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Postponing the decision of final destination: A potential way to make IKEA more flexible and responsive

Master's Thesis in the Master's Programme Supply Chain Management

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Logistics postponement in IKEA's distribution system

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Abstract

IKEA is a global retailer in the home furnishing business. The delivery lead time for products to reach IKEA stores or IKEA distribution centres from suppliers located across the globe can be up to 16 weeks and during this time the actual need will change. As a result the order quantity which is based on the forecasted quantity is not always matches the actual need. In addition to variation in demand, constraints in supplier capacity and distribution result in stock out, excess stock or early deliveries. In order for the company to stay competitive and grow in the e-commerce business, there is a need for a more flexible and responsive supply chain. Therefore IKEA has realised potentials in implementing a postponement strategy in the distribution network to achieve this. In order to explore if postponement is feasible for IKEA, the distribution network has been mapped. The consequences of deciding destinations early in the supply has been discussed for each IKEA stakeholder. Currently, IKEA decides the final destination, which can be a store, distribution centre or a customer distribution centre, when they place an order to a supplier. Customer distribution centres are used for online customer orders. IKEA has three different replenishment solutions from suppliers to stores or selling units, Direct Delivery, delivery through distribution centre and Combined Supply, which is a combination of the other two solutions. Some of the deliveries that is categorised as Direct Deliveries are cross-docked at a distribution centre. These deliveries are called Transit Deliveries.

External companies have been interviewed about the use of deciding destination at a later stage. Their inputs in terms of benefits and challenges with the postponement concept has been used together with interviews with employees at IKEA entities and IKEA suppliers to create and analyse three different postponement scenarios. The first scenario is to postpone the destination decision until shortly before an order is dispatched from a supplier. This is most valuable for make-to-order suppliers who have a long production lead time. The second scenario is to postpone the destination decision until shortly before the goods are received at a distribution centre. This is only suitable for Transit Deliveries, where goods are cross-docked at distribution centres. The third scenario is to postpone the destination decision until shortly before the goods arrive at a consolidation point, port of loading or port of discharge. The scenario can be suitable for all the replenishment solutions.

The thesis result can be an addition to the existing literature about postponement, which is mostly about delaying the production or movement of goods until the customer demand is known. However, postponement can be implemented by delaying the decision of final destination of products during the production phase or during the distribution.

Key words: postponement, distribution network, replenishment, order fulfilment, lead time, planning and execution

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List of Abbreviations

BA	Business Area
CDC	Customer Distribution Centre
CS	Combined Supply
CP	Consolidation Point
CPU	Central Parcel Units
DC	Distribution Centre
DCG	DC Group
DD	Direct Delivery
FCA	Free Carrier Agreement
HFB	Home Furnishing Business
IoS	IKEA of Sweden
MRR	Mid Receiving unit close to the Receiver
MRS	Mid Receiving units close to the Sender
OTD	On Time Delivery
POL	Port of Loading
POD	Port of Discharge
SU	Selling units
SUP	Supplier

1. Introduction

With increasing competitiveness in the business environment, balancing between demand and supply becomes more and more critical. When a company is in close proximity to its suppliers and customers, demand and supply are easily communicated, thereby products can make a quick way through the supply chain (Ross, 2015). However, as the distance and time widen, the ability to access products and deliver to markets in short time diminishes. Globalization has led to increased supply lead times, more unreliable transit times and various consolidation possibilities (Bowersox, 2010). Logistics has grown in complexity for global companies, which has led to less flexible and consistent supply chains (Bowersox, 2010). In the same time, agile supply chains with rapid response to unpredictable changes in demand is increasingly sought-after (Rushton, Croucher and Baker, 2017). The ability to meet customers' requirements in ever-shorter time has become critical (Christopher, 2011). This is due to today's multichannel and fast-changing business environment (Fernie & Sparks, 2014). Customers demand more variety in products and the product availability in all the sales channels is essential to keep customers (Christopher, 2011).

In today's global marketplace, supply chain management is one premier operations management strategy for companies that seek competitive advantage. One way to bridge the distance gap between demand and supply is through management of logistics in the supply chain (Ross, 2015). Logistics concerns planning, controlling and implementing procedures for efficient and effective storage and transportation of goods (Hou, Chaudhry, Chen and Hu, 2015). Furthermore, the role of logistics is to satisfy the day-to-day service and product requirements of the supply chains. Postponement is a business strategy that has gotten more attention as a way for companies to become more flexible. Most of the prior studies have focused on postponement and flexibility within the manufacturing area. However, postponement can be applied on logistics and distribution of retail business.

The case company in this study, IKEA, is a multinational leading retailer in the home furnishing business. The company's business idea is to offer a wide range of furnishing products at low prices. In order to stay competitive and be able to offer affordable prices, IKEA has to optimize their entire supply chain. The company has realised potential improvements in the logistics management in order to become more flexible and responsive and meet the customer through various sales channels. The supply lead time from IKEA's suppliers to IKEA stores can be up to 16 weeks, and during this time the customer demand can change. Hence, the stores can get too much or too little quantities, or too early or late deliveries. Deliveries at the right time, right place and right quantity is critical for the stores as they have limited storage space and product availability is essential.

Today, IKEA has three different replenishment solutions to deliver goods from suppliers to the customers. The main selling point for IKEA is stores. However, with the rise in online sales the use of customer distribution centres that are used for online shopping orders has increased. Stores and customer distribution centres are together termed selling units. The goods can be transported directly from suppliers to the selling units, this replenishment solution is then called

Direct Delivery. Goods can also be cross docked at an IKEA distribution centre without any storage, it is called *Transit Delivery*. Additionally, the goods can be transported from suppliers to an IKEA distribution centre where the goods are stored until any selling unit request them, this solution is referred to as *DCG Delivery*. The replenishment solution can be combined for certain articles, meaning that stores and customer distribution centres are supplied by both Direct delivery or Transit Delivery and DCG Delivery, and it is referred to as Combined Supply.

IKEA gives suppliers information about quantity, date of delivery and destination when they place orders to them. Destination means stores and customer distribution centres in case of Transit Delivery and Direct delivery, and distribution centres for DCG Delivery. Hence, the Transit Delivery solution is today considered as a Direct delivery solution in the planning and execution although the goods are passing through a distribution centre. IKEA wants to investigate the possibility to postpone the decision of destination with the purpose of being more flexible and responsive towards changes in customer requirements. The company wants to explore if it is possible to send the final destination to suppliers in the end of the production lead time or if it is possible to postpone the destination decision after the goods are sent from suppliers.

1.1 Purpose and research questions

The aim of the study is to map the potential benefits and challenges in the IKEA supply chain when postponing the destination decision. The first step is to study the current replenishment solution and the key issues with it. The focus is on how IKEA is affected by deciding final destinations at the stage of order placement to suppliers. The following research question will enquire the concerns and issues with the various stakeholders, including suppliers, IKEA distribution centres, IKEA stores, IKEA customer distribution centres, the transport and customs. Research question 1 is formulated in order to answer this.

1. What are the key issues within IKEA's replenishment solutions when the decision of destination is made at an early stage?

A market study is performed to get an understanding of the postponement concept. Further on taking the IKEA context into consideration, efforts will be made to build scenarios. The following research question 2 is therefore created.

2. How could IKEA leverage the concept of postponing the decision of final destination with different scenarios?

To conceptualise the benefits and challenges of postponing the destination decision in IKEA's supply chain, research question 3 is formulated.

3. How would postponing the decision of final destination will affect IKEA's overall supply chain?

1.2 Scope

This study is limited to the home furnishing retailer IKEA and its distribution network including suppliers, consolidation points, transport operations, distribution centres, stores and customer distribution centres. Interviews were mostly limited to Swedish market and IKEA entities operating in Sweden.

1.3 Reading guidelines

Chapter 4 and 5 present an overview of IKEA's distribution network and replenishment solutions.

Chapter 6 gives the readers a critical overview of present situation, when the decision of final destination is taken early in the supply lead time.

Chapter 7 presents a summary of interviews held with external companies. Three retail companies based in Sweden and USA, one supply chain consulting company based in Sweden and one international trade consultant based in India.

Chapter 8 examines different scenarios with postponing the destination decision and how it affects the different stakeholders.

2. Theoretical framework

The theoretical framework includes a description of the home furnishing retail business and its characteristics. It also includes theories and concepts in planning and control, physical distribution, postponement and cross docking.

2.1 Retail business

Retail means reselling of goods and services to customers through different sales channels where a retailer buys the products or services and sells it to the end consumer. Retailers are the final loop in a supply chain. These major sales channels or the customer touch points can be traditional brick-and-mortar stores, vending machines, personal selling, online or e-commerce and multichannel retail (Pride et al., 2018; Morgan, 2013). However, many retailers are not only acting as intermediaries between the seller and the buyer but they are defining the business model (Sorescu et al., 2011). They are involved in product development, developing the supply chain network, enhancing the customer experience as well as creating value for all the stakeholders. Furthermore, the retailers' logistic flexibility affect their supply chain members as the retailers get an increased scope in supply chains.

The retail business is transforming everyday with the globalisation and new technologies. Retailers are entering into new markets, attracting new customer segments with new products and are competing to provide customers with better shopping experience (Sorescu et al., 2011). More and more companies operate in the global marketplace with global attributes such as global sourcing, global production, centralisation of information, centralisation of inventories but at the same time they serve for local requirements (Rushton et al., 2017). To increase the availability of the product and to avoid uncertainty in the supply chain, retailers are sourcing from multiple suppliers and from multiple countries. In this way they are also avoiding the dependence on a single supplier (Datamonitor (2012). Global sourcing has become a time-tested approach for the competitive advantage as a way to reduce the cost of sourcing (Trent and Monczka, 2005; Birou and Fawcett, 1993). Global sourcing is an integrated and collaborative sourcing strategy with the aim to have comparative advantage in cost and competitive advantages in quality, technology and delivery performance (Hultman et al., 2012; Alguire et al., 1994; Birou and Fawcett, 1993).

Logistics operations are more complicated in the global environment and to plan and manage logistics as an integrated system is difficult (Rushton et al, 2017; Birou and Fawcett, 1993). The complexity because of the globalisation provides some implications such as extended supply lead times, complicated node management, extended and unreliable transit times and a need for greater visibility in the supply chain. It requires huge investments in the physical distribution network and communication platforms to make the products available (Birou and Fawcett, 1993).

Optimal use of supplier capacity, warehouse space and transport network is demanded in today's retail business in order to stay competitive. Sorescu et al. (2011) emphasise the importance of operational efficiency and operational effectiveness for the innovation in the retail business model. According to Sorescu et al. (2011), operational efficiency is about doing things right, which can be achieved by streamlining the back end operations, and it includes sourcing and optimal inventory turnaround. Operational effectiveness is about doing the right things such as matching the demand of the customers with the supply.

2.2 Home furnishing retail business

The home furniture industry can be characterised as low technology based manufacturing with high volume of trade and the manufactured commodities have low value-to-bulk ratios (Drayse, 2008). Before industrialisation, furniture were mainly handcrafted but with the industrial revolution, mass production has taken the centre stage (Morgan, 2013). Historically, furniture have been considered as durable goods with long life and the consumption pattern is mostly infrequent with average consumers re-furnishing only 1.5 times in their lifetime (Leslie and Reimer, 2003). However, product innovation and introduction of wider range of products allow consumers to change the perception of furniture as a commodity to a lifestyle and fashion item (ibid), which in turn increases the consumption.

The global home furnishing business generally consists of three segments: Furniture, Floor Coverings, and Household Textiles (Datamonitor, 2012; Global Home Furnishing Market, 2014), however there may be other categories such as electrical and electronics products and plants added to the list. According to Datamonitor (2012) and Global Home Furnishing Market (2014), the Furniture segment basically consists of all the furniture's in the bedroom, living, dining, outdoor and office space; carpets, rugs and hard covering are part of the Floor Coverings segment; and the Household Textile segment consists of beddings, cushions, mattresses, bathroom textiles, door mats and all other textile products. The Furniture segment accounts for the highest percentage of share in terms of volume and value (Datamonitor, 2012).

With the presence of big retailers, the home furnishing retail sector is very competitive in advanced markets like Europe and North America, as well as it is fragmented with local manufactures and regional retailers in most of the countries (Datamonitor, 2012). IKEA became the first company to introduce ready-to-assemble furniture in flat pack where the customer assembles the product, resulting in considerable savings for the business in packaging, storage and distribution.

Like any other retail business, home furnishing business is experiencing changes in the sales format and it is accommodating multiple sales channels combining with the traditional physical stores. The increasing penetration of internet and the popularity of the e-commerce are giving the platform to new players to enter the market and it is also providing the consumers with wider choice of products (Datamonitor (2012). Furthermore, retailers are opening small format stores at city centres which make it convenient to commute for customers. Additionally, these

stores provide customer more personalised shopping experience, where customer can feel the product and get it delivered to their homes from local distribution centres.

2.3 Planning and control - order fulfilment

Order fulfilment concerns the ability to turn a customer's requirements into an actual order delivery (Rushton et al., 2017). In order fulfilment, information elements such as documenting and receiving an order is included to select and deliver the goods. Some companies divide between order-taking components, which are information-based, and order-delivery components, which are both information-based and physical. Manufacturing companies use different approaches for order fulfilment. One production approach is make-to-stock, which means matching production and inventory with customer demand forecasts. Hence, products can be finished before companies receive customers' orders (Jonsson and Mattson, 2009). Another production approach, make-to-order, means that products are not made until confirmed orders are received for the products. Thereby, products can be made after receipt of customers' orders and for make-to-order manufacturing operations, orders have an impact on the production itself (Rushton, Croucher and Baker, 2017).

There is a lead time between when a customer order is placed to a supplier, and when different processes such as production and delivery is done. Lead time can be described as the time lag between supply of products and their requisition or demand (Dasgupta, Mukhopadhyay and Ghosh, 2017). Rajaniemi (2012) divides between five different types of lead times, see Figure 1. Firstly, order lead time, also called supply lead time, is the time between when a customer order is received at a supplier to when the order is fulfilled and the customer has received the goods (Chopra & Meindl, 2016; Rajaniemi, 2012). Secondly, order handling time is the time between when a customer order is received and when the sales order is created. The sales order is created when the order is entered into the system. This time include validation of the order to ensure its correctness. Thirdly, manufacturing lead time consists of the time between when a sales order is created and when the production is finished. The manufacturing lead time tells how fast finished goods can be shipped, but do not tell anything about how fast the production of goods has been. Hence, the manufacturing lead time is important in make-to-stock production. Fourthly, production lead time is the time between when the physical production starts and when the production is finished. In contrast with manufacturing lead time which is more an external measurement, the production lead time is an internal measurement. The production lead time tells how long it takes to produce the order. Lastly, delivery lead time is the time between when production is finished and when the customer order is delivered.

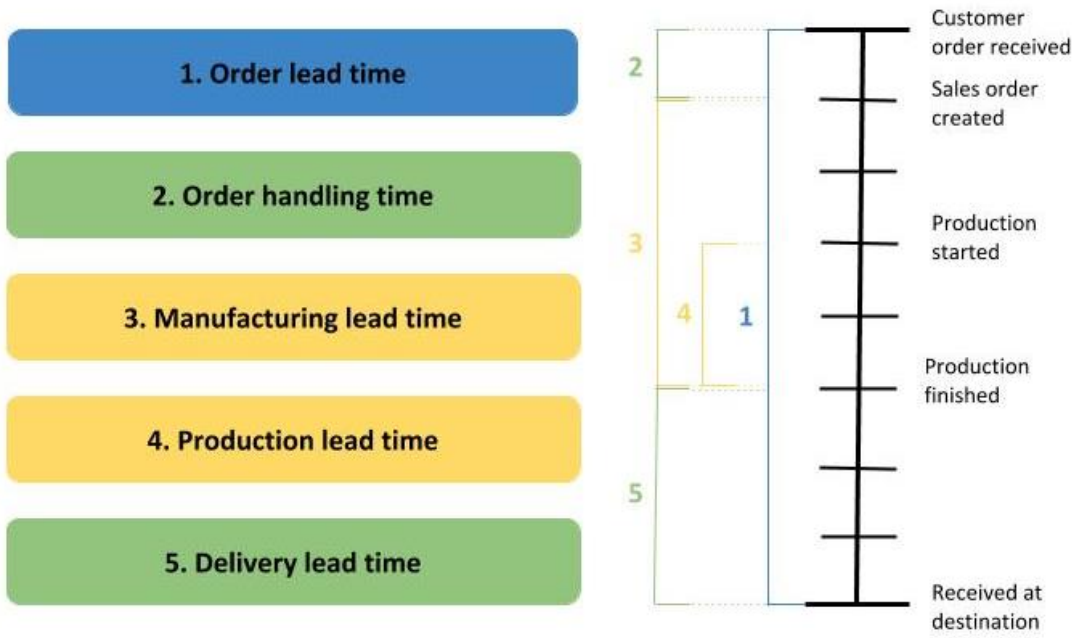

Figure 1. Five different types of lead time. Order lead time include the total time from when a customer order is received to when it is delivered to the customer (Rajaniemi, 2012).

2.4 Physical distribution

According to Rushton et al. (2017), the term logistics includes materials management and distribution. Major components within logistics include transport, warehousing and inventory. Furthermore, distribution represents storage and flow of goods from production to the customer. The distribution operation incurs a cost and depending on the product characteristics, the relative cost can be high. For low-cost, bulky products such as cement for example, the relative distribution cost appears high while for high-value products like spirits, the relative cost appears low.

Distribution and logistics are complex, it is not merely about transport goods from one storage point to another (Rushton et al., 2017). Operations often need to be dynamic to meet variations in customer requirements. Physically distributing products from the point of production to the point where they are made available for end customers can be called the physical distribution channel. Traditionally, the end point for consumer products has been a retail store, but it may also be the customer's house or pick-up points in case of online shopping. Distribution affects both the customer value and the supply chain cost directly, why it is a key driver of the overall profitability (Chopra and Meindl, 2016). To be able to achieve high availability of goods at a low cost, good distribution design and operations are essential.

There are several possible distribution channel alternatives between suppliers and retail stores or customers' homes. The supplier can deliver direct to retail stores, and generally this channel is only used when full truck loads can be delivered from the supplier (Rushton et al., 2017). Additionally, the supplier can deliver to their own warehouse and store the goods before they are sent to retail stores. Moreover, the supplier can deliver goods via a retailer's distribution

centre. Further on, goods can be delivered to consolidation centres where goods from various suppliers are consolidated and thereafter sent to a distribution centre. This kind of distribution channel where the retailer own the distribution centres has grown in importance as a result of the increase in large retail organisations. In case of online shopping and catalogue shopping, goods can bypass the retail store. The goods are then delivered from the supplier or from distribution centres by post or parcels carriers to consumers' home. Therefore, based on product characteristics and customer choice, several different channels are often used to get the products to the market.

When distribution centres are used, companies can use central distribution centres, meaning that one or a few centres are used to supply retail stores for several countries (Rushton et al., 2017). National distribution centres can be used to supply retail stores in one country, and regional distribution centres generally supply few stores within a country. Centralisation means stocking inventory at a central distribution centre, and decentralisation means stocking inventory at multiple distribution centres.

The choice of distribution channel can depend on size, spread and density of the market (Rushton et al., 2017). In a large market with widely geographic spread, long channels are often used. A long channel means that several storage points are used and different movements are used for products when they are distributed from the point of production to the final customers. In reverse, markets with few buyers and within a limited geographical area, short channels are used. Furthermore, the choice of channel can depend on the product itself. For high-value items short channels are often used as a high gross profit margin can cover higher distribution costs. For time-sensitive products and complex products, short channels may also be most appropriate. When it comes to new products, the final demand is unknown, and more flexibility may be needed with for example central inventory, hence a long channel is more appropriate.

2.5 Postponement and speculation

Postponement and speculation strategies are opportunities to achieve cost-effective and timely deliveries of products by rearranging conventional logistics and production structures (Pagh and Cooper, 1998). In recent decades, the postponement concept has started to receive more attention from academics and executives in companies (Ferreira, Tomas and Alcântara, 2015). The concept was introduced in the marketing literature by Alderson (1950) as an approach to reduce risk and uncertainty costs tied to the form, place and time differentiation of goods by making changes as late as possible.

In 1965, Bucklin extended the postponement concept by introducing the speculation concept as the contrary of postponement and applied the concepts on the distribution channel. The speculation strategy means that the differentiation of goods should be made at earliest point of time to facilitate economies of scale, but the strategy may lead to substantial inventories. Bucklin (1965) views postponement as a way to shift the risk associated with owning goods from one position to another in the supply chain. Furthermore, Bucklin means that postponement cannot be done everywhere as activities cannot be postponed forever, hence

postponement and speculation must always be combined. The postponement concept has evolved and is currently seen as an organisational concept (Yeung et al., 2007). The scope of postponement has expanded. It has developed beyond only considering marketing to also include purchasing, product development, manufacturing, logistics, and promotion processes (Yang, Burns and Backhouse, 2005).

Postponement can be defined as a strategy which intentionally delays the differentiating and/or value-adding activities until more information about the actual demand becomes available (Van Hoek, 1999; Yang, Burns and Backhouse, 2005; Yeung et al., 2007). There is consensus among researchers regarding the definition of postponement, however, there are large variance of how to make a classification of different postponement types (Mihiotis, 2013; Ferreira, et al., 2015).

Yang, Yang and Wijngaard (2007) formulate four types of postponement strategies based on the state of inventories. The first postponement strategy, logistics postponement, is a strategy where products have taken their final form before customer orders, but the final movement of products are postponed. As virtual inventories do not depend on the physical location of the inventories at the time when orders are placed, e-commerce can be facilitated by this strategy. The second strategy is production postponement and means that semi-finished products are kept undifferentiated for as long as possible. The third strategy is purchasing postponement which means that companies postpone the purchase of raw materials or components until demand is available. The fourth strategy, product-development postponement, means that low-risk subprojects are postponed and most resources are assigned to the riskiest and longest lead-time sub projects. In Figure 2, it could be seen how the Customer Order Decoupling Point (CODP) is associated with the different postponement types. The CODP is where the customer order penetrates in the supply chain and forecast-driven activities are distinguished from order-driven activities.

