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Impact of Omni channel in a central warehouse

An analysis of warehouse activities for an electronic retailer

Master thesis within Business Administration

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Abstract

Master Thesis in Business Administration

Title:	Impact of Omni channel in a central warehouse: An analysis of warehouse activities for an electronic retailer
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Purpose: The purpose of this study is to analyze the impact Omni channel has on the warehouse activities in a central warehouse for electronic retailers. In order to fulfill the purpose the following research questions are analyzed and answered; “What are the challenges in the warehouse activities in a central warehouse for an electronic retailer when Omni channel is utilized?” and “How can the challenges in the warehouse activities be managed in a central warehouse for an electronic retailer using Omni channel?”

Methodology: The research method for this study is qualitative with an abductive approach. A single case study has been conducted based on interviews and observations. Furthermore, the literature review is based on scientific articles. The empirical findings from the case study have been a complement to the limited literature of warehouse activities connected to Omni channel. The analysis has required the authors to continuously match the empirical findings and literature in order to be able to fulfill the purpose. In order to analyze the answer the first research question an Ishikawa diagram is used. Furthermore, a tree diagram is used in order to analyze the answer for the second research question.

Findings: There are various challenges identified in the warehouse activities in a central warehouse for electronic retailers using Omni channel. Furthermore, the authors identifies challenges that have an impact on the warehouse activities where Omni channel is the cause for creating the challenges. Lastly, the authors provide the reader with improvement factors in order to manage the challenges identified.

Theoretical implications: The authors identify five theoretical implications for this study; large pallets, non-integrated WMS, a non-suitable picking equipment, a non-suitable layout, and packing. These challenges occur as an outcome of Omni channel and therefore can be seen as a theoretical contribution to the limited literature.

Managerial implications: It is crucial for electronic retailers to identify the challenges in the warehouse activities and understand the underlying reason for why the challenges arise. Furthermore, improvement factors can be identified and implemented by an extended analysis. However, modifications are required since there are various factors that can differ between electronic retailers using Omni channel.

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I Introduction

In the first chapter a background of the subject is given. Moreover, the problem discussion, purpose, and research questions of the study are presented. Lastly, an outline of the study is presented.

I.1 Background

The retailing industry in Sweden has been growing remarkably the last decades as well as the competition for electronic retailers (Hultman & Elg, 2013; LaSalle, 2013). In the supply chain, retailers are closest to the customers which mean that they are the first one to receive information about customer demand and requirements (Gosling, Purvis, & Naim, 2010). Today, retailers' role is changing due to the fact that customers' behavior and trends are changing. The uncertainty within a supply chain brings additional challenges for retailers, especially for retailers within the electronic business (Karimi Manjili & Tabar, 2011). An underlying reason for this is that the retailers within the electronic industry are offering similar products with decreasing prices on the products. This leads to an intensified competitiveness on the market (Rämme, Gustafsson, Vestin, Lindblom, & Kilander, 2010).

The traditional retail stores allows consumers to touch and feel the merchandise while online retailers tries to attract consumers by offering them a wider product selection, lower prices, and content which provides the consumer reviews and ratings of the products (Brynjolfsson, Hu, & Rahman, 2013). The difference between shopping in a traditional store and an online store is that the stores have different informational needs depending on which type of shopping channel the consumer use (Burke, 2002). In order to be successful in the new economy, it has been recognized by companies to combine traditional and online strategies (Brynjolfsson et al., 2013). The integration between the two channels is referred as an Omni channel in the literature (Rigby, 2011). The current customer utilize multiple channels while shopping depending on what they think is more convenient for the specific purchase, and at what stage they are in the shopping process (Nunes & Cespedes, 2003). Therefore, it is important for retailers to distinguish why consumers choose to use online shopping or traditional shopping.

Actors in the traditional business require new solutions for the logistics function if they want to go online (Delfmann, Albers, & Gehring, 2002). The usage of e-commerce makes it necessary to have a logistic function which can handle daily and small orders of individual customers with same-day deliveries (Agatz, Fleischmann, & Van Nunen, 2008). It is a complicated task to make home deliveries on time. Therefore, a success factor is to obtain an efficient distribution network for companies in the e-commerce market (Delfmann et al., 2002). This success factor is also applicable for Omni channel, where there is an integration of traditional and online stores. Retailers with Omni channel face challenges with designing a successful inventory and logistic structure in order to meet customer demand (Chiang & Monahan, 2005).

A warehouse is a crucial component of any supply chain (Gu, Goetschalckx, & McGinnis, 2007). The warehouses are utilized by various actors where retailers are one of the actors (Shiau & Lee, 2010). The activities that are included in the warehouse are; receiving, storage, order picking, sortation, and packing & shipping (Rouwenhorst et al., 2000). The basic requirements for the warehouse is to manage the activities (Gu et al., 2007). Furthermore, there are difficulties in each warehouse activity where each activity needs to be implemented, operated, and coordinated carefully. In order to obtain long term benefits and cost savings, an efficient design of the warehouse is required (Gill, 2009). The design of the warehouse also requires decision making regarding the performance of the different warehouse activities.

Previously it has been expected that online stores will drive out the traditional retailers. However, recent studies have criticized this view and it has been underlined that different type of channels can be used depending on which or what type of customers to target (Ward, 2001). Due to the fact that the pressure of integrating logistic capabilities and functions is a problem, the current competitive environment put pressure on being able to deliver products on shortest lead time possible. Considering the previous reasoning, it is of great interest to further analyze Omni channel and the pressure it puts on the warehouse activities. A case study is conducted at one of the Swedish electronic retailers. The electronic retailer is currently working with Omni channel and therefore it is interesting to get a further insight on how Omni channel is utilized today in practice, and the challenges that are faced in the central warehouse.

1.2 Problem formulation

The market competition put pressure on companies to continuously make improvements which in turn put pressure on the warehouse to achieve higher performance (Gu et al., 2007). Retailers using Omni channel face difficulties with managing warehouse activities (Trunick, 2015). The most common warehouse challenges are; *inventory accuracy, inventory location, warehouse layout, redundant processes and picking optimization* (Blanchard, 2013). According to De Koster, Le-Duc, & Roodbergen (2007), the decision making regarding the layout of the warehouse activities is one of the key issues. An efficient warehouse layout include; knowledge of the inventory, training of personnel, and managing the products (Scioscia, 2014). This also put pressure on how planning and control decisions should be organized (Faber, Koster, & Smidts, 2013). Additionally, the challenges faced for the warehouse activities involves shorter response time, greater product variety, and increased inventory control. In order to meet the current challenges, a consequence is to manage the warehouse both effectively and efficiently (Faber et al., 2013).

Previously, there has been research on warehouse challenges of traditional stores and online stores separately. However, research on Omni channel regarding the pressure it puts on the warehouse has been limited (Tetteh & Xu, 2014). There have been difficulties for retailers using Omni channel when it comes to manage warehouse activities such as selection of an appropriate storing method, handling equipment, and a warehouse layout (De Koster et al., 2007). Furthermore, companies have to create new solutions in order to manage challenges with a supply chain that is not customized for different channels (Chaturvedi, Martich, Ruwadi, & Ulker, 2013). Therefore, the concept of Omni channel requires further research since it is in its early developing stage (Tetteh & Xu, 2014). The gap in the literature is a motivation to form this research that is focused on the warehouse perspective on *the challenges electronic retailers face in the central warehouse activities when they are utilizing Omni channel*.

1.3 Purpose

The purpose of this study is to analyze the impact Omni channel has on the warehouse activities in a central warehouse for electronic retailers.

1.4 Research questions

The following research questions will be answered in this study and thereby fulfill the purpose:

RQ1: What are the challenges in the warehouse activities in a central warehouse for an electronic retailer when Omni channel is utilized?

It is of great importance to identify the challenges in the warehouse activities in order to analyze the impact Omni channel has on the central warehouse. When the challenges are identified a further analysis of the pressure Omni channel put on the warehouse activities is carried out. By analyzing the theoretical framework and empirical findings it is possible to identify these challenges.

RQ2: How can the challenges in the warehouse activities be managed in a central warehouse for an electronic retailer using Omni channel?

It is primarily possible to manage the negative impact Omni channel has on the central warehouse after the challenges are identified. The improvement factors are identified by analyzing the theoretical framework, empirical findings, and the outcome of the first research question.

1.5 Disposition

In Table 1.1 below, the content of each chapter in the study is presented.

Table 1.1 Disposition

Chapter	Content
1. Introduction	This chapter presents the background to the topic and the research. Furthermore the problem description, the purpose, and the research questions are presented.
2. Theoretical framework	The theoretical framework consists of theories that are used by the authors for this study. The theories included in this chapter are necessary as a background knowledge which is required for the analysis. The main focus in the literature is put on the warehouse activities.
3. Methodology	In this chapter it is described how the study is conducted. The chapter includes the research process, research approach, research objective, research method, case study, data collection, literature review, empirical analysis, and trustworthiness of the research.
4. Empirical findings	In this chapter, the authors present the empirical findings from the case study. This mainly includes the warehouse activities in the central warehouse.
5. Analysis	This chapter presents the analysis of the theoretical framework and empirical findings in order to answer the research questions.
6. Discussion & conclusions	This is the final chapter where the authors present the fulfillment of the purpose. Furthermore the theoretical implications, managerial implications, and further research are discussed.

2 Theoretical framework

This chapter consists of theories that are linked to the purpose of the study. The chapter starts with an outline of the theoretical framework. Furthermore, a description of different types of retailers are presented. Lastly, theories within warehousing, warehouse activities, and information technologies are presented.

2.1 Outline theoretical framework

The theoretical framework is introduced by a brief description of different types of retailers such as; traditional retailing, online retailing, and retailers using Omni channel. The theories are a baseline to understand Omni channel, which is the integration of both the traditional retailing channel and the online retailing channel. In this study the main focus is on the central warehouse. Therefore an overview of warehousing is given as well as the warehouse layout, return, and the information technologies that can be utilized in a warehouse. The layout needs to be taken into consideration since it has an impact on how the different warehouse activities work. Return is a separate flow that needs to be taken into consideration if customers are not satisfied and want to return a product. Furthermore, information technologies (IT) such as warehouse management system (WMS), Radio Frequency Identification (RFID), and barcoding are presented since the IT is the main tool to manage the warehouse and the warehouse activities. Additionally, WMS integrate and make it possible to manage the products and the warehouse activities. Lastly, the chapter provides a description of each warehouse activity in a central warehouse; receiving, sortation, storage, order picking, and packing and shipping.

2.2 Types of retailers

Traditional retailers – Traditional retailers have physical stores where the customers can view and examine the products directly from the shelves (Grieder, Buck, Banfi, Kment, & Fitzner, 2014). Furthermore, the customers can immediately bring the products home after a purchase. Traditional retailers have an infrastructure that consists of warehouses, trucks and stores, which have been well-tried over the years and successfully serving the customers (Rigby, 2011). However, this results in high investments of physical infrastructure when they enter or expand to new markets.

Online retailers – Online retailers are serving the customer without the expensive physical infrastructure (Rigby, 2011). Online retailers interact with the customers through website where search, select and payment of products are included with minimum of effort, time and convenience anonymously (Grewal, Iyer, & Levy, 2004). The physical infrastructure consist of warehouse, shipment and delivery which online retailers outsource (Rigby, 2011).

Retailers using Omni channel – The retail industry has for the last years been divided into; online retailers or traditional retailers (Noble, Shenkan, & Shi, 2009). Thus, recently the concept of combining online- and traditional retailing has occurred, which is improving customer satisfaction where the strengths for both channels are utilized (Gallino & Moreno, 2014). Omni channel refers to the integration of traditional retailing with online retailing (Rigby, 2011). This concept is suitable for customers who want both the online features as unlimited opening hours, products and price transparency, likewise the features of traditional retailing such as examining the product, personal selling and the experience of doing a purchase in a store. The customers value differs during a purchase, thus most likely customers want the complete interaction of traditional retailing and online retailing.

Customers can therefore combine the different channels and use the different services these channels offer (Gallino & Moreno, 2014; Piotrowicz & Cuthbertson, 2014). For instance, searching best price on the website while examining the product in a traditional retail store (Carlton & Chevalier, 2001). The output of this is a wide range of alternatives for customers, and therefore results in a high risk of switching between channels and retailers. However, Verhoef & Donkers (2005) pushes that integration of channels will result in increased customer loyalty. Furthermore, sharing resources and the infrastructure in an integration of channels can decrease costs (Oh, Teo, & Sambamurthy, 2012). Additionally, satisfied customers will lead to reduced customer service costs (Chatterjee, 2010). The flexibility will increase due to the usage of integrated channels to be able to quickly deliver products and manage returns (Benner & Tushman, 2003).

