on acknowledged academic articles and frameworks, which cemented solid and trustworthy foundations for developing and providing a purposeful research.

## 4 Empirical Findings

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*In this chapter, the authors will present the empirical data collected during the interviews. The data was collected from four Swedish retailers, all applying e-commerce, with the respondents having distinct positions within the companies.*

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### 4.1 Company A

*Company A is a Swedish fashion retailer, with three associated companies. The head office is located in the southwest of Sweden. They started their business as a mail order company, but later on merged into the e-commerce business. The three associated companies, later on referred to as brands, have very different target groups. Brand 1 focuses on mature women in their 50s, while brand 2 focuses on mature women but have also a younger sense to the clothes. Finally, brand 3 differs from the other two as it targets the young and fashionable females through more high fashion garments. The three brands are closely connected using the same supply chain, suppliers and warehouse. Brand 1 and 2 sell clothes mainly designed and produced by the company, while brand 3 purchases most of the clothes from more known brand such as Acne, B-young, Benetton, Hugo Boss etc.*

*Company A's respondent was interviewed on 10 April 2012, the respondent was the supply chain manager for the company, responsible for two of the company's brands mostly. The respondent had been in the position for one year at the time, but worked before for the company in other positions. Also, the respondent had previously worked for another Swedish retailer in the mid 2000, giving at times some comparison between the two companies. The interview was conducted face-to-face, at the company head office in the southwest of Sweden, and lasted approximately 1 hour 20 minutes. After the interview, the researchers were given a tour of the company's warehouse, and explained how the company handled the inbound logistics-picking and packing-outbound logistics.*

#### 4.1.1 The Product Features

The respondent stressed the company had a large number of different products, clothes, home electronics, home decorations, workout equipment. The respondent is in charge of the clothing part of the products the company sells. The clothes the company sells are highly standardized, and no customization is available to the customer. The products are available in different models, sizes and colors.

When the company introduces a new product for the season or into their basic assortment, they will try and purchase the product in a small volume. This means that the company will try and push the minimum quantity limit downwards. This can, however, be hard to achieve, and the company will have to fulfill a minimum quantity, which usually is around 400-600 pieces of each color, with all sizes. The purchaser will at times be pushed towards a decision, and have to make a guess, or "dare" as the respondent put it. The company will then have to replenish the products that are successful during the season. For a product that is not selling well, the company will take actions before the season is over, and try to sell with discounts.

For a product that is in the growth or mature stage, the company will look at past sales history, and will forecast accordingly the amount they believe will sell. The products in the growth and mature stages have a higher buying volume in the beginning of the season, as the company believes the product will sell well, given their forecasts. When the product then reaches the decline stage, either being a dying product or at the end of the season, the product will no longer be replenished. The company keeps track of each product line during the season, and if they can identify a dying product they will mark it in their system. Another department will then look into the matter, and sees if the product has a chance of



being sold out without discounts. Otherwise, they will have midseason sales, or end of season sales. The declining products will be bought in low volumes, or no volumes at all, after the initial purchase has been placed at the beginning of the season.

The respondent emphasized that when the purchasing is done, it is to a large extent a dialogue between the buyer/purchaser and its suppliers. The products value is exploited at the beginning of the manufacturing processes, and the value does not increase after the CODP. The products monetary value is low, and therefore the company ships in bulk.

#### **4.1.2 The Market and Demand**

The products of Company A do not have a high demand uncertainty. Therefore, last year sales coupled with other variables, help the company develop their forecasts. Before a season collection is purchased, the company will have discussions with its suppliers, look at market trends, and for some brands they will even visit specific locations.

The company buys the products from its suppliers, and the products are shipped in bulk to Sweden. The transportation takes up to 35 days, by boat. The company does most of the purchasing way before the season starts. It takes between 4 to 6 months before the products arrive from the supplier at the warehouse in Sweden. The company is involved in the production with many of its suppliers, conducting quality tests regularly and at each of the steps of the supply chain. For brand 3, the company does usually not produce the products, and therefore its purchasing process differs compared to the one for the other two brands. For brand 3, the purchasing is done later, closer to the actual season, once the company has received the suppliers' 'items of the season'. This can be done because Brand 3 does not have to deal with potential production problems.

When a customer places an order, the system registers it, and at 10pm the order batch runs. When the batch has run, the floor personnel will start moving products from the buffer area into the picking area. Then the personnel will pick up the product, and sort it according to regions. This described order process will usually be done the next day, provided that the customer has placed the order before 10pm. Otherwise, one more day is required. If an order contains a product that is not in stock, the customer can still order it without being notified it is actually not at the warehouse. At the same time, the system would calculate, based on several variables, whether or not the entire order should be postponed until the item arrives, or if the available products should be shipped separately. The product(s) will be delivered to the customer within 2-3 days, depending on the mail service. The package weight and its size will determine if it can be delivered to the customer home address, or at pick-up place. For some of the company's markets, the customer is able to choose between different carriers.

#### **4.1.3 The Manufacturing and Logistics**

Most of the products are sourced from Asia, namely 90% from China and 10% from India, Bangladesh and Pakistan. At times, the company had sourced products from Europe, mainly in Turkey. With products being produced in Asia, and the company using sea as the main mean of transportation, lead-times are long. The time for the products to travel by boat goes from 35 days and up. The company has decided to use sea transportation in order to keep costs down. Given that the product is finished, it therefore can be shipped in bulk with sea at a low rate. At times, if the company sees a sudden need for a replenishment of a product, they use air transport, however it is rare. In addition, choosing sea

transportation is also in relation with the company's environmental responsibility policies, where they look for both cost efficiency, and low environmental impacts. A third mode of transportation that the company has used in the past, though not that much in recent times, is a combination of air and sea, namely air-sea. With this mode, the products are transported by boat on one part of the route (i.e. Asia-north Africa), and then by air for the remaining distance (i.e. Sweden). However, this has not been used recently, due to the lower airfreight rates that exist today, which would make air-sea more expensive than air.

When the products arrive in Gothenburg, Sweden, they are transported by truck(s) to the company's warehouse. At the warehouse, the company stores the product line for approximately 18 weeks. The warehouse is an important resource for the company as the products arrive in a finished state, and they are shipped from there. The warehouse is a "tullsäkert", which means that the company pays its custom fees only when the products leave the warehouse, and not before that. This has a huge impact on the company's financial flow. The company also has a warehouse in Czech Republic, from where they supply the Central and Eastern Europe market (CEE-market). All the purchasing is done at the head office.

The company weighs and measures the products to record it in the system. This is important because they need to have an approximate weight and size for the final packaging. The company's personnel then put the product(s) in plastic bags or paper cartons (for delivery), depending on the value and the type of product(s). Some commercial flyers, or giveaway products may be added to the order when it is being packed with no product alterations. The company has the possibility to do labeling on the products, but has chosen not to do this. However, this can be done if a product has been labeled incorrectly. The company performs the change, and sends an invoice to the responsible supplier.