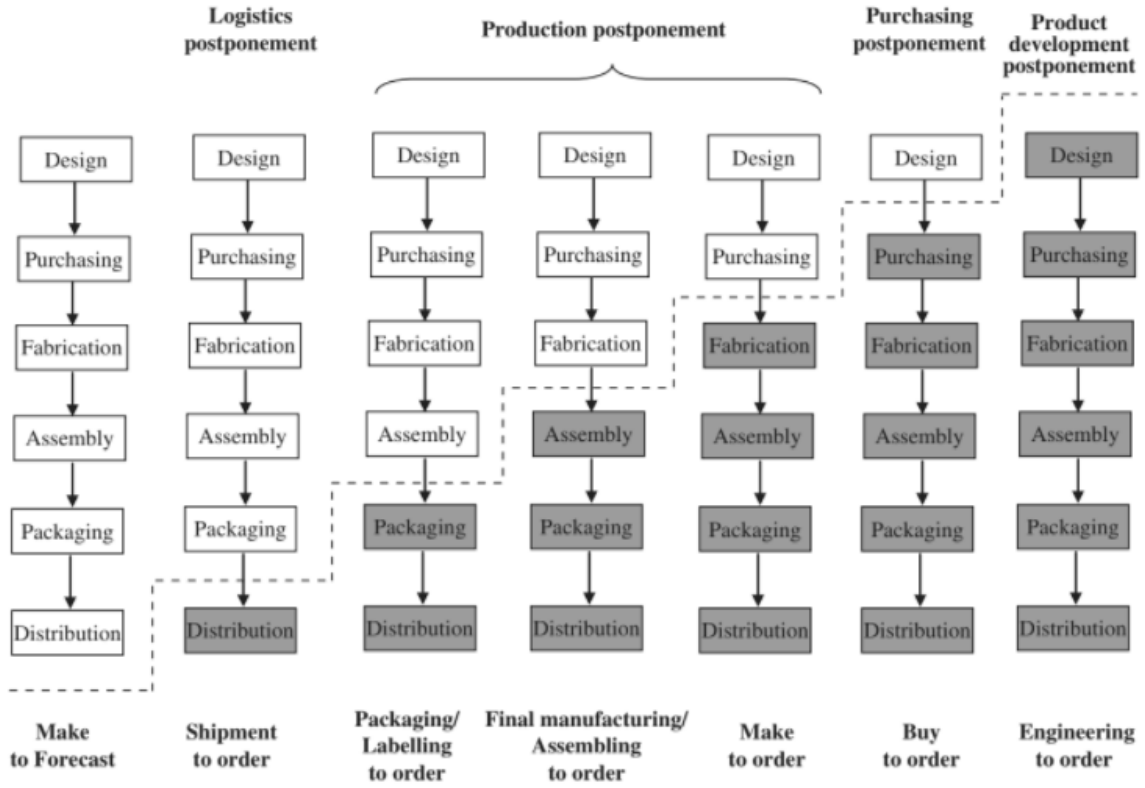

Figure 2. Four different postponement strategies: logistics postponement, production postponement, purchasing postponement and product development postponement. The white boxes are activities done before CODP, and the grey boxes are activities done after it (Yang, Yang and Wijngaard, 2007).

Pagh and Cooper (1998) introduce four generic supply chain postponement/speculation strategies. The strategies consist of full speculation strategy, logistics postponement strategy, manufacturing postponement strategy, and full postponement strategy, see Figure 3. The speculation strategy means that all manufacturing and logistics operations are based on inventory forecasts. The form and movement of goods to forward inventories should be done at earliest possible time (ibid.) In this case, the CODP is located at the lowest level downstream in the supply chain. A decentralised distribution system is used and the product is stocked close to the customers. By this strategy, full economies of scale can be achieved as the products can be manufactured and distributed in large lot-sizes. However, the inventory investment will be high as a result of the decentralised inventories, and obsolete products may occur. When stable customer demand and high volumes are apparent and pivotal in the supply chain, this strategy is feasible (Mattsson, 2002).

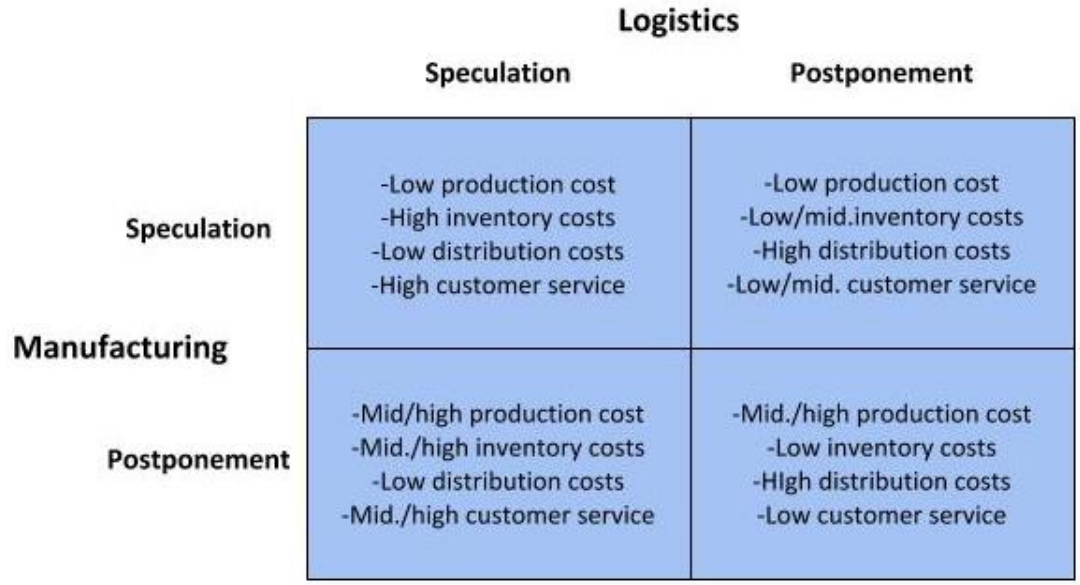

Figure 3. Four supply chain postponement and speculation strategies and the related implications of each (Pagh and Cooper, 1998).

The manufacturing postponement strategy means that the final manufacturing operations are performed after the product has been logistically differentiated some point downstream in the supply chain (Pagh and Cooper, 1998). The CODP is positioned prior to the final manufacturing operations. The products are distributed throughout a decentralized distribution system. The strategy will lead to reduced total inventory, and simplify the inventory planning and management. The complexity of customer order processing will increase and economies of scale will be reduced for the manufacturing operations performed downstream in the supply chain compared with the speculation strategy.

According to Pagh and Cooper (1998), the logistics postponement strategy means that direct distribution from a centralised inventory to final retailers of fully finalized products are done. The CODP is moved upstream, to the central warehouse level. The full postponement strategy means that both manufacturing and logistics operations are initiated by the customer order. The strategy results in low inventories in the distribution system and low manufacturing inventory costs.

Ferreira et al. (2015) argue that many of the theoretical classifications share the same concept, to delay the operations related to manufacturing or logistics until demand is available. Manufacturing postponement and production postponement are new denominations for the form postponement. Logistics postponement is also referred to as time postponement, geographic postponement and place postponement in the literature. In this study, the focus will be on the distribution of finishing goods, hence logistics postponement will be the focus.

2.5.1 Logistics postponement

Logistics postponement refers to the flow of the final product (Pagh and Cooper, 1998; Yang, Yang and Wijngaard, 2007; Xiaoxun and Jiajun, 2016). Bowersox and Closs (1996) distinguish between time and place postponement, but refer to both as logistics postponement. Time postponement is defined as when forward movement of goods is delayed until the customer requirements are known. The place postponement is defined as keeping storage at centralised locations and ship the goods when the customer requirements are known.

Several benefits can be explored when using the logistics postponement strategy. A benefit with postponement is that decisions are taken later regardless of the postponement type used, which increases the ability to respond quick to changes in customer demand (Graman and Magazine, 2006; Xiaoxun and Jiajun, 2016). Hence, companies can achieve better flexibility and more agile delivery by shortened and more reliable lead times (Pagh and Cooper, 1998). By taking decisions at a later point in time, increased product availability and reduction in loss of sales can be achieved (Ferreira et al., 2015). When decisions are delayed, forecast on aggregate demand is possible which makes it easier to do accurate forecasts (Yang and Burns, 2003).

In case of logistics postponement, the total inventory requirement is smaller, and thereby the inventory and carrying costs will be lower because of the risk-pooling (Mihiotis, 2013; Pagh and Cooper, 1998). Moreover, Chaudhry (2010) mentions that maintaining inventories at final locations do not only increase inventory costs, but also lead to stock outs or excess stock at the final locations. This because the balance of stock between final locations may not correspond to the actual customer requirements. When inventory is centrally located, there is greater flexibility in directing the goods to where it is needed. However, the logistics postponement strategy where regional warehouses are replaced by one central warehouse may lead to smaller shipment sizes and faster modes, hence increase the distribution costs (Pagh and Cooper, 1998; Chaudhry, 2010; Xiaoxun and Jiajun, 2016).

Each company needs to identify a suitable CODP by finding a balance between speculation, i.e. forecast-driven activities, and postponement, i.e. customer-driven activities in the supply chain (Cooper, 1993). Yang and Burns (2003) mention that there may be limited value to apply a postponement strategy in easy predictable environments. The postponement strategy is a way to deal with the demand uncertainty in turbulent environments (Ferreira et al., 2015). Innovative products with short life cycles and great market uncertainty serve best for logistics postponement. According to Van Hoek (2001), the postponement strategy is feasible when products are more sensitive to inventory costs than transport costs, i.e. high value products with large product variety. Furthermore, the longer the supply chain channel is, the greater are the potential benefits of postponement (Mihiotis, 2013).

Christopher et al. (2006) introduce four supply chain strategies, see Figure 4. Choice of strategy depends on supply characteristics, if the lead time is short or long, and on demand characteristics, if the demand of a specific product is predictable or unpredictable. An

unpredictable demand and long supply lead time implies that a postponement strategy should be used. Leaglie means a combination between lean and agile. Lean implies cost efficiency while agile implies flexibility and quick response to customers' needs in the supply chain.

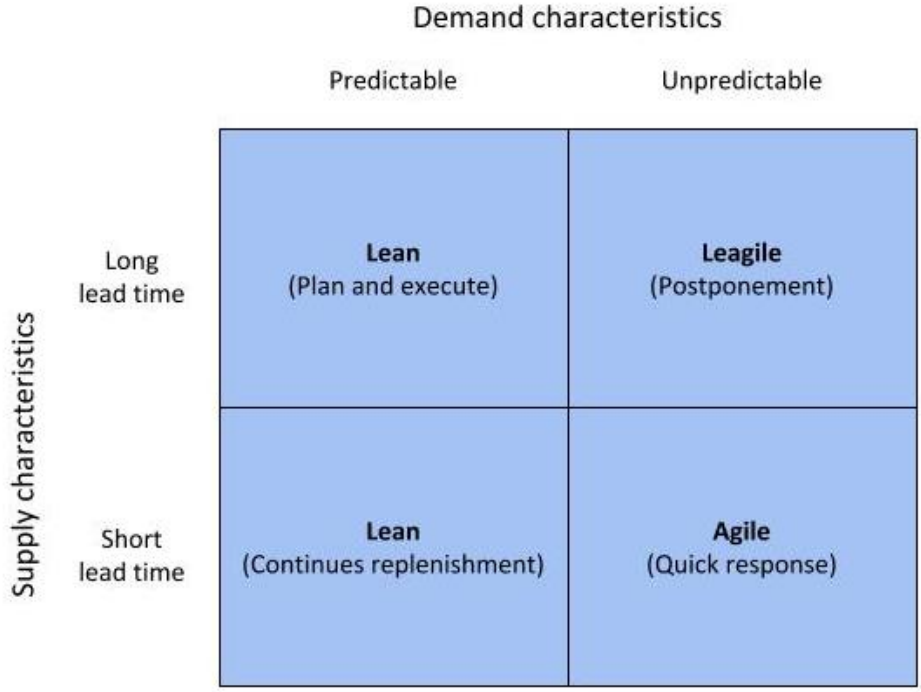

Figure 4. Four supply chain strategies depending on demand and supply characteristics (Christopher et al., 2006).

2.5.2 Implementation of postponement

In general, there are understandings of the actual benefits of the postponement concept among companies. However, how to implement postponement and convince all parts of an organisation and supply chain are the main challenges. Graman and Magazine (2006) mention resistance to change processes, culture of the organisation, lack of coordination and organisational readiness as possible difficulties when implementing postponement. Older organisations which have strong local autonomy often find it more difficult to implement changes that represents a radical departure from existing practices, whereas younger companies often quickly reconfigure their operations. Several other potential barriers such as product and production characteristics, how a company manages its suppliers or customers, operational control and government regulation are mentioned in the literature (Yang, Burns and Backhouse, 2005; Bowersox et al., 2013). Furthermore, Chaudhry (2010) mentions lack of informational linkage across the supply chain as a key barrier towards the application of postponement strategy. Hence, information and communication technology (ICT) should be used to make the logistics chain transparent enough to make postponement feasible.

When implementing postponement, a holistic view is needed (Yang and Burns, 2003). The viability of postponement depends on the structure of the supply chain characteristics (Yang and Burns, 2003; Ferreira et al., 2015). Open communication towards suppliers and customers is needed and as with other implementations, top management support is essential (Ferreira et al., 2015). Moreover, cross-functional teams should be created as it makes it easier to determine

how changes in one area of the supply chain affect other areas (ibid). Graman and Magazine (2006) mean that there is a trade-off between postponement and forecast accuracy. The need for postponement diminishes as the forecast accuracy improves. Hence, it may be more cost effective to improve the forecast accuracy than to implement a postponement strategy.

2.6 Cross-docking

Cross-docking is a logistics strategy where incoming shipments are unloaded from inbound vehicles at a distribution centre and loaded into outbound vehicles with little or no storage in between (Belle, Valckenaers and Cattrysse, 2011; Chopra and Meindl, 2016). If the goods are stored, they should only be so for maximum 24 hours. By this strategy, shipments can be consolidated, shorter delivery lead times can be achieved, and unnecessary inventory can be minimised (Yan and Tang, 2009). In a traditional distribution centre goods are stored, and when a customer request items, they are picked and shipped to the destination (Belle et al., 2011). Storage is costly because of inventory holding costs, and order picking is costly because it is labour intensive. Hence, as the cross-docking strategy eliminates the need of storage and order picking, costs can be reduced.

Cross-docking is not the best strategy in all circumstances. The strategy is suitable if the demand rates are more or less stable, as there should be no imbalance between incoming load and outgoing load (Belle et al., 2011). With predictable demand, the planning of cross-docking becomes easier. Moreover, as cross-docking minimises inventory level at warehouses, stock-out situations may more often occur. Cross-docking lowers the total inventory as goods are stocked at stores instead of both at stores and warehouses (Chopra & Meindl, 2016). If the unit stock-out cost is low, cross-docking can be the preferred strategy.

By using cross-docking instead of the traditional distribution process, the decision making process in the distribution system is affected (Yan and Tang, 2009). Two different cross-docking types can be used, namely pre-distribution and post-distribution cross-docking (Belle et al., 2011). In pre-distribution cross-docking, the suppliers do the preparation and sorting, and they have to know the order quantities of orders placed by each store (Yan and Tang, 2009). In post-distribution cross-docking, assignment of goods to destinations is made when they arrive at the cross dock. It will be higher operations' costs at the cross-dock as the preparation and sorting will take place there. By post-distribution cross-docking, the influence of demand fluctuations can be reduced as the risk during the transportation period from the supplier to the cross-dock can be pooled. Hence, post-distribution cross-docking combines the advantages of pre-distribution cross-docking and traditional distribution centre through risk-pooling.

3. Method

In this chapter, the research approach and strategy is provided as well as the research process. Furthermore, the different data collection methods, including a literature review, interviews, observations, internal documents and a survey, are described. Lastly, scenario building and the reliability of the study is discussed.

3.1 Research approach

For the study, an abductive approach was used. An abductive approach is a combination of an inductive approach and a deductive approach (Kovács and Spence, 2005). When using an inductive approach, the aim is to generate new theory by collecting data, while a deductive approach is used for testing theory. The abductive approach means that empirical and theoretical results has a constant relation (Dubois and Gadde, 2002). The research question can be changed when new empirical findings and new theoretical insights are received (ibid.). In this study, new directions of the research have been taken by both empirical and theoretical findings during the process. The authors of the study spend three months at IKEA of Sweden in Älmhult, as it is a way to obtain knowledge of how the organisation works and what theory is needed (Ong, 2012). By continuous empirical findings at the organisation, the theoretical framework was modified. Kovács and Spence (2005) describe that an abductive approach begin with a real-life observation and thereafter iterate between theoretical insights and empirical findings. By this, new understanding is developed and knowledge can be applied in different ways. The study started with observing how IKEA is currently working with its distribution and replenishment and the observation was based on the interviews and visits to IKEA stores, suppliers and distribution centres. In order to comprehend the problems with the current state and to research on the suitability to postpone the destination decisions, several interviews, a literature review and a survey were made. Hence, an abductive approach was suitable for the study.

3.2 Research strategy

Bryman and Bell (2003) separate between qualitative research strategy and quantitative research strategy. A qualitative research strategy means that non-quantifiable measurements are used for subjective analysis. The qualitative research is suitable when beliefs, incentives or motives needs to be understood. A quantitative research strategy means that measurable data is used for statistical analysis (ibid.). In case of a quantitative research method, the author generally put efforts on how and what to quantify but there is a risk of ignoring the related relationships or circumstances (Sofaer, 1999). A qualitative research method helps in understanding the events, scrutinize the patterns and identify the variations (ibid.). Depending on the data that needs to be used in a study, a decision of what strategy should be pursued is made. To map IKEA's distribution network and to analyse scenarios of postponing decision of final destination, a qualitative research strategy was chosen to be most suitable.

3.3 Research process

The research process was divided into three steps, see figure 5. The first step was to collect data by interviewing people working at IKEA and to make study visits, i.e. observations, at different IKEA sites. By this, IKEA's distribution network was mapped and problems with deciding final destinations early in the supply were detected. Furthermore, internal documents were studied to get more information about the distribution network and also to verify the information from the interviews. Additionally, the empirical findings were guiding the search for relevant literatures to get a deeper understanding of the subject. This step helped in answering the research question 1.

The second step was to create different scenarios with postponement in order to improve the current distribution network. Moreover, the scenarios were tested by interviewing different stakeholders in IKEA's supply chain, including suppliers, transport department, customs department, DCs and IKEA of Sweden. Furthermore, a market study of retail companies was done through a survey and external interviews. Literature was studied in order to create the survey. People with suitable roles within several different companies were contacted to participate in the survey and interviews. The second step answered research question 2.

The third step is to visualize the pros and cons with the scenarios and take into consideration the external actors' experiences that were found in step 2. Additional interviews and literature study was needed based on the new upcoming information. This step answered research question 3.

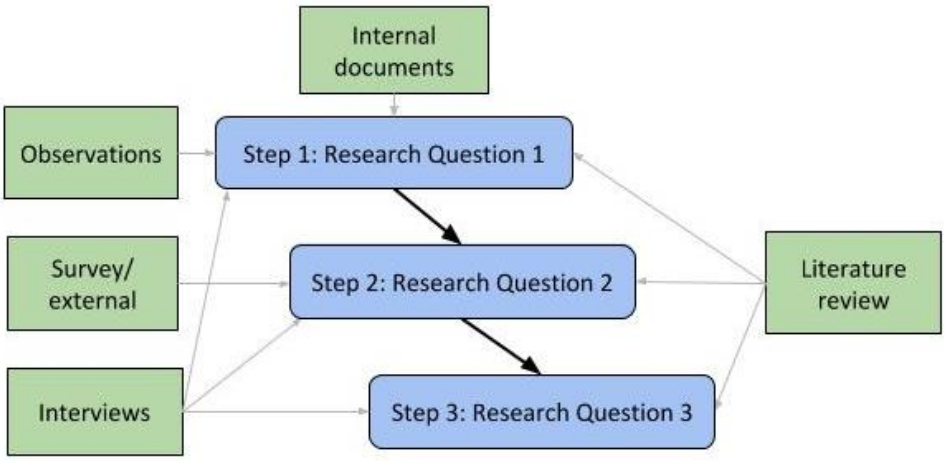

Figure 5. The research process. Green boxes is the data collection methods used and blue boxes is the steps and research questions. The grey arrows show the methods used for each step, and the black arrows show that step 1 helps to answer research question 2, and both step 1 and 2 are needed to be able to answer research question 3.

3.4 Data collection

When performing a research study, it is of importance to have multiple sources of data in order to eliminate subjective viewing (Bryman and Bell, 2003). In the study, data was collected through a literature review, internal and external interviews, internal documents, observations and a survey.

3.4.1 Literature review

According to Bryman and Bell (2003), a literature review is important when performing a research study. It is necessary to gain general insight and knowledge of the field of study and to create a theoretical framework. Chalmers library's database, Mendeley, Summon, and Google Scholar were used for the literature search. According to Bryman and Bell (2003), using synonyms in the searching is an efficient way to find the right information. Some of the keywords that were used in the search for relevant literature were "postponement", "logistics postponement", "geographic postponement", "cross docking", "distribution cross docking", "physical distribution", "order replenishment", and "home furniture retail". In order to be time-efficient, only abstract, introduction and conclusion in the papers were read, and if it seemed relevant, the other parts were read as well. In some cases, searching among references in the relevant articles was done, and thereby new sources were found.