2.3 Central Warehouse

Warehousing is an important part of the supply chain since it is the place where the material is distributed from (Naik, 2004). Therefore the stock for distribution has to be maintained in order to meet customer demand. In order to get material into the warehouse and out from it, various types of equipment and personnel is required in order to manage the products in the following activities (Naik, 2004; Rouwenhorst et al., 2000):

- *Receiving* – In the receiving activity products arrive according to the quantity and quality that is specified in the order. Normally, the products arrive in large pallets.
- *Sortation* – When the products arrive in large pallets to the receiving activity, a repacking is required. Additionally, multiple orders from one supplier have to be sorted and transported to the next coming activity.
- *Storage* – In the storage activity the products are stored in the central warehouse until a demand arises for the products.
- *Order picking* – When there is a demand, the products have to be picked from the storage in order to meet the order by using different equipment.
- *Packing and shipping* – The products are then packed and loaded in trucks, trains, or another carrier in order to be delivered to the customer.

There are various resources that have to be included in the warehouse activities such as; labor, equipment, and space (Gu et al., 2007). In order to achieve minimum cost, optimal capacity and throughput the warehouse activities have to be implemented carefully.

2.3.1 Warehouse Layout

A warehouse layout is of great importance since it has an impact on the operations within a warehouse (Roodbergen, Sharp, & Vis, 2008). Some of the stages that need to be taken into consideration in a warehouse layout are the following: receiving, sortation, storage, order picking, and packing and shipment (Rouwenhorst et al., 2000). Depending on what type of warehouse it is, there are investments such as storage system and sorting system required. There are also other dimensions that have to be considered in a layout:

- Dimensions of storage types and dock areas
- The amount of material handling equipment
- A layout of the overall system and the number of personnel

In order to achieve long term benefits and cost savings, an efficient design of the warehouse is required (Gill, 2009).

The design of the warehouse involves the location of the different warehouse activities, and the connection between the activities that have to be taken into consideration (De Koster et al., 2007).

Products that have higher moving should be placed near the picking lanes. The picking lanes in turn should be close to the shipping areas (Scioscia, 2014). The movement of the products within the warehouse should be analyzed in order to make rearrangements when needed. Additionally, products have to be replenished and the incoming products have to be allocated to storage locations (Rouwenhorst et al., 2000).

2.3.2 Return

When the products move backwards in the supply chain it is called reverse logistics (Tibben-Lembke & Rogers, 2002). Mostly, the products in reverse logistics are from customers who have returned the product shortly after the purchase. As already mentioned, the usage of online retailing is growing and one key challenge is the return management (Brohan, 2005). Return management refers to the activities of gatekeeping, returns and avoidance of these functions (Rogers, Lambert, Croxton, & García-Dastugue, 2002).

Retailers mostly set up the return flow inside the warehouse (Quinn, 2002). In order to achieve an effective return flow it is necessary to separate the returned products from the rest of the warehouse activities. There are mainly three objectives for the separation of the return flow; prevent the mix of returned products with first quality products, prevent loss, and to prevent shipment of returned products that have not been properly processed.

2.3.3 Information technologies (IT)

In this section Information technologies such as *Warehouse management system (WMS)*, *Radio Frequency Identification (RFID)*, and *barcoding* will be presented. These technologies makes it possible to improve the warehouse activities and provide the warehouse with real time update, communication, and facilitate automation (Gu et al., 2007). Most information technologies require human decision making which are complicated and requires experience and training in order to achieve quality in the decision making (Park & Kim, 2013).

Warehouse Management System (WMS) – In order to manage the warehouse activities, a warehouse management system can be utilized (De Koster et al., 2007). A warehouse management system gives a better control and tracking of the inventory and therefore, an appropriate software is required (Scioscia, 2014). One of the tools that are of great importance is warehouse management solution. However, a successful warehouse operation does not only require the tools, the personnel must also have knowledge about the tools and the inventory. The tools also have to fit the warehouse layout and the products that are being handled. When there are investments in a WMS, it is of great importance that the software fits with the existing technologies and that they are able to adapt to each other. Furthermore, an inventory management system provides visibility throughout the supply chain (Napolitano, 2013).

Radio Frequency Identification (RFID) – RFID is a technology which transfer information with radio waves (Attaran, 2007). The information transfer between different RFID readers and tags follows to a middleware in order to process the outcome. Each item with a RFID tag contains with unique data such as shipping details, production date, and product ID.

The usage of RFID leads to benefits such as improving asset management, reduce shrinkage, efficient material handling and improved product availability (S. Li & Visich, 2006). However, issues regarding technology, privacy, security, and national standards are drawbacks from using RFID (Ngai, Moon, Riggins, & Candace, 2008). Furthermore, the cost of implementing RFID can be seen as a barrier (S. Li & Visich, 2006).

Barcoding – Since 1970s barcodes have been used as a global identification of products (Attaran, 2007; White, Gardiner, Prabhakar, & Abd Razak, 2007). A drawback of this technology is that the barcode needs to be visualized in order to be scanned and furthermore transfer the information (White et al., 2007). Therefore, the barcode can easily be affected or destroyed by environmental factors, such as dirt and temperature. Thus, a benefit is that the technology is cost efficient (Bray, 2013).

2.4 Receiving

Receiving is the first warehouse activity where incoming goods arrive to the warehouse (Gu et al., 2007). Furthermore, the receiving activity involves assigning the trucks to the specific dock and the schedule of unloading the trucks (Gu et al., 2007). When the goods arrive they have to be unloaded from the trucks in the receiving area, the inventory has to be updated in the system, and lastly the incoming quantity has to be controlled (De Koster et al., 2007). Automated cubing equipment can be utilized in order to obtain size and weight information in the WMS on incoming products and thereby avoid human error (Specter, 2014). This activity is costly and the workload is high (Gill, 2009). However, the costs can be reduced by a well-designed receiving activity. The incoming goods can either be stored in the warehouse or placed in a cross-docking area. Cross-docking is a method used to efficiently distribute products without storing them (Apte & Viswanathan, 2000). This method can be used in order to improve responsiveness and reduce inventory (S. Li & Visich, 2006). Furthermore, cross-docking provide the warehouse with a fast product flow, reduced inventory costs, and handling costs (Heragu, Du, Mantel, & Schuur, 2005).

2.5 Sortation

The sortation of products can be carried out in various warehouse activities. In order to facilitate the order picking activity, the incoming pallets can be separated and sorted into single packages (De Koster et al., 2007). Additionally, sortation is required while picking multiple orders (Gu et al., 2007). There are two sorting processes that can be used during the order picking activity; sort-while-pick and sort-after pick. Sort-while-pick is carried out during the order picking activity whereas sort-after-pick is carried after the order picking activity.

2.6 Storage

In the storage activity the incoming goods are assigned to different locations in the warehouse (De Koster et al., 2007). Stock planning is required in order to determine when shipments will arrive, in what quantities and how the products will be kept in the warehouse (Van Den Berg, 1999). If the stock planning is carried out in detail, the costs in a warehouse can be reduced. Within the warehouse a storage location planning is required in order to determine how the products should be stored. Additionally, the different zones have to be planned as well. A storage location plan may give benefits such as effective utilization of space and thereby reduced internal travel time in the warehouse for storage/retrieval and order picking. If the storage of the products are decided manually it can result in increased operation time and human mistakes (Hausman, Schwarz, & Graves, 1976).

Products that are put in a storage can be located in the warehouse in several ways (De Koster et al., 2007; Pohl, Meller, & Gue, 2009). The most common types of storage are: *random storage, dedicated storage, and full turnover storage, class based storage, family grouping, and seasonal products*.

Random storage: In a random storage, the products are located in a randomly decided spot which is empty (Petersen, 1997). A drawback of random assignment is that the transportation distance is increased (Il-Choe & Sharp, 1991). It is preferable to utilize this type of storage when there is a computerized system available.

Dedicated storage: In this type of storage, the products have a specific location in the warehouse where they should be placed (De Koster et al., 2007). A drawback is that even if the products are out of stock, the spot remains reserved so that other products cannot be placed there instead.

Full turnover storage: The products are placed at different locations in the storage depending on what type of turnover the products have (De Koster et al., 2007). The products that have a low turnover should be placed in the back of the warehouse, and the products that have a higher turnover should be accessible more easily. The difficulties with this storage type is that the assortment changes constantly as well as customer demand. Therefore, a restocking has to be carried out frequently (Malmborg, 1996).

Class based storage: The products are classified into different classes based on how popular they are (De Koster et al., 2007). The products with highest turnover should stand for 15 percent of the products stored and contribute with 85 percent of the turnover. Based on this, the products are placed in different locations of the warehouse. The fast moving items are called A-items; the next class is B-items, and lastly C-items are the slow moving items.

Family grouping: There are customers who may place an order with products that go together with another product. In that case, these products should be located close to each other (De Koster et al., 2007). This type of storage type is based on a relation between products. A difficulty is to know, or be able to predict the correlation between different products (Brynzér & Johansson, 1996).

Seasonal products: There is a problem with retailers that have seasonal products since they have a limited selling season (Monahan, Petruzzi, & Zhao, 2004). Therefore, the problem arise since the products are not included in the assortment in the remaining seasons.

2.7 Order picking

The picking activity includes clustering and scheduling of customer orders (Shiau & Lee, 2010). Furthermore, the products are being picked from the storage locations in order to be prepared for shipment. The order picking activity is costly, time consuming, and requires manual human work (Grosse & Glock, 2014). There are differences in the picking activity between traditional store orders and online orders since the size of the order varies (Napolitano, 2013). There are different types of picking equipment that can be utilized for the material handling such as *pick to light, voice directed picking, and handheld device* (Billingsley & Connolly, 2008; Naik, 2004). The selection of order picking equipment has an impact on the decisions regarding operations and design of the warehouse (Gu et al., 2007).

Decision about the order picking process should be based on the following (Rouwenhorst et al., 2000):

- Information about the batch sizes and how they are sequenced.
- The order pickers have to be assigned the picking tasks and the sequence they should pick the orders.
- Assigning the products to lines and taking care of arriving and departing trucks to their docks.

Pick to light – The characteristics of this order picking equipment is that there is a light and display at each picking place (Naik, 2004). The software used shows what the next pick is going to be and in which quantity the orders should be picked.

Voice Directed Picking – For this order picking equipment there is a voice which tells the personnel what product to pick and which quantity (Naik, 2004).

Handheld device – The handheld device scan the labels on the shelves and identify the product (Billingsley & Connolly, 2008). The handheld device can be utilized in order to scan both barcodes and RFID.

However, there are differences between online orders and traditional stores. The picking method for online orders is typically carried out by using cart zone picking or zone batch picking (Napolitano, 2013). Orders that have a single unit order are usually packed in a separate area in the warehouse.

2.8 Packing & shipping

Different types of goods can be packed before delivery (Shiau & Lee, 2010). The packaging activity can be carried out either manually or by using a device. In order to minimize the cost, it is required to select a suitable packaging type (Cochran & Ramanujam, 2006). There are differences in the packing activity between traditional store orders and online orders (Napolitano, 2013). The orders for traditional stores consist of full pallets and orders for online customers consist of single pieces (Alexander, 2014). The online orders can be handled in batches which requires a high speed packing activity (Napolitano, 2013).

Shipping is the last warehouse activity where the products are distributed to the customers from the docks (Gill, 2009). Furthermore, the workload is high and costly in this activity. A distribution network gives the possibility to improve operational costs, traveling distance and customer satisfaction (Alshawi, 2001). Furthermore, Trochhia & Janda (2003) argue that order fulfillment lead to a high customer satisfaction and customer loyalty. The outsourcing of transportation and distribution of products to a third party logistics provider have been adopted in various industries (K. Li, Sivakumar, & Ganesan, 2008). By using a third part logistics provider many companies can achieve a higher efficiency in the shipping activity. Thereby, the retailers can focus on their core competence (Lieb & Bentz, 2005).

3 Methodology

This chapter presents the methodological choices and design for the study. The research approach, research method, research objectives, and research strategies are described. Lastly, the data collection, literature review empirical analysis, and the trustworthiness of the study is explained in this chapter.

3.1 Research process

The research process for this study can be divided into six steps (see Figure 3.1): problem formulation, method strategy, literature study, empirical study, compilation of data, and data analysis. The research process started with a meeting with the CEO at the company in order to discuss the current issues in the central warehouse. In order to formulate the problem, the authors carried out a brief background check in the literature on the phenomenon of Omni channel where a gap was identified. Based on the meeting and the background check in the literature, possible research questions came up and were discussed in order to formulate the purpose and the final research questions. In order to fulfill the purpose and the research questions, the method strategy was chosen by the authors. For this study, a case study was considered to be an appropriate research method where it would give the authors a deeper understanding of the phenomenon due to the limited literature. Furthermore, the authors decided to use observations and interviews in order to collect the data. Additionally, a literature review was conducted. The literature study was initiated before the empirical study in order to gain knowledge about the phenomenon and to get a better understanding before the company visit. The empirical study was then compared to the theoretical framework along the data collection process.

