E-commerce in International Trade

Impact on Supply Chain and Warehouse Management

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Abstract

This thesis studied how the introduction of e-commerce in the international trade has influenced the supply chain mechanisms and logistics operations in the global trade context. As a result, the study raises the issue of the relationship between the material flow and information flow.

The methodology of the paper was that of an inductive case study with qualitative methods of data collection. Based on a literature review and a series of interviews, the determinants of e-commerce influence were defined. Cases of supply chain management and warehouse operations were used to validate the framework.

The outcome on the research was theory about the relationship between the information and material flow. The theory is based on the present experience and development of the key issues of the research. The theory predicts the future developments in e-commerce, supply chain management and warehouse operations.

Although the theory was based on a deep literature review and semi-structured interviews, there were certain limitations. The study did not take into account several factors in the international trade operations. For example, monetary, political and economic issues were not studied.

Companies could use the theory proposed by this work to develop their strategic supply chain and warehouse management plans. However, a greater value of this research is that students can become familiar with the presented issue and study it further.

Keywords/tags: e-commerce, international trade, supply chain, warehouse operations, information flow, material flow

Miscellaneous

Contents

FIGURES

TABLES

Abbreviations

B2B – Business to Business

B2C – Business to Consumer

B2G – Business to Government

C2C – Consumer to Consumer

C2B – Customer to Business

EDI – Electronic Data Interchange

G2C – Government to Consumer

G2G – Government to Government

GATT – General Agreement on Tariffs and Trade

GDP – Gross Domestic Product

ICT – Information and Communications Technologies

IMF – International Monetary Fund

OECD – Organization for Economic Co-operation and Development

SCM – Supply Chain Management

SME – Small and Medium-Sized Enterprises

WMS – Warehouse Management System

WTO – World Trade Organization

XML – Extensible Markup Language

VAL – Value Added Logistics

VAS – Value Added Services

1 Introduction

Over the last few decades, international trade has experienced several rapid changes. These changes characterize the dynamism of the modern trends in international trade. Evidently, the significance of e-commerce in the development of international trade has a growing tendency. Burinskienė (2011) states that under the modern globalization circumstances, the application of information and telecommunication technologies has become a crucial factor of development in both international trade and economy in general. For the past years, e-commerce has had its influence on the international trade and logistics operations. The rapid growth of e-commerce in the globalized world has led to a great pressure on the logistics operations. Many companies have had to adjust their operations. Supply chain strategies and warehouse operations have been modified rapidly.

It is noticeable that those logistics operations are evolving with the implementation of new technologies and that there is growth in trading. Research has introduced the idea that the main driving force of changes is e-commerce. In this research, the focus was on B2B and B2C business models.

The study assumed that the recent changes in logistics operations were under the influence of e-commerce. Hence, the study focused on the relationship of informational and material flows.

The study was divided into three timeframes, as shown in Figure 1. First, the history of international trade and the development of e-commerce and their relation to supply chain management and warehouse operations were reviewed. Secondly, the current situation in logistics companies regarding this phenomenon was analyzed. Finally, the role of e-commerce in the development of logistics trends   was examined. These timeframes were analyzed in order to find certain patterns and develop the theory.
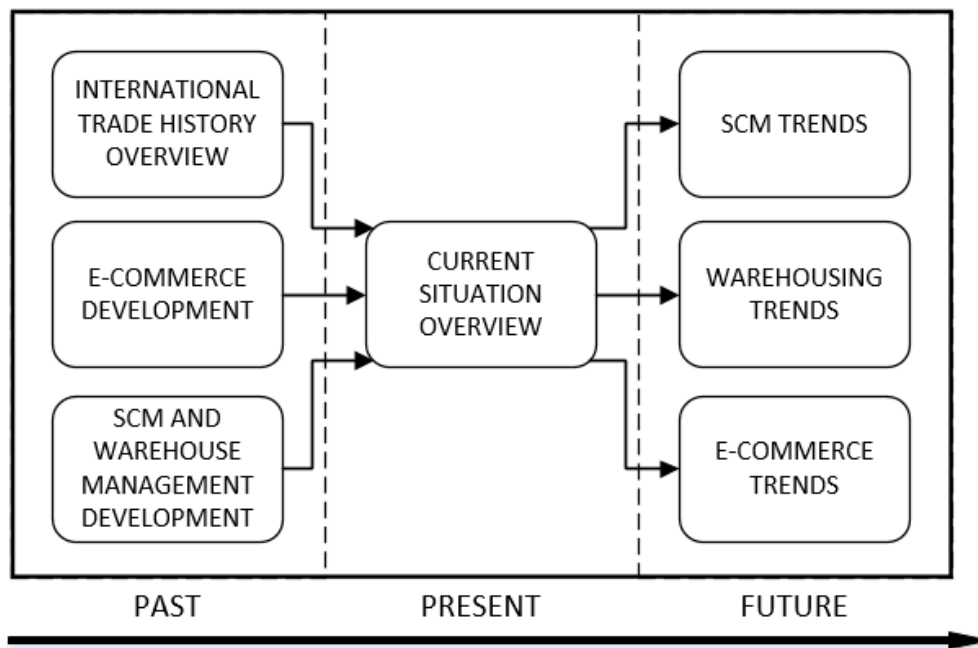
FIGURE 1. Research structure