3.4.2 Interviews

In order to map the distribution network, interviews were conducted in a semi-structured form, meaning that open questions were asked. In this way, the interviewees could answer in their own terms and be reflecting. If a more structured interview form had been chosen, some relevant aspects could be missed out. According to O'Gorman and MacIntosh (2015), it is suitable to perform less structured interviews face-to-face to be able to absorb information more effective. Most of the interviews were performed face-to-face, but some of the interviews were held through Skype or by phone when face-to-face meetings were not possible. In order to focus on the interviewees' answers and ask follow-up questions, it is of importance to document the conversation by taking notes or recording (O'Gorman and MacIntosh, 2015). Therefore the most of the interviews were recorded. However, some of the interviewees did not want to be recorded and this was of course accepted. Afterwards, the interviews were transcribed. In some cases, the interviewees were contacted for a second round of interviews to get some of the information confirmed or dismissed and to ask follow-up questions.

Interviews were conducted with employees at IKEA of Sweden, IKEA Purchasing Services, IKEA Svenska Försäljningar AB, IKEA Services AB, IKEA Supply AB, IKEA Distribution Services GmbH & Co. KG, and IKEA Services India Private Limited. This in order to gain understanding about how IKEA's distribution network works like and potential problems with it. The persons were selected with help from the authors' supervisor at IKEA, and the purpose was to get information from different perspectives and from people with different knowledges and experiences. The objective with the interviews were also to discuss how the postponement idea could affect the different parts of IKEA. In total, 26 interviews with different employees at IKEA companies were conducted. In Appendix I all interviews are summarised by providing company name, role, date of interview and type interview. Apart from interviews with IKEA companies, interviews with two of IKEA's suppliers, Pallco and Spaljisten, were conducted. The goal with these interviews was to get an understanding of their perspective on IKEA's order planning, and how the postponement idea could affect the suppliers. The interviews are summarised in Appendix II.

3.4.3 Internal documents

To understand the standard working methods in the case company, interviews were of great help. However, companies normally document their working methods and these manuals could reinforce the inputs that are collected through interviews. Efforts were made to collect and read the general working principles, competence profiles and various terminologies used in the case company. Special training and instructions were taken to use the Qlikview application to read and understand the different parameters of the distribution. Qlikview is a business intelligence and visualisation software that allows users to access data from multiple sources in a single platform in the form of reports, charts and graphs for better visualisation and decision making (Floyd, 2013).

3.4.4 Observations

Observation is a common used data collection method in a qualitative research. Observations allow the researchers to experience or to inspect the events using their own sense and to read the body language of the participants (Kawulich, 2005). While interviews present views of the participants and literature summarises the theory, an observation gives a personal experience. Visits to distribution centres were helpful in understanding the different activities like planning, loading/unloading, storage and space utilisation. Similarly, visits to selling units provided the understanding of challenges faced by those units with the product availability and space constraints. Since the supplier is the first actor in the upstream of the supply chain, comprehending views from their perspective were very useful. Interviews, literature review and observations were conducted simultaneously, therefore observations were yielding valuable inputs in refining the questions and ideas for next interviews and for finding relevant literature.

3.4.5 Survey

When a research is about analysing the benefits and challenges of a concept, one approach is to study the current use of that particular concept by others with somehow similar conditions. According to Wang (2014), a survey is an effective tool to get insights from the wider respondents as it takes less time and it is cost effective compared to other methods like interview, mail, telephone or visit. Richardson (2005) points out that a survey is useful when it is a need of answers or opinions from a large number of sources and the questions that are put forward are simple to understand and do not require any further explanation. To get the desired response from the larger population, a survey can be initiated via physical mail, telephone or online. With the advent of web-based survey tools it takes less time and minimum cost to administer the survey, and it is much easier to collect and analyse the data (Gay et al., 2009).

By adopting the theories from Wang (2014) and Richardson (2005), the survey was divided into three phases and a timeline was fixed to follow the progress of the survey. The 3 phases are as follows:

1. Planning and preparation of the survey
2. Testing and distribution of questionnaires
3. Response and analysis of answers

1. Planning and preparation of the survey

The first phase is important as it involves defining the objective of the survey and preparing the list of questions according to the objective. The research question 2 is the guiding factor to formulate the objective of the survey. The objective of the survey is to find out at what stage of the distribution the retail companies are deciding the final destination of deliveries and what are the benefits or challenges perceived when decision is taken closer to the destination. The theoretical framework and the initial interviews were put to use for preparing the list of questions. Since the topic is very technical and requires higher understanding from the respondents, efforts were made to explain some of the questions with extra notes. Questions were formulated in a way that they were not sensitive to answer and not including internal information that respondent do not want to share.

Special instructions like 'possible to select multiple options' and extra comment boxes were provided wherever it was necessary. The form of the questions are pre-coded questions with certain options. According to Richardson (2005), pre-coded questions are easy to answer and require less effort to analyse as compare to the open questions. The sequence of the questions were written in logical manner which means that questions which were easy to answer were put first then followed by some specific technical questions.

2. Testing and distribution of questionnaires

The platform used for the online survey was www.surveygizmo.com which provides software as a service for online surveys and is rated best in class. The platform allows to form questions with multiple options like 'radio buttons', 'check box', 'drop down', 'star rating grid' et cetera. The platform provides an option to send the survey to multiple persons with an email campaign and it could also be sent one at a time through personal mail or the link can be posted in any social media. A test version of the survey was sent to the authors' supervisors and three IKEA employees to get feedback on the questions and to check the ease of answering the questions. After analysing the feedback certain changes were incorporated. In case of an online survey the questions and the instructions should be comprehensive because there will not be any further explanations (Berends, 2006).

The survey was meant for the respondents who are working in the logistics and supply chain function in retail industry. Since the IKEA business interest is in the home furnishing business, efforts were made to select professionals working in home furnishing retailers across the globe. The main source of finding the respondents was LinkedIn. In total 74 respondents were selected from 22 companies located in 6 countries.

Finally, the survey was sent out to all the respondents, and the link of the survey was also posted in the 'logistics and supply chain professionals' forum at LinkedIn which has a member base of more than 250 000. After a week, a gentle reminder mail with the survey link was sent out to all the respondents. The survey questionnaire can be found in Appendix IV.

3. Response and analysis of answers

According to Wang (2014), Berends (2006) and Gay et al. (2009), two of the major issues with a survey is the low response rate and the no response to certain questions, and it is a major challenge to improve the response rate. In order to improve the response rate, efforts were made to incentivize the respondents for their time and inputs. An incentive in form of sharing the findings or result of the survey was communicated in the mail when the survey was sent out. In Table 1**,** the response status of the survey is shown.

Table 1. Response status of the survey.

Online Survey	**No's**
No of selected respondents	74
Bounced	19
Did not wish to share the process	2
No response	49
Desired Response	4

In total, four responses were received and there were two persons who did not wish to share their logistic processes. The desired response rate of the survey was 7%. The low response rate is further discussed in chapter "9. Discussion".

3.4.6 External Interviews

In addition to the interviews with IKEA entities and suppliers, five external interviews were conducted to study their distribution network and replenishment setup, see Appendix III for a summary of the interviews. Two of the retail companies are based in Sweden and one retail company is operating in USA. One of the interview was held with a supply chain consulting company based in Sweden and which provides consultancy services to with various retail organisations. The last interview was conducted with an international trade consultant based in India. The interviews were semi-structured with questions extracted from the survey that suited the specific organisation.

3.5 Data analysis - Scenario building

The IKEA's supply chain consists of multiple entities and each entity plays a major role in achieving the goal of product availability at lowest cost. Present working strategy, issues and views from these entities were collected through interviews and site visits. Finally, the data collected from interviews, observation, internal documents and literature were analysed with help of scenarios to apply the concept of postponement in assigning the final destination.

Scenarios provide a structure or a framework for the future course of action while considering the challenges and opportunities that will arise with changing parameters (Farge, 2017). Scenarios help in taking better business decisions for the organisations when it involves multiple stakeholders and altering the present working methods affects all its stakeholders. In other words, scenarios assist in visualising the risks when making decisions (Farge, 2017). Typical example of scenarios are military war games where decisions are taken after analysing different scenarios. According to Durance & Godet (2010), scenarios should be logical and feasible to the applied context. The scenarios can be categorised into three sections: explorative, goal specific and predictive, see Figure 6 (Börjeson et al. 2006; Farge, 2017).

The exploratory scenarios are answers to questions like 'what can happen?' or what can be the result or effects due to the external factors and strategic factors. The goal specific scenarios are used to get specific results either by conservation of the present system or by transformation. The idea of the predictive scenarios is to predict the outcome or 'what will happen?' either by forecasting or analysing what-if situations.

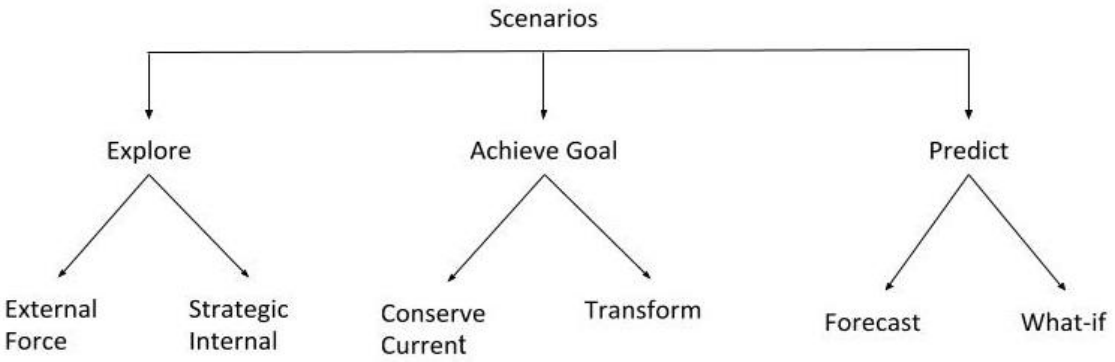

Figure 6. Three categories of scenarios: explorative, goal specific and predictive (Börjeson et al. 2006; Farge, 2017).

For this research, the exploratory scenario building was suitable as Börjeson et al. (2006) emphasise that exploratory scenarios are developed when the users are well aware of the present situation and want to explore the outcome with alternate strategies. The two criteria that build the scenarios are external and strategic. How the external factors affects the stakeholders and how the changes in internal strategy guide the new developments will assist in building these scenarios. What-if scenarios are sometimes identical to exploratory scenarios but Börjeson et al. (2006) highlight that exploratory scenarios are planned with long-term horizon with structural changes whereas what-if scenarios are focused on immediate changes.

When planning the scenarios the focus should be to ask the right questions rather the finding the answers. Examining the present facts, observations and the future perception will bring comprehensive images into the scenarios. Farge (2017) recommends not to create more than five scenarios in order to avoid confusions and complexities and also insists to consider multiple thoughts and inputs. In this study three scenarios are developed and these scenarios can be implemented independently or can be combined together depending upon the lead time, product characteristic and overall benefits.

3.6 Reliability of the study

Triangulation is an effective method to increase the reliability of research findings (O'Gorman and MacIntosh, 2015; Yin, 2014). The triangulation method means that several sources of information are used to confirm the core content and reduce bias within the research (ibid). There is a risk of collecting subjective data when performing interviews in a qualitative research (Bryman and Bell, 2003). By using several data sources, the reliability could be secured. In total, 26 internal interviews, 2 interviews with suppliers and 5 external interviews were made, and multiple interviews with people in similar positions were conducted in some of the cases. Moreover, assumptions based on the interviews were confirmed or dismissed by comparing with other data such as internal documents and the literature review. The time spent at IoS gave direct access to information and employees, and thereby the reliability of the data was strengthen. Figure 7 illustrates how the different data sources were used to confirm the information.

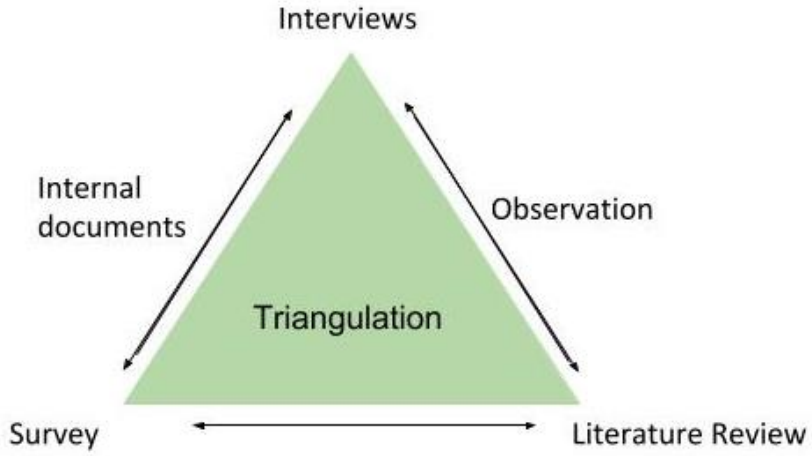

Figure 7. Triangulation by using five different data collection methods.

4. About IKEA

In 1943, Ingvar Kamprad founded IKEA in Elmtaryd, Agunnaryd (IKEA, 2018b). The company begun as a mail-order business with general products for sale and has through time evolved to a unique concept by both developing and retailing low-price home furnishing products. IKEA's vision is "create a better everyday life for the many people", and the business idea is "offer a wide range of well-designed, functional home furnishing products at prices so low that as many people as possible will be able to afford them" (IKEA, 2018a). The vision and business idea explains the concept of offering quality at affordable prices for the customers.

The IKEA concept is a global success. In FY2017, IKEA operated 355 stores in 29 different countries and the sale reached 34.1 billion euro (IKEA, 2017). The biggest market is Europe, which accounts for 66% of the total retail sales, while the American market stands for 19%, the Asia Pacific market accounts for 11% and the Russian market stands for 4% (IKEA, 2017). Figure 8 shows how many stores, distribution centres and customer distribution centres that exist in the different markets. In 2015, IKEA had nearly 1000 suppliers and Europe stood for 60% of the sourcing, Asia 35%, North America 3%, Russia 2% and South America 1% (IKEA, 2015).

Figure 8. The geographical presence of IKEA stores, distribution centres (DCs) and Customer Distribution Centres (CDCs) in FY2017 (IKEA, 2017).

There are several companies which are operating under the trademark of IKEA. The company operates the stores under franchise agreements. In Figure 9, a simplified overview of IKEA's franchise system is presented. The parent company of the IKEA group of companies is INGKA Holding B.V., which is based in Netherlands and controlled by stitching INGKA foundation (IKEA, 2018a). INGKA Holding B.V. is one of the franchisees and owns the majority of the stores. Moreover, the majority of the distribution centres and the customer distribution centres are also owned by INGKA Holding B.V.

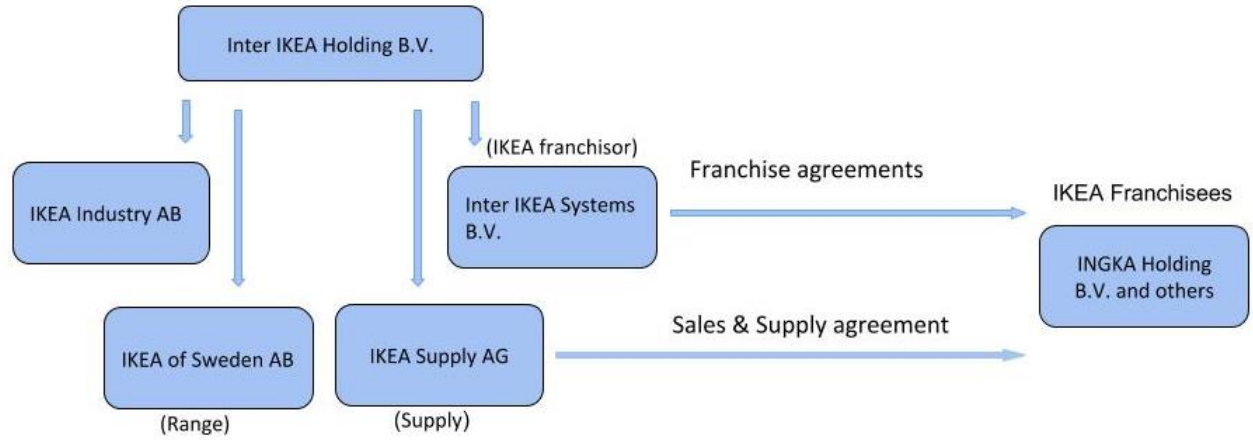

Figure 9. A simplified overview of IKEA's franchise system (IKEA, 2018c).

Inter IKEA group is a group of companies under the umbrella of Inter IKEA Holding B.V., whose main areas of interest are Franchise, Range & Supply and Industry. Inter IKEA systems B.V. is the worldwide franchisor who owns the IKEA concept and the IKEA brand, IKEA of Sweden AB (IoS) is responsible for design and development of the product range and IKEA Supply AG is responsible for the supply. IKEA Industry is a wood-based furniture maker for the IKEA product range and it is the largest manufacturer of the wooden furniture in the world (Inter IKEA, 2018a).

IoS is organised into 10 Business Areas (BAs), including Bedroom & Bathroom, Kitchen & Dining, Textiles, IKEA food, Livingroom & Workspace, Children's IKEA, Lighting & Home Smart, Cooking & Eating, Outdoor & Storage and Free Range (Inter IKEA, 2018b). These Business Areas are divided into 20 Home Furnishing Businesses (HFBs) (IKEA, 2018d). Similarly, materials used for the IKEA products are divided into 40 Categories based on similar industry and production techniques, such as ceramic, glass, metals, plastics et cetera (IKEA, 2018d).

IKEA Supply AG is the wholesale company, hence the owner of the goods from the suppliers to the selling units and responsible for replenishment of goods (Inter IKEA, 2018a). When the stores receive the goods, they become the owners. Regardless of the replenishment solution, IKEA Supply AG is responsible for delivering the goods to the stores with free carrier agreements (FCAs) as incoterms.

5. IKEA's Supply chain

This chapter presents the basic principles of IKEA's supply chain network along with the functions of its major stakeholders. It gives the reader a brief idea about IKEA's distribution strategy and its replenishment solutions.

5.1 Distribution Network

IKEA has approximately 10 000 articles in the product range in each store (IKEA, 2014). There exist country unique versions of products, thereby the total number of articles is more. In 2016, the total volume of goods held in IKEA's entire supply chain was more than 9 million cubic meter with a value close to 6 billion euro (IKEA, 2016a). This stock is spread across the distribution network which includes suppliers' finished goods inventory, and stock at distribution centres, intermediary consolidation points, customer distribution centres and IKEA stores. IKEA has stores across the globe and the sourcing area is often not the same as the sales area. Hence, many products have long delivery lead times and considerable amount of the stock is in transit to selling units. In order to keep the stock at an optimum level in all the nodes and to keep the overall supply chain cost low, an efficient replenishment solution and an optimised distribution network are required. Figure 10 shows a simplified overview of IKEA's distribution network. Below, the different units in the distribution network are described more in depth.

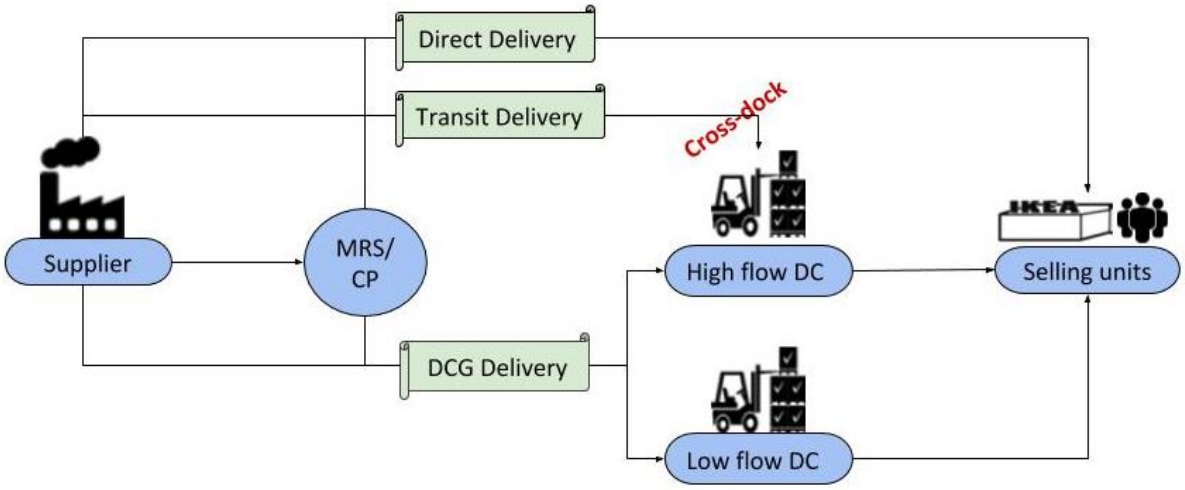

Figure 10. A simplified overview of IKEA's distribution network: Supplier, MRS/CP, Low flow DC, High flow DC, MRR, store and CDC are included. The different replenishment solutions, Direct Delivery, Transit Delivery and DCG Delivery are also shown.

5.1.1 Supplier

IKEA's suppliers are the manufacturers of the company's range of products. IKEA has around 1000 suppliers around the world, including the own IKEA Industry production units. Some suppliers make-to-order, meaning that IKEA creates orders, then the suppliers start to produce the products. Other suppliers make-to-stock, meaning that they have finished products in stock based on IKEA forecast and ready to send when IKEA creates an order. The production lead time for IKEA's suppliers is in average 15 days.