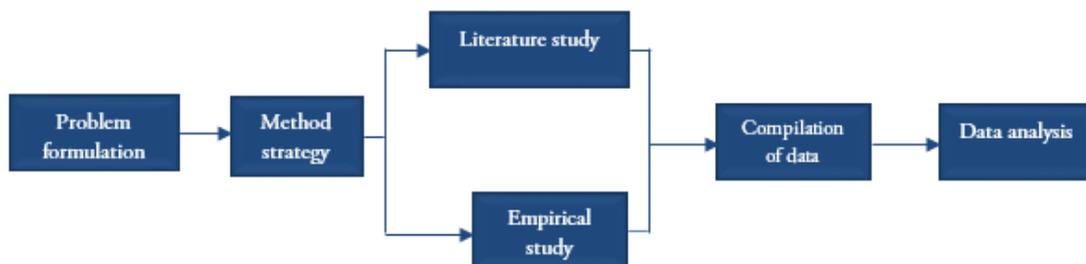


Figure 3.1 Research process

When relevant data had been gathered, the authors made a compilation of the data and analyzed the outcome of the data collection. Based on the analysis, the authors were able to answer the research questions and fulfill the purpose.

3.2 Research approaches

Research approaches can be divided into three different types; deductive, inductive, and abductive. When a research develop hypothesis from existing theory and then test these hypothesis it is called deductive approach. Thus, if the research is designed with collection of data and developing a theory as an output from the data analysis it is called inductive approach. A research approach generally is depending on the theories available (Eriksson & Wiedersheim-Paul, 2006). Since the authors did not entirely base the study on empirical findings in order to create new theories, an inductive approach was not appropriate. Furthermore, the authors have not been able to form hypotheses based on the existing literature and therefore a deductive approach was not appropriate.

The abductive approach is initiated with a phenomena taken from the real-life (van Hoek, Aronsson, Kovács, & Spens, 2005). Furthermore, the matching of the real-life phenomena and previous literature is a crucial part of the study (Dubois & Gadde, 2002). A combination of an inductive and a deductive approach results in an abductive approach which have been chosen for this study. The abductive approach is suitable when it is uncertain whether the research approach is pure deductive or inductive (Taylor, Fisher, & Dufresne, 2002). The authors started with a literature review in order to gain further knowledge about the phenomena. While gathering information, the authors identified various gaps in the literature that can be analyzed further. In order to analyze the gaps further, an empirical study was conducted. The empirical findings complement the limited literature of warehouse activities connected to Omni channel. When the challenges and improvements for the central warehouse activities were analyzed at the case company, the authors identified challenges from the empirical findings which were not found in the literature and vice versa. In order to be able to fulfill the purpose of the study the authors were required to collect additional data both from the literature and the case study. Therefore, the analysis of the challenges and improvements required the authors to continuously match the literature study with empirical findings and vice versa.

3.3 Research objective

Due to the fact that previous studies in the field of Omni channel are limited, an exploratory research has been conducted. According to C. Fisher (2007), exploratory research provides an insight and deeper understanding of a problem. When there is lack of previous research carried out, or when there is a new topic, an exploratory research is preferable (Yin, 2013). Additionally, the aim of this study is to gain deeper knowledge and insight about Omni channel, identify challenges and improvement factors for a central warehouse. Thereby, an extension of the existing theory can be provided. When the data is being collected, secondary data is useful for exploratory research (Yin, 2013). Additionally, interviews can be carried out in order to gather the data (Yin, 2013). As mentioned in chapter 3.1, secondary data such as scientific articles have been used in order to get an insight of the field of Omni channel. Furthermore, interviews were conducted at the case company, in order to complement the limited literature in this field.

3.4 Research method

There are two types of research methods; qualitative and quantitative . The quantitative method is based on numerical data and the numbers provide an understanding of the phenomenon (Wilson, 2014). The characteristics of a qualitative method is when people and events are described without using measurements (Thomas, 2003). The qualitative method is useful when there is a need for a general understanding for the concepts that needs to be explored (Walker, Cooke, & McAllister, 2008). The qualitative research method will therefore be utilized in order to get a better understanding of the problem stated in the problem discussion. Furthermore, the study is not based on numerical data and the phenomenon will not be described with numbers or measurements. Lastly, the chosen research method will make it possible to answer the research questions in this study since the data collected is based on previous literature and an empirical study.

3.5 Case study

In order to collect empirical data for this study, the authors have chosen to conduct a case study. The case study was based on several company visits, observation, and interviews. According to Yin (2013), a case study is suitable when a qualitative and exploratory research is used. As mentioned previously, a qualitative and an exploratory research is used in this study. Therefore, a case study is preferable according to the authors. In this study the research questions are constructed with “what” and “how” questions. As mentioned by Yin (2013), for research questions constructed with “why”, “how” and “what”, a case study is the best strategy to use. In this study, a single case study has been conducted due to the fact that the company in this case study is in need of improvements in their warehouse. The company is a large actor in the electronic retailing business in Sweden, and therefore it is of relevance to analyze the warehouse activities at the company. Only one case company was selected and analyzed in order to gain a deeper knowledge about the phenomena. Since the authors were analyzing each warehouse activity in a central warehouse, a single case study was suitable in order to make it possible to carry out a deeper analysis of each activity in the warehouse. Thereby the authors could identify challenges and possible improvements in the central warehouse. The name of the retailer will not be exposed due to confidentiality. Therefore, the retailer will be called Company X throughout the study.

3.6 Data collection

In order to answer the research questions, empirical data was collected by various techniques such as: interviews and observations. When a case study is conducted, multiple sources are preferable since a combination of sources complement each other (Yin, 2013). It was of great importance to gather empirical data from Company X, in order to understand the challenges Omni channel put on the warehouse activities in a central warehouse since the literature was limited in this field.

3.6.1 Interviews

Interviews are useful for researchers when reliable and valid data has to be collected for the specific study. Interviews can be carried out in multiple ways. In this study, semi-structured interviews have been conducted since they are beneficial in an exploratory research. Additionally, the respondents’ opinions can add value to the study. According to Esterby-Smith, Thorpe, & Jackson (2012), semi-structured interviews are preferable when:

- There are a large number of questions to be answered
- There are complex or open-ended questions involved

Due to the complexity and the limited literature, several interviews were conducted in order to get a deeper knowledge and to understand the challenges electronic retailers face in the central warehouse when they are using Omni channel (see Table 3.1).

In the first interview the authors were provided with background information about Company X. Furthermore, the authors had a review about the current situation in the central warehouse with the CEO. The second interview was conducted with the Logistics Manager in order to get a deeper knowledge about the current situation in the central warehouse where the issues were discussed. In the third interview, there was a review of each warehouse activities in the central warehouse in order to discuss the issues further.

This interview was conducted with the Logistics Manager, Logistic Developer, and System Administrator in order to get an overview of how the different functions and warehouse activities are connected to each other. For the authors it was of great importance to interview the System Administrator in order to understand the complexity and how the information is transferred within and between the different activities through the system. The fourth interview covered additional information regarding the warehouse activities. Furthermore, the authors wanted to clarify whether the information received from previous interviews were correct or not. In the fifth interview, the authors conducted an interview with the two Team Leaders for the central warehouse in order to discuss the different warehouse activities from a different point of view. In the remaining interviews, one person from each warehouse activity was interviewed in order to get deeper knowledge about each warehouse activity. Furthermore, strengths and weaknesses for each activity were discussed with the respondents. The Team Leader for the receiving activity covered the receiving activity, sortation activity, and the storage activity. Additionally, the staff for the picking activity covered both the picking activity and the storage activity. The authors did not make any specific interview regarding the shipping activity since this activity is outsourced to a third part logistics provider. Additionally, any specific interviews regarding the return activity was not carried out since this activity is handled by a separate service department.

Table 3.1.1 Interviews

Interview	Date	Respondents	Duration time
1.	22/1-15	CEO	3h
2.	22/1-15	Logistic Manager	1h
3.	11/3-15	Logistic Manager Logistic Developer System Administrator	4h
4.	22/4-15	Logistic Manager Logistic Developer	0,75h
5.	22/4-15	Team Leader 1 for warehouse Team Leader 2 for warehouse	0,75h
6.	22/4-15	Team Leader receiving activity	1h
7.	22/4-15	Staff for the picking activity	0,5h
8.	22/4-15	Staff for packing activity	0,5h

Before each interview, the authors sent a list of interview questions in order for the respondents to be able to prepare for the interview. Thereby, the respondents could gather missing data and provide the authors with as much information as possible. The interviews were conducted face to face in order to avoid misunderstandings between the interviewer and the respondents. The interview questions were open ended with room for the respondents to add information that was applicable and crucial for the study. There was also room for the authors to ask additional questions in order to make sure that the information given was correctly understood.

Each interview was recorded and complemented with notes in order to have a backup. The recordings and the notes were summarized directly after each interview in order to avoid the risk of losing or forgetting the received information. All the interviews were conducted in Swedish and therefore a translation to English was required. When the empirical findings were completed, the document was sent to the Logistic Manager in order to ensure that the authors had a correct understanding of the activities and challenges. Additionally, the Logistic Manager could verify whether the information in the document was correct or not.

3.6.2 Observations

There are various ways of conducting an observation depending on the situation (Yin, 2013). An observer as participant was carried out in the central warehouse of Company X in order to get a better understanding of how the warehouse activities are carried out. Additionally, the authors wanted to identify challenges and possible improvement factors in the different warehouse activities. The observation lasted for 90 minutes where the authors were given an overview of the warehouse activities. Furthermore, the observation was carried out after the third interview in order to ensure that the warehouse activities were correctly understood. During the observation there was also room for additional questions and explanations from the respondents in order to get a deeper understanding of the activities, challenges, and possible improvement factors.

3.7 Literature review

The literature studies of Omni channel gave an overview of the phenomenon and thereby complemented the empirical data. A literature review is a crucial aspect in the research procedure (C. Fisher, 2007). By using literature review researchers can identify, evaluate and understand recent articles in a specific field (Fink, 1998). A literature review was conducted in order to gain insight into the phenomenon of Omni channel and the challenges it puts on the warehouse for electronic retailers. Additionally, literature concerning improvement factors for challenges in the central warehouse was collected. The literature was a base for the theoretical framework for this study in order to answer the research questions and to fulfill the purpose. First of all literature was found by searching with key words in different data bases such as: Emerald, Science Direct, EBESCO, Diva, ABI/INFORM Global. The key words used in the searching of literature were: *Omni channel, multiple channels, integration of traditional and online stores, retailing, warehousing, picking processes + warehouse, handling equipment, IT applications + warehouse, return, placement + warehouse, and electronic retailing*. The authors for this study decided to only use literature such as scientific articles instead of books, due to the fact that articles are updated and therefore more relevant.

By reading the abstract, conclusions and further research in the articles, it was possible to screen out the irrelevant articles and summarize the relevant literature for this study. Furthermore, information about further research has given the authors an insight of the limited research on warehouse activities connected to Omni channel. The outcome of the literature review has been that previous research discusses the complexity Omni channel puts on the warehouse activities. However, previous research leave out the reason why Omni channel makes the warehouse activities complex. To our knowledge, possible improvement factors in the warehouse activities where Omni channel create challenges are not covered in recent articles.

3.8 Empirical analysis

In order to fulfill the purpose, both a theoretical framework and empirical findings have been used. In the beginning of the study the literature review has given the authors an overview of electronic retailers using Omni channel. The case study has given the authors a deeper knowledge about the phenomenon of Omni channel. The case study has also laid a base for a further literature review. The data collection has resulted in an understanding for challenges and how to manage these challenges in the warehouse activities in a central warehouse. When the base for the theoretical framework was set, it was possible for the authors to conduct further interviews. The interviews resulted in a deeper understanding for the challenges and how to manage the challenge in the warehouse activities in the central warehouse. The information gathered from the literature study and case study was analyzed separately in order to receive useful information. Furthermore, the outcome of the separate analysis was compared to each other in order to identify gaps in both the theoretical framework and empirical findings. An additional analysis was carried out in order to identify challenges that were caused specifically by using Omni channel. Thereby, the data analysis was concluded and resulted in answering the research questions and fulfill the purpose (see Figure 3.2).

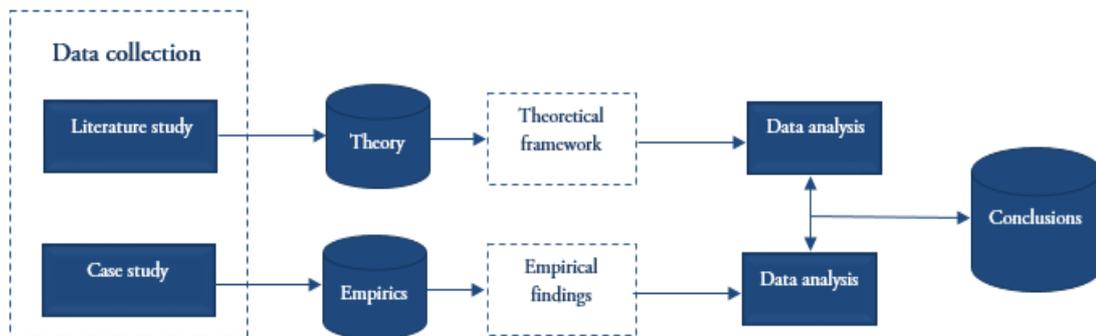


Figure 3.2. Empirical analysis

(Based on (Hedén & Tiedemann, 2014), p.9)

Data collected during the study has resulted in various challenges in the warehouse activities in the central warehouse. According to Ohno (1988), a five Why analysis can be used in order to find the primary cause for each challenge. In order to present the output of the five why analysis, an Ishikawa diagram has been utilized (see Figure 3.3). The challenges have been identified based on questions such as; “What are the challenges in the central warehouse?”, “In which warehouse activity can a challenge be identified?”, “When does the challenge occur?”, “Who/What is causing the challenge?”, “What is the consequence of this challenge?”, and “Is this challenge specifically caused by Omni channel?” By using the five Why analysis the authors have been able to answer the first research question.