Since a product line is stored for approximately 18 weeks, the amount stored differs between seasonal and basic products. Seasonal products have less stable demand, and therefore they are bought in lower volumes, which means less quantities are "buffered" at the company's warehouse. Basic products, which have a more stable demand, are available for several seasons. They are bought in higher volumes, and the buffer at the warehouse is higher. Basic products are thereby also stored for more than 18 weeks in general.

The company tries to apply economies of scale as much as possible. The same product(s) can be sold for the three brands the company has. This increases purchased volumes, and it also minimizes the number of products that the company needs to store. Another way through which they achieve economies of scale is the sea bulk shipment. This lowers the purchasing price of the product(s). Nevertheless, an offset exists between price and time.

The respondent did not mention any special capabilities that were needed or apparent for their supply chain or logistics handling.

#### **4.1.4 The E-commerce Specificities**

According to the respondent, the company does not have any specificities of e-commerce impacting its logistics system. The company has been working with some of its suppliers for a long time. Besides, the company uses a similar distribution system compared to the one they were using before entering the e-commerce sector. The company still provides its mail order service. Customers are able to place order either through the company's web store, catalogue or phone.

#### 4.1.5 Company A Within-Case Analysis

Company A can be described as a company that uses the full speculation strategy. The products the company offers are standardized, with a narrow range, as well as MTS. Economies of scales is used at all levels of the supply chain, from production to shipping and storing. The products have a low demand uncertainty, and they can be bought in high volumes given forecasts based on past sales data. The value of the product is added in the very beginning of the process, long before the customer receives the product. The only postponement opportunity available to the company would be through the strategic location of its warehouse. In this sense, it could be argued that the company applies logistics postponement. However, the authors chose to classify it as a company that applies a full speculation strategy, because most of the determinants are inline with this strategy, rather than with the logistics postponement strategy.

### 4.2 Company B

*Company B is a Swedish retailer focusing exclusively on e-commerce. The company was founded in 2003, and has its head office in the south of Sweden. In the company's so far short life, it has been recognized as a successful e-tailer. The company focuses on selling clothes, mainly shirts, chinos, ties, polo shirts and accessories. The company tailors everything according to the customers' wishes, and therefore all products are customized.*

*The respondent representing this company was interviewed on 11 April 2012. The respondent is the founder/business developer/financial director. The respondent has worked for the company since its start in 2003. The interview was made over E-mail, due to the respondent's busy schedule. The answers were slightly less thorough, due to the inability of asking multiple sub-questions and to elaborate on the answers. However, the authors were satisfied with the answers provided.*

#### 4.2.1 The Product Features

The company provides a type of clothes that could be sold in any store, but without the enormous amount of options the customer is given with the online design tool. The orders are completely different since each customer is able to customize the product in so many ways. The same level of customization would be hard, not to say impossible to achieve offline without having to increase the costs, and consequently the final price. In the respondent's opinion, the company does not have any seasonal products.

The products that the company provides have been in fashion for quite some time, such as shirts, chinos and polo shirts. The product changes in color from season to season, but the product itself has moved past the introduction stage a long time ago. It varies between growth (new colors) and maturation. When the company feels a need to innovate, they simply provide changes to the existing product, such as colors, buttons or cuttings. Since the entire production is customer-initiated, the only thing that will be pre-produced is the fabric and the stand-alone parts (i.e. button). Hence, it is easy and quick for the company to introduce a new product/style since just an assembly between fabric and stand-alone parts is needed. In general, the raw materials are bought in low volumes. As a CODP is placed really upstream in the supply chain, it leaves no room for economies of scale. Simply no production process can be performed prior to receiving a customer order.

The value of the product increases at the end of the manufacturing process as the raw materials unassembled, meaning prior to the CODP, are of low value. Once the order has been received, the parts can be put together and assembled. Then the value increases all along the production line. The monetary value is low to medium.

#### **4.2.2 The Market and Demand**

The products have a high uncertainty in demand, due to the high level of customization. The company uses past data to develop forecasts, and then to polish it given the trends they can identify on the market. The respondent states that “>99% of all products are customized”, and therefore no or very little production can be performed prior to the decoupling point. The company buys the fabric in advance and all the parts that are needed to produce a finished product. The company stores its raw materials in Sri Lanka, prior to sending them to the production facility, which is also located in Sri Lanka.

The respondent provided the authors with a table of delivery history for the past 15 weeks, with a focus on 13 key numbers. The numbers were presented as a medium value of all the orders of the week. The key aspects can be seen in the appendix B. In average, the total time from order to customer delivery was between 10.7 days and 17.2 days. The company assumes the flight time to be 3 days.

#### **4.2.3 The Manufacturing and Logistics**

When a customer order has been completed, in regards to manufacturing, the product will be stored in Sri Lanka until the next shipping occasion. The company has chosen to use airfreight for its products. According to the respondent, other shipping methods would result in too long lead-times, and it would consequently affect the business negatively. The company ships products from the plant in Sri Lanka twice a week, usually on Tuesdays and Thursdays. When the product arrives in the south of Sweden, it will be stored at the distribution center for one to two days, before it is shipped to the customer. The company aims at having a two-day shipping time from the distribution center for national shipping, and a four-day shipping time for international shipping.

The company does not apply economies of scale in any major extent. The company tries to have several suppliers, so that those suppliers compete against each other while prices competition decreases prices. At the same time, the company keeps this base of suppliers as low as possible. As the respondent states it “*the higher volumes we purchase from a supplier, the better price we can achieve*”.

Special capabilities that are required for the company’s products are, according to the respondent, not obvious. The products are produced and distributed in a way that does not require any special knowledge or skills that differ, compared to normal production processes for this type of products.

#### **4.2.4 The E-commerce Specificities**

The company is very special regarding the way it operates. For instance, the large variation of products is possible due to the e-commerce website. The website is able to guide the customer through the necessary steps to purchase the product, while also providing the customer with a visual picture of how the finished product will look like. All these options and customizations would not be possible in a non e-commerce environment.

Another important part of the business is the carrier selection. The company has tried multiple airfreight providers. Flight routes, rates as well as lead-times are important as they affect the whole business. At the moment, the company feels that they have found a route and a carrier that satisfies its needs. According to the respondent, other means of transportation are excluded since it would result in too long lead-times, unless the production facilities could be moved closer to the customer market.

#### **4.2.5 Company B Within-Case Analysis**

The company is classified as one using a full postponement strategy. The products are so customized that the company is unable to do anything before the COPD. This is reflected throughout a wide range of products, and also through the value that is added in the final stages. The company cannot apply economies of scale in any major form, except for raw materials. The wide range and high customization level result in an extremely high uncertainty of demand. The company is very reliant on the Information technology that captures the customer orders.