Suppliers are connected to multiple DCs and selling units depending on the products and the replenishment solutions. The supply lead time between a supplier and selling units depends on if it is a make-to-stock or make-to-order supplier, in the latter case the supplier's production lead time is of importance. Furthermore, the delivery lead time between a supplier and selling units as well as the replenishment solution chosen will affect the supply lead time. IKEA uses On Time Delivery Supply Chain (OTD SC) to measure the performance of the supply chain. OTD SC is measured by two sub measurements, OTD Sender and OTD Logistics, see Figure 11 below. OTD SC is measured in terms of quantity and time, and is contributed by all supply chain partners in order to improve the logistic performance and execution. OTD Sender is a measurement of the supplier performance with the readiness of the finished goods corresponding to the orders (Process Developer 3). Early readiness, cancellation of order and delay in production will affect the supplier performance. Apart from the OTD Sender measurement, suppliers are measured by for example quality and sustainability in production. The OTD Logistics measurement is further explained in "5.2 Transport solutions".

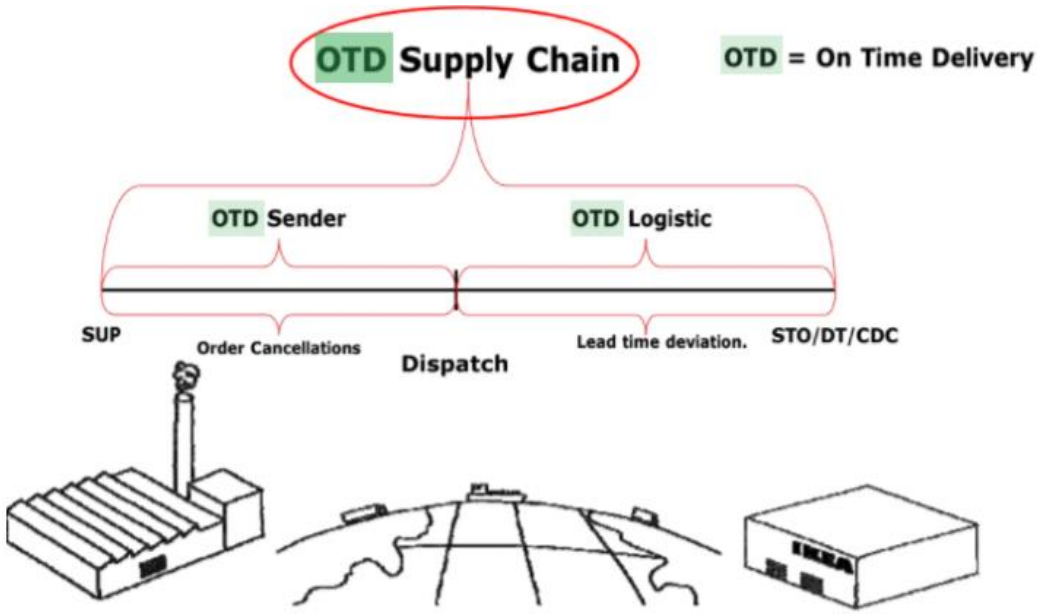

Figure 11. IKEA uses On Time Delivery Supply Chain to measure the supply chain's ability to execute orders according to plan. It includes the sub measurements OTD Sender and OTD Logistics.

5.1.2 Distribution Centre (DC)

IKEA's distribution centres (DCs) are strategically located logistics units for storage and consolidation of goods. Today, IKEA has 41 distribution centres across the globe (IKEA, 2018c), see Figure 12. The stock at the DCs is replenished from suppliers, and the stored goods are transported to selling units on requirements. The DCs are also used as transit points, meaning that goods are unloaded from trucks and without taking into storage, they are loaded within 24 hours on new trucks and thereafter transported to selling units.

The company has a wide range of products and each product has a different demand and sales volume. In order to achieve economy of scale and to ensure the optimal use of the transport

network along with the available storage space, DCs are divided into two categories, High flow DC and Low flow DC. High flow DCs are situated close to the selling units and typically serve one or a few countries whereas Low flow DCs are centrally located for a specific region and cater more countries. Goods are generally transported in full pallets from suppliers to DCs and from suppliers to selling units. In case of replenishment from High flow DCs to selling units the goods are mostly transported in full pallets, whereas goods are generally transported in pieces and multi-packs from the Low flow DCs to the selling units.

Figure 12. The geographical locations of IKEA's DCs. IKEA has in total 41 DCs (IKEA, 2018c).

5.1.3 Distribution centre group (DCG)

Instead of measuring the safety stock for individual DCs, a distribution centre group (DCG) structure is established to calculate the consolidated safety stock and replenishment orders to the suppliers (IKEA, 2013). Hence, a DCG is a group of DCs for a specific geographic region responsible for replenishing the stock to the selling units of that region. Figure 13 illustrates a simplified view of IKEA's DCG network.

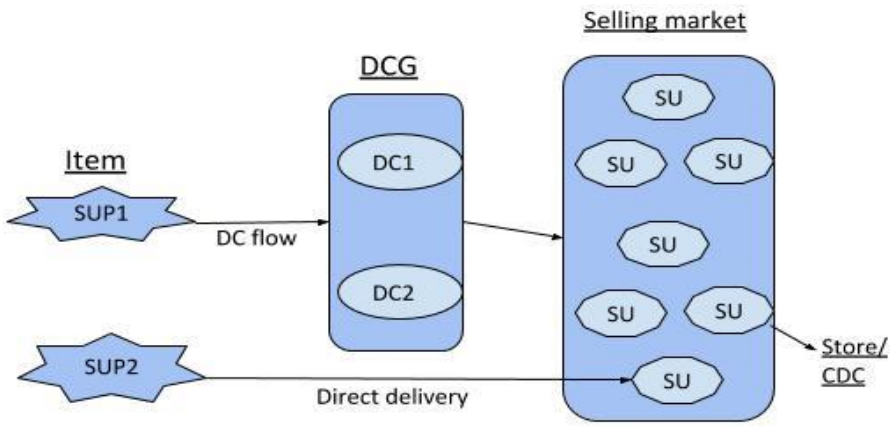

Figure 13. A simplified view of DCG network (IKEA, 2013). One DCG, which can consist of a few DCs, supply several selling units.

5.1.4 MRS and MRR

Mid receiving units close to the sender (MRS) are facilities close to the suppliers and are used when suppliers do not have the required volume to achieve the economical transport. The goods are consolidated at MRS to achieve full truck load or full container load. MRS can also act as a waiting zone for the final products until a vehicle is placed for the transport. A consolidation point (CP) at the sender side is one example of a MRS. Similarly, mid receiving units close to the receiver (MRR) are facilities close to the receivers. Goods from suppliers can be stored or cross docked at a MRR before sending to the selling units. Hence, a DC is a MRR per definition. A MRR sometimes acts as an external warehouse closer to the stores for rapid replenishment. Due to limited storage space that some stores have, extra warehouses closer to them and these warehouses are replenished from DCs.

5.1.5 Selling Unit (SU) and Sales channels

The last, most downstream units in the distribution network of IKEA are the selling units, and through these IKEA meets the customers. Selling units include both physical stores, Customer Distribution Centres (CDCs) and Central Parcel Units (CPUs). CDCs are warehouses that looks like DCs on the outside, but the goods are picked for individual customer orders. CPUs are similar to CDCs but handle only orders which are smaller in size, i.e. parcels. The stores are used as physical touchpoints and function like a cash and carry concept while the CDCs and CPUs mostly are used for the digital touchpoints. In some markets IKEA has small-format stores at city centres where customers can get more personalised shopping experiences, they place orders at the store and get the products delivered to their homes from CDCs or CPUs. In case of the digital format, customers place orders at the company's own website and the products are delivered from the CDCs or CPUs. Hence, CDCs and CPUs are designated for orders from customers using IKEA's website, phone but also for customers that place orders at stores. The CDCs and CPUs are responsible for delivering goods directly to the final customer through external distributors. The orders can be delivered to customers' homes or to designated pick-up points.

In 2017, IKEA had 355 physical stores in 29 countries and 26 customer distribution centres in 13 countries (FY2017, 2017). The replenishment of CDCs, CPUs and physical stores are done in the same way, through delivery from suppliers or DCs. Each selling unit is connected to both Low flow DC and High flow DC. There are no flows from selling units back to suppliers or DCs, and rarely any flow between the selling units. CDCs and CPUs are more automatized than stores. The physical stores have often limited storage space and need goods on time, while CDCs and CPUs have more space to work with. In CDCs and CPUs goods are not displayed like in stores but are put on racks in pallets or in boxes and are picked as per the customer orders.

5.2 Transport solutions

IKEA is responsible for planning and execution of the transport of goods from suppliers to DCs and to the selling units. The minimum delivery lead time between supplier and selling unit is one day and the maximum can be up to 98 days. The goods may go by multiple modes of transport, as the goods are transported by sea for the longer distances. For shorter transports, trucks and carriers are most often used, but also trains to a certain extent. The transport operations are divided into five geographical areas: North Europe, Central Europe, South Europe, North America and Asia Pacific. North Europe and Asia Pacific are the biggest areas for transport operations. The transport operations are always planned and executed with the sender's perspective. This means that the transport planning is based on the flow of goods from suppliers of a particular area to DCs and selling units across the world and for flow of goods from DCs to selling units of a particular area. For example, a team responsible of North Europe transport operations will only act on the flows that are originated in North Europe. If a delivery is sent from a supplier in North Europe to DCs or selling units in North America, a team responsible of North Europe will take care of the transport operations to the port in North America. Thereafter the team responsible of North America will take over the responsibility of the transport operations from the port to the DC or selling unit. In the same way, if anything is sent from a supplier in North America to North Europe, a team responsible in North America will take care of the transport operations to the port in Europe, thereafter a team responsible in North Europe will take care of the transport operations.

Figure 14 shows a simple depiction of the IKEA transport network. Depending on the volume, goods from suppliers in China meant for European selling units can be sent directly to a port or consolidated at a CP. Different ports can be used as port of loading (POL) based on ship availability, freight cost, time and volume. Similarly, different ports in Europe can be used as port of discharge (POD) with proximity to the DCG. As mentioned earlier movement from port of discharge to selling units or DCGs will be handled by respective transport area. The figure also depicts similar goods flow from Europe to selling units in USA.

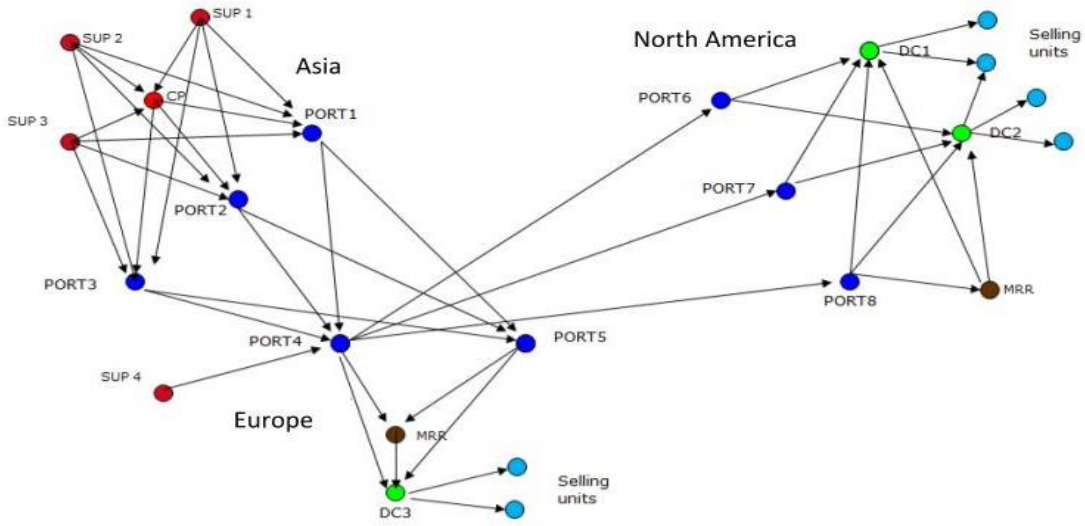

Figure 14. A simplified supply setup with multiple nodes and combinations (IKEA, 2018e).

When IKEA purchases transport, they buy transport capacity. As it is not possible to put trucks or ships into stock, there must be a plan of how much the need is. Transport capacity planning is about accurate forecasts of volume and network. It must be the right volume but also the right sender and receiver combinations. In order to forecast the transport, future volume, future network and historical information is taken from the replenishment forecast. The information is converted into transport dimensions and the number of trucks and space in ships needed can thereby be calculated. The transport department is provided with the replenishment solutions that should be used between suppliers, DCs and selling units, and information about delivery solution, for example if a consolidation point should be used. By this information, a transport network can be designed, including suppliers, CPs, DCs, selling units and ports. Contracts are made with several external carriers and the contracts can be until further notice, for one to three years, or one-time buys. Transport has to be purchased from address to address as IKEA makes agreements on delivery routes with the carriers and these routes cannot be easily changed.

There are different purchasing patterns for transport at IKEA. The purchase can be driven by changes such as expansion within IKEA, the market situation and the cost goal development. Expansion such as opening of a new market or opening of a new store in the existing market and sourcing from a new supplier are some of the factors influencing the overall volume and transport network. Moreover, planned regular yearly events are made for the ocean transports. Every year IKEA goes to ocean carriers and presents the volume forecast and transport network in order to purchase the ocean transport. Purchasing is also done on instant need because of unforeseen changes. The actual need may be more than the forecasted need due to various reasons such as campaigns and extra orders from the stores. In these cases, IKEA needs to make manual orders to carriers to meet the instant need and secure the availability of trucks and space in the ships. Over-forecasting of the transport capacity may also happen and it can affect the agreed price levels with the carriers. Stability and accuracy in the forecast are two major elements in order to secure the transport capacity and get good prices from the carriers.

The transport department makes both mid-term and short-term planning. In mid-term planning, forecast is made for the current financial year and the next financial year. Short-term planning is done either weekly or every second week for 12 weeks in the future. The carriers are already nominated on routes but if any peaks are found, it will be acted on. In the daily business of transport, the delivery planners have access to what goods suppliers have ready to send in one system, and the planners send out transport bookings to carriers in another system. Thereafter, the suppliers get notifications and the loading and transport takes place three days after in case of transport by sea, and two days after in other cases. For the transport from DCs to selling units, vehicles will be booked one day in advance. The aim is to always send full truck loads in order to avoid transporting air and to perform economically in transport.

In the same way as OTD sender is a measurement of the supplier performance, see “5.1 Supplier” and Figure 11, the OTD Logistics is a measurement for the IKEA transport performance. Timely and full deliveries of the orders ensure better product availability for the customers (Qlikview, 2018). Some of the on time measurements can be seen in Table 2. Orders are often sent with prolonged lead time, i.e. safety lead times, in order to prevent shortages.

Table 2. OTD Logistics measurements. All orders that are received before the "on time" measurement are considered as too early, and all orders that are received after are too late. Moreover, cancellations are never "on time" (IKEA, 2018f).

Valid for	Measurement
SUP-DCG	Goods received 0 to 30 days too early are "on time"
SUP-SU	Goods received 0 to 7 days too early are "on time"
DCG-SU	Goods received 0 to 7 days too early are "on time"

5.3 Customs

IKEA has offices in North America, Asia Pacific and Europe that support custom clearance and other custom related matters and these are called custom service centres (CSC). Each CSC provides services to IKEA stores, DCs and other IKEA entities in that particular region. The CSCs are also involved in process development and implementation of customs laws and regulations.

For example, CSC EU in Älmhult, Sweden, supports IKEA stores and distribution centres in 18 European countries, primarily with custom clearance. Custom declarations for most of these European countries are handled digitally in a software platform which is connected to a software system at custom authorities of that country. The documents for the custom clearance are generally available approximately 2-3 weeks prior to the arrival of the ship at the port of discharge. For some countries where the digital platform is not implemented, the CSC EU sends the necessary documents to a custom broker. A custom broker is an external agent who is appointed by IKEA to do the custom clearance. All the documents should be provided to the broker one week in advance of the ship arrival.

In general, to make the process smooth, there should not be any amendment once the custom declaration has been made. However, if any changes are occurring with the shipment, for example changes of the final destination, amendments must be done immediately. To comply with custom rules and regulations it is advisable to have corrected documents. It is possible to change the destination of the shipment after dispatch from supplier but before the custom clearance, yet it is complex and time-consuming. When goods are imported to the European Union, custom clearance is done at the entry point of the European Union, i.e. at a seaport, airport, landmark border or bonded warehouse, and thereafter goods are free for movement inside the European Union. For countries within the European Union where declaration is made in the digital platform, the shipment can be custom cleared on the same day, but for countries where it is done manually the time taken is minimum two days.

When a CP is considered in the replenishment solution, the supplier sends the documents, i.e. invoice, packing list, country of origin et cetera, to the CP along with the consignment.

Thereafter the CP consolidates the goods from multiple suppliers as per the final destination and a new shipment number is generated. The CP in turn prepares the export documents and makes necessary arrangements to make the custom clearance for export. The CP is responsible for all consolidation services but has no role in fixing the final destination.

There are many storage facilities available at close proximity to ports around the world which are known as free trade zones and bonded warehouses. These facilities provide retail and manufacturing companies with warehousing and distribution. Free trade zones are generally located near the seaports and airports to facilitate trade and to attract investments in a country. These are named differently in different countries such as free zones or export free zones and in United States of America it is referred to as Foreign trade zones. Akinci and Crittle (2008) define free trade zone as duty free areas which facilitate warehousing and distribution. Goods can be stored, exhibited, transhipped and if necessary re-exported duty free. Some of the benefits of a free trade zone according to IKEA (2018g) are duty avoidance and greater flexibility.

Similar to a free trade zone, a bonded warehouse is a customs approved location where an importer can store the goods without paying any custom duty if the goods are not meant for sale immediately after the import (Verksamt, 2017). Custom duty will only be paid when the goods are taken out from the bonded warehouse for further sales. In case goods are not sold or there is no buyer for the imported goods in the imported country, the merchandise can be re-exported without any payment of duty.

5.5 Packaging & Label

Labelling of IKEA products provides necessary information to customers and it should meet the regulatory requirements of the selling market. Additionally, the label should meet the requisite of warehousing and goods flow functions (IKEA, 2015a). Labelling and packaging are mostly standardised to serve different markets. However, there are variations and for example, the article number used for the markets in Russia, Asia and Europe is different. A sample of a label is shown in Figure 15, and the article name, article number, dimension and barcode is visible in the label.

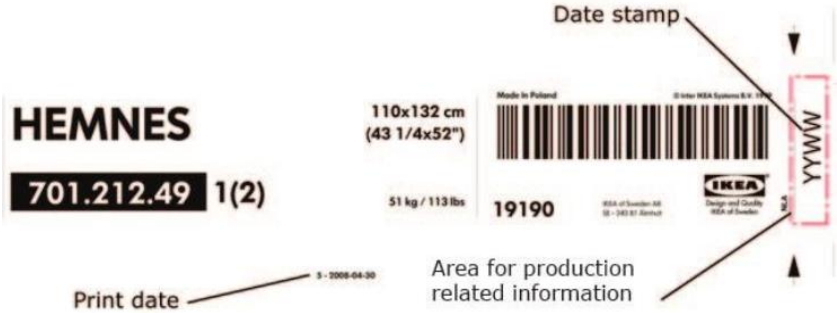

Figure 15. A sample label for an IKEA article (IKEA, 2015a).

5.6 IKEA's replenishment solutions

A selling unit is replenished in three different ways: through Direct Delivery, Distribution Centre Group delivery (DCG Delivery) and Combined Supply. The main objective of the replenishment solutions is to meet product availability at the lowest cost (IKEA, 2016a). Today, the total share in volume of pure Direct Delivery replenishment is approximately 70%, the total share of DCG Delivery is 22% and the total share of Combined Supply is 8%. However, there are differences between the different selling units, and for example smaller stores have less Direct Deliveries than bigger stores.

In case of pure Direct Delivery, the goods are delivered directly from the supplier to the selling unit without being stored in a DC. However, goods that go by Direct Delivery can pass through various intermediate nodes including CPs and ports on the way to selling units. Some of the Direct Delivery goods are cross docked at a DC in order to meet optimal level of volume or full truck load in the transport. To be able to send frequent and not too big deliveries to the selling units, the cross docking is needed. When the goods are cross docked at a DC, it is called Transit Delivery. In case of Transit Delivery, goods are unloaded from trucks at the DC and within 24 hours loaded on new trucks and sent to selling units. For the Transit Delivery, only High flow DCs are used, not Low flow DCs. The goods that are replenished through Direct Delivery, including Transit Delivery, normally fall under the high volume and high flow category. Sofa and mattresses are example of goods with high volume and high flow, therefore Direct Delivery often is used as replenishment solution. These goods are bulky and costly to transport, therefore local supply and Direct Delivery is often chosen as replenishment solution. The DCs sometimes hold safety stock for goods that go through Direct Delivery, which means that in case of disturbances in the Direct Delivery, goods can be delivered from DCs to the selling units instead to a certain extent.

In case of DCG Deliveries, goods are stored at DCs for a longer period and are pulled by the selling units when required. Full truck loads with many different article numbers and from many different suppliers can be delivered to single stores from the DCs. As DCs are designated for specific regions with certain stores, the replenishment can sometimes be done by milk runs. When using a milk run as the delivery solution, goods are delivered to more than one selling unit from a single shipment (IKEA, 2018h). The goods stored at the DCs are normally low volume and low flow goods.

Combined Supply means a combination of DCG Delivery and Direct Delivery to the same selling unit and for one article number (IKEA, 2017a). The percentage is fixed between the Direct Delivery and the DCG Delivery, and it is reviewed periodically to reach the required availability. The main objective of combining DCG Delivery with Direct Delivery is to have a safety stock at the distribution centre to meet the uncertainty of demand and to reduce the safety stock at the selling unit (IKEA, 2017a). IKEA mainly uses Combined Supply for goods with long transportation lead time.