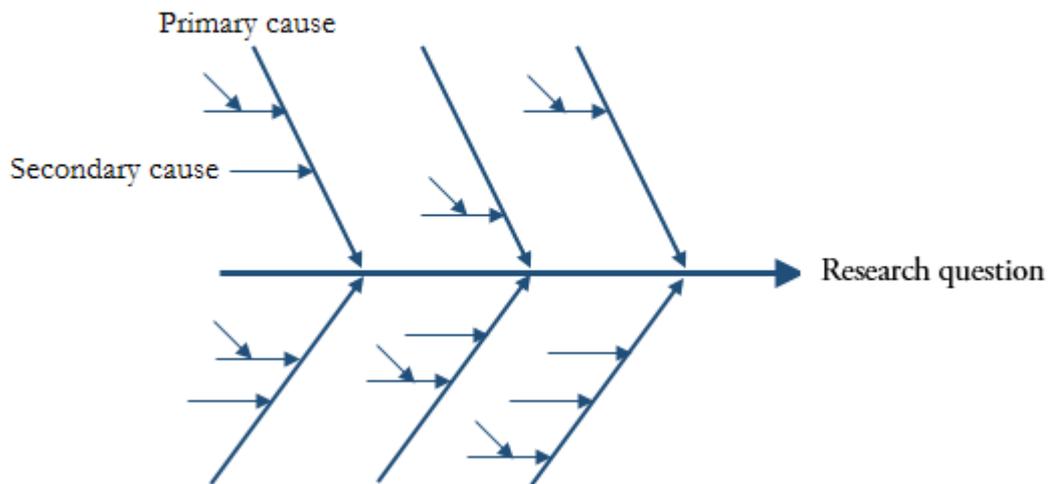


Figure 3.3. Example of Ishikawa diagram

(Based on (Ohno, 1988))

The research question is set as the body of the diagram, and the primary as well as the secondary causes is illustrated by the smaller arrows.

In order to be able to analyze and structure how the challenges in the warehouse activities in a central warehouse can be managed, the authors have utilized a tree diagram (see Figure 3.4). A tree diagram give the possibility to break down a central problem in different levels (Bergman & Klefsjö, 2007). There can be difficulties in finding a way to manage challenges. Therefore, the alternative improvements occasionally have to be analyzed and prioritized. The improvement factors have been formulated based on questions such as; “How can the impact of the challenge be managed?”, “How can the impact of the challenge be minimized?”, and “How can this challenge be avoided?” By using a tree diagram the authors have been able to present the answer of the second research question.

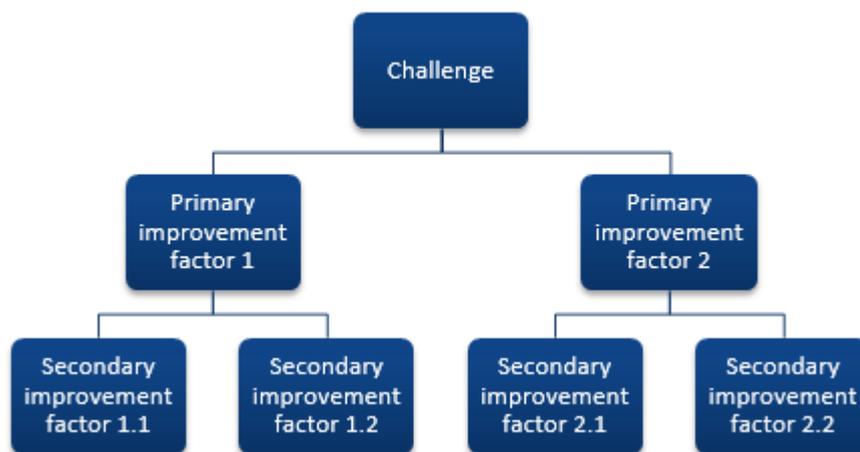


Figure 3.4. Tree diagram

(Based on (Bergman & Klefsjö, 2007), p.240)

Level 1 in Figure 3.4 represents the identified challenge from the first research question. The second level represents the primary improvement factors. The following levels under the second level represent secondary improvement factors.

3.9 Trustworthiness

A qualitative research is affected of subjectivity, which make the credibility of data crucial (Walker et al., 2008). The ability to increase credibility, validity and reliability is of great importance. According to Saunders et al., credibility can be replaced with internal validity and transferability can be replaced with external validity. Reliability is a way of measuring to what extent the process can be repeated with the same output. Robson (2002), claims that reliability of qualitative data is affected by four factors; observer bias, observer error, participant error, participant bias and subject. By interpret the data individually observer bias can be reduced. Furthermore, observer error is solved by having a clear interview schedule. The third factor, participant error, can be reduced by establish a comfortable date and time for the interviewees. Lastly, the risk of participant bias or subject can be reduced by anonymity in interviews. Validity refers to what extent a study exact measure a specific research concept

In order to increase the trustworthiness of the study, the authors conducted several interviews with respondents from different layers in the organizational structure. Thereby, the authors were provided with information from different point of views and trustworthiness can thereby increase. The observer error have been avoided by having semi-structured interviews and an interview schedule. The interviews with the staff for each warehouse activity were conducted individually in order to avoid observer bias. Furthermore, the interviews were set up together with the respondents in order to reduce the participant error. In order to reduce the participant bias, all the respondents were given the possibility to be anonymous. Additionally, the interview questions were sent to the respondents' before the actual interview in order to give them the possibility to prepare. Furthermore, the authors described the purpose of the study and how the collected data were going to be used in the study. In order to increase the validity, the authors recorded each interview and took notes during the interview. After each interview the authors summarized the information gathered and compared the notes with the recording in order to ensure that all parts had been understood correctly. During the interviews, both authors were present where one of the authors could take notes and the other author could lead the interview. All the interviews were conducted in Swedish; therefore the authors had to translate the information gathered into English. After the translation, the document was sent to the Logistic Manager in order to verify the information.

According to Silverman (2010), generalization of the findings in a research is about how it can be generalized and thereby be applied to other researches within a similar area where research is about to be done. This research has been carried out in corporation with one electronic retailer using Omni channel in Sweden. The findings may contribute to the gap that exists in the literature for Swedish electronic retailers. However, the identified challenges and the improvement factors can differ depending on how the warehouse activities are currently structured and managed due to the fact that it is a lower transferability when only one electronic retailer is analyzed. Furthermore, there are improvement factors that electronic retailers are not able to manage in terms of the cost aspect. Thus, even if the cost aspect has to be taken into consideration the improvement factors can be applied for electronic retailers.

4 Empirical findings

In this chapter a description of the case company is provided to the reader. Furthermore, a detailed overview of the warehouse activities at the case company is provided.

4.1 Company X

The case company is a large actor in the electronic retailing business in Sweden. Company X is currently using Omni channel where they are serving both online customers in Sweden and Norway and several traditional stores in Sweden. Company X offer products within; home electronics, televisions, computers, cell phones, cameras, sound systems, office accessories, car accessories, personal care, and additional accessories for electronics. The price of the products are the same regardless of which channel the customer is purchasing products from.

4.1.1 Organizational structure

The organizational structure for Company X can be divided into three layers. The first layer consists of the CEO. The second layer consists of the different departments where logistics is one of the departments. This department is managed by the Logistics manager. Furthermore, the logistics department is divided into different functions that are connected to the logistics operations which represents the third layer. The central warehouse has a direct connection to all the included logistics functions that is covered in this study.

4.1.2 Receiving & paying options for customers

There are various options for the customer to receive and pay for the products they purchase from Company X's different channels; at the traditional store, online store, send from store, collect in store, pay in store, and reserve.

Traditional store: The customer makes a purchase from a traditional store and receives the product instantly after payment.

Online store: Customer makes a purchase online where they pay for the product. If the customer pay the freight, they receive the products the day after, if the order is placed before five PM. The second option is to receive the product within three to five working days with free freight.

Send from store: If the product is not available at the central warehouse, the customer can place an order online and the product will be sent from a traditional store.

Collect in store: The customer place an order online and pay directly. Thereafter, the customer chooses a certain store where it is preferable to pick up the product. However, it is required that the product is available in the store.

Pay in store: The customer can visit a traditional store and pay for the product even if it is not available at the moment. The product is then delivered from the central warehouse directly to the customer.

Reserve: The customer can see if the product is available in a specific store and decide to reserve the product. The product is then retrieved and paid at the traditional store.

4.2 Warehouse activities at Company X

In order to manage the warehouse activities, an Enterprise Resource Planning system, a warehouse management system, and barcoding is used. These information technologies are well-functioning and a good base in order to manage the central warehouse at Company X. There are mainly five different warehouse activities in the central warehouse; receiving, sortation, storage, order picking, and packing and shipping. Additionally, the return activity is covered separately. In Figure 4.1 an overview of the warehouse activities are presented.



Figure 4.1 Warehouse activities at Company X

The sortation activity is not an independent activity since the sortation is carried out in the receiving activity by the staff in this activity. However, in order to explain the actual sortation activity, the authors have decided to separate the sortation activity from the receiving activity. After the first sortation, the receiving activity continues and is completed by the second sortation.

4.2.1 Receiving

The receiving activity is divided into six steps. In the first step the suppliers book a slot time in order to deliver the incoming products. Company X has a rule where each supplier has to be on time. There is a time frame where Company X has the possibility to decline the supplier if the time variation of 15 minutes is exceeded. The reason for the rule is the tight schedule of daily deliveries from various suppliers. During high season Company X has to decline the suppliers more often in order to manage the tight schedule. Thus, during low season Company X is more flexible and therefore allow the delays to some extent. It is the team leader for the receiving activity that decides whether to decline or approve the delays. In step two the suppliers deliver the incoming products to the docks with a delivery note and an order number. The staff have to unload the truck and inspect the incoming pallets in order to identify visible damages. If there are damages on the pallets, the staff have to report it to the order office. Additionally, the staff have to inspect if the quantity of pallets is correct based on the consignment-note. If the quantity is correct and without damages, the staff give their signature which clarifies that the incoming pallets are received. However, if the quantity is incorrect the staff have to re-count the quantity and if it is still incorrect the staff need to report the variations to the order office. Lastly, the staff place the pallets at the receiving area where the pallets are divided based on the consignment. In step three, a sortation is carried out (see chapter 4.2.2).

In step four, after the first sortation, there is an arrival registration of the products where the delivery note is used in order to identify the order number by scanning the barcode. If the barcode is damaged the handling will increase due to manual corrections. The staff have to begin with the first incoming consignment of the day and there is a rule where the incoming consignment should only have to wait for arrival registration for one hour. The order number is then added into the system where all the part numbers are included and information such as product name, quantity, and placement for each product is given. The system also gives information whether the shelf where the product should be placed in the central warehouse is full or not. If the placement is full, the staff manually suggest a buffer placement.

If the products from the parcel are new, they have to be weighed and measured by the staff in order to be included in the system and facilitate the picking, storage, and packing activities. Additionally, products that have been in the assortment for a while need to be updated with the measurement and weight in the system manually. However, there can be inaccurate weighing and measuring since it is carried out manually by the staff. During this step, the staff choose a suitable placement for the products by using the WMS. However, the placement chosen by the staff does not always match with the most suitable placement and therefore, corrections can be required. Additionally, the staff prioritize the placement for the products manually which can require corrections if a non-suitable placement is chosen. Furthermore, the quantity is controlled again and if there is a variation the staff have to create and fill out a variation form in order to have the correct quantity in the WMS. If the manual counting is incorrect there will be a variation in the system. Lastly, a parcel number is created on the correct amount of incoming products. In step five, the products in the consignment have been arrival registered and the products are sorted a second time.

4.2.2 Sortation

There are two sortation steps in the central warehouse which are carried out manually. The first sortation occurs after the incoming pallets are placed in the receiving area based on the consignment. At Company X, the incoming pallets arrive from various suppliers and in various quantities. Due to the various quantities and the large pallets the workload is high in this activity. The staff have to split the pallets based on the article number, where for instance each color for the same product has to be sorted separately. If the supplier deliver for instance several boxes of black cell phones, there is a possibility that one product differ from the color mentioned on the box. If the staff do not notice the variation, the product will be placed in the wrong spot in the shelf in the central warehouse, and thereby a wrong product can be delivered to a customer. Furthermore, the staff count the products and compares the quantity with the delivery note. If there is a variation in the quantity, the staff have to report this to the order office that solves the variation. If the staff do not notice the variation there will be incorrect information in the system. Additionally, the staff sort the products based on different product categories.