### **4.3 Company C**

*The company is a Swedish retailer that mainly focuses on e-commerce as its main market. However, the company also has a physical store. The company is located in the southwest of Sweden, and was mainly providing clothes for sport clubs previously, but then expanded its market on e-commerce under another name. The store sells T-shirts, sweaters, soft pants, bags and others.*

*The respondent representing the company was interviewed on 12 April 2012, and was responsible for both the e-commerce store and the physical store the company owned. The respondent has worked for the company for a bit over one year. The interview was conducted over Skype and lasted for 30 minutes.*

#### **4.3.1 The Product Features**

The respondent representing company C stressed the company offers a high customization level. On the one hand, the product width is rather narrow (since only seven types of garments are at the customers' disposal, namely t-shirt, polo, hoodie, pants, beanie, scarf and bag), whereas on the other hand, its depth is quite long, not to say endless, thanks to the high level of customization offered.

The way the company handles the different stages of the product life cycle is as follows: new products are at first produced in small quantities. Afterwards, sales are analyzed and compared to previous trends, so that a decision can be made concerning a potential increase in production. All blank products are first purchased in Lebanon from their main supplier, and then they are shipped to Sweden so that they can be customized. Products that have been selling good for quite some time are customized at the manufacturing premises in Sweden, and then stocked. This means that those products are in the growth or maturation stage. These processes are done in advance, on a MTS strategy.

Volume is not a determinant that comes into play, as all garments supplied are both relatively light and easy to move. Orders are transported by air given the low number of total items they may hold.

Furthermore, it must be noted that value occurs within Sweden, since non-customized products are of no/low value. Value is only created when the CODP occurs, once the customized product is ordered.

#### **4.3.2 The Market and Demand**

Given the high level of customization offered, this characteristic remains portrayed throughout the high level of demand uncertainty surrounding company C. While the interview was conducted, the respondent emphasized several times that *"it is not possible for us to actually build any kind of forecasts"*. Therefore, the company finds itself in a "waiting and standing" position, where the only step, within the manufacturing process that can be processed before the CODP, is the purchasing of the blank products.

In terms of delivery time, and in spite of its high level of customization, products are delivered quite rapidly. An order is processed, produced, packed and delivered to the customer within 2 weeks at maximum. Carrier selection is possible, though not exempt from charges that must be paid by the customer himself. However, blank products are ordered in different colors and sizes directly from suppliers based in Lebanon. A lead-time oscillating between six and eight weeks is necessary, from the time the supplier order is placed until the merchandise is delivered to the company's warehouse.

### **4.3.3 The Manufacturing and Logistics**

The respondent responding on behalf of company C underlined they handle their logistics operations in a very specific manner. A central warehouse centralizes every purchase, which as a matter of fact manages as well the shipping of the final products to the customers. Firstly, the company places an order of blank products of different sizes and colors to its suppliers based in Lebanon, which usually takes six to eight weeks to get delivered to the company's warehouse in Sweden. Transportation by air is used. A ratio of one order per month, of a minimum of 600 items for each Stock-Keeping-Unit (SKU), is regular. Additional orders are placed in case of a sudden rise in demand. Nevertheless, the warehouse always holds a certain amount of non-customized/blank products that can be used any time. This can be assimilated to a buffer.

The next step, namely the decoupling point, is the previously described "standing and waiting" position. The company has to wait until a customer places an order: the order can be either for one of their MTS products, or for a customized product. In the first case, shipping and delivery processes usually occur within two to three days. The customization of a product engenders a longer manufacturing process. The customer has two options: select a pattern present in the company's catalogue, or send his own pattern directly to the company, in a specific electronic format. However, this personal pattern has to be approved. Once the approval is given, the company sends an electronic draft to the customer of what the final product will look like for customer approval. Then, the production of the customized garment can be launched. A two-week lead-time is expected, although most of the time customers receive their personalized garment within one week. Additionally, customers are able of enquiring a special carrier, instead of using the regular Swedish postal service.

Given the high level of customization the company provides, it is uneasy for them to apply and benefit from any economies of scale. The demand being truly uncertain, the only economies of scale they can use concern the purchasing of the blank products. Lastly, in regards to the special capabilities, it has to be highlighted none were found.

### **4.3.4 The E-commerce Specificities**

As an e-commerce company, this company stands out through: a high level of customization, a preview of the final product, and the capability to meet various customer requests in terms of design. Additionally, it must be put forward the company obtain a wide product depth without having a wide product width.

### **4.3.5 Company C Within-Case Analysis**

The findings suggest that the company uses a manufacturing postponement strategy. On the one hand, the level of customization offered is rather high, with a level of demand that is quit uncertain and uneasily foreseeable. On the other hand, no economies of scale are

used, except for the blank products that receive not customization treatment. An ATO strategy is applied, coupled with a CODP that occurs upstream in the supply chain.

## **4.4 Company D**

*The company is a Swedish retailer with the head office located in the southwest of Sweden. The company started its business as a mail order company, and has since moved towards e-commerce. The company is a medium to large sized-company, and focuses on providing fashionable clothes at a reasonable price. The company does not have any physical stores. Its online store allows the company to be active in eight countries.*

*The respondent representing company D was interviewed on 19 April 2012. The respondent was the purchasing manager for the company. The respondent has been working for the company for thirty years, with a few years at the company's affiliated company. The interview was conducted over phone, and lasted for 45 minutes.*

### **4.4.1 The Product Features**

The respondent representing Company D highlighted that the company provides its customers with a wide range of garments. The company makes use of a MTS strategy since products are bought and sold as so.

Product life cycle constraints are dodged through a wise use of a reverse planning. Items are bought months ahead of their actual distribution. Heavy advertisement is used for new products, whereas light advertisement is used for products at a growth or maturity stage. The products that are dying are put on the outlet section of the company's website. The company differentiates between initial orders and repeats orders, rather than using the different stages of the life cycle. The respondent therefore states that the life cycle does not impact the way the products are sourced, stored or distributed. The initial orders are purchased in general in lower volumes, while the repeat can be in medium-high volumes.

The company has a wide product width, while the product depth remains narrow. For the customer, this is reflected through a wide product choice. However, the product depth is narrow, offering products that are very similar. As orders tend to contain a high number of total items, sea transportation is prioritized. Therefore, volume is an element that comes into play. Value is created early in the supply chain process, since it intervenes right after the product is produced.