One example of an article that is used for Combined Supply is an armchair called BYHOLMA ach grey. The direct share for the item has been fixed at 80% for certain markets and 20% is DCG Delivery. This means that efforts will be made to replenish stores with 80% of the need directly from the supplier and the balance, 20% of the need, will be kept at a DC. Figure 16 shows an example of a Combined Supply article.

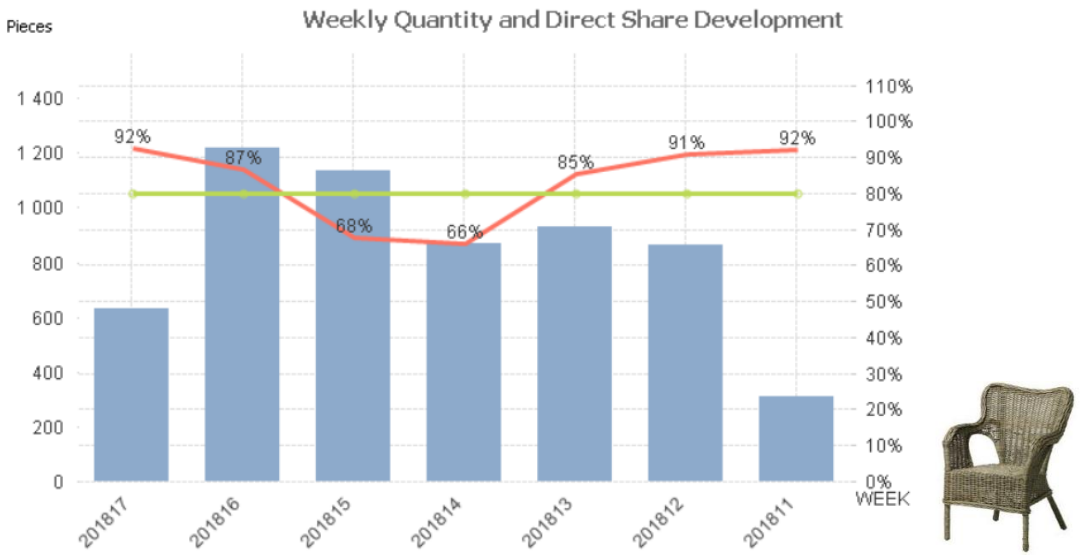

Figure 16. The article BYHOLMA ach grey is taken as an example of a Combined Supply article. The green line shows the original plan of Direct Delivery in percentage, and the red line represents the actual Direct Delivery sent.

5.6.1 Pricing for different replenishment solutions

A selling unit will buy a particular item at three different prices depending on the replenishment solution. This implies that the landed cost for an article for a selling unit will vary whether it has been sourced directly or through a DC. The main reason for the different prices is due to the inclusion of handling and storage cost when the item is coming through a DC. The cost of an item when it is cross docked at a DC, i.e. when Transit Delivery is used, is less then when a DCG Delivery is used, as not as much handling and no storage is needed.

The purchasing price of an article for a selling unit in the three different replenishment solutions: Cost in case of *DCG Delivery* > cost in *Transit Delivery* > cost in *Direct delivery (Process developer 4, 2018).*

5.7 Plan and balance of sales and supply

There are five basic interconnected activities that drives the sales and supply planning. These are Sales planning, Demand planning, Need planning, Capacity planning and Balancing, see Figure 17. The primary objective of the plan and balance sales and supply process is to have a synchronised plan for sales and supply. Identification of potential risks and deviations and development of necessary measures will improve the product availability as per the customers demand and make products available at the lowest cost (IKEA, 2018l). The present system of distribution at IKEA is focused on feeding the stores efficiently with minimum inventory, but

the future will be more challenging as IKEA wants to meet customers through multiple sales channels (IKEA, 2018k).

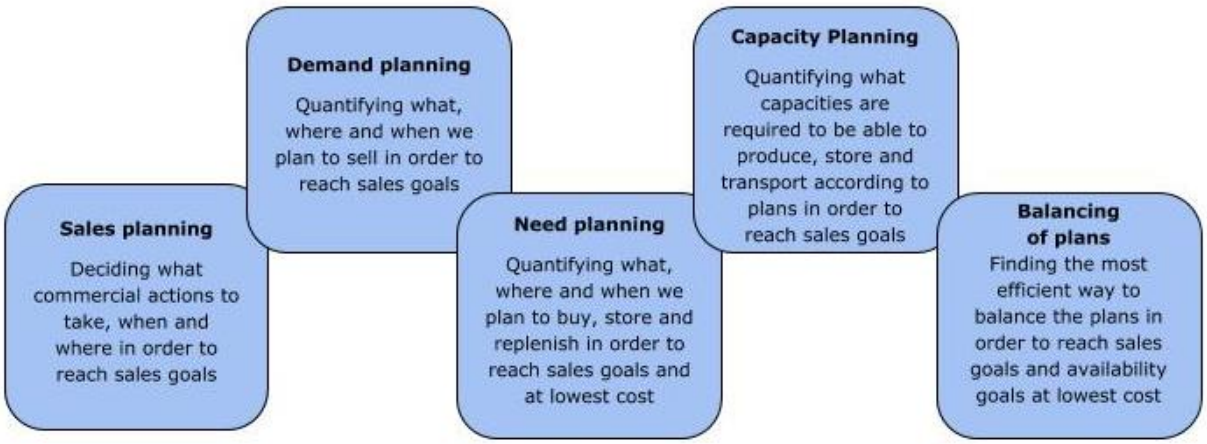

Figure 17. Five sub processes of plan balance and sales and supply (IKEA, 2018m). Sales planning is the driver for rest of the four processes and these four sub processes are executed throughout the year.

5.7.1 Sales Planning

The sales plan is carried out for the total IKEA market which includes all the stores and e-commerce business. IKEA sales plan translates business and commercial plan into a more real and specific form and it defines the prerequisites for the supply plan (IKEA, 2018j). The Sales planning is done at two separate levels, the first is the tactical sales plan with a plan horizon of FY+2 and the second is the operational sales plan with a plan horizon of FY+1, see Figure 18. The future planned sales in turnover and index for the total range is the tactical sales plan (IKEA, 2016b). Inputs from the retail market, business areas and the future growth plan are considered to derive the sales plan. The global sales plan guides the retail market sales plan for creating quantifiable goals and actions to meet the expected sales. The operational sales plan (FY+1) uses the tactical sales plan (FY+2) as a base.

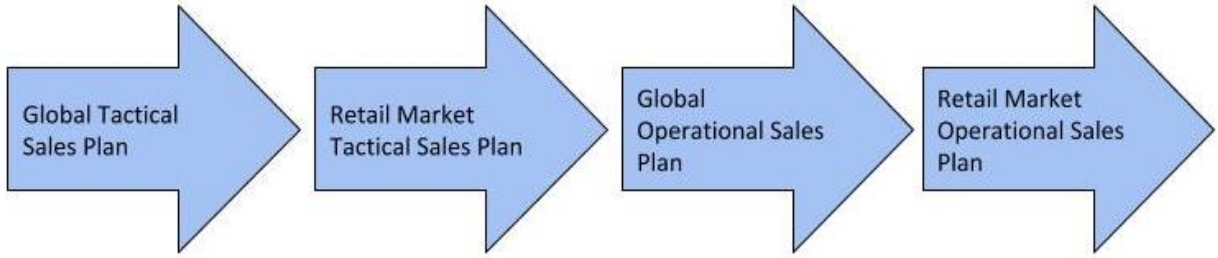

Figure 18. IKEA Sales plan (IKEA, 2018j). The sales plan is a bottom up plan agreed between retail units and IoS and it is aligned with top down sales goal.

5.7.2 Demand Planning

Demand planning is about quantifying the future demand by considering the past sales and the present situation that may affect the future demand. Global and regional economic conditions, changes in the product range, activities of the sales plan along with historical sales figures are analysed together to find the trend of the demand. Continuous observations and systematic adjustments according to the new information on hand are also required. In case of strategic

and tactical planning, the demand is set at an aggregate level whereas for operational planning the demand is set at an article level (IKEA, 2018n).

5.7.3 Need Planning

Need planning is carried out to balance the need with the available capacity. As illustrated in Figure 19, forecast at the region level is broken down to forecast for the selling unit and the article level. By considering the stock status which includes the safety stock, goods in transit, stock on hand and planned orders, the need for the selling units and the aggregated need at the DCG level is calculated. The quantity that has to be replenished from the distribution centre to selling units will give the need for the DCG, and order proposals are sent to the suppliers accordingly. Similarly, order proposals are generated for replenishing the goods directly from the supplier to selling units. The guiding factor for the need planning is the availability of the products at the selling unit with lowest possible cost as per the actual need of the final customers and that can be achieved with optimal replenishment solutions.

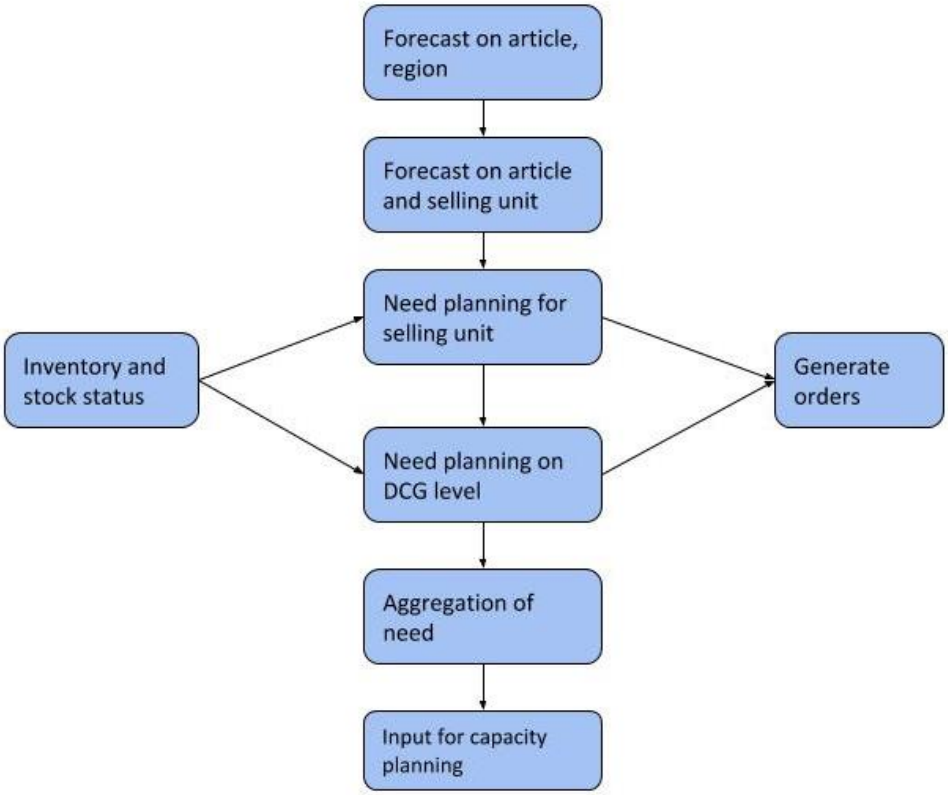

Figure 19. Overall planning at IKEA (IKEA, 2018i). Need planning is based on utilisation of available capacity and setting up optimal replenishment solution.

5.7.4 Capacity Planning

Capacity planning is about optimising the use of available capacity and the resources in the entire supply chain. When the total need for IKEA is calculated, it is important to check the supplier capacity and any other possible capacity constraints in the supply chain. For example, there can be constraints in transportation with the availability of vehicles or required minimum volume to reach full truck load. Furthermore, space at the supplier premises, DCs and selling

units is also an important factor. In case of any mismatch of these capacities against the total need, it has to be quick adjustments to ensure the availability. Figure 20 represents the adjustment of total need for IKEA due to imbalance between capacity and demand and how it changes the order proposal to supplier.

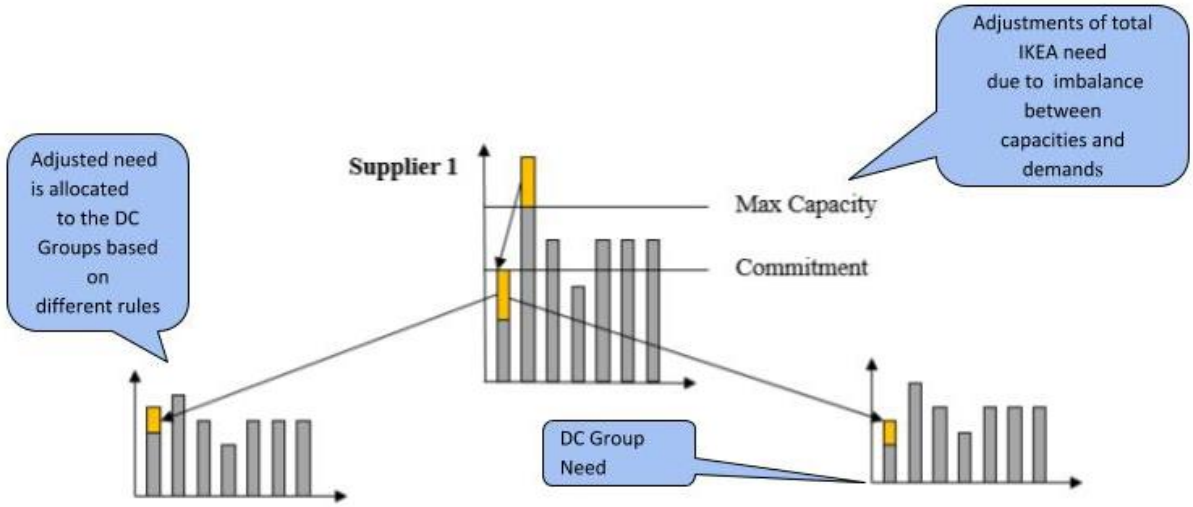

Figure 20. Supplier capacity planning and adjustment to total IKEA need due to imbalance in the capacity and demands (IKEA, 2018i).

DCG needs are represented by bars in the above picture and are aggregated to create order proposal to the supplier. The second aggregated bar in the order proposal is exceeding the maximum capacity that the supplier can produce, therefore some of the quantity has to be produced earlier by the supplier when the capacity is available. This requires balancing in the order as per the supplier's capacity to meet the need. If the supplier has space to store the goods then it is stored at the supplier, otherwise it has to be delivered to each DCG. Similarly if the supplier does not have the capacity, the supplier confirms less quantity against the order proposal and the confirmed quantity will be allocated to the sales unit based on different rules and priorities.

5.7.5 Balancing of plans

Balancing of plans is about balancing the above mentioned plans in a most efficient way to reach the sales goals. The availability of products at the lowest cost is a crucial factor while balancing the need of the selling units and capacity of suppliers, transport network and warehousing.

5.8 Order fulfilment

The demand system at IKEA generates the forecasts. Thereafter, the Demand and Supply Fulfilment system takes the forecasts, point of sale history and other algorithms and run the replenishment solutions. The output of the fulfilment is order proposals, or replenishment orders. This output is sent to the Order Management System in case of distribution from DC to selling units, and the Global Purchasing System in case of distribution from supplier to DCs or selling units. In these system, the orders are created. When orders are created, things as

transportation constraints are taken into consideration. IKEA sends the supply plan (order proposals) far in advance to the suppliers. Hence, the make-to-stock suppliers can plan their production as per the supply plan. The suppliers will dispatch as per the actual created order. Depending on how long time it takes to fill a truck at a supplier, the lead time between when an order is created and when it is dispatch could be rather short. As an example, Spaljisten sends orders with a maximum lead time of five days between placed order and dispatched order.

Stores use a Store Replenishment System (SPS). In this system, store managers place forecasts, which are matched with the sales space for each article, and if it correlates, the system will run automatically. The system knows when articles are sold and when the order point is. Each article has a set amount that will come as smallest, for example one pallet or box which the system uses. If the sales space is increased, store managers will have to adjust in the system manually. Typically, 80% of all sales comes from 20% of the total range.

When orders are created by IKEA to the suppliers, the quantity, destinations and dispatch dates are set, see Figure 21. The lead time from when a supplier receives the order to when the order is dispatched is set considering the filling rate to the destination. In case of Direct Delivery and Transit Delivery, IKEA cannot secure a precise level of orders towards the supplier. In case of DCG Delivery, the DC is set as the destination. For both Direct Delivery and Transit Delivery, the destinations set in the orders are the selling units. This means that the Transit Delivery, where goods from suppliers are cross-docked at a DC before they arrive to a selling unit, is considered as a Direct Delivery solution in the planning and execution of orders.

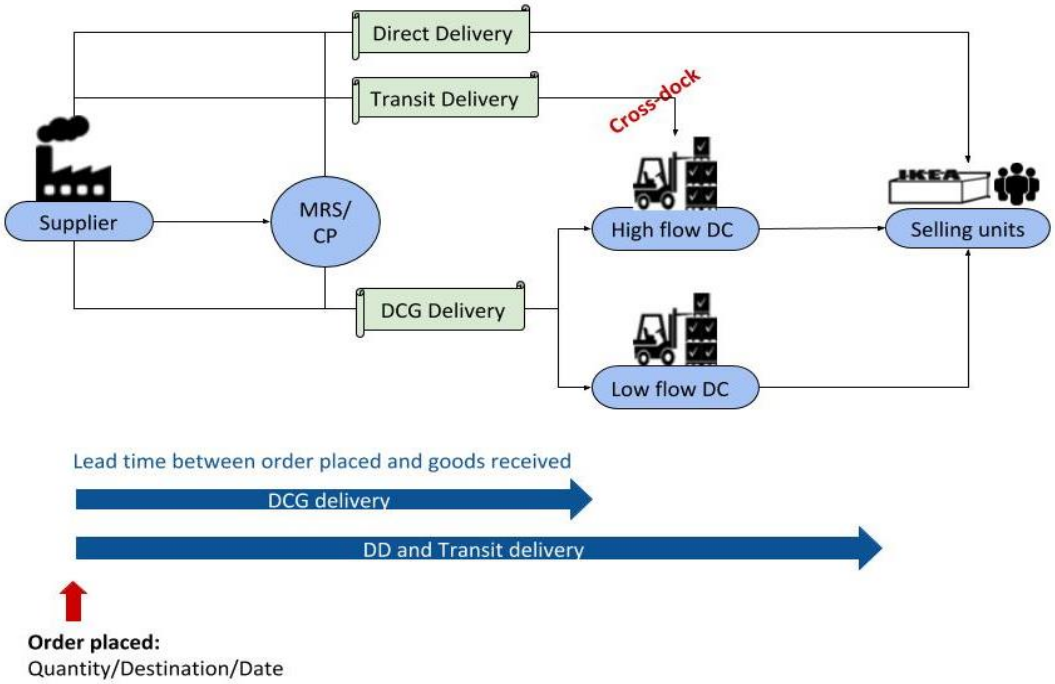

Figure 21. The order that IKEA place to the suppliers include quantity, destination and dispatch date. For DCG Delivery, DCs are put as destinations and for Direct Delivery and Transit Delivery, selling units are put as destination. The figure illustrates the lead time between when an order is created and when goods are received at DCs or selling units.

6. Empirical findings

Currently, the final destinations are decided when orders are released to suppliers. The selling units may receive orders according to the forecast. However, the orders may come too early or late from the receiving perspective because of changes in demand during the supply lead time. Once an order is created for a selling unit, it will go to that designated selling unit even when there is no need (Process Development Manager), as it is not possible to change the destination in middle of the flow (Retail Logistics Capacity & Flow Planner).

IKEA's fulfilment system calculates the need every day to send orders for the future period. The need is influenced by the actual sales, forecast, incoming orders and any activities in the stores like promotions, campaigns and sales offers. To illustrate the demand variation with time, a DC flow article called BLÅREGN cushion has been picked, where the flow is from one of the High Flow DCs to four stores of that region. All of the four stores are located close to the DC and the goods are delivered in one day notice or the day after placement of the orders. Figure 22 shows the need for week 17 for the article when the need is pulled on 4 consecutive weeks, on week 13, 14, 15 and 16. Week 17 includes two extra days, 30th April and 1st May. It shows the variation in need for each store between the weeks.

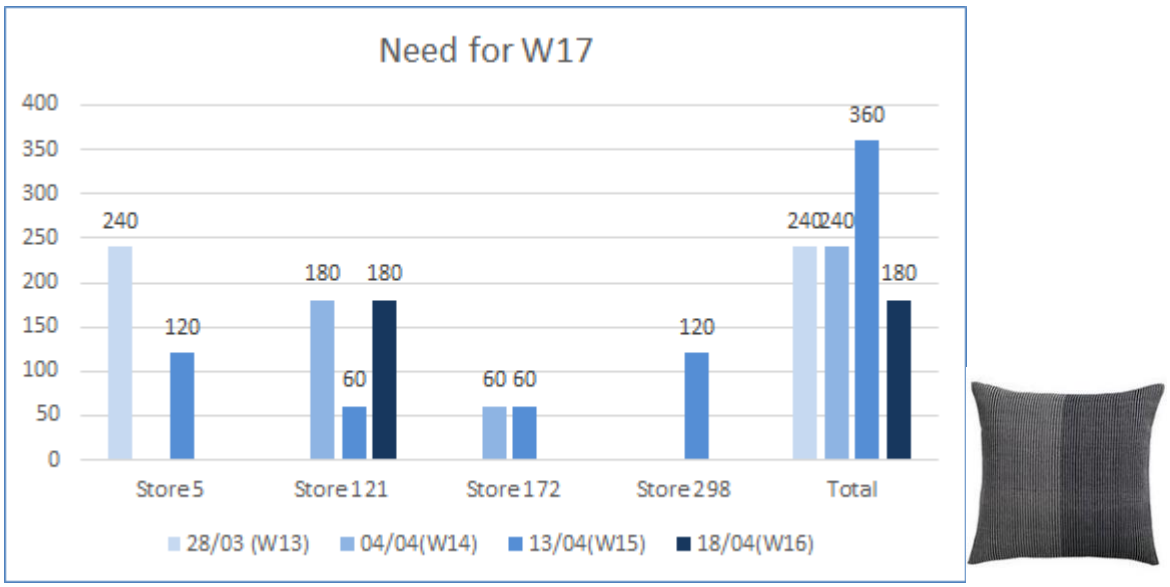

Figure 22. The need for week 17 for the article BLÅREGN cushion when the need is pulled on 4 consecutive weeks.