The second sortation is based on online products and full pallets delivered directly to a store. It is the Team leader for the receiving activity who coordinate the direct deliveries. The full pallet which is going to be delivered directly to a store is placed at the receiving area in order to avoid unnecessary handling of the products in various warehouse activities. The reason why the pallet is placed in the receiving area is due to that the receiving and shipping is carried out in the same area for products going directly to stores. The remaining products are stored in the central warehouse and are therefore waiting for placement.

4.2.3 Storage

The activity starts with the staff scanning the order number on the products placed in the receiving area after the second sortation. When the order number is scanned by the staff, it is possible for the system to identify the specific storage area for the products. Furthermore, the staff place the products at the specific spot chosen by the staff and then the barcode on the storage shelf is scanned. When the barcode is scanned, the products are locked to the storage shelf in the system. Additionally, the inventory balance is shared for traditional stores and the online store which makes it crucial for a well-functioning WMS.

At Company X the products are stored in full pallet, half pallet, wire shelf place, and metal shelves. Currently, most of the small products are placed in plastic boxes in order to avoid displacement of the products. However, there is still a possibility that the small products can be displaced since they can fall out from the plastic boxes if they are full, and some of the small products are placed directly on the shelves. The products are placed according to family grouping which means that products that are linked to each other are placed in the same area. When an online customer purchases several products this type of grouping facilitate the picking activity, since the products purchased usually are within the same group. Additionally, it facilitates for the traditional stores since the pallets are packed based on the categorization in the stores. Company X is currently also using random storage and products that have high turnover can be placed manually at specific storage spots by the staff. There are also seasonal products which have to be managed and controlled by the staff manually. Additionally, the central warehouse has buffer storage above the shelves where the products are stored. These buffer spots are refilled by the staff when the regular placement for the products is full. The central warehouse has a buffer team that makes sure that the regular placement is filled with products, and that empty spots are refilled from the buffer. There is a buffer team in order to have an efficient order picking activity without any disruptions regarding the empty shelves. However, empty shelves can occur if the buffer team has several shelves to refill at the same time. In the storage there is also a safety area where expensive products such as mobile phones are placed. Lastly, there is no cross-docking area at Company X currently which complicate the product flow in the central warehouse since direct deliveries to traditional stores are made. Currently Company X place the products for direct deliveries in the receiving area.

4.2.4 Order picking

The staff pick orders by using a handheld device regardless of the batch size. The order picking is based on an order queue where all outgoing orders are listed based on five different flows. The orders are picked by following the order queue which include orders for both traditional stores and online customers. The staff choose an order manually from the order queue and receives the order information in the handheld device. The information given in the device is based on a picking optimization which calculates the minimal picking route and the amount of products that can be placed on a pallet. When the product has been picked from the shelf, the staff scan the barcode on the shelf. Thereby, the product is shown as picked in the system and the stock balance gets updated directly. If there are multiple orders for one specific product, the staff only scan one product and picks the quantity shown in the handheld device. In this stage it is possible that variations occur due to the fact that the staff do not match the quantity given in the handheld device with the actual quantity picked. These variations are detected in the packing activity where the staff control the quantity before packing the order. If there are numerous products picked, the packing staff put the extra products aside. Thus, if there are less products picked than the order shows the staff in the packing activity have to pick an extra product from the shelf in order to ship the full order to the customer. After the picking route is completed the staff have to transport the products to the packing area and confirm that the orders have been picked and thereby this activity is finalized.

For online customers there are mainly four picking flows, where the first flow is a single piece flow where one product ordered by the customer is delivered in Sweden is picked and placed on a trolley. The second flow is a single piece flow where one product ordered by the customer is delivered to Norway are picked and placed on a trolley. It is the same staff who pick orders for single piece flows both to Swedish customers and Norwegian customers.

The orders delivered to Norway are always prioritized due to longer transport distance. The third flow is batch picking where the staff use a trolley with either 48 or 96 sections. The handheld device determines which section the products should be placed in based on the customer order. When a customer order two or more small products they are placed in the same section on the trolley. The trolley with 48 sections has larger space for each section in comparison to the trolley with 96 sections. The order queue decides which trolley to use based on the product size. However, incorrect measurements in the system can result in the wrong picking flow and thereby an inefficient picking activity. If the incorrect measures are identified, the staff have to report the variation to the order office where corrections are made. Additionally, the shape of the products can make it difficult for the staff to place the products in the sections since the system base the measures on volume and not on the shape. These incorrect measures are also reported to the order office.

The fourth picking flow consists of at least one bulky product without outer packaging in the customer order. Therefore, they have a separate picking flow where they are directly transported to the packing area. The last picking flow for products delivered to stores. These are picked and placed on a pallet. After the picking route the pallet is transferred to the receiving area where the staff prepare the pallet for delivery. The pallets are packed for delivery at the receiving area due to the fact that receiving and shipping is carried out in the same area. The staff pick products for one store at a time in order to facilitate the shipping process.

When the last product is picked, the handheld device informs that the staff are required to verify that the last product is picked and that there are no variations in the system. Thus, in the safety area an inspection is required after that each product is picked in order to identify variations in an early stage. If there are variations, the staff need to report this directly to the order office.

4.2.5 Packing & shipping

The packing activity is based on the different picking flows mentioned in chapter 4.2.4. For single piece flow for both Sweden and Norway, each product has to be scanned and thereby the information about the product is given in the system. The staff scan a packing label that is placed on the pack surface and then a shipping label is printed. The system gives suggestions on a suitable packaging based on size and weight. However, if the measuring and weighing of the products are incorrect from the receiving activity a non-suitable packaging will be presented in the system. Furthermore, the system bases the packaging type on the volume of the products and not the shape of the product. Therefore, the wrong packaging type will be suggested by the system. After the product is packed, the label is placed on the package and then strapped by a strapping machine. Lastly, the package is placed on the conveyor belt in order to be transported to the Company X's third part logistics provider who is located next door. During the transportation, the label is scanned and an order confirmation is sent to the customer.

The first step for the batch flow is to scan the trolley with products that are going to be packed. The system will give information about the products included in each trolley section. The staff start to pack from the first section and control the order meanwhile they pack the products. The actual packing of products is the same as it is for the single piece flow. As mentioned in chapter 4.2.4 customers that order at least one bulky product has its own packing flow. In this flow the small products are packed separately and later consolidated with the bulky product.

Thereafter, the order is placed on a half pallet and gets plastic-coated by the staff. Lastly, the label is put on the packaging and the package is manually transported to the third part logistics provider by the staff.

For traditional stores there are two packing flows. In the first flow, the products that are delivered directly to the store are packed at the receiving area after the sortation to avoid unnecessary handling of the products in the warehouse activities. In the second flow, the staff transport the products directly after the picking activity to the receiving area for packing. For the both flows, the products are then placed on a pallet with a label on it, and transferred to an area where it waits for shipment by the third part logistics provider. Lastly, the staff place the pallets on the third part logistics provider's truck.

4.2.6 Return

Company X has a return flow which is separated from the warehouse activities and managed by a separate service department. If the customer is not satisfied with a product or it needs to be repaired, they can either return it to one of the stores or send it back to the central warehouse. Each store has a small service department where minor problems can be fixed. Additionally, the service department can repack the product and place it in the store again. If there is a need for a more extensive repair, the product is sent to the service department in the central warehouse. When the product is repaired or when there is a return, the service department repacks it and places it as a new order in the system. If a returned product has expired from the assortment, Company X re-sell it in a traditional store at a lower price in order to make it attractive for the customers.

5 Analysis

In this chapter the two research questions are answered by using the theoretical framework and empirical findings. The first research question is analyzed and answered by using an Ishikawa diagram. From the analysis of the first research question there are challenges identified in each warehouse activity. Furthermore, challenges created by Omni channel itself are presented. The second research question is analyzed and answered by using a tree diagram. From the analysis of the second research question several improvement factors are identified in order to manage the challenges identified in the first research question.

5.1 What are the challenges in the warehouse activities in a central warehouse for an electronic retailer when Omni channel is utilized?

The authors have identified various challenges in each central warehouse activity. In the following sections, the challenges for each central warehouse activity are analyzed and presented in an Ishikawa diagram for the reader. Additionally, challenges for WMS and the returns are identified. The reason why WMS is included even if it is not a warehouse activity depends on that it is a system which control and manage the warehouse activities in the central warehouse. The reason why the returns are included even if it is not a separate warehouse activity depends on that it is often a part of the central warehouse. Therefore, WMS and returns are included since they are important parts of the central warehouse. Thereby, it is possible to answer the first research question will be answered.

5.1.1 Receiving

According to Specter (2014), the human factor plays a crucial role. Furthermore, manual measuring and weighing of products can cause human error. Additionally, manual decision making regarding placement of products in the central warehouse can result in human mistakes and increased operation time (Hausman et al., 1976). According to Van Den Berg (1999), a storage location has to be planned in order to achieve effective utilization of space in the central warehouse since a suitable placement gives benefits such as reduced internal transportation, and efficient order picking. However, human decision making require training and experience (Park & Kim, 2013). Based on literature and empirical findings the authors indicate that the human factor can be seen as a challenge in the central warehouse (see Figure 5.1). The incorrect information in the system which is based on human error leads to variations regarding decision making. Incorrect decision making creates additional handling for the staff since corrections are required in order to achieve an efficient management of the central warehouse. These corrections require additional workload such as further measuring, weighing, counting, and updates of the new information in the system. Furthermore, when incorrect placement is chosen, internal transportations increase since a manual correction of a suitable placement is required. Lastly, further errors along the warehouse activities occur if the variations are not detected and corrected in an earlier stage such as incorrect packaging and an incorrect choice of trolley in the picking activity. This challenge occur regardless of if it is an online retailer, traditional retailer, or a retailer using Omni channel since the challenge is created where manual work is carried out.

The empirical findings do not indicate that barcoding is a challenge. However, it is mentioned in the literature that a barrier for barcoding is that the code needs to be visible in order to be scanned, and thereby add information into the system (White et al., 2007).

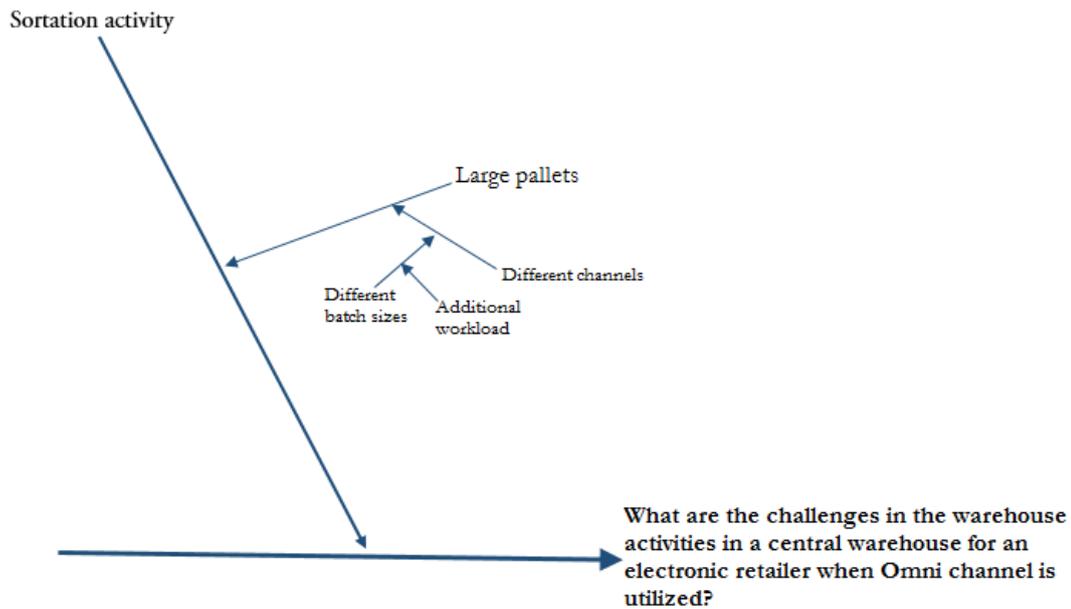


Figure 5.2 Challenges in the sortation activity

Based on the reasoning above, large pallets have an impact on the warehouse activities in the central warehouse when Omni channel is utilized.

5.1.3 Storage

According to Roodbergen et al. (2008), the layout within a warehouse has a significant impact on the activities. Furthermore, it is crucial to plan the placement for the products in the central warehouse (Van Den Berg, 1999). Additionally, an efficient stock planning can result in reduced costs in the central warehouse and different zones in the warehouse have to be planned. Furthermore, retailers face difficulties regarding seasonal products since they have a limited selling season (Monahan et al., 2004). Manual decision making can have a negative impact on the placement of products in the central warehouse where the outcome is increased operation time and human mistakes (Hausman et al., 1976). Based on the literature and the empirical findings the authors indicate that the layout can be seen as a challenge in central warehouse (see Figure 5.3). The layout for retailers using Omni channel is complex since the different channels handle various product volumes. Furthermore, customers from different channels have to be served efficiently which puts pressure on a suitable layout. A non-suitable layout is based on incorrect placement of products which is an outcome of incorrect storage type and manual decision making. The incorrect placement of products result in creating additional handling for the staff since corrections are required such as finding a new suitable placement manually. These corrections require additional workload such as increased internal transportations. This challenge occur regardless of if it is an online retailer, traditional retailer, or a retailer using Omni channel since the challenge is created when an inappropriate storage type is chosen and by manual decision making. However, the complexity increase for retailers using since various product volumes and different channels have to be served.