### **4.4.2 The Market and Demand**

The delivery time to get the merchandise from its point of production to its point of destination, namely from Asia to Sweden, usually varies between five to six weeks. However, it only takes between three to five days for the customer to receive his order. Company D offers two value-added services: the selection of the mean of transportation, namely the speed of transportation, and also where the package can be collected. The order can either be collected at the nearest customer's pick up place, or be delivered directly to his house, depending on the packages size and weight. As mentioned earlier, the company uses a reverse planning that provides a precise view of the orders. Usually products are all purchased three to six months in advance. As an example, the summer season will be ordered in winter, so that the products are at company's disposal on time.

Concerning the demand, since no customization processes are involved into the manufacturing of the products, every item is purchased based on previous trends and/or similar trends. A certain uncertainty margin is used concerning the order of new products. Past sales of similar product are analyzed and used for developing forecasts. Products that are

already present in the assortment can be sourced more accurately thanks to available sales history.

#### **4.4.3 The Manufacturing and Logistics**

All products are transported through sea from Asia (mainly China) to Sweden, where they are then discharged and transported by truck to the company's warehouse. Different suppliers located in Asia handle the sourcing part. A distinction is made between new products and regularly ordered ones: the new ones will tend to be produced by new suppliers, although the company tries as much as possible to keep its partners unchanged. However, suppliers that produce "repeat orders" do not usually differ. In that way, this eases the company's situation since a repeat order is placed to a partner who already knows all the requirements.

In regards to the economies of scale, and given the high level of speculation the company relies on, economies of scale are used at three levels: at the sourcing level first, where the company tries to maximize its amount of products purchased so that the demand is met accurately. Then at the transportation level, where cost per item decrease as the quantity of transported items increase. And finally, at the storing level, an economy of scale is also used since it results from the sourcing and the transportation part.

The company uses no special capabilities. However, it is relevant to stress the key partnerships created over the year in Asia play an important role into the way the company handles its repeat orders.

#### **4.4.4 The E-commerce Specificities**

The company is capable of delivering quickly a large number of items to its customers all over Sweden. Images of all items are available on the company's website. In addition, items can be delivered, for most of them with an average delivery time of five days. A wide product width range is available, whereas quite a narrow product depth is present. This is largely due to the low, not to say non-present level of customization.

#### **4.4.5 Company D Within-Case Analysis**

The findings suggest that company D makes use of a full speculation strategy since they principally rely on economies of scale. A MTS strategy is used as the main method of production. Therefore, this prevents the company from offering customization options to its customers. Hence, the level of uncertainty can be presented as quite low, compared to companies that offer high level of customization.



## 5 Analysis

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*In this chapter, the authors will provide a thorough analysis of the empirical data, using relevant theories from the literature review. The authors have divided the chapter in four sections, based on the research questions.*

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### 5.1 Influence of The Product Features on The Choice of Postponement Strategy For E-commerce Companies

In the previous literature, the product characteristics have been identified as an important section concerning the implementation of postponement and the choice of the postponement strategy applied. In order to answer the first research question, the specific determinants responsible for the postponement strategy selection need to be analyzed.

#### 5.1.1 The Product Life cycle

The product life cycle has four stages, presented in the framework by Pagh and Cooper (1998). The stages, initial, growth, maturation and decline, are suggested to influence the choice of a postponement strategy (Pagh and Cooper, 1998). Within the product life cycle one should take into consideration the stage, volume products are bought in, and cost/service strategy the company uses.

**The stages** of the product life cycle were not of importance for any of the companies analyzed. The companies had similar ways of treating the products in the different stages. However, there were almost no difference in regards to the logistics and manufacturing operations for the stages. If a product in the initial stage was bought at a low volume at first, and then would sell well, the company would replenish it. However, it would be done in the same way as if the product had been in the mature stage. The data suggest that the product life cycle stages do not have an impact on whether companies make use of a postponement strategy or not. This also means that the stages have been found to have no impact on the actual strategy applied.

**The volume** is connected in some sense to the stage of the product life cycle. All companies deal with the demand uncertainty for new products by trying to place at first an order of low volume. For products in the mature stage, the companies have access to more accurate sales data and, they can therefore place orders of higher volume. Companies that apply a full postponement strategy are forced usually to operate with low order volumes, in order to be able to cope with the high level of demand uncertainty. However, companies with a full speculation strategy may buy products in high volumes, achieving economies of scale. The empirical data suggests that the volume important. Nevertheless, those findings differ compared to the framework Pagh and Cooper (1998) developed. Companies applying full speculation strategy purchase in high volumes, which is in contradiction with the low/medium volume purchasing method presented in the framework.

**The cost/service strategy** suggests that in the initial and growth stage of the life cycle, the company should have more customer service. For the maturation or decline stage, the company can focus more on cost efficiencies. This was not indicated in the empirical data as having an impact on the use of a postponement strategy, or as influencing which one should be used.

**Comparing all three** of the product life cycle elements, the findings suggest that the stages were not used by any of the companies to determine how manufacturing or logistics operations should be handled. In the framework, the volume was connected to the stages. How-

ever, it was found that when connected the volume had little importance. When disconnecting the two, the volume was found to be of importance, on a higher level. If the company wishes to buy products finished in a high volume, there is little room available for postponement strategies. The service/cost strategy connected to the product life cycle stages did not have an impact, as suggested in the framework that products in the initial stage should have more customer service. It was however found that companies applied the same level of service during all stages of the product life cycle.

### 5.1.2 The Product Characteristics

The product characteristics can be divided in two sections: product type and product range. The type refers to the level of customization or standardization the product has (Pagh and Cooper, 1998). The range refers to the number of variations the company offers of each product.

**The type** of the product in the empirical data can be categorized as follows: company A and D's products are standardized, while company B and C's are customized products. The customization of the product has an impact on whether the company applies some postponement or not. Companies with standardized products were less likely to apply postponement, but rather choose to use the full speculation strategy. In the case of e-commerce, these companies can still be argued to apply logistics postponement as they store and distribute the products from one strategic location. For companies with customized products, the degree of the customization had an impact on the choice of the postponement strategy. For company B, with highly customizable products, where the company could not perform any production prior to the CODP, the full speculation had to be applied. For company C, on the other hand, with some customization some steps could be performed while still keeping the product undifferentiated for as long as possible, which is the goal of manufacturing postponement (Yang *et al.* 2007; Davila and Wouters, 2007; Yang *et al.* 2004; Skipworth and Harrison, 2004; Lee, 1998). Therefore, the researchers concluded that the product type is important for the decision of the postponement strategy selection and application.

**The range** of the product is closely connected to level of customization: with standardized products the range is narrow, while for customized products the range is wide. This is also important to remember when deciding on the product type, as a wide range means that more customization has to be done. The range can therefore be found to influence the choice of a postponement strategy: if there is a narrow range the company does not need postponement in the same ways as it does with a wide range, which requires it to cope with a higher uncertainty.