The total planned quantity for week 17 on week 13 was 240 pieces for all of the four stores. When the need was calculated on week 15, it was changed to 360 pieces and on week 16 the new required quantity was 180 pieces. Similarly, the requirement for the individual stores was also changing over the period. For store 5, the required quantity was 240 on week 13 but on week 16 it changed to 120. For store 298, there was no need when the planning was done on week 13, but on week 15 the need was 120 pieces in week 17.

The variation in demand with time is a result of many factors. There is a general understanding that many stores over-forecast with up to 20% (Retail Logistics Capacity & Flow Planner). The central IoS forecast is more stable and accurate (Retail Logistics Capacity & Flow Planner; Process Developer1). For popular products with high sales volume, the demand is often stable. However, for products with smaller sales volumes, the forecast may not be as accurate and changes in demand pattern can be large (Category Area Logistics Manager). Moreover, new products and distinct seasonal products may be fluctuating a lot in demand (Retail Logistics Capacity & Flow Planner), and things like activities is often hard to forecast accurate (Solution owner 1). Stores can also manipulate inventory by increasing the sales space (Solution owner 1). To fill up the sales space, stores need to get extra pallets and stores are ordering manually to get the extra quantity.

The time between when orders are placed to the suppliers, and when the selling units receive the goods, the demand can change a lot. The problems linked to this for different units in IKEA's supply chain is analysed below and the consequences of deciding the destination early in the supply stage are discussed.

6.1 Planning & Execution

Today, Planning and Execution at IKEA does not consider intermediary units like CPs, POLs and PODs for any of the replenishment solutions, and DCs are not considered in case of Transit Deliveries. There is no flexibility in changing the destination after the orders are released to suppliers. The lead time between when orders are released to suppliers and when DCs or selling units receives the goods could be up to four months, hence the demand may change a lot during this time. There is an aim to become more flexible and responsive in the distribution in order to decrease stock outs and over-stock situations at selling units, hence also decrease costs.

In today's setup, IKEA does not always send orders when they are ready, instead they wait until a full truck can be sent to a particular selling unit as the price for Direct Delivery is cheaper. The Process Development Manager points out that instead of waiting to fill the truck for individual stores, goods can be consolidated for multiple selling units and can be cross-docked at a DC to get faster deliveries.

As the company plans to increase its footprint in the e-commerce, which means that the final customer will move away from shopping at physical stores, the present supply network needs to be more responsive and agile. IKEA may have to delivery more goods to CDCs instead of stores. It will be expensive and inefficient to store goods in multiple locations for the orders generated from online sales. Furthermore, the range of products will increase substantially with e-commerce which requires effective capacity utilisation of the suppliers, transport and CDCs.

6.2 Suppliers

The supply plan that IKEA releases to suppliers provides information about quantities and delivery dates required by each DC and selling unit even though it does not give any extra value to their production plan to know where each order will go (Pallco; Process developer 1; Process developer 7). In case of make-to-stock suppliers, the details about the quantity for each DC and selling unit is not needed until when IKEA creates the order. Further on, for make-to-order suppliers, these details are only needed in the end of the production. However, if specific product features are required to be noted for certain markets, the destination information is useful further in advance.

The make-to-stock suppliers have to keep much in safety stock and it requires flexibility in their capacities to take the variations in orders (Process Development Manager). For example, Pallco explains that they had a safety stock of one week's finished goods some years back, but today they keep three weeks of safety stock because of the fluctuations in the orders. Similarly, Spaljisten stores two to four weeks finished goods. Pallco means that for the products that are old they can keep stable production. However, for newer products, the production is less stable, and when IKEA plans any campaigns or front-loads[1], Pallco and Spaljisten are not informed in advance and therefore they need to be flexible in the production. Moreover, the suppliers have experienced the bullwhip effect, meaning that the stores have taken out more than usual from DCs, and in turn the DCs have responded by ordering even more from the supplier. Both Pallco and Spaljisten implies that more stable forecasts and ordering from IKEA's side would be very valuable as it would lead to more stable production. Pallco mentions that for the product SKAVSTA, they sometimes use three shift and other times four shifts. In case of more stable orders, Pallco would be able to use three shifts at all times and thereby decrease the labour costs. With more stable orders, the suppliers would also be able to utilise their capacity in a better way.

The suppliers share their stock figures and production plan with IKEA, but these do not get into IKEA's planning systems. Hence, it can look like the suppliers are tight in capacity even if they have much in stock (Process developer1; Pallco). By sharing both production plan and the stock figures, IKEA will be able to make realistic orders. Currently, IKEA is feeded with supplier's capacity. However, IKEA does not take into consideration the production capacity in their orders, they do not order as for the suppliers' batch sizes. Instead, they order as per the need for dispatch, for example IKEA order one pallet even though the supplier's batch size is ten pallets. The planning system at IKEA is programmed to order always what is needed, even if the orders are unrealistic high, and then IKEA or suppliers may have to cancel orders and manually interfere (Process developer1; Category Area Logistics Manager).

[1] Front-loading is used during constrained periods and means that stock is taken in earlier than needed.

6.3 Distribution Centres

Today, the planning department at DCs go through ITM[2] to see how much inbound transport will come on the day after (Process Developer 6). Furthermore, the DCs book trucks for the outbound transport to selling units one day before the goods should be sent. The DCs have delivery schedules for unloading and loading slots. The DCs plan their manpower weeks in advance based on the forecasts. For example, the DC in Älmhult plans manpower four weeks ahead based on the forecast of Transit Deliveries and DCG Deliveries and how much inbound flow and outbound flow it will be. According to Process Developer 6, one of the biggest challenges for the DC in Älmhult today is the massive amount of destinations that the DC delivers to. The DC delivers to 40 different destinations, meaning that an inbound truck may have Transit delivery goods that should be split on 40 different destinations. The DC may then need to have 40 open gate areas at the same time. Furthermore, Process Developer 6 explains that the DC in Älmhult has much in stock in periods, and it could be hard to find empty spaces.

6.4 Transport

According to the Capacity Planner, one of the biggest issues for transport today is that decisions are in general made too late. The planning of vehicle placement in case of road transport is done weeks in advance (Capacity Planner). The overall sourcing and replenishment set up are translated to transport planning and freight capacity. There is not much flexibility with routes as the transport bookings must be done from one destination to another destination and the transporters are intimated in advance with freight volume for any specific route. However, transport purchases in short notice are also common due to the variation in demand or sales. To get a good price from transport operators and shipping lines, stability in demand and accuracy in the forecast is very important.

6.5 Selling units

The CDCs can handle more demand variations than stores, as they have more storage space. Therefore, the focus will be on stores and not CDCs. The Sales and Supply Support Managers in both the stores IKEA Bäckebol and IKEA Kållered, and the Sales co-worker in the IKEA Älmhult store mention that they often have too much in stock. As the stores have limited storage capacity and one of the most expensive handling costs for a store is to put things up at racks, deliveries at the right time are very valuable for them. However, the deliveries often come in time according to the OTD-logistics agreement (i.e. that the deliveries are allowed to arrive to stores seven days before the set date in case of Direct and Transit deliveries), but for the stores it is still too early. If the stores could get the deliveries on the decided arrival date, they would be able to put more goods directly into store space instead of putting them up on racks.

[2] ITM means IKEA Transport Management and it is a web-based application for transport order management, shipment management, planning and optimisation, visibility and one stop solutions with payment, tax calculation, billing and financial analysis with respect to the transport.

In case of DCG Deliveries, there are rarely any problems, the stores get the deliveries in the right time and quantity as the delivery lead time is short between DCs and stores. For example, the delivery lead time between DC and the IKEA stores Bäckebol and Kållered is only two days, and the delivery lead time between DC and IKEA store Älmhult can be as low as one day. These problems of early deliveries are common in case of Direct Delivery and Transit Deliveries (Sales and Supply Support Manager 2). According to the Sales & Supply Support Manager 2, Transit Deliveries are often on better time than Direct Delivery. Apart from suppliers sending orders too early from the stores' point of view, one of the reason for early delivery is that DCs normally prioritise the Transit Deliveries against the DCG deliveries. This because they cannot hold the transit goods for more than 24 hours. DCs dispatch the transit goods first even though the current need for the selling units is DCG stock. The Retail Logistics Capacity & Flow Planner also explains that there is a wish for more direct flow as it is cheaper for the stores. However, direct flow often means big pallets which have to be stored and take long time to sell for the stores. As stores do not grow in storage, the storage capacity may be an increasing problem.

Apart from getting too early deliveries, employees at IKEA stores in Bäckebol, Kållered and Älmhult mention that they have problems with Combined Supply. They mean that because of the long delivery lead times the Combined Supply often involves, they do not get deliveries as per the updated demand. They get too much, but also too little. Sales & Supply Support Manager 1 and Sales & Supply Support Manager 2 mention that the stores often get too much goods from the Combined Supply. The Sales co-worker at the Älmhult store mentions that when there are disturbances in transport that make delivery from supplier impossible or very late, the store gets delivery from the DC instead, and thereafter the store gets the late delivery and the normal delivery from the supplier. Hence, the store gets a lot more than needed in the end. This because the decision of destination is taken already at the supplier, and the deliveries cannot be redirected to for example the DC instead even if the goods are cross-docked there as legal documents will not allow it (DCG Operational Support Team Leader). In Table 3 below, the challenges and benefits with deciding the final destination early is summarised for the different stakeholders.

Table 3. Some of the challenges and benefits with deciding the final destination early in the supply, as is done in status quo, are summarised below.

Stakeholders	Benefits	Challenges
Planning and Execution	• Can plan for full truck loads to single destination	• Do not consider the intermediary units in the planning • Not flexible in changing destination • Growing the e-commerce
Supplier	• Product differentiation for specific market	• Many order lines, complicated planning
DC	• Advance planning for storage and manpower	• Capacity Utilisation
Transport	• Advance route planning • Better capacity commitment to transport operator	• Little possibility for consolidation
Selling Units	• Receive as per the forecast	• Early deliveries • Excessive stock • Stock-outs

7. External interviews

To get more knowledge about postponement, five interviews with external companies were conducted. Below, details of each company and learnings about postponement in destination decision from the companies are summarised. All these interviews were inspiration to build the scenarios for the case company.

7.1 Company A

Company A is a supply chain consulting company that operates in the Nordic market. The company works with improving customers' supply chain and has implemented over 500 projects since 2005. IKEA is one of Company A's customers in the project of implementing Supply Chain Guru. According to the VP Service Director at Company A, to be able to allow a system to automatically re-distribute volumes between different locations, it is of importance to have a completely centralised planning team. Someone has to be responsible for changing the destination and take necessary actions to allocate the quantity when there are variations in demand. Situations may arise when the consolidated order quantity is less or more than the real demand. In those scenarios there have to be manual interventions or some mechanism that prioritise the quantity between the stores.

Company A has some clients who are working with this postponement concept and the re-distribution has appeared to be more of a manual decision. According to the VP Service Director, one needs to have a dispatch destination to be able to place an order in most ERP system. Some clients to Company A have solved it by adding a reallocation point between suppliers and stores. They use these stocking points as destinations for the suppliers instead of stores. The stores may have to send orders to a warehouse, and in turn the warehouse sends orders to suppliers. This will lead to increased handling cost at warehouses as they will need to take the demand variations while the stores will have higher flexibility, shorter lead time and lower safety stock. If the stores create orders, they will not accept automatic re-allocation of the orders leading to that they get less or more than ordered just because other stores ordered too little or too much than they needed in the end.

7.2 Company B

Company B is a fashion chain. The company has most of its market in Europe but does also franchise to countries outside Europe (Supply chain developer). Company B has fashion products with short shelf time which are hard to forecast as there do not exist any historical sales data. However, some of Company B's products are basic clothes with demand that is easy to predict and with longer shelf life. Company B has three distribution centres in Europe and most of the suppliers are located in Asia, but there are also some in Europe. For suppliers in Asia, the delivery lead time to a DC is about 70 days. Almost all the goods go through one of the DCs, there are very few direct deliveries from suppliers to stores.

The company send orders to the suppliers without giving any packing lists or dispatch instructions. After the suppliers have started to produce the orders, the packing lists including which quantity should be dispatched to which DC is sent. Company B has not had any issues working in this way. In case of big events, such as Chinese New Year, the packing list will be sent with bigger marginal. The company cross dock about 50% of the products at the DC, the rest is put into storage until the goods are needed. In case of cross-docking, the decision of which store will get what quantity is decided four days before the goods arrives to the DC. Company B has had this setup for many years with the purpose to be as flexible as possible. According to the Supply Chain Developer, the setup works well and is especially good when the e-commerce grows. A disadvantage with not giving suppliers the final destinations is that the suppliers cannot pack goods as per the store requirement, rather it has to be done by the DCs. However, it may not be possible to send the goods in boxes from suppliers anyhow as it will lead to less filling rate. For transport from DCs to stores, Company B has standing bookings for every day and have had few problems with it. If extra volume must be sent from the DC, extra trucks are booked on short notice, but it is not often required.

7.3 Company C

Company C is a Swedish retail chain that operates in Sweden and Norway and sells mostly electronic peripheral products. The main sales channel is physical retail stores and the online sales accounts for around five to six percent of the total turnover. However, the online sales are growing rapidly (Logistic Manager). In total there are 116 stores, 101 in Sweden and 15 in Norway. The sourcing is done mostly from China but there are few suppliers in USA and Sweden as well.

The stores are replenished from a centralised warehouse located in Malmö and the company has a small third party warehouse in Oslo for Norwegian market. It also has a third party warehouse in Malmö for about 1000 pallets as the capacity in the central warehouse is limited and it cannot handle a large consignment of import containers. The third party warehouse in Malmö unload the containers, repack it and send them to the central warehouse for storage and further distribution. The goods can be delivered to all the stores from the central warehouse in maximum two days and the lead time for the delivery through online sales is as well two days. However, if there is a great demand from any store, including Norway stores, goods can be delivered directly to the store from this third party warehouse without any storage at the central warehouse.

Stores and the central warehouse are one single legal entity and all the stores in Sweden are owned by one company and in Norway it operates as another company. Each store gets a proposal for the goods they will order from the warehouse every evening and when they check and confirm the proposal, it goes to the warehouse management system (NICE logic). The system then creates picking orders for the next day. Goods are picked and dispatched on the same day. For the Norwegian stores there will be a sales transaction between the two companies and it requires custom clearance to send goods to Norway from Sweden. The company makes

the forecast for all the stores centrally and the stores do not take any action on pricing, the pricing is done centrally.

The company is working on setting up a new supply chain organisation and is planning to split the consignment into multiple shipments for each store right away at the origin. When the consignment arrives at the Sweden port, it will be divided and delivered directly to stores without routing through the central warehouse. Additionally, the Logistics Manager mentions that consignment can be splitted at the discharge port as per the new demand for each stores because when the lead time is twelve weeks, the demand can change a lot.

7.4 Company D

Company D is a retailer that operates more than 690 department stores in United States. The Company has an increasing e-commerce business. Company D separates the flow for the online sale from the flow for the stores (VP in Production and Planning). For online sale, goods are stored at DCs, and for stores the goods are cross-docked at DCs. Most of the goods are not produced in United States. The company has no direct delivery from suppliers located outside United States but there is limited percentage of direct delivery from suppliers inside United States. The supply lead time can be up to 12 weeks. The decision of final destination is taken at the supplier even if goods are cross-docked at a DC. The VP in Production and Planning explains that stores are a shrinking business for the company and storage capacity is not a big issue. Company D works with combining their sales channels. For example, if a product is not available at a store, the customer can get it shipped for free online. Additionally, they have less assortment in stores than online. As an example, they have only a few colours of a shirt in store, and if another colour is demanded it can be ordered online.

7.5 Company E

Company E is an educational unit based in India. The company is focused on providing vocational training in the field of international trade and it also conducts workshops and customized trainings to many corporates in trade related topics. The interviewee is an international trade consultant and is the Founder and Director of the institute. The international trade consultant mentions that free trade zones (FTZ) and bonded warehouses are the common approach for many retailers across the world for warehousing and distribution. Most of the countries have free trade zones to promote trade and give access the less complicated trade procedures. Goods meant for export or even for domestic consumption can be stored in FTZ for longer periods. Other operations like packaging, labelling, assembly, sorting, cleaning, and if required destroying, can be done at these facilities with very limited restrictions. FTZs are generally used by exporters to sale in another country. Bonded warehouses are used by importers to stock the imported goods without paying any custom duty until goods are removed for further sales in the imported country. If goods are not sold they can be exported without any custom duty. According to the international trade consultant, these bonded warehouses are used by the retailers when the actual sales are not executed immediately after the import.

8. Analysis - Scenarios

Retailers get an increase scope in the supply chains (Sorescu et al., 2011). The business is transforming everyday with globalisation and new technologies and logistics operations has become more complicated (Rushton et al., 2017). In the same time, the need of more flexible and responsive supply chains to meet changes in customers demand is increasing (Christopher, 2011; Rushton et al., 2017). Align with this, IKEA expresses a need of becoming more flexible and responsive with the deliveries to be able to deal with demand variations and to solve problems incurred by different stakeholders. The Process Development Manager mentions that the need for flexibility increases as things change more rapidly even though it is not possible to source quicker.

Datamonitor (2012) expresses that e-commerce and the increase penetration of Internet are increasing the need for more flexibility in the home furnishing business. The Process Development Manager mentions that IKEA's online sales probably will increase, and therefore there should be greater flexibility in redirecting goods to CDCs instead of to stores. With IKEA's aim to achieve a more agile distribution network, different changes in the planning of replenishment are suggested. A possible improvement is to postpone the decision of final destinations. Apart from achieving agility towards the market, IKEA's hope is also to produce more stable orders to suppliers, leading to higher possible capacity utilisation, which is a major cost factor (Process Development Manager). A postponement strategy is a way to make more cost-effective and timely deliveries (Pagh and Cooper, 1998).

The theory about postponement has been studied. Manufacturing postponement is about postponing some manufacturing operations until after the CODP meanwhile logistics postponement means that the final movement of products which have taken their final form is postponed (Yang, Yang and Wijngaard, 2007). The CODP, where forecast-driven activities are distinguished from order-driven activities, is in this case at a central warehouse, before the goods are distributed to their final locations (Pagh and Cooper, 1998). IKEA does not want to postpone the final movements of products. Instead, the company wants to order finished goods from suppliers and thereafter change the destination. As no postponement strategy in the academic literature covers this, a new postponement strategy has been evolved. The proposed new concept of postponing the destination decision means that there will not be any bigger changes in the distribution network structure. Instead, the change will lie in the way of planning the orders.

The new postponement strategy fits in with the definition of postponement, i.e. that it is a strategy that intentionally delays differentiating and/or value-adding activities until more information about the actual demand becomes available (Van Hoek, 1999; Yang, Burns and Backhouse, 2005; Yeung et al., 2007). As for all postponement strategies, postponing destination decision increases the ability to respond quickly to changes in customer demand (Graman and Magazine, 2006; Xiaoxun and Jiajun, 2016). This could lead to increased product availability and reduction in loss of sales (Ferreira et al., 2015). Postponing the decision also makes it possible to do aggregated forecasts, which in turn makes it easier to do accurate

forecasts (Yang and Burns, 2003). This is align with that IKEA wants to create more stable orders to the suppliers.

A logistics postponement strategy leads to reduced inventory holding costs (Mihiotis, 2013; Pagh and Cooper, 1998), and Van Hoek (2001) implies that postponement is most feasible for products that are more sensitive to inventory costs than transport costs, i.e. high value products with large product variety. In this matter, postponement is not feasible for the home furnishing business as it is characterised with low value goods and high volumes of trade (Drayse, 2008). However, Rushton et al. (2017) explain that for low-cost and bulky products, the relative cost of distribution appears higher than for higher value products. Moreover, postponement of destination decision does not have to lead to a need for smaller shipment sizes and faster modes, hence higher distribution costs, in contrast with the case of logistics postponement. To succeed with a logistics postponement strategy, the locations and structure of distribution centres may have to change. Rushton el al. (2017) explain that distribution centres can be centralised, national or regional. IKEA has central distribution centres for the Low Flow and National distribution centres for the High flow and with the proposed postponement strategy, the distribution centres' locations will not be changed. Hence, IKEA will not have to ship smaller shipment sizes or choose faster transport modes than today. IKEA will in this way be able to achieve economic of scale in distribution, which is a speculation strategy, but in same time postpone destination decision. In the same way as for logistics postponement, there is a greater flexibility in directing goods to where the need is.

Christopher et al. (2016) introduce four supply chain strategies and implies that for long supply lead times and unpredictable demand, a postponement strategy should be used. Ferreira et al. (2015) explain that postponement is a way to deal with demand uncertainty. Thereby, innovative products with short life cycles serve best for the postponement concept (Ferreira et al., 2015). IKEA mostly has products with long life cycles. However, furniture goods have become more fashion with customers re-furnishing more and more frequently (Leslie and Reimer, 2003). Moreover, the demand variations at IKEA have been proved in chapter "6. Empirical findings". Mihiotis (2013) explain that companies with long supply chain channel, i.e. companies in a large market with widely geographical spread, have a greater opportunity of using postponement as the demand changes with time. IKEA has long distribution channels, the lead time between suppliers and selling units can be up to 16 weeks. There can be long production lead times in case of make-to-order suppliers, and/or long delivery lead times. The delivery lead time between suppliers to selling units within the same continent is often a few weeks, whereas the delivery lead time between suppliers and selling units within different continents could be up to 98 days (Process Developer 1). There are many different potentials when combining different senders and receivers depending on lead times and type of products, and depending on this a postponement strategy will be more or less suitable.