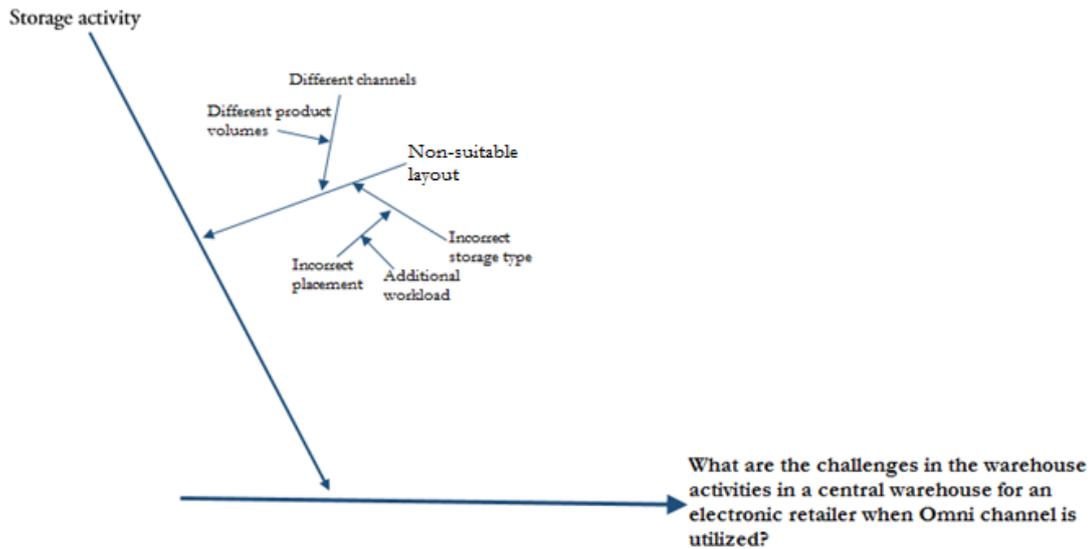


Figure 5.3 Challenges with a non-suitable layout

Based on the reasoning above, a non-suitable layout has an impact on the central warehouse when Omni channel is utilized.

5.1.4 Order picking

Order picking is an activity that is time consuming, costly, and requires manual work (Grosse & Glock, 2014). Furthermore, for electronic retailers using Omni channel there are differences in the picking activity due to the order size (Napolitano, 2013). There are various types of picking equipment and the selection of a suitable picking equipment is crucial since it has an impact on the central warehouse layout and the activities (Gu et al., 2007). Based on literature and empirical findings, the authors indicate that the order picking can be seen as a challenge in the central warehouse (see Figure 5.4). The challenge in the order picking activity is to efficiently pick the orders with a suitable picking equipment. For electronic retailers the orders differ both in batch sizes and product sizes. If a non-suitable picking equipment is utilized it results in additional workload for the staff since the picking equipment is not customized for the orders that are picked. This challenge occurs regardless of if it is an online retailer, traditional retailer, or a retailer using Omni channel since the challenge is created when an inappropriate order picking equipment is chosen. However, the complexity increases in the order picking activity for retailers using Omni channel since the batch size differs depending on which channel the orders are picked for. Furthermore, the manual prioritization of which channel to pick for primarily is a challenge for retailers using Omni channel since the complexity increases due to that customers from both channels are required to be served. If the customer demand is not fulfilled, there is a possibility of unsatisfied customers and losing customers.

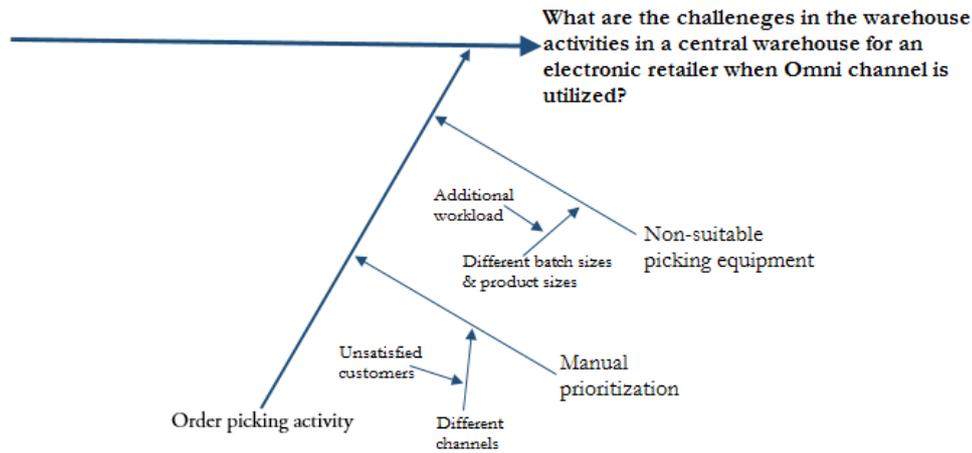


Figure 5.4 Challenges in the order picking activity

Based on the reasoning above, a non-suitable picking equipment and manual prioritization has an impact on warehouse activities in the central warehouse when Omni channel is utilized.

5.1.5 Packing & shipping

According to Napolitano (2013) and Alexander (2014), the differences in order sizes require separate packing flows. Based on the literature and empirical findings, the authors indicate that a non-suitable packing activity is seen as a challenge in the central warehouse (see Figure 5.5). The challenge in the packing activity is to efficiently pack orders which occur regardless of if it is an online retailer, traditional retailer, or a retailer using Omni channel since the challenge is created when an inappropriate packing activity is carried out. However, the complexity in the packing activity for retailers using Omni channel increase since the orders have to be packed efficiently for different channels with various order configurations, batch sizes, and product sizes which requires an adaption in this activity. Based on the reasoning above, a non-suitable packing activity has an impact on the central warehouse when Omni channel is utilized.

An inefficient shipping activity can lead to increased operation costs, increased transportation, and decreased customer satisfaction (Alshawi, 2001). If an electronic retailer do not fulfill the orders it will directly affect the customer satisfaction (Trocchia & Janda, 2003). Based on the literature and empirical findings, the authors indicate that the shipping activity can be seen as a challenge. The challenge in the shipping activity is to efficiently deliver the right product at the right time to the right customer. If this is not achieved it can result in unsatisfied customers and the possibility of losing customers. This challenge can occur regardless of if it is an online retailer, traditional retailer, or a retailer using Omni channel since the challenge is created when an inefficient shipping activity is carried out. Thus, the shipping activity for retailers using Omni channel is complex since they are delivering products to various customers and traditional stores. This combination requires a well-functioning shipping activity in order to satisfy and serve customers in both channels.

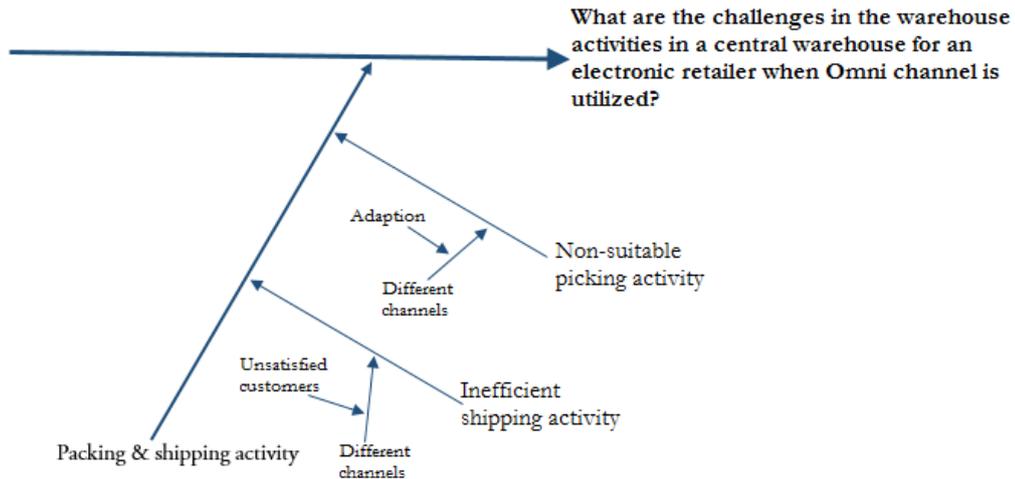


Figure 5.5 Challenges in the packing & shipping activity

Based on the reasoning above, an efficient shipping activity has an impact on the central warehouse when Omni channel is utilized.

5.1.6 Return

According to M. L. Fisher (1997), products in the electronic industry have short life cycles. Based on the literature and empirical findings the authors indicate that products with short life cycles can result in difficulties in the return flow for expired products due to the fact that an expired product does no longer existing in the retailer’s assortment (see Figure 5.6). This is a challenge since the product does no longer have a placement in the traditional store, it is not visible on the web page, and does no longer have a placement in the central warehouse. Therefore, a challenge occur since the product is well-functioning thus not visible in the system. This challenge occur regardless of if it is an online retailer, traditional retailer, or a retailer using Omni channel since the challenge is created by expired products.

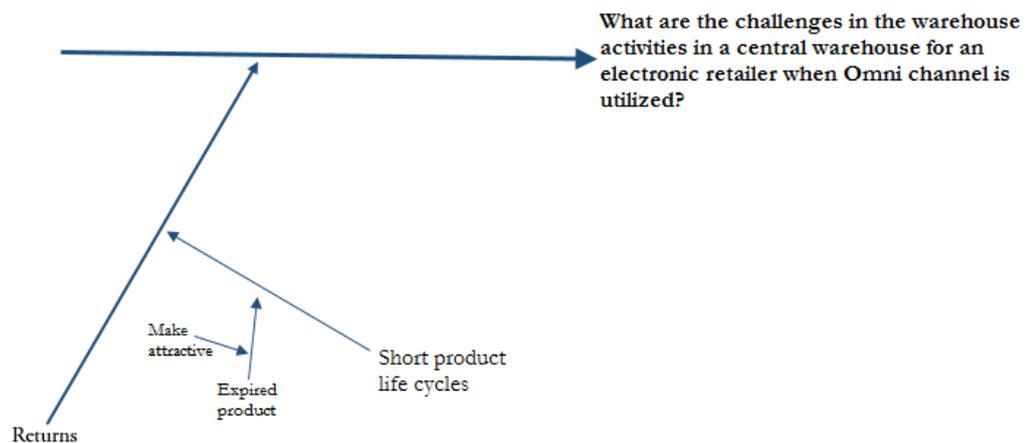


Figure 5.6 Challenges in the return activity

Based on the reasoning above, making an expired product attractive on the market has an impact on warehouse activities in the central warehouse when Omni channel is utilized.

5.1.7 WMS

In order to achieve an increased control and management of the activities in the central warehouse, a warehouse management system is required (Scioscia, 2014). Additionally, a supportive system requires that the staff have knowledge about the WMS and is able to manage the information provided by the system. Based on literature and empirical findings, the authors indicate that it is a challenge to implement a WMS that supports different decision making for the warehouse activities in the central warehouse (see Figure 5.7). It is a challenge since various functions have to be integrated and controlled in order to manage the inventory efficiently. This challenge occur regardless of if it is an online retailer, traditional retailer, or a retailer using Omni channel since the challenge is created by a non-supportive WMS. However, the complexity increase with the WMS for retailers using Omni channel since the control and integration of both channels is required. Furthermore, the inventory balance needs to be integrated with real time update in order to meet customer demand for both channels.

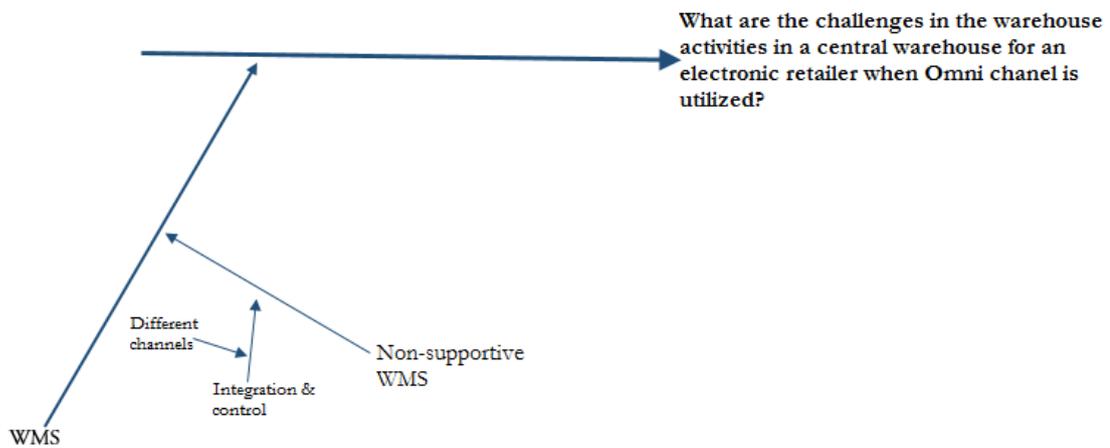


Figure 5.7 Challenges with WMS

Based on the reasoning above, a non-integrated WMS has an impact on warehouse activities in the central warehouse when Omni channel is utilized.