**Relating the two**, it has been found that they are closely connected with each other and that both of them have an influence on the postponement strategy. Therefore, it is important for companies to consider the type and range of their products before choosing the postponement strategy. The more available customization, the more postponement is required. For instance, company B, with its highly customized products, was unable to do anything prior to the CODP, and therefore needed to apply the full postponement strategy. For company C, offering a lower customization level if compared to company B, the strategy was to apply a manufacturing postponement strategy since some steps can be performed prior to the CODP.

### 5.1.3 The Value

The authors did not obtain the necessary information to analyze this in depth. The value is divided into monetary density and value profile.

**The monetary density** is the difference between the weight/volume of the product and its price. The authors believe that company A and D have a low monetary value of their products, as they are purchased in high volumes and sold at a rather low price. Company B and C have a higher monetary density, as the products are of the same approximate weight however, more expensive due the customization process. In general, the authors believe the monetary density is low since the products do not reach high prices, such as fashionable garments from known fashion designers. The monetary density is found to impact whether a company should apply any postponement, due to the fact that products with low density are cheap to store but expensive to move. The products with high density are expensive to store, but easily movable.

**The value profile** concerns at what point in the supply chain the majority of the value is added to the product. For Company A and D again, there was similarities: the value of their products was added when the manufacturing was completed, which was done in the initial stages of the process. For company C, the products are first produced into blank garments, however the increase in value can be connected to the printing of the design. This means that the value is added at the final/late stages of the process. For company B, the value is connected to the manufacturing, which lies in the customization. This implies that the value is added at the final stages as the manufacturing operations are done, after the CODP. With this in mind, the conclusion is that the value profile is of importance when deciding whether to use postponement or not. It also influences which strategy the companies should apply, for the products where the value is added in the initial stage the full speculation have been found to be more likely to be used. For products where the value is added in the end, the full postponement strategy was used.

**Relating the two** determinants monetary density and value profile, the companies did not specifically state that it had an impact on how they choose to operate their logistics and manufacturing. However, with the links found between them, then it is clear that the value profile should be considered as it can be connected to the level of customization a product is involved with. In regards to the four cases studied, it is not clear whether the monetary density is of importance. The assumption made is that it may be because in general the monetary density is low for all of the products. However, it can be said that for company B's products, the monetary density was higher, and therefore is in line with the choice of full postponement strategy. The reason behind this is that it would be too expensive to have in stock a model of all the products the company can offer.

### 5.1.4 Summary Regarding Product Influence

The product features influence the choice of a postponement strategy. It can be summarized that the product life cycle stages do not have an impact on this choice. All companies treated the stages in the same way. The cost/service strategy was also found to have no impact since it did not change through the PLC. However, volume is a determinant that had an impact on the choice of a postponement strategy.

The product characteristics were found to be very important for the decision of whether to apply a postponement strategy, and also concerning the one that should be used. This was mainly due to the fact that the more customized a product is, the higher the level of uncertainty is.

The value of the product did not appear to be a very important determinant for the choice of postponement. The value profile can in some cases be related to the choice of postponement strategy.

## **5.2 Influence of The Market and Demand on The Choice of Postponement Strategy for E-commerce Companies**

The market and demand characteristics have been found in previous literature to be of importance when deciding whether to use postponement or not. It is also argued that it needs to be considered for deciding which strategy the company should use. In this section, the authors will analyze the market and demand characteristics, and their influence on postponement decisions.

### **5.2.1 The Relative Delivery Time and Frequency**

**The relative delivery time** is on average long or short, calculated on the delivery time to the customer in relation to the time for manufacturing and transportation (Pagh and Cooper, 1998). When relative delivery time is long, it is suggested to apply a postponement strategy, whereas if the delivery time is short, speculation can be applied. The empirical data suggest that for products that are customizable, the relative delivery time is longer. This is due to the fact that the companies are “on-hold” with some of the manufacturing processes until the customer places the order. The delivery time from the point of order is then much longer, compared to customers that order standardized products. The standardized products can be manufactured in advance, and therefore the time that it takes to deliver the goods once the order is received is much shorter. The relative delivery time is influenced by the mode of transportation used by companies, which is influenced by the economies of scales companies wish to achieve. If a company, with customizable products, uses sea as its main shipping mode, the relative delivery time will increase. Still a company with standardized products can use sea freight, this without increasing the relative delivery time at the same way. The researchers concluded that the relative delivery time has to be taken into consideration when the company decides the postponement strategy.

**The delivery frequency** refers to the average delivery frequency to customers in proportion to the average manufacturing and delivery cycle time (Pagh and Cooper 1998). The companies with the speculation strategy had a high delivery frequency, as they ship to customers much more often than they receive goods from their supplier. The company with full postponement, on the other hand, received goods much more frequently. Hence, if the same amount of orders is served, the frequency is lower. This is of importance for the choice of a postponement strategy. A company with customized products cannot manufacture them in advance, and thus forced to have a lower delivery frequency. For products that are more standardized, a higher delivery frequency can be achieved.

### **5.2.2 The Uncertainty of Demand**

**The uncertainty of demand** is the basis for the development of postponement strategies. As stated in the frame of reference, the goal of postponement is to reduce, not to say eliminate uncertainty (Yang *et al.* 2007). The different levels of uncertainty imply that different postponement strategies should be used. For a company with a low demand uncertainty, a full speculation can be applied, while for a company with high demand uncertainty the full postponement is preferred (Pagh & Cooper, 1998). In between these are the manufacturing and logistics postponement.

Company A and D have a low level of uncertainty, which connects with the MTS strategy they apply. The CODP for both of these companies is at the very end of the supply chain, and the companies focus on productivity rather than flexibility. This goes along with what Rudberg & Wikner (2004) stated in their work in regards to the CODP. For company C, the uncertainty is high, but some manufacturing processes were performed prior to the CODP, using an ATO strategy. For company B, the company uses MTO, as products are manufactured at the customer's initiative. Given the figure 2.2 present in the frame of reference, MTO occupies the second highest available level of customization

The CODP and the demand uncertainty are, according to the analysis, very important to the decision of the postponement strategy. The questions a company wishing to implement a postponement strategy has to ask are as follows: where is the CODP positioned? What steps can be performed prior to the CODP? What steps can be performed after the CODP? If most of the uncertainty is created because of the wide range of products, then postponement should be applied. The empirical data support that this is one of the most important determinants. For companies with high demand uncertainty, full postponement, or logistics postponement strategies should be used. For products having a low demand uncertainty, it is advised to prioritize the use of a speculation strategy.