In following, three scenarios for postponing the destination decision at IKEA are described. The discussion is mostly based on interviews with different IKEA entities and IKEA suppliers, but also on the external interviews.

8.1 Scenario 1: Assigning the destination at the end of production

When IKEA places an order to a supplier, quantity, destination and dispatch date are included. In this scenario, supplier will receive the total aggregated quantity for all destinations and dispatch date when the order is released. The destinations are instead decided right before the orders are dispatched from suppliers, and IKEA will send dispatch instructions including the quantity for each destination to the suppliers, see Figure 23. This scenario can be applied on every replenishment solution, i.e. Direct Delivery including Transit Delivery, DCG Delivery and Combined Supply.

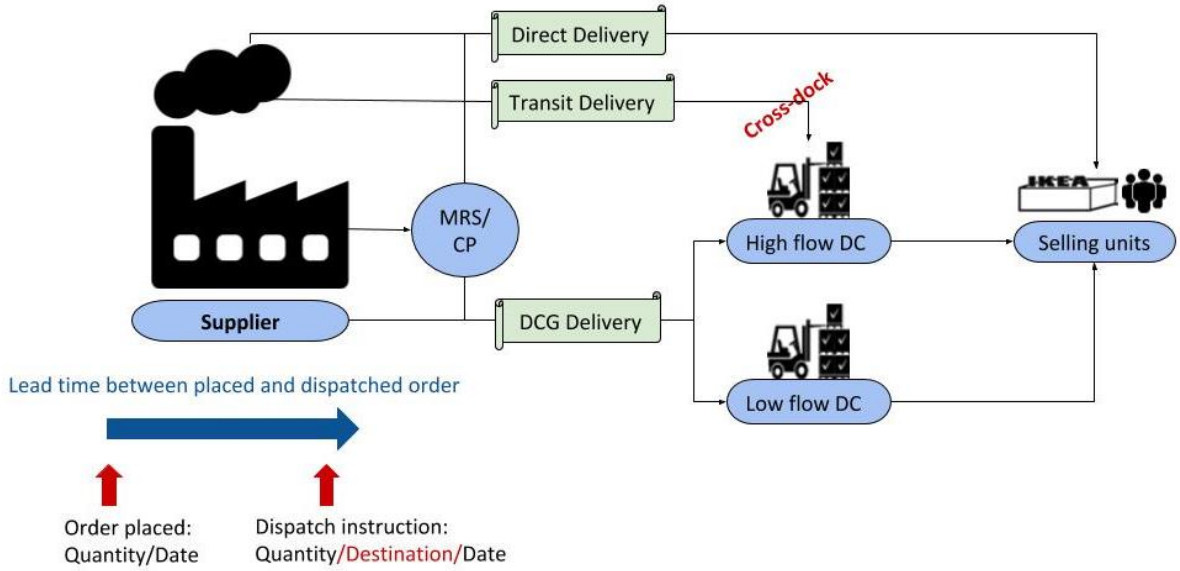

Figure 23. The scenario implies that the decision of destination is taken at the end of the lead time. The lead time is the time between when an order is placed to the supplier and when the order is dispatch from the supplier.

Depending on the lead time when an order is placed and when it is dispatched, the scenario will make more or less difference to the status quo. The scenario is most suitable for suppliers that make-to-order and have long production lead times. Production lead time is the time for how long it takes to produce the goods ordered (Rajaniemi, 2012). The make-to-order suppliers have longer manufacturing lead time, i.e. the time from when sales orders are placed to when the production is finished, than make-to-stock suppliers. In case of make-to-stock, manufacturing lead time is zero as the production happens before orders are placed. Hence, the time between when orders are place to when they are dispatch could be very short. Moreover, in case of orders having long delivery lead times, i.e. long time between when orders are dispatched and when they arrive to the destinations, the effect of this scenario may only be marginally. Hence, the scenario is most suitable for make-to-order suppliers with long production lead times and when the delivery lead time is short.

The suppliers, Pallco and Spaljisten, do not see any problems with this scenario. It will be another way to work for the suppliers, but knowing the destinations already in the beginning do not add any value for the suppliers. Instead, it may get easier for the suppliers to plan if they only get the total quantity instead of several order lines for the different destinations. However,

both Pallco and Spaljisten are make-to-stock suppliers, i.e. they produce goods and keep them in stock before they have received a customer order. Therefore, the scenario may not lead to any difference in how they work as they get an order and dispatch it shortly after. For example, the lead time between when orders are placed to when they are dispatched are usually five days for Spaljisten. Moreover, many of the IKEA Industry suppliers also produce against ready-made stock (Process developer 1).

One of the biggest challenges with the scenario is how to handle if the total ordered quantity is not balanced with the total updated quantity when the destinations are decided (Company A). If there is a balance, there will not be any problem. However, if the total quantity when the order is created is more than in the updated dispatch description, there must be clear rules about how to do with the excess quantity. For example, the destinations that demanded more in the beginning can get more anyway, or the excess quantity can be divided between the different destinations. In a similar way, the total ordered quantity could be less than the total quantity wanted in the dispatch instructions. In this case, some units will get less than needed, therefore there must be clear rules about the prioritization. In both the cases when the total quantity do not match, there may be problems with acceptances from the different units, i.e. DCs and selling units. No unit wants to be punished because other units did order too much or too little in the first place. It will be especially difficult in case of Direct Delivery, when orders are sent direct to selling units, as selling units have limited storage capacity and the product availability is of great importance.

The road transport from suppliers to port of loading is booked three days in advance if the goods will go by the sea, and in other cases two days in advance. Hence, the destinations must be decided at least three or two days before the dispatch date. The effect of the scenario on the transport will depend on if there are big changes between the planning and the execution (Capacity Planner). If the changes are only minor, there will not be any problems. The effect also depends on how many DCs and stores the supplier sends to, as it is not possible to redirect transport from a supplier to a DC or selling unit that there are no transport agreements between (Capacity Planner).

Since the decision will be taken before the dispatch from supplier there will not be any issue with preparing the custom document for the export clearance. Packaging and labelling can be an issue, if the switching is between distinct markets. This because there can be different labelling and packaging standards for certain markets or countries and the producer should know this in advance before packaging and labelling.

In case of Transit Delivery, DCs only look at the incoming goods one day in advance, and therefore the scenario will not affect the DCs. For the DCG Delivery, the DCs will get orders based on newer information and thereby their actual demands can be better matched. For example, if they require less in the dispatch instructions than when the order is created, they will get more space for other goods. In Direct Delivery and Transit Delivery, the selling units will receive goods based on newer information. This means that goods delivered will be better matched with their actual demand on the arrival day. However, the scenario do not deal with

early deliveries to selling units. Moreover, as discussed, it may only be marginally newer information if the suppliers make-to-stock and/or there are long delivery lead times.

Instead of postponing the destination decision from order released to order dispatched, another possibility is to not include destinations in the supply plan that is sent to the suppliers. Instead, the destinations could be included in the released order. This would affect both make-to-stock and make-to-order suppliers. IKEA would be able to send orders as for the suppliers' production batch sizes. The suppliers would only see the aggregated demand needed, which would simplify their planning for production.

8.2 Scenario 2: Assigning the destination at DCs for transit flow

Currently, the Transit Delivery is considered as a Direct Delivery solution in the planning system. It is not considered that the transit deliveries are passing through a DC on their way to the selling units. A possibility is to consider the actual physical flow of the Transit Delivery, i.e. include the DCs in the planning. Instead of deciding the selling unit destination already at the supplier, the decision can be taken at a later point in time, closer to the DC. When an order is created, the total quantity, DCG destination and dispatch date will be included. When the goods are reaching closer to the DCs, dispatch instructions including the quantity for each selling unit should be assigned, see Figure 24. The scenario does only consider Direct Delivery and Combined Supply replenishment solutions, and only when Transit Delivery is used. The scenario is suitable when the order lead time is long, both the manufacturing lead time and the delivery lead time. The delivery lead time from DCs to selling units is short, it could be as low as one day.

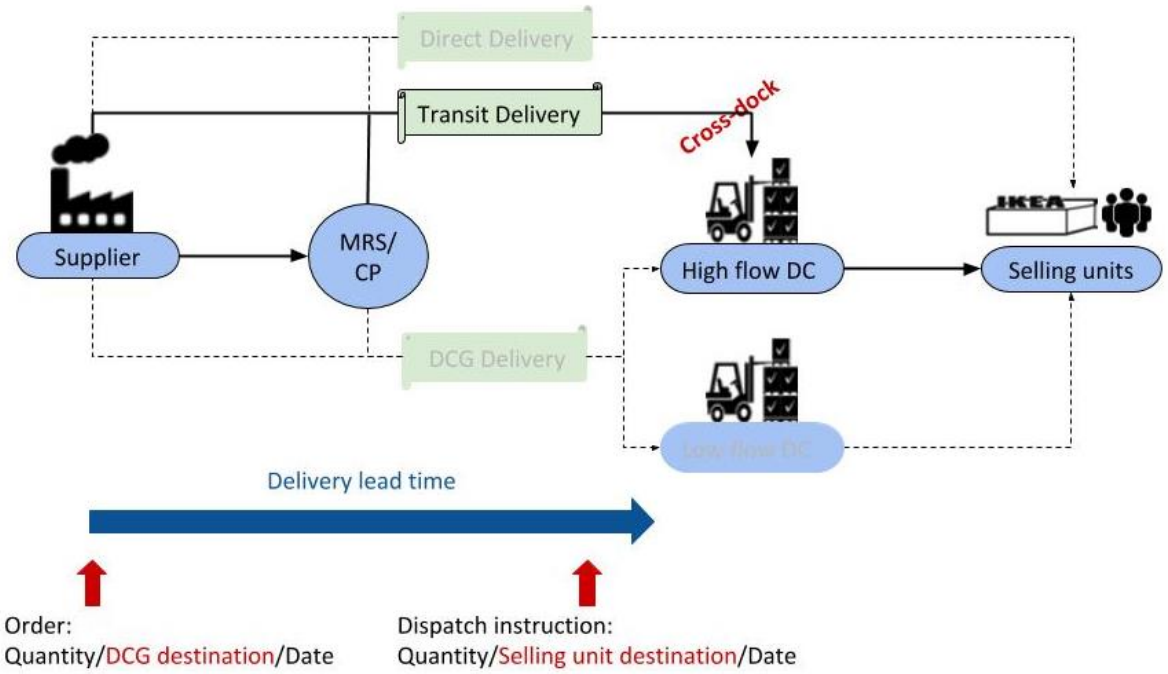

Figure 24. The scenario that the decision of final destination is taken at the end of the delivery lead time between a supplier and a High flow DC.

In this scenario, the supplier would be given the DCG destinations instead of the selling unit destinations for the Transit Deliveries. The suppliers do not see any bigger issues with the scenario. They do not think that it adds any value to see the selling unit destinations as the focus is on the summary of all orders (Pallco). The planned order quantity for each selling unit will be aggregated to one single quantity for each DC. By this, a simplified network can be achieved and it can result in more stability in the orders (Process Development Manager). By providing better stability, the suppliers will be able to use their capacity better. If IKEA delivers better plans and orders, smaller buffers will be needed (Process Development Manager).

Both Spaljisten and Pallco mention that stability in production is very value adding, hence there is a chance to lower the purchasing price. However, if IKEA continues changing orders by placing manual orders and interventions there will still be a problem for supplier (Process Development Manager). Moreover, promising suppliers lower flexibility may not be optimal for the selling units, as sales is not always consistent and thereby flexibility is needed (Category Area Logistics Manager). For example, it is difficult to avoid that new products creates unstable demand and therefore unstable production. One possible challenge for the suppliers is that the scenario may lead to lower traceability. The traceability is a quality issue, suppliers may want to know where pallets went if there occur any problems with the goods (Pallco). However, with better communication and traceable mechanism untraceable situation can be avoided.

Goods must always have a receiving destination when they are sent from a supplier in order to go through custom clearance. Instead of assigning a selling unit as the receiving destination address, a DC can be the destination similar to that of a DCG flow. However, instead of storage, goods will be cross docked for the final destinations.

The scenario will not make any difference for how the transport is done from suppliers to DCs, as it will be similar to DCG Delivery. At present, DCs only look at the incoming goods one day in advance, therefore there will not be any difference for DCs in this matter. However, one of the biggest challenges is how to deal with if the total quantity order from the suppliers does not correspond with the total updated quantity that the selling units demand. Belle et al. (2011) argue that cross-docking is suitable if demand is stable, it should not be any imbalance between ingoing and outgoing goods. However, as the scenarios are built to deal with uncertainties in demand, there will have to be a solution for absorbing this imbalance, either by the DCs or selling units.

If the selling units do not demand as much as ordered, the DCs may have to take the excessive goods into storage. This means that some of the Transit Deliveries may become DCG Deliveries shortly before they arrive to the DC. Goods that should have been cross-docked must be stored at the DC, which means increased inventory holding costs and handling which is labour intensive, therefore also costly (Belle et al., 2011). As DCs plan their staff weeks in advance based on forecasts, the scenario would lead to that they have to be more flexible with the staff as DCG Deliveries require more handling. If the total quantity needed in the end is much smaller than what was ordered, the DCs may have problems with space for storing the goods. As the stores tend to over-forecast, it is possible that the DCs will end up with more

stock than today. Depending on each DC's capability to store more and handle more, it could be solved with or without extending the storage areas.

If the selling units demand more than ordered from the suppliers, DCs may have to provide with the extra quantity needed from their storage, which also requires more planning and handling than forecasted. The DCs will have to add or increase safety stocks of Transit Delivery goods. Moreover, the selling units would have to pay DC price for these goods as they are stored at the DC and sent like a DCG Delivery. This will allow DCs to cover the expense of handling and storage. Dynamic pricing mechanism can be an option to compensate DC and make the product cheaper for the selling units. In case of Transit Delivery, the purchase price of goods for stores can be set according to the number of days goods are stored at DC. Consideration should also be given to the constraints at DC, otherwise the pricing can be higher for stores due to the constraints at DCs (Process Developer 6). If the total quantity needed in the end is much bigger than what is ordered, DCs will probably not have enough in stock to provide the selling units. Instead of letting the DCs handle the imbalance, the selling units could get more or less than the updated demand. In that case, clear rules on prioritization between the stores must be formulated otherwise there may be challenges with acceptance from selling units.

Today, DCs book transport one day in advance for the outbound flow to selling units. Hence, as Transit Delivery means that the goods should only be stored at the DCs for maximum 24 hours, the final destinations must be decided before they arrive to the DCs. IKEA wants to deliver full truck loads, and as Transit Deliveries can be combined with DCG Deliveries to the selling units, this will not be any bigger challenge (Process Developer 6). For example, the DC in Älmhult delivers big volumes every day and at least one truck every day to almost all destinations. If there are not enough of volumes, the orders are planned for the next day instead (Process Developer 6).

If the outbound flow from DCs to selling units is much different from the transport forecast, there will be challenges. If there are big changes in the transport volume, additional trucks may have to be booked for some selling units and less transport to others (Capacity Planner). As the transport department today has problems with that decisions are made too late, they want to have stable and accurate forecasts, postponing decisions, i.e. make decisions in later point in time go against the transport operations. There is no flexibility in routes, the transport bookings must be done from one destination another destination. However, this scenario will not affect the transport network, the suppliers and DCs will still send to the same selling units.

Instead of getting deliveries based on a forecast that was set at the suppliers, the selling units will get deliveries based on an updated forecast from when the dispatch instructions are made. When delaying the decision of destination, forecasts can be done on aggregate demand, which makes it easier to do accurate forecasts (Yang and Burns, 2003). The selling units will be able to provide better service than currently towards their customers as they will get products as per updated requirements, thereby the product availability will increase and over-stock decrease. Both Sales & Supply Support Manager 1 and Sales & Supply Support Manager 2 are positive

towards this postponement scenario, and hope it is going to solve the problems with getting goods too early and getting unneeded goods from Combined Supply. The orders that in the end are delivered to a selling unit are created based on DC lead time (plus some few extra days) instead of the supply lead time. In case of disturbances in Transit Delivery flow from supplier to DC, the selling units are today replenished by the DCs, and thereafter they get the Transit Deliveries, i.e. goods they do not need. In this postponing scenario, the selling units would get the goods from DCs and goods that are in transit can be re-steered to other stores or can be stored in DC instead.

When the selling units receive Transit Deliveries as per updated demand, less stock will be required at the selling units. Stores may not feel the need to put manual orders or over-forecast to the same extent. However, there may be a problem for the selling units with visibility of goods flow as the goods will not be dedicated to stores until shortly before they reach a DC (Sales & Supply Support Manager 2).

The scenario may lead to that stores get the right quantity at right time and are able to put the goods directly into sales spaces instead of up on racks, hence the handling cost can be decreased. As one of biggest issues for stores today is that they get orders too early, postponing the final destination decision may not help completely. If the OTD-logistics agreement, i.e. that Transit Delivery orders can come up to seven days earlier than the set arrival date still holds, the goods will still arrive too early from the stores' point of views. The OTD-logistics agreement may have to be changed to fewer early days in case of the Transit Delivery. However, there might be some pricing agreement as described above so that the DCs store the goods for some days until the requirement arrives from the selling units.

A possibility with the postponement scenario is that the most optimal replenishment setup for each product and selling unit may change. More Transit Deliveries may be preferred instead of DCG Deliveries, which is better for the DCs as they get less to handle and store. For example, the Combined Supply can in some cases be replaced with Transit Deliveries. DCG Deliveries are used in Combined Supply mostly as safeguard for stock out in case the Transit Delivery or Direct Delivery do not come on time or correspond to the actual demand. Postponement would diminish this problem, especially if DCs are used to absorb the deviations in demand. Furthermore, some of the DCG Deliveries may be replaced by Combined Supply were some percentage is Transit Deliveries and the rest DCG Deliveries as the goods will not be as sensitive to the lead time between supplier and DC. This could decrease the total cost in the supply chain as DCG Deliveries are costly in terms if inventory holding cost and handling cost. Another possibility is that some Direct Deliveries can become Transit Deliveries instead to increase the flexibility and provide more frequent and smaller deliveries.

Postponing the destination decision may lead to greater transit flow, which means that the goods will not be stored at DCs and handling will be lesser. This will help in achieving the economic and environmental sustainable goals. Lesser storing and handling means that less energy will be used by the DCs in terms of lighting, forklifts usage as well as for heating and cooling. Moreover, if DCs absorb the demand variations instead of selling units, it will require

less safety stock in total, hence less storage in total, which is good from both an economical and sustainable point of view.

8.3 Scenario 3: Assigning the destination at intermediary nodes

When goods are transported from suppliers to selling units they often pass through various nodes where goods are stored temporarily and the mode of transport is changed. This is especially true when goods are sourced from one continent and sold in another. These nodes include CPs, port of loading (POL), port of discharge (POD) and external warehouses closer to the selling units. There is a possibility to shift the decision of final destination to these points instead of taking the decision at the supplier as in scenario 1 or close to DCs as in scenario 2, see Figure 25.

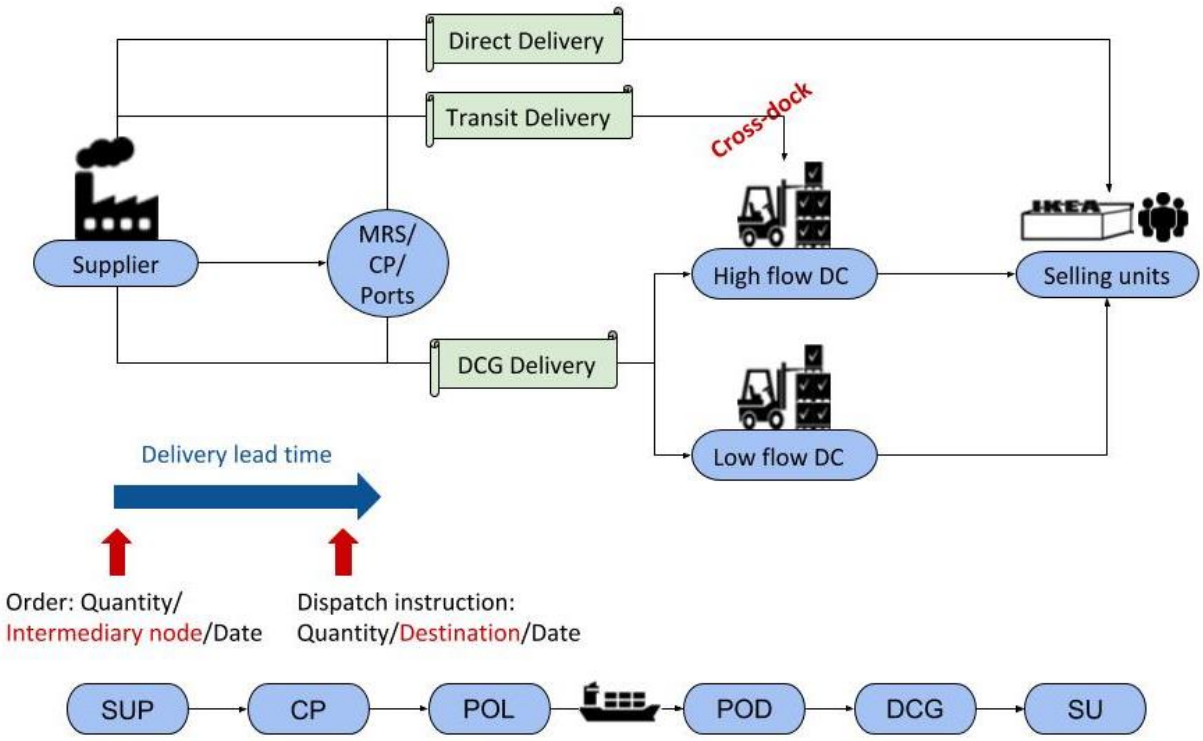

Figure 25. The scenario means that the decision of destination is taken in the end of the delivery lead time between a supplier and an intermediary node. Intermediary nodes include CPs, POLs and PODs.