5.2 How can the challenges in the warehouse activities be managed in a central warehouse for an electronic retailer using Omni channel?

Based on the challenges identified in chapter 5.1, theoretical framework and empirical findings, the authors have found possible ways to manage these challenges. The improvement factors are analyzed and presented in a tree diagram where the reader can follow how the challenges in the warehouse activities are managed. Thereby, it is possible to answer the second research question.

5.2.1 Integrated system

According to Gu et al. (2007), warehouse activities can be improved by using information technologies. It is crucial to integrate a WMS with additional technologies in order to support the central warehouse (Scioscia, 2014). Furthermore, WMS provide a better control in the central warehouse. Furthermore, human error can be avoided by using WMS (Specter, 2014).

By not having an integrated system that supports the warehouse activities in a central warehouse leads to various challenges (see chapter 5.1). Therefore, the authors suggest one improvement factor for this challenge, which is to integrate the system in order to support the warehouse activities (see Figure 5.8). An integrated system that supports various functions and applications can increase the quality of decision making regarding prioritization of product placement and orders picked. Therefore, the incorrect decision making decrease which results in minimized variations and handling of corrections that have to be made manually by the staff in various warehouse activities. Due to the complexity Omni channel create in the central warehouse, an integrated system which handle both channels is required. The integration facilitate the information sharing between the channels with real-time updates, inventory balance, and coordination of the warehouse activities.

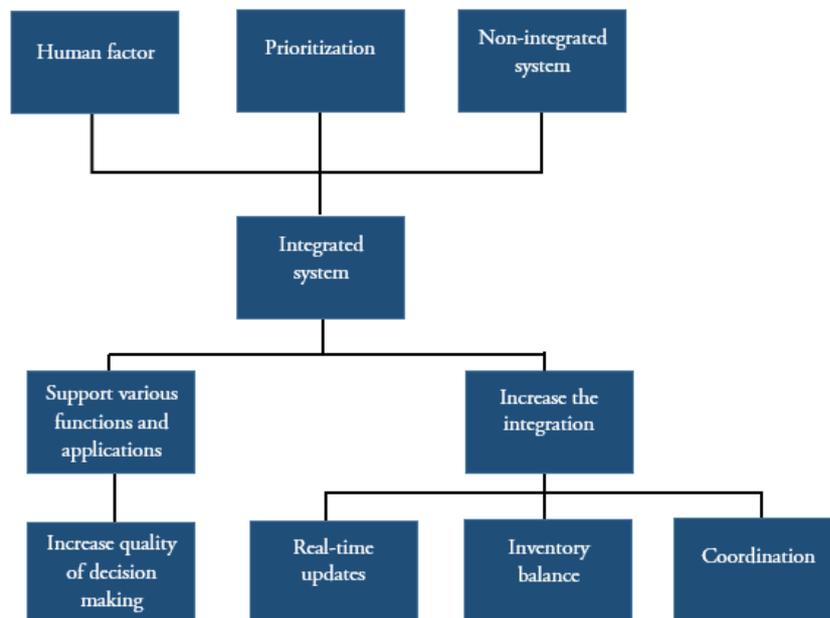


Figure 5.8 Integrated system

Based on the improvement factor mentioned above, the authors conclude that the challenges with human factor, prioritization, and a non-integrated system can be managed.

5.2.2 Automation

Information technologies facilitate automation and communication with real time updates (Gu et al., 2007). Based on the literature the authors propose one primary improvement factor; Automation in order to be able to manage the challenge with human factor (see Figure 5.9). The human factor plays a crucial role in this activity since it can have a negative impact if the information is incorrect (see chapter 5.1). Automation can lead to minimized variations in the receiving activity where the staff counts, measure, and weight incoming products. Therefore, the corrections that have to be made after the incorrect information decrease and it facilitates the subsequent errors in various warehouse activities such as incorrect packaging and incorrect choice of trolley in the picking activity. Furthermore, the additional workload will decrease since the efficiency in the warehouse activities increase.

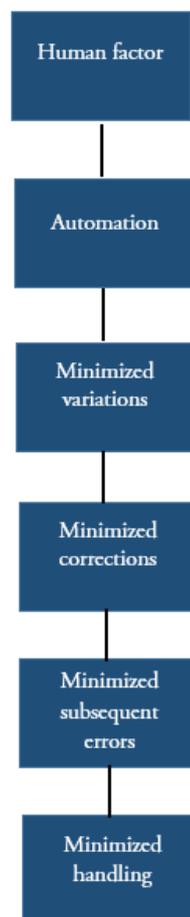


Figure 5.9 Automation

Based on the reasoning above, the authors conclude that the challenge with human factor can be managed by taking the improvement factor into consideration.

5.2.3 Outsourcing

In various warehouse activities sortation of products have to be carried out in order to facilitate the handling of incoming products to the central warehouse (De Koster et al., 2007). Furthermore, a third part logistics provider can achieve higher efficiency in the shipping activity for retailers (K. Li et al., 2008). By outsourcing the shipping activity, the retailers can focus on their core competence (Lieb & Bentz, 2005).

Based on the literature, the authors suggest one improvement factor; Outsourcing in order to manage the challenges with large pallets, shipping, and the human factor (see chapter 5.1). Outsourcing can lead to minimized handling in the receiving activity and sortation activity (see Figure 5.10). The sortation according to product grouping can be outsourced to the suppliers who can sort and pack the products in the pallets based on product grouping. Additionally, products that are going directly to a specific store can be sorted by the supplier based on which store the pallets are directly delivered to. If the supplier is not able to send a full pallet for a specific store, the pallet can be filled with products for different stores. Thus, the products shall be joined together based on specific stores. By outsourcing the sortation these steps are eliminated and therefore the additional workload can decrease. It is crucial to fulfill orders and therefore electronic retailers can outsource the shipping activity since the warehousing is the core competence and not distribution of products. An inefficient distribution of products can result in unsatisfied customers. However, the electronic retailer loose full control and there is a risk of sharing sensitive information when outsourcing is carried out. Thus, by using outsourcing an efficient delivery of products to both channels can be achieved.

Thereby the electronic retailers can focus on achieving an efficiency in the warehouse activities and the focus remains on the core competence. Lastly, electronic retailers can outsource the measurement and weighting of the products in the receiving activity to the suppliers. Thereby, information about the products' measure and weight is received in order to be able to eliminate this process in the receiving activity. By eliminating this process the variations and incorrect information decrease which leads to minimized corrections and the additional workload. Furthermore, the subsequent errors such as incorrect packaging and incorrect choice of trolley in the picking activity are possible to eliminate. Due to the complexity Omni channel put on the central warehouse, outsourcing can decrease the complexity in various warehouse activities.

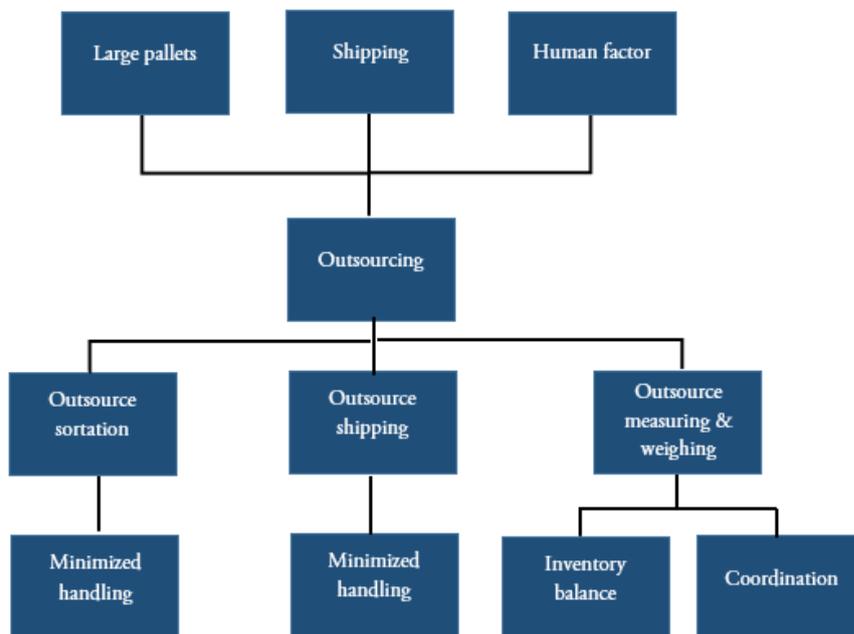


Figure 5.10 Outsourcing

Based on the reasoning above, the authors conclude that the challenges with large pallets, shipping, and human factor can be managed by taking the improvement factor into consideration.

5.2.4 RFID

The benefits with RFID are efficient material handling, improved product availability, reduced shrinkage, and improved asset management (S. Li & Visich, 2006). However, a drawback for RFID is that it is costly in comparison to barcoding (S. Li & Visich, 2006). Based on the literature, the authors suggest the usage of RFID as an improvement to manage the challenge with barcoding (see chapter 5.1). RFID is costly to implement thus the authors consider that the benefits with RFID outweigh the drawback. RFID can lead to minimized handling in the receiving activity where manual adjustments can be required (see Figure 5.11). Furthermore, the issue with not being able to make manual adjustments results in that the products are required to be sent back to the supplier is eliminated by using RFID. Therefore, the additional workload which is created by the required corrections can decrease.

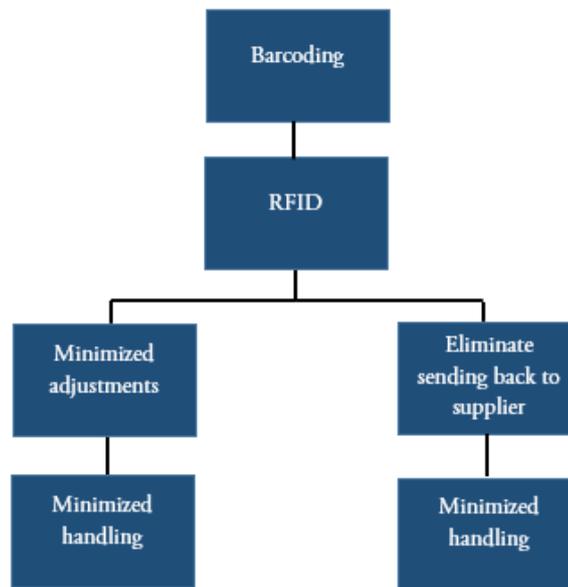


Figure 5.11 RFID

Based on the reasoning above, the authors conclude that the challenge with barcoding can be managed by taking the improvement factor into consideration.

5.2.5 Suitable layout

The warehouse layout have an impact on the warehouse activities where an efficient warehouse layout results in long term benefits and cost savings (Roodbergen et al., 2008). By using cross-docking the products can efficiently be distributed without storage and with a fast product flow the inventory and handling costs can be reduced (Heragu et al., 2005). Lastly, a suitable storage type can result in decreased internal transportation time and an increased utilization of the space in the central warehouse (Van Den Berg, 1999). Based on the literature the authors suggest two improvement factors; cross-docking and suitable storage type in order to manage the challenge with an inefficient product flow and non-suitable storage type (see chapter 5.1). In order to minimize unnecessary handling of products with direct delivery, cross-docking can be used since the total amount of received products does not have to go through the storage and picking activity in the central warehouse before distribution (see Figure 5.12). This leads to an efficient product flow and therefore electronic retailers are able to temporary store products at the shipping area which will simplify the handling in the warehouse activities.

Therefore, an efficient preparation before delivery of products can be utilized by adding a cross-docking area to the warehouse layout and thereby decrease the additional workload in the central warehouse. The second improvement factor is a suitable storage type for the central warehouse. For electronic retailers using Omni channel an integration in the WMS of random storage, class based storage, family grouping, and seasonal products is preferable. Random storage is suitable since a WMS system can support decisions concerning a suitable storage spot for each product in the central warehouse. Furthermore, class based storage can be used in order to divide the products based on popularity and thereby store the products in a preferable spot. Family grouping can be integrated since products that belong to each other often are purchased together and therefore can be stored nearby. Lastly, seasonal products require storage spots periodically. Therefore, these products can also be integrated in the WMS in order to have suitable storage spots in the central warehouse. Furthermore, dedicated storage and full turnover storage is not suitable storage types.

Dedicated storage use specific spots for each product which is not suitable since there are both seasonal products and frequent update of the assortment. Additionally, full turnover storage is not suitable when the assortment and customer demand is changing frequently. Therefore, using random storage, class based storage, family grouping, and seasonal products result in decreased internal transportation and increased utilization of the space in the central warehouse. By using these storage types, the electronic retailer achieve place and picking optimization in the central warehouse.