Research was performed as the Bachelor`s graduate thesis for the Logistics department of JAMK Technology.

1.1 Motivation

Personal interest in the matter helped to choose this topic. During the author's exchange period in South Korea, he took several classes related to international trade. These classes revealed the importance of logistics from the economic point of view. While reading all the articles related to this issue, the author discovered that there were only a few exploring more than one idea. Most of the articles focused on the successfully implemented solutions based on e-services. Thus, the author decided to conduct a study that would cover all these examples in one piece, examine them, and present one constant vector of the future development of the industry. Hopefully, those who read this study, will at least become familiar with this issue. The highest achievement will be if the study inspires people to look into this matter further.

1.2 Research Methods

The aim of the study was to provide a better understanding of the e-commerce phenomenon. Another aim was to examine its influence on supply chain management and warehousing.

From the beginning, it was clear that this topic required a comprehensive literature review as well as a qualitative in-field study in order to reach the roots of this matter. In order to provide a complete picture an inductive approach and a qualitative research method were selected for the study.

An inductive approach firstly involves making specific observations. Moreover, data relevant to the researched topic is collected. Once a substantial amount of data has been collected, certain patterns can be discovered in the data. Next, a tentative theory is developed that could explain those patterns. Schutt (2006) summarizes the process of as inductive approach as follows:

> *When researchers take an inductive approach, they start with a set of observations and then they move from those particular experiences to a more general set of propositions about those experiences. In other words, from data to theory, or **from the specific to the general***.

Figure 2. outlines the steps involved with an inductive approach to research.

FIGURE 2. Inductive approach structure.

Qualitative research is characterized by the collection and analysis of textual data (surveys, interviews, focus groups, conversational analysis, observation, ethnographies (Olds, 2005)), and by its emphasis on the context within which the study occurs. The research questions that can be answered by qualitative studies are questions such as:

- What is occurring?
- Why does something occur?
- How does one phenomenon affect another?

Answers to these questions generally require rich, contextual descriptions of the data. By implementing qualitative research methods, the author reviews literature and brings to the light questions and theories of the research topic. Literature is analyzed using a qualitative comparative analysis. In this study, a series of semi-structured interviews that allowed asking open-ended research questions was implemented in order to support the literature review. . The interviews were analyzed by combining constant comparison and qualitative comparative analyses.

When using a qualitative method, a pattern is analyzed after which theory is presented. The theoretical perspective of a study describes the approach used to explain reality in relation to past developments and future trends. The data is examined without preconceptions of the existing theory or pre-determined categories. This allows themes or categories to emerge from the data. This process allows new insight that would not be possible if an existing theory or concept were imposed on the data. (Crotty, 2003).

1.3   Research Problems

The survey of literature published by leading world publishers showed that only 6% of all research focused on the topic of the application of e-commerce in international trade (Burinskiene, 2011) (See Table 1). The same result came from the Google Scholar platform: for the search term "international trade" the search engine provided 2800000 results, whereas for "international trade, e-commerce" the result was 153000. The ratio between 153000 and 2800000 is 5.5%.

Table 1. Scientific literature on the topic of e-commerce in international trade. (Burinskiene, 2011)

Years	Literature dedicated to international trade	E-commerce research in the literature dedicated to international trade
1976-1980	1562	4
1981-1985	2001	3
1986-1990	2823	12
1991-1995	3568	18
1996-2000	2148	353
2001-2005	2139	436
2006-2010	1174	108
Total	*15415*	*934*
%	**100%**	**6,1%**

The conclusion is that there is a lack of works in scientific literature about the use of e-commerce in international trade.