The first possible option is to assign the initial destination as CP. As a result goods can be consolidated at CP as per the new demand on hand. This is applicable to the products that are routing through CP at present. By shifting the decision point towards CP, it will offer extra buffer time to incorporate the new demand and assign the final destination or next possible destination. However, CPs are not meant for storage and they are just cross docking facilities. For example, one CP which is dedicated for stores in several countries of EU has an average handling lead time of 1,8 days (Transport capacity planner). Additionally, CPs are generally positioned close to the supplier, therefore the available time for delaying the decision of destination is very short or negligible. The possible benefit with this approach is when the demand for one market is more critical compared to other market. In that situation, goods can

be assigned with new port of loading or different ship than the original plan. If more than one port of loading is available for that CP, according to new demand or vessel availability, a postponed destination decision can be made.

The second possible option is to shift the decision of final destination or next possible destination to the port of loading in case of intercontinental movement. Deciding the destination decision at the port of loading will also provide flexibility in postponing the destination decision. For example, if the original supply plan was to replenish specific stores in North Europe from Asia and after some days it was found that some stores in South Europe have greater demand than stores in North Europe. In that case, goods can be allocated to a new vessel that has voyage to a South European port. Free trade zones provide opportunities for storage and distribution (EXIM Institute). IKEA can use the available space for storage in these free trade zone and make decision of next destination with new information on hand. There are two major challenges that can be looked into for finding the suitability of this option, warehousing cost and ocean freight booking. The trade-off between the extra warehousing cost and less responsive supply chain need to be mapped. Ocean freight booking is not done in short notice and if the next available vessel is not close to the requirement, then the opportunity with postponement will be lost.

The third possible option is to take the decision of final destination at the port of discharge. Bonded warehouses can be used as cross docking facilities after the custom clearance and goods can be allocated according to the new demand. The major benefit is that Transit Delivery goods will no more have to pass through a DC, which can be a detour, but can be sent directly to the selling units. The trade-off is between the extra facility cost and a less responsive supply chain. This scenario means that the distribution network is extended and warehouses close to the port of discharge is used as transit points. The scenario could be used for all replenishment solutions, but most suitable for Direct Delivery and Transit Delivery. In case of Direct Delivery and Transit Delivery, decision of selling unit can be taken at this facility. In case of DCG Delivery, PODs are normally assigned to a DCG which is at proximity.

The suppliers will be affected the same way as in scenario 2, with the difference that the destinations will be CPs, ports and/or external warehouses instead of DCs. The limitation can be with the packaging and labelling. As the packaging and labelling is different for articles between different markets, it is restricted to where goods can be send. When it comes to Customs and documentation, changing the port of loading and port of discharge in a short notice will require the system to adapt to the situation very fast. Bonded warehouses close to the ports can be used as intermediary initial destination for customs clearance.

In case of operating new bonded warehouses close to the ports, a new transport network must be set up, with new transport agreements. A bonded warehouse provides the opportunity to de-stuffing the container and cross docking, as a result, truck trailers can be sent to selling units instead of containers. This will reduce the handling time at selling units and avoid the chances of detention and demurrage of the containers. Availability of space in these bonded warehouses can be a challenge with the high trading volume of IKEA. In the beginning, available space

can be used for a certain article and for long term benefits, developing a new bonded warehouse can be an alternative solution.

In case of using a warehouse close to the port of discharge, three cases will occur. The total dispatch quantity can be balanced with the newer requirements. If the new requirements are less than what is dispatched, the goods have to be sent to DCs or selling units to avoid storage. If the new requirements are higher, there will need to be a prioritizing of which DCs and selling units will get what.

The stores will be able to get orders based on more updated information. If a node close to the sender is used and the delivery lead time is long, there may not be any bigger difference from current state. However, if a warehouse closer to the receiver is used, the destination decision can be done on updated demand.

8.4 Summary of the scenarios

In Table 4, the pros and cons with each scenario is presented. Apart from the challenges mention in each scenario, implementing a scenario may require major changes in IKEA's current IT systems. There are many systems and different players in the chain of information. There is low visibility in today's IT system landscape, and with the postponement idea it is of importance to be able to track the flow of goods in a good way (Retail Logistics Capacity & Flow Planner). Currently, selling units have the visibility of their incoming goods but with postponement, goods are not meant for any specific selling unit until the decision is taken. Today's planning logic will have to be changed, and there will be great changes in replenishment plan and the Order Management System (Process Development Manager).

Furthermore, if forecasts get more accurate, the postponement concept may not be worth to implement (Graman and Magazine, 2006). For example, IKEA has a project with making an aligned forecast, which may solve some of the same problems that postponement is initiated to solve. Today, the Store Replenishment System and IoS forecast do not talk to each other, and the idea is to combine them in an aligned forecast and thereby make more accurate forecasts. Other projects that are ongoing may also influence the possibility and need of postponement.

The idea of postponing the final destination decision has implications on the sustainability. If selling units could get deliveries on updated demand, there will be fewer scrapped products. Hence, resources on producing the products, transporting them, store them and then scrap them can be avoided. It is therefore good from an environmental point of view to postpone the destination decision. This interrelate with economical sustainability, as the selling units would have less stock outs or over stock situations. Postponing the decision of the final destination could also lead to better relationships with the suppliers, i.e. there is a social aspect in this as well, as it could simplify the planning and production for suppliers. For example, scenario 1 may lead to suppliers getting orders as per their production capacity instead of orders for each destination.

Table 4. The pros and cons with the different scenarios.

	Pros	Cons
Scenario 1	+ Simplified planning for suppliers + Selling units will get deliveries as per delivery lead time → better product availability + Suitable for long production lead times + Suitable for all replenishment solutions	- Not suitable for make-to-stock suppliers - May not be worth if long delivery leads times - Must deal with imbalance in total quantity
Scenario 2	+ Selling units will get Transit Deliveries as per DC lead time → better product availability + Aggregate forecast at supplier	- DC needs to take the variations OR clear rules/prioritization are needed - Only for Transit Deliveries
Scenario 3	+ Selling units will get deliveries as per Intermediary node lead time → better product availability + Free up the DC space + Suitable for all replenishment solutions	- Extra cost for new facility or bonded warehouse - New distribution structure - Must deal with imbalance in total quantity

9. Discussion

The different steps that have been taken in order to collect information from IKEA entities and external companies are quite exhaustive but there are certain challenges that cannot be overlooked. Richardson (2005) emphasises that the survey questions should be simple to understand and it should not require any further explanation, however the answers to some of the questions in the created survey were not identical when an interview was conducted with the same person. It implies that there is some complexity in the questions. The main reason could be the technicality of the subject which requires to provide research background to the respondents to assist them in answering.

Although efforts were made to select right recipient working in the logistics and supply chain area and provide them incentives with survey result, majority of the recipient choose to not respond. One of the reason for the low response rate is due to the fact that some respondents did not wish to share their logistics processes. If the respondent rate had been higher, a greater understanding for how usual the proposed postponement concept is, and advantages and disadvantages would be obtained. However, the IKEA context is specific and the concept will have to be modified according to the situation.

Instead of making a survey and limited interviews, another approach could be to make a deep study of for example three furniture retailers from different markets. This may provide another approach to study the postponement concept in the existing distribution network of these furniture retail companies. Since the thesis topic was initiated by IKEA and it was limited time available, it has not have been possible to study other companies in-depth.

One of the other limitations with the study is with the interviews conducted at IKEA. There can be contradiction with the views and concerns represented by the interviewee with other employees of that particular department. In some cases, only one person within a department was interviewed, which may lead to some bias. Furthermore, interviews were mostly conducted with IKEA entities based in Sweden and suppliers in Sweden. For example, only employees from Swedish IKEA stores were interviewed. It is possible that IKEA stores in other countries would have other problems than those mentioned.

The scenarios are analysed taking the viewpoints of different stakeholders, however it could also be possible to test the scenarios with some quantitative research. Quantitative analysis may give more insights into the implication of postponing the destination decision.

10. Conclusion and recommendation

The competition and use of e-commerce is growing in today's business environment. Companies tend to get more globalised, something that is connected with increased supply lead times. In the same time, the need to become more flexible and responsive towards changes in customers' demand is increasing. IKEA has realised a way to become more flexible and responsive in its distribution. Today, IKEA decides to which destination orders will go already when the company places orders at suppliers. The lead time between a supplier and a store could be up to 16 weeks, and customer requirements can change a lot during this time. Employees at IKEA stores confirm that there is a mismatch between the supply and the actual demand, and this is one of the key issues within IKEA's replenishment solutions. It is not possible to redirect orders from one destination to another. Hence, the flexibility and responsiveness in the distribution flow is limited, and this ends up in costs because of stock-outs and over-stock situations. This answers the research question *1. What are the key issues within IKEA's replenishment solutions when the decision of destination is made at an early stage?*

In order to become more flexible and responsive towards customer demands, postponement strategies have been used by companies for several decades. However, research papers only explore the usefulness of manufacturing and logistics postponement which mainly are about delaying the production or postponing the movement of goods until the customer requirements are known. This study has filled a gap in the literature by giving insights into the benefits and challenges with postponing decision of destination to capture the new information of demand. The potential of postponing the destination decision to a later point in time has been tested through three different scenarios that are applied on IKEA's distribution network.

Scenario 1 considers deciding the final destination shortly before the order is dispatched to the supplier and it is mostly suitable for make-to-order suppliers and when the production lead time is considerably long compare to the delivery lead time. Scenario 2 is when decision of the final destination is taken shortly before the goods arrive to a distribution centre. It is appropriate when the Transit Delivery replenishment solution is used and when the delivery lead time is long as the transit time can be utilised to assign updated demand to the products at the distribution centre. The selling units get their stock with a short lead time. Scenario 3 is utilising the nodes consolidation points, port of loading and port of discharge as the intermediary decision points for assigning next destination. This can for example be useful to free up the space in distribution centres by taking the decision of final destination at the bonded warehouse or free trade zone located close to port of discharge. The second research question is by these three scenarios answered, *2. How could IKEA leverage the concept of postponing the decision of final destination with different scenarios?*

The three scenarios have been analysed and a summary of pros and cons with each of them for each stakeholder has been created. All the scenarios would make IKEA more flexible and responsive towards customer demands. However, it could be more or less costly. For example, the manpower at distribution centres may have to become more flexible in case of if scenario

2 is implemented. Moreover, scenario 3 could lead to increased facility costs. How many make-to-order suppliers and make-to-stock suppliers IKEA has, how the division of production lead times and delivery lead times is, and how much the actual demand varies with time for different products will determine how much difference postponing the destination decision will make. Hence, the third research question is answered, *3. How would postponing the decision of final destination will affect IKEA's overall supply chain?*

This study is mainly focused on the qualitative method of collecting information through interviews, literature and analysing the external companies' distribution set up. It helps in understanding the concept and its effect from different perspectives. On the other hand, to map the actual cost saving and to find out the improvement in product availability, a quantitative data analysis will be a way forward. It is recommended to evaluate the scenarios with quantitative analysis for any product that has greater variation in actual need compared to the forecast. For example, if scenario 2 or scenario 3 is implemented, the pricing mechanism used for the different replenishment solutions will be affected. IKEA must look at the total cost of the supply chain and investigate how to deal with the pricing. If the quantitative analysis presents better product availability without too much increase in cost, IKEA can start implementing the scenarios as pilot basis to gauge the reactions from the different stakeholders.

When implementing the postponement concepts, it is important to take into consideration that IKEA's stakeholders may be resistances to change processes. As IKEA is an old and big organisation, it may be especially difficult to make the change. In order to succeed with the implementation, a holistic view as well as top management support is needed. Coordination between the different functions is necessary to understand how changes in one area affect other areas. Moreover, open communication towards the different stakeholders, i.e. suppliers, transport, DCs and selling units is important. Information and communication should be used to make the supply chain more transparent, which is necessary in order to make postponement feasible.

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Appendix I - List of Interviews with IKEA Employees

Sl No	Company	Role	Dt of interview	Type of Interview
1	IKEA of Sweden AB	Process Developer 1, Need & Capacity IoS	2018-01-16, 2018-03-28, 2018-04-20	Face to Face
2	IKEA of Sweden AB	Process Development Manager, Need & Capacity IoS	2018-01-25	Face to Face
3	IKEA of Sweden AB	Solution team leader, Need & Capacity IoS	2018-01-26	Face to Face
4	IKEA of Sweden AB	Process Developer 2, Need & Capacity IoS	2018-02-01	Face to Face
5	IKEA of Sweden AB	Process Developer 3, Need & Capacity IoS	2018-02-01	Face to Face
6	IKEA Svenska Försäljnings AB	Retail Logistics Capacity & Flow Planner, Retail Supply Integration	2018-02-08	Phone
7	IKEA of Sweden AB	Process Developer 4, Need & Capacity IoS	2018-02-12	Face to Face
8	IKEA of Sweden AB	Process Developer 5, Need & Capacity IoS	2018-02-13	Face to Face
9	IKEA Svenska AB	Process Developer 6, Operation Support Management DC Älmhult	2018-02-13, 2018-05-08	Face to Face
10	IKEA Svenska Försäljnings AB	Sales co-worker, Goods Receiving, Älmhult Store	2018-02-15	Face to face
11	IKEA of Sweden AB	Solution owner 1, Need & Capacity	2018-02-15, 2018-05-08	Face to Face
12	IKEA of Sweden AB	Process Developer 7, Need & Capacity IoS	2108-02-16	Face to Face
13	IKEA Svenska AB	Team Leader, Goods Out Skift 2 CDC Torsvik	2018-02-20	Face to Face

14	IKEA Purchasing Services (Sweden) AB	Delivery Planner, Transport Planning PLANE	2018-02-21, 2018-05-11	Face to Face
15	IKEA Purchasing Services (Sweden) AB	Capacity Planner, Transport Business Steering PLANE	2018-02-21, 2018-05-07	Face to Face
16	IKEA Supply AG	Supply Development Receiving Specialist	2108-02-21	Skype
17	IKEA Purchasing Services (Sweden) AB	Customs Support Specialist, Customs Support 1 PLANE	2018-02-21	Face to Face
18	IKEA Services AB	Logistic specialist RSI Global	2018-02-26	Face to Face
19	IKEA of Sweden AB	Solution Owner 2, SC Optimization & Simulation IoS	2018-02-26	Face to Face
20	IKEA Svenska Försäljnings AB	Sales & Supply Support Manager 1, Bäckebol Store	2018-03-06	Face to face
21	IKEA of Sweden AB	Supply Manager, Supply LTG IoS	2018-03-06	Face to Face
22	IKEA Distribution Services GmbH	DCG Operational Support Team Leader	2018-03-08	Skype
23	IKEA of Sweden AB	Solution Owner 3, SC Optimization & Simulation IoS	2018-03-09	Face to Face
24	IKEA Services India Private Limited	Business Developer, Lighting	2018-03-19	Skype
25	IKEA of Sweden AB	Category Area Logistics Manager	2018-03-23	Face to Face
26	IKEA Svenska Försäljnings AB	Sales & Supply Support Manager 2, Kållered store	2018-04-19	Face to face

Appendix II - List of interviews with IKEA suppliers

Sl No	Company	Role	Dt of interview	Type of Interview
1	Pallco AB	Factory manager	2018-02-22	Face to face, factory visit
2	Spaljisten AB	Factory manager	2018-04-06	Face to face, factory visit

Appendix III - List of interviews with external companies

Sl No	Company	Role	Dt of interview	Type of Interview
1	Company A, Sweden	VP Service Director	2018-03-20	Skype
2	Company B, Sweden	Supply chain developer	2018-04-26	Phone
3	Company C, Sweden	Logistics Manager	2018-05-11	Phone
4	Company D, USA	VP Production and Planning	2018-05-14	Skype
5	Company E, India	International Trade consultant	2018-05-17	Phone

Appendix IV - Survey Questionnaire for external companies

Logistics Postponement in Supply Chain

If you cannot or do not want to answer a question, you can skip that particular question

1. What company do you work for?

2. What is your role/function in the company?

3. What type of industry is the company in?

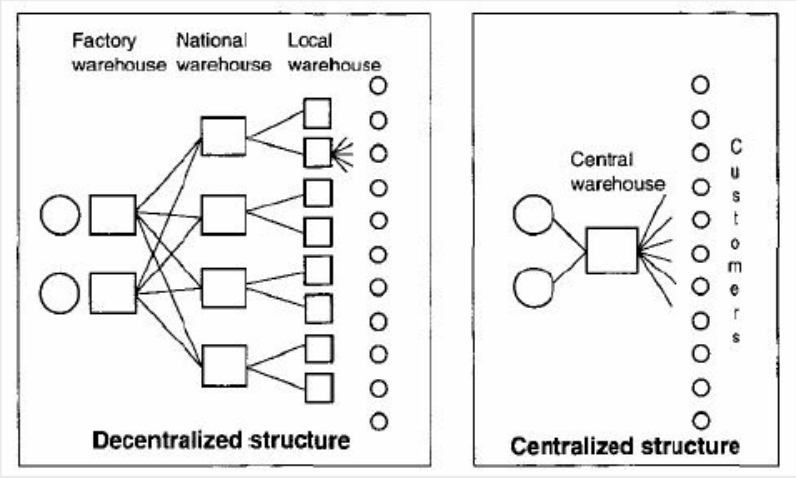
- Furniture Retail
- Apparel Retail
- Multibrand Retail
- Other - Write In

4. What are the channels of sales?

(Possible to select multiple options)

- Physical store
- E-commerce
- Other - Write In

5. Do you have a Centralized or Decentralized Distribution System?



(Abrahamsson,1993)

- Centralized Distribution System
- Decentralized Distribution System
- Other - Write In

Comments

6. How do you rate the data integration among different internal functions of your company?

(Higher rating for an integrated ERP system, where users have access to real time data)

	Rating
Quality	✖ ★ ★ ★ ★ ★

Comments

7. Do you have an integrated demand forecasting system for all of your selling units?

- Yes
- No

Comments

8. Do you balance demand forecast with the supplier production capacity and with the capacity of distribution network?

- Yes
- No
- Other - Write In

Comments

9. Do you have central replenishment planning or do each sales unit plan their own replenishment?

- Central Replenishment Planning
- Individual Store Replenishment Planning
- Both
- Other - Write In

Comments

10. Do you send separate instructions for dispatch after the purchase order is released to suppliers?

- ○ No, only one order for manufacturing with dispatch instructions
- ○ Yes, first manufacturing order followed by dispatch distructions
- ○ Other - Write In

Comments

11. What is the order frequency to the suppliers?

(Possible to select multiple options)

- ☐ Daily
- ☐ Weekly
- ☐ Monthly
- ☐ Other - Write In

12. Do you consider the full truck load before releasing the orders ***or*** do supplier consolidate the orders to secure the volume for full truck load?

- ☐ Order release based on filling rates
- ☐ Consolidation of orders to get full truck load
- ☐ Other - Write In

Comments

13. What is the maximum supply lead time* you have?

*We define supply lead time as from when the order is released, including both production lead time and transport lead time

1 week — 30 weeks

15 weeks

14. What kind of replenishment setup do you have?
(Possible to select multiple options)

Cross-docking: It is a logistics strategy where incoming shipments is unloaded from inbound vehicles and loaded into outbound vehicles with little or no storage in between.

- [ ] Direct Delivery from Supplier
- [ ] DC/Warehouse Delivery
- [ ] Cross-docking at DC
- [ ] Other - Write In

Comments

15. How big is the share of direct deliveries from suppliers to selling units?

- ○ Only direct delivery
- ○ Mixed set up with high percentage of direct delivery
- ○ Mixed set up with low percentage of direct delivery
- ○ No direct delivey
- ○ Other - Write In

Comments

16. Do the selling units buy the same product with different prices depending on the replenishment setup?

- ○ Yes
- ○ No
- ○ Only have one replenishment setup
- ○ Other - Write In

Comments

17. In case of cross docking, when do you have to take the decision of the final destination of goods?

(Possible to select multiple options)

- ☐ At the supplier premises before dispatch
- ☐ During transit before reaching the Distribution Centre
- ☐ At the Distribution Centre
- ☐ Do not use cross docking
- ☐ Other - Write In

Comments

18. In case of cross docking, if the decision of the final destination is taken after the dispatch from the supplier's end, what benefits do you see?

(Decision during any of the transit points - Port of loading, Port of discharge, Consolidation Point, Cross Docking area)
(Possible to select multiple options)

- [ ] Reduces the inventory level at stores
- [ ] Improves the availability of the products
- [ ] Reduces the bull-whip effect
- [ ] Increases the just in time deliveries
- [ ] Simplifies the network
- [ ] Other - Write In
- [ ] Do not use cross docking/do not take the decision after dispatch from supplier

Comments

19. In case of cross docking, if the decision of the final destination is taken after the dispatch from the supplier's end, are there any problems?

(Possible to select multiple options)

- [ ] Less visibility and less control for the receiving unit
- [ ] Labeling and Packaging
- [ ] Legal issues with documents
- [ ] Legal issues with customs
- [ ] Transport booking
- [ ] Manpower planning at warehouse, selling unit etc.
- [ ] Other - Write In
- [ ] Do not use cross docking/do not take the decision after dispatch from supplier

Comments

If you feel to share something important or like to share your reflection, please utilize the space below.

20. We may like to get back to you for follow-up questions, are you willing to participate?

- ○ Yes
- ○ No