### **5.2.3 Summary Regarding Market and Demand influence**

The market and demand are factors that are found to have a high influence on the choice of postponement and on the strategy applied. The relative delivery time has to be considered, as a short delivery frequency requires the products to be finished, or semi-finished, when the customer orders. Still, for a long delivery frequency, the product is much less likely to be in finished state. The delivery frequency for standardized products is higher, however more economies of scale can be achieved. But a tradeoff is the incapability to provide customization options. The uncertainty of demand is one of the most important determinants. Hypothetically, if there were a known demand, it would be easy to forecast and postponement would not be necessary. However, the situation is not that way. Instead, the higher the uncertainty is, the more likely a company uses postponement. Thus, it is expected that benefits will be gained.

## **5.3 Influence of Manufacturing and Logistics Systems on The Choice of Postponement Strategy for E-commerce companies**

Within the frame of reference explored, the framework of Pagh & Cooper (1998) advocates that the choice of a postponement strategy may be influenced by the way a company manages its manufacturing process as well as its logistics. The section below analyzes the answers gathered throughout the cases, and it tries to answer the third research question.

### **5.3.1 The Economies of Scale and Distribution Channels**

Throughout the empirical data gathered, it was seen that two distinct trends stand out: whereas companies A and D seem to operate on a similar basis in regards to the way they handle their logistics, companies B and C worked differently. This is largely due to the different levels of customization the companies had to offer.

**The economies of scale:** before analyzing the way products are transported, let us first have a thorough look at the way products are actually sourced. Companies A and D apply a MTS strategy, both relying on partners, mainly located around Asia, and therefore sidelining the influence customers can have on the products' design. This first point is portrayed

in the figure 2.2 presented in the frame of reference: businesses that involve customers at very low level must heavily speculate all along their supply chain. Then, if a connection is made with the definition of the postponement strategies, it can be concluded a MTS strategy should make use of a full speculation strategy. In addition, a compelling fact must not be sidelined: companies A and D both tried to benefit from the use of economies of scale. The purpose is to get more items for a better price, as the more they buy, the more the price per item decreases. Costs are also saved in terms of transportation since they can be spread on more products. Hence, an additional element of the framework developed by Pagh & Cooper (1998) is strengthened, namely that the choice of a speculation strategy and the use of economies of scale are closely connected. In regards to companies B and C that apply a high level of customization, a complete different situation was found. Whereas company B used MTO, company C used ATO. The use of those strategies means that customers intervene into the manufacturing processes. Whereas economies of scale can be applied for the parts that are standard, it is not applicable to the parts that are modular. Thus, the findings again support the framework by Pagh & Cooper (1998), since companies using small economies of scale must opt for either a full postponement strategy or a manufacturing postponement strategy.

**Distribution channels:** the empirical data suggest that company A and D are using the “Direct marketing by mail-order retailers that go online”, when referred to the frame of reference. The main reason behind this regards the high level of involvement the companies have into the manufacturing process. They participate actively in the design process, perform regularly quality controls and try to maintain strong relationship with their suppliers that are overseas. Besides, it can also be argued that these two companies use partially the distribution delivery center fulfillment strategy. The difference is that the companies do not have physical stores, however the customer is still able to pick up its package at drop-off locations, therefore performing the “last mile”. For companies B, if connected to the frame of reference, it can be referred to as a pure-play e-tailer. This can be connected to the postponement strategies, as pure-play e-tailers lack presence in physical sales channels due to specialization. The company can be described as using a build-to-order fulfillment strategy, where it is important to have a high level of collaboration within the distribution channel, this in order to ensure materials are available when needed. If connected to the frame of reference, company C can be described as a “direct sales/marketing by manufacturers”. Those are manufacturers that take the opportunity to get closer to their customers, while applying a high level of customization. They sell straight from their physical store, or through their website. Those two criteria present therefore a strong connection with the company C. Concerning the order fulfillment strategy, the build-to-order is the one mostly in line with the characteristics of company C the findings presented. This can be connected to the manufacturing postponement strategy, as customers are involved at a relatively high level in manufacturing process.

### 5.3.2 The Special Capabilities

**The special capabilities:** refer to special or unique knowledge a company possesses, which would significantly influence the manufacturing or logistics handling. In the empirical data, the authors were unable to find any kind of special capabilities connected to the logistics or manufacturing of the company’s products. Therefore, the researchers believe that this determinant can be excluded as one that influences whether companies apply postponement, as well as the advised strategy.

### **5.3.3 Summary Regarding Manufacturing, Economies of Scale and Special Capabilities**

As a conclusion on that part, it can be said that economies of scale influence the choice of a postponement strategy. Also, the type of distribution channels seems to have a connection with the chosen postponement strategy. However, the determinant special capabilities had not been in any of the cases that were studied. Thus, it seems irrelevant to the researchers to actually leave this determinant as one that could influence the choice of a postponement strategy.

## **5.4 Influence of The E-commerce Specificities on The Choice of Postponement Strategy for E-commerce Companies**

**E-commerce specificities:** the frame of reference studied showed a lack of knowledge in regards to whether or not certain e-commerce specificities may influence in some way the choice of a postponement strategy. The part as follow gathers the elements found in the empirical data, and intends to draw conclusions upon the fourth research question.

It seems companies A and D, which were adopting a speculation strategy, were heavily relying on a close cooperation with a number of suppliers located in Asia. Companies B and C, applying high level of postponement, were also maintaining close partnerships with their respective suppliers. However, in terms of number, those suppliers were fewer. The researchers believe the situation for companies B and C could actually be more harmful than it would be to companies A and D, in case of a sudden problem arising with their suppliers. This is mainly due to the fact that the suppliers for companies B and C are heavily integrated in the supply chain. Though those suppliers can be substituted, it is with difficulty.

### **5.4.1 Summary E-commerce Specificities**

It can be agreed that only one new determinant, capable of influencing the selection of a postponement strategies, has been found. The number of suppliers seems to exert a non-negligible influence in regards to the postponement strategies companies must opt for.

## **5.5 Findings Discussion**

### **5.5.1 The Full Postponement Strategy**

The full postponement strategy refers to moving the CODP upstream, so that few operations are performed under uncertainty, and the rest of them are initiated through the customer order. According to what the authors have found, it is suggested a company portraying most of the characteristics as follows would benefit from using the full postponement strategy. Firstly, the company offers products that present high degree of customization. Therefore, the company will tend to have a wide product range, with a value that increases only at the final stages. The company is forced to buy products and/or raw materials in low volumes because of the level of customization offered. Secondly, this level of customization results in a high uncertainty of demand, which engenders long relative delivery times and therefore low/medium delivery frequencies. Thirdly, the high level of customization inhibits the employment of any major economies of scale. Fourthly, the authors' findings suggest that there is a connection between a full postponement strategy and a company with a low number of key suppliers.