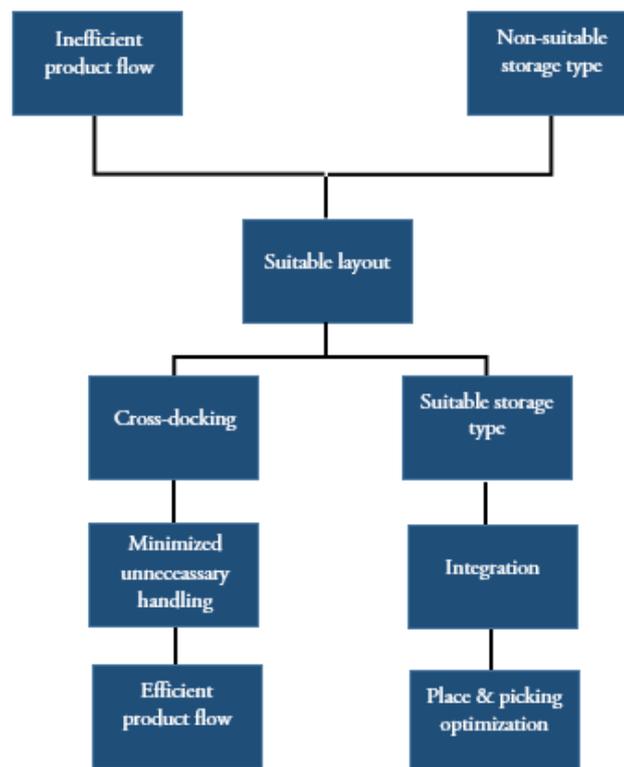


Figure 5.12 Suitable layout

Based on the improvement factors mentioned above, the authors conclude that the challenge with an inefficient product flow and a non-suitable storage type can be managed.

5.2.6 Suitable picking equipment

According to Gu et al. (2007), the selection of picking equipment is crucial since it has an impact on handling of the products in the central warehouse. Based on the literature, the authors suggest one improvement factor; suitable picking equipment in order to manage the challenge of a non-efficient picking equipment (see chapter 5.1). By using a suitable picking equipment the efficiency in the picking activity can increase (see Figure 5.13). Electronic retailers using Omni channel pick orders both for traditional stores and online stores which leads to constantly picking different product sizes and batch sizes. Smaller product sizes can efficiently be picked with a handheld device since the staff are not required to use both hands during the picking activity. However, larger products can efficiently be picked by using voice directed picking or pick to light since the staff are required to use both hands during the picking activity. It is preferable to combine the handheld device with either voice directed picking or pick to light since it facilitates the picking activity where Omni channel is utilized.

The combination of the picking equipment will entail that the staff receive additional information in the handheld device regarding the suitable picking equipment for the upcoming order. Thereby, the staff are able to change picking equipment based on the recommendations given in the handheld device. By using this combination the picking activity the efficiency will increase. Furthermore, the order picking can be carried out regardless of which of the different channels the orders are picked for. Therefore, an additional flexibility is created in the picking activity.

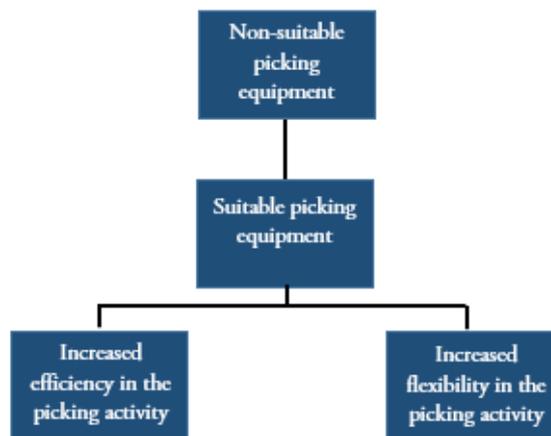


Figure 5.13 Suitable picking equipment

Based on the reasoning above, the authors conclude that the challenge of a non-suitable picking equipment for the central warehouse can be managed by taking the improvement factor into consideration.

5.2.7 Make expired products attractive

The short product life cycles are a challenge for electronic retailers (see chapter 5.1). According to the authors, there is a difficulty since it is not possible to extend the product life cycles. Based on the empirical findings, it is possible to manage this challenge by making expired products attractive on the market again. According to the authors' knowledge, this improvement factor has not been seen in the literature. Therefore, the authors suggest one improvement factor; make expired products attractive as mentioned in the empirical findings (see Figure 5.14).

This can be carried out by offering a lower price on the products in a specific traditional store in order to be able to sell the products even if they have expired from the assortment. By offering the products in a specific traditional store, the electronic retailer can avoid to add the expired product into the assortment. Furthermore, the expired products do not have to go through each warehouse activity in order to be placed on the market again for possible customers. This facilitates the return activity for the electronic retailer who can resell an expired product.



Figure 5.14 Make expired products attractive

Based on the reasoning above, the authors conclude that the challenge with short product life cycles can be managed by taking the improvement factor into consideration.

5.2.8 Separate packing flows

According to Cochran & Ramanujam (2006), a suitable packing activity can minimize the cost. The different orders for electronic retailers using Omni channel can be handled in separate packing activities since the order sizes varies (Napolitano, 2013). Based on the literature and empirical findings, the authors suggest one improvement factor: separate packing flows in order to manage the challenge in the packing activity (see chapter 5.1). For electronic retailers using Omni channel it is crucial to adapt the packing activity for various product sizes and batch sizes (see Figure 5.15). The packing activity for traditional stores require that full pallets are managed efficiently while the packing activity for online customers requires high speed of packing small packages. Therefore, a combined packing activity for both channels is not efficient. Due to the complexity Omni channel create in the packing activity, separate packing flows are required. The separate flows will facilitate the packing activity since the different channels have different characteristics.

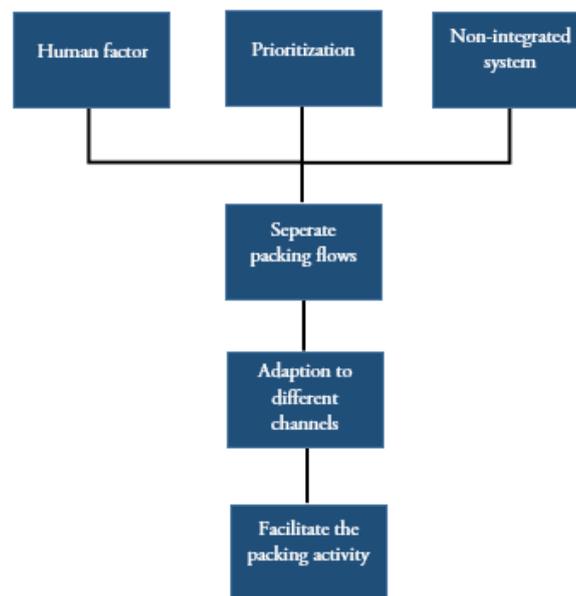


Figure 5.15 Separate packing flows

Based on the improvement factor mentioned above, the authors conclude that the challenges with human factor, prioritization, and a non-integrated system can be managed.

6 Conclusion & Discussion

In this chapter the authors conclude the findings from the analysis. Additionally, a discussion considering the fulfillment of the purpose and the research questions is presented. Furthermore, theoretical implications, managerial implications, and future research are discussed.

6.1 Fulfillment of purpose

The two research questions are answered by the theoretical framework and empirical findings. Challenges identified in the warehouse activities for electronic retailers using Omni channel are; large pallets, human factor, barcoding, non-integrated WMS, non-suitable layout, non-suitable picking equipment, packing, and shipping. Furthermore, the first research question distinguish between challenges that are created by Omni channel itself and challenges can also be recognized for electronic retailers using traditional stores and online stores separately. The challenges created by Omni channel in a central warehouse are; large pallets, non-integrated WMS, non-suitable picking equipment, prioritization for picking, layout, and packing. Thereby, the first research question is answered. In order to answer the second research question, the authors have identified improvement factors for each challenge mentioned in chapter 5.1. Based on the outcome of the analysis of the two research questions, the authors conclude that the purpose is fulfilled.

6.2 Theoretical implications

Based on the analysis, the authors have identified five theoretical implications for this study; large pallets, non-integrated WMS, non-suitable picking equipment, a non-suitable layout, and packing. Omni channel is the cause for these challenges and since there is no previous literature that supports these statements to the authors' knowledge. Therefore, these challenges can be seen as a theoretical contribution for this study.

Large pallets increase the handling for electronic retailers using Omni channel since an additional repacking and sortation is required in order to manage products that serves both traditional stores and online customers. For electronic retailers using Omni channel, it is a challenge to integrate both traditional stores and online stores regarding the management of incoming orders, incoming pallets, inventory balance, and prioritization. It is a challenge for electronic retailers using Omni channel to efficiently pick orders where the orders differs in batch sizes since the orders for traditional stores have larger batch sizes and orders for online customers have smaller batch sizes. Furthermore, for electronic retailers using Omni channel it is a challenge to find a suitable layout since online orders require small product volumes and traditional stores require large product volumes. Additionally, the warehouse is required to manage direct delivery to traditional stores. Lastly, it is a challenge for electronic retailers using Omni channel to implement an efficient packing activity since traditional stores and online customers require different packaging due to that the product volumes differ. Based on the reasoning above, the authors conclude that these challenges contribute to the existing literature regarding the phenomenon of Omni channel.

6.3 Managerial implications

In order to manage the challenges in the warehouse activities, the electronic retailers are required to identify the challenges which can be seen as the first step. It is of great importance for the electronic retailers to not only identify the challenges, but also understand the underlying reason why the challenge occurs. Thereafter, improvement factors can be identified and

analyzed in order to manage the challenges. In this study, a contribution of improvement factors that are useful for electronic retailers using Omni channel are provided.

Additionally, there are some improvement factors that are applicable for traditional retailers and online retailers. However, the implementation of the improvement factors requires an extended analysis of each warehouse activity for the specific electronic retailers. Furthermore, the financial aspect of the implementation of the improvement factors is needed to be taken into consideration.

The identified improvement factors are not only applicable for Company X, but also for other electronic retailers using Omni channel. Furthermore, the improvement factors can also be utilized by retailers using Omni channel within another industry. The reasoning behind this is that the study is not based on specific products handled by Company X. The focus is on challenges and improvement factors in warehouse activities in a central warehouse which is also a part of the supply chain for other electronic retailers using Omni channel within another industry. However, the identified improvement factors in this study are focused on the identified challenges at Company X. Therefore, modifications are required since there are various factors that can differ between retailers using Omni channel.

6.4 Future research

The authors have identified a few areas for future research. First of all this study have been conducted with one case company. Therefore, a future research can be conducted with multiple case companies in order to get a deeper understanding in the field of electronic retailers using Omni channel. By using multiple case companies, it is possible to identify further challenges and improvement factors. Furthermore, research within other retailing industries using Omni channel can be a possible area since the literature is limited in the field of Omni channel. In this study, the focus has been on the warehouse activities in a central warehouse. However, it is of great importance to analyze each warehouse activity to a greater extent. Additionally, the other parts of the supply chain can be analyzed since this study only focus on one part of the supply chain. Lastly, it is of interest to analyze electronic retailers using Omni channel in various parts of the world.

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Appendix I – Interview guide

The following questions are broad since we want to have an open discussion in order to get a deeper understanding of the warehouse activities in the central warehouse. If there is anything you want to add or give examples of, you are free to elaborate.

Questions regarding the warehouse

- Could you describe what the main activities are in the central warehouse?
- What happens in each activity?
- Are there any difficulties in each activity?
- What are the strengths for each activity?

Questions regarding the warehouse layout

- How is the central warehouse divided physically currently?
- Could you describe the layout of the central warehouse?
- What strengths and drawbacks does the current layout have?

Questions regarding Omni channel

- Are there any differences between the products stored for traditional stores and online customers in the central warehouse?
- Is there any difference in the assortment between traditional stores and the online store?
- Could you describe how Omni channel is currently utilized in the warehouse?
- How is the integration made for products delivered to traditional stores and the online store? How are the incoming orders managed when Omni channel is utilized?

Questions regarding the IT-system

- Which IT systems are utilized in the central warehouse in order to manage the products?
- What are the strengths and weaknesses for the IT system?
- Could you describe where the products are sent from when an online order is placed by a customer?
- Do you have any receiving and payment options for the customers?
- Could you describe each payment option?

Questions regarding returns

- How are the returns handled currently in the warehouse?
- Is there any difference between returns from traditional stores or the online store?
- Are the customers able to return the products in the traditional stores?
- How does the current situation look like when it comes to returns?

Questions specific for each warehouse activity

- How is each step in this activity carried out?
- Are there any difficulties in any of the steps?
- What are the strengths for this activity?
- Do you have any suggestions of how you would like to improve this activity or a specific step in this activity?

Thank you for your time and cooperation, we will send the document with the empirical findings where you can read and edit the information given in the empirical findings before the thesis is published.