### **5.5.2 The Logistics Postponement Strategy**

The logistics postponement strategy refers to having operations that are centralized. According to what the authors have found, it is suggested a company portraying most of the characteristics as follows would benefit from using the logistics postponement strategy. Firstly, provided that the company offers a certain degree of customization, the product range is medium/wide, allowing the value to be added during the final stages. The company will have the tendency to buy products/raw materials in medium volumes. Secondly, the customization offered results in a medium/high uncertainty of demand, which engenders medium relative delivery times and therefore medium delivery frequencies. Thirdly, the use of centralized processes allows the company to apply economies of scale to a rather large extent. Fourthly, the authors' findings suggest that there is a connection between a logistics postponement strategy and a company with a high number of key suppliers.

### **5.5.3 The Manufacturing Postponement Strategy**

The manufacturing postponement strategy refers to having standard and modular parts, thereby being able to keep inventory level low while providing customized products. According to what the authors have found, it is suggested a company portraying most of the characteristics as follows would benefit from using the manufacturing postponement strategy. Firstly, provided that the company offers some degree of customization, the product range is medium/narrow, allowing the value to be added in between the initial and the final stages. The company will have the tendency to buy products/raw materials in medium/high volumes. Secondly, the customization offered results in a medium to low uncertainty of demand, which engenders medium relative delivery times and therefore medium/high delivery frequencies. Thirdly, the company can apply economies of scale to some minor extent as few processes can be performed under speculation. Fourthly, the authors' findings suggest that there is a connection between a manufacturing postponement strategy and a company with a low number of key suppliers.

### **5.5.4 The Full Speculation Strategy**

The full speculation strategy refers to having highly standardized products, therefore leaving no room for customization. According to what the authors have found, it is suggested a company portraying most of the characteristics as follows would benefit from using the full speculation strategy. Firstly, provided that the company does not offer any degree of customization, the product range is narrow, allowing the value to be added in the initial stages. The company will have the tendency to buy products/raw materials in high volumes to benefit from economies of scale to a major extent as every process is performed under speculation. Secondly, since no customization is offered, this results in a low uncertainty of demand, which engenders short relative delivery times as well as high delivery frequencies. Thirdly, the authors' findings suggest that there is a connection between a full speculation strategy and a company with a high number of key suppliers.

### **5.5.5 The Revised Framework**

Based on the findings the authors have presented in the previous sections, the framework by Pagh & Cooper (1998) has been revised. The revised framework is illustrated in figure 5. One of the main change made is the fact that the product life cycle section has been removed, since the authors were unable to connect this in anyway with the choice of postponement. Also, the determinant volume, which was previously connected to the PLC, is now a determinant by itself, under the section product. This was done since the volumes products are bought in were found to influence the choice of the postponement strategy.



Besides, another change in the product features section was the removal of the monetary density. The authors did not find any connection between the monetary density and the choice of the postponement strategy. The other determinants in the product features section remained unchanged, given the established relationships with the choice of postponement strategies.

On the one hand, market and demand characteristics were unaltered since the authors saw clear connections between these determinants and the choice of the postponement strategy. On the other hand, the authors removed the special capabilities determinant from the manufacturing and logistics section. This was because the findings had not identified any connections between special capabilities and the manufacturing or logistics operations performed. Hence, there was no connection with the choice of the postponement strategy. The authors preserved the determinant economies of scale since it was found to highly influence the choice of the postponement strategy. Also, a new determinant was established, under a new section named E-commerce, concerning the number of key suppliers the company has. The authors found that for companies with a high degree of customization the number of key suppliers was low, whereas this number was high for companies providing no customization.

**The concept of the profile analysis - Revised framework**

Some important P/S- decision determinants			Generic P/S-strategies			
			The full speculation strategy	The manufacturing postponement	The logistics postponement strategy	The full postponement strategy
P r o d u c t	Volume		High	←	→	Low
	Product characteristics	Product type	Standard	←	→	Customized
		Product range	Narrow	←	→	Wide
	Value	Value profile	Initial stages	←	→	Final stages
Market and demand	Relative delivery time		Short	←	→	Long
	Delivery frequency		High	←	→	Med/low
	Uncertainty of demand		Low	←	→	High
Manufacturing & logistics	Economies of scale		Large	Small	Large	Small
E-commerce	Number of key suppliers		High	Low	High	Low

Figure 5 The concept of the profile analysis - revised framework Pagh & Cooper 1998

## 6 Conclusion

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*In this section, the authors will discuss the findings of the analysis, and present the conclusion. The research contributions will also be discussed in the end of the chapter, as well as the further research possibilities.*

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The purpose of this study was to explore (1) which factors determine whether e-commerce companies use postponement, and (2) which determinants are responsible for their strategy selection. This was pursued throughout a multiple case study of four firms, where interviews allowed the researchers to gather empirical data that could be analyzed, connected to the frame of reference. In the end, it helped provide a revised framework.

### 6.1 Theoretical Contributions

The research the two authors conducted has led to several theoretical contributions. The first theoretical contribution concerns the revised framework the authors have provided in section 5.5.5. This framework is meant to bridge the gap the authors had presented in the problem discussion. This problem discussion regarded the lack of available frameworks to help companies choose the right postponement strategy, especially applicable to companies operating on the B2C e-commerce sector. Throughout this framework, the authors present the determinants that were found as having an influence on the choice of the adequate postponement strategy. It was found that the following determinants, concerning the product features, have an influence on whether a company can apply postponement or not: the volume (high or low), the product type (standardized or customized), the product range (narrow or wide) and the value profile (value added either in the initial or in the final stages). Also, it was found that for the market and demand characteristics, the relative delivery time (short or long), the delivery frequency (high or low) and the uncertainty of demand (low or high), were determinants influencing the applicability of a postponement strategy. In addition, economies of scale (large or small) present under the manufacturing and logistics characteristics were also found as influencing the possibility to apply a postponement strategy. Finally, the authors were able to incorporate a new determinant, namely the number of key suppliers (high or low), which influences whether companies apply postponement.

The second theoretical contribution regards determinants that advise which postponement strategy should be chosen. The connections between determinants and the four types of postponement strategy can easily be seen using the revised framework. The full postponement strategy is connected with products that have a high level of customization, which are bought in low volumes, which present a wide product range and the value added in the final stages. Additionally, due to the postponement processes, the delivery time and frequency are respectively long and low. Economies of scale can uneasily be used, given those products present a high uncertainty of demand. The collaboration with a low number of key suppliers is of importance for the full postponement strategy.

The logistics postponement strategy is connected with products that have some level of customization. They are bought in medium/low volumes, present a medium/wide product range and have the value that is added in the final stages. Additionally, due to the postponement processes, the delivery time and frequency are respectively medium and medium. Economies of scale can only be used on centralized operations. The collaboration with a high number of key suppliers is of importance for the logistics postponement strategy.

The manufacturing postponement strategy is connected with products that have some level of customization. They are bought in medium/high volumes, present a medium/narrow product range and have the value that is added in between the initial and the final stages. Additionally, due to the postponement processes, the delivery time and frequency are respectively medium and medium/high. Economies of scale can only be used on standard parts, given those products present a rather medium/high uncertainty of demand. The collaboration with a low number of key suppliers is of importance for the manufacturing postponement strategy.

The full speculation strategy is connected with products that have no customization. They are bought in high volumes, present a narrow product range and have the value added in the initial stages. Additionally, due to no postponement processes, the delivery time and frequency are respectively short and high. Economies of scale are to be used in a major extent, given those products present a low uncertainty of demand. The collaboration with a high number of key suppliers is of importance for the full postponement strategy.

In conclusion, it can be summarized that the product type, the product range and the uncertainty of demand are the main determinants that influence whether a company applies a postponement strategy, as well as the chosen one.

## **6.2 Managerial Implications**

For managers, the authors can give the following advises: firstly it is of importance for manage to keep in mind that the supply chain they intend to use, is in line with the product characteristics, since those characteristics will shape the final supply chain. If the product characteristics and the supply chain have a mismatch, the customer will be dissatisfied in some way.

A second advice is that managers must keep in mind that there are tradeoffs between different determinants for the framework. Therefore, while using the framework, the managers have to evaluate the importance of each determinant and prioritize them accordingly.

A third advice is that the company may have to use different strategies and supply chains for different products, the company can not evaluate one product and then base everything on this evaluation. Each product is different, and therefore the result will also vary.

## **6.3 Final Reflections and Suggestions for Future Research**

### **6.3.1 Final Reflections**

The researchers must also stress the difficulties they have faced to find companies willing to participate in their research, although this was anticipated. Contacting numerous companies without being able to obtain interviews with all of them was sometimes afflictive for the authors. The authors contacted more than 20 worldwide companies. Even though they were fortunate enough to receive four positive answers, the ratio between the number of companies of contacted and the number of positive answers seems rather low.

In the authors' opinion, the method used for the research was the most appropriate for this study. However, with another method, such as quantitative the authors could have been able to collect wider empirical data. This would have allowed for more generalizable result. The risk would then have been to not be able to capture data with high details.

The choice of only looking at the e-commerce B2C clothing sector was made because it was believed this would ease the data comparison between the cases. Therefore, the results are only generalizable to this section. However, if the authors would have been able to collect data from multiple sectors, a much wider and general conclusion could have been presented.

### **6.3.2 Suggestions for Future Research**

In regards to future research other researchers could explore, the authors of this study believe the industry sector could be broaden, namely investigate a sector other than the clothing industry. Also, further research should focus primarily companies that offer a high level of customization, where it is more likely to use postponement. Therefore, compelling conclusions can be drawn from this future research.

Another future area of research is both to confirm the established determinant and investigate new ones. This is necessary as business operations and markets change constantly. It will contribute to improving the literature in this field, while ensuring that there is an accurate and up to date framework available for managers.

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## Appendix A Interview Questions

### Distribution

1. Could you please briefly describe the distribution channel for a basic product?
  - a. How is the product sourced?
  - b. What mode of transportation is used?
  - c. How is the product stored?
  - d. For how long in general is the product stored?
  - e. What is the lead-time between once your order has been placed and the actual reception time of the products?
  - f. How often do you order/receive deliveries from your manufactures?
  - g. What is the lead-time between a customer order and his delivery?
2. Could you please briefly describe the distribution channel for a seasonal product?
  - a. How is the product sourced?
  - b. What mode of transportation is used?
  - c. How is the product stored?
  - d. For how long in general is the product stored?
  - e. What is the lead-time between once your order has been placed and the actual reception time of the products?
  - f. What is the lead-time between a customer order and his delivery?
3. What happens once a customer order has been placed (for a basic product)?
  - a. What is the state of the product?
  - b. Which are the steps that still need to be performed before the product is delivered to the customer?
4. What happens once a customer order has been placed (for a seasonal product)?
  - a. What is the state of the product?
  - b. Which are the steps that still need to be performed before the product is delivered to the customer?

### Product

1. Does the product life cycle stage (introduction, growth maturation or decline) have an influence on the way the product is handled?
2. Do you buy products in high volumes or low volumes? Does the strategy differ between seasonal and basic products?
3. Is there a difference in terms of cost/service-strategy between basic products and seasonal products?
4. Are products more standardized or customized?
  - a. If customizable, how is/are this/these operations handled?
5. Do products have a wide or narrow range, i.e. color size... etc?
  - a. How is this handled, so that the “right amount” of products is available?

### Market

1. How do you develop forecasts (last years sales etc?)

### Manufacturing and Logistics

1. Do you apply economies of scale along the supply chain (sourcing level, storing level...)?
2. Are there stages in the design process that require special/unique capabilities for the product?

### **E-Commerce**

Are there any other important determinants for the decision of which type of logistics that should be applied?

Given the short introduction you have been provided with concerning the postponement strategies.

1. Which one do you think your company applies?
2. Does it differ between seasonal and basic products?



## Appendix B Sales History Table, company B

Se följande tabell för lite historik

Week	Until approved	Until printed	Until cut	Until produced	Until in transit	In the air (assumed)	Until distributed	Total	Days in Sri Lanka	Days in Sweden
50	1.3	0.6	0.7	5.0	2.0	3	0.7	13.3	8.3	2
51	0.9	0.5	1.0	3.9	2.1	3	0.9	12.3	7.5	1.8
52	0.9	1.2	1.2	4.1	4.3	3	2.5	17.2	10.8	3.4
1	0.8	1.6	1.8	3.0	2.5	3	2.8	15.5	8.9	3.6
2	0.9	0.4	0.4	4.5	1.9	3	0.4	11.5	7.2	1.3
3	1.0	0.4	0.4	3.7	1.8	3	0.4	10.7	6.3	1.4
4	0.8	0.4	0.3	3.0	1.7	3	1.9	11.1	5.4	2.7
5	0.8	1.0	0.5	2.9	2.9	3	0.3	11.4	7.3	1.1
6	1.1	1.0	0.9	5.0	2.7	3	0.7	14.4	9.6	1.8
7	0.7	0.4	0.4	3.7	1.9	3	0.8	10.9	6.4	1.5
8	0.5	0.6	0.3	3.2	3.0	3	1.9	12.5	7.1	2.4
9	0.5	0.5	0.4	3.9	3.2	3	0.9	12.4	8	1.4
10	0.7	1.2	1.9	4.3	1.7	3	1.1	13.9	9.1	1.8
11	0.8	0.8	1.7	4.4	1.8	3	1.2	13.7	8.7	2
12	0.9	0.4	0.7	5.7	1.9	3	1.9	14.5	8.7	2.8