Performing interviews was time consuming and required a certain travel budget. A major drawback in the research was that there was an influence of biases from the interviews and literature review. Nevertheless, as mentioned in the previous chapter, the author tried to be open-minded and focused on the data itself, rather than on the conclusions of the others.

1.4   Research Questions

Specifically, the study attempted to answer the following questions:

I.   What is the influence of e-commerce on international trade?

II.   Can managerial skills in e-commerce bring a competitive advantage?

III.   What is the effect of E-commerce on the global supply chain?

IV.   What is the effect of E-commerce on supply chain management and warehouse operations?

1.5   Importance of the study

The study could shed light on the problem of the relationship between e-commerce and logistics. As a result, it could trace the impact of e-commerce on logistics. This study reflects modern issues in supply chain and warehouse management. Logistics operations are a part of the global trade, therefore logisticians need to react single-mindedly to new challenges and tackle problems that are more complicated. The development level of information technologies is growing, and the needs are perceived in a new way, which is apparent in the practice of e-commerce. Apparently, the importance of e-commerce technologies in the development of international trade is immense and has a tendency to grow: under the modern globalization circumstances, the application of information and telecommunication technologies has become a crucial factor of development in both the international trade and economy in general.

2   Theoretical basis

In qualitative research, document analysis is an important part of the study. In this research, the theoretical basis provides the ground ideas for a better understanding of the study outcomes. The theoretical basis was used as a channel to the past. Milestones of the influential events are discussed in this chapter.

2.1   International Trade

Throughout history we can see that trade has been the driving force of progress and the tool to spread innovations and discoveries. Ancient merchants travelled many days and long distances to find exotic and unique items in order to increase their wealth. For these people trade was a way of live. It is known that some tradesmen were richer than their rulers. An unknown trader, whose life was described in a book called "Isaac the Jew", written in 10th century by the Persian author Buzurg, had a cargo worth an estimated million dinars – an incredible amount given that a middle class family could have subsisted on 24 dinars per annum (Clarke,2015).

2.1.1 Silk Road

A little insight into the world of the ancient trade is crucial for understanding the merchants` incentives for trading. In the context of logistics, the famous Silk Road is reviewed here. Judging by the road's name, silk was the main and most valued commodity. Thanks to its little weight, compactness, enormous demand and high price, it was ideal for trade and long-distance transportation. Mainly the goods moved from the East to the West. However, caravans rarely traveled all the way due to security reasons. Therefore, throughout the route cities with big multilingual bazars emerged. The governors of these cities collected tax for a safe passage and participation in the bazar.

The greatest value of the Silk Road was the exchange of culture. Ideas related to art, religion, philosophy, technology, language, science, architecture and every other element of civilization were exchanged on the Silk Road along with the commercial goods.

The lesson learnt from the insight of Silk Road is that trade is a crucial part of the world's economy and human civilization. Silk Road provides a great example where information traveled along with the material flow. The greatest source of knowledge was books. With the introduction of the Internet, we entered into a new era of trade where new rules emerge. With the introduction of e-commerce technologies, a gap between the informational and material flow emerged.

2.1.2 Modern Trade

Modern international trade is tied to the economies of countries willing to participate in global trade. The well-being of some countries is highly dependent on trading activities that the countries are performing. The principles of the modern international trade were created during and after the Second World War. During the Second World War, several countries benefited from selling armory to their alliances. However, most of the goods were delivered as loans. Thus, in order to make sure that the debts would be paid off, the countries created the International Monetary Fund (IMF) and the World Bank at the Bretton Woods Conference in July 1944. Moreover, they signed the General Agreement on Tariffs and Trade (GATT) at an

international conference in Geneva in October 1947. In addition to that, the countries that had lost the war had to be controlled and told what they could and could not do.

In 1995, the World Trade Organization (WTO) replaced GATT. According to the official website, the World Trade Organization (WTO) is the only international organization dealing with the global rules of trade between nations. Its main function is to ensure that trade flows as smoothly, predictably and freely as possible.

For countries that have adopted the international economic policies promoting greater trade and investment, such as joining the WTO or reducing trade barriers by bilateral agreements, evidence suggests that this has influenced on rapid economic growth and income. For example, according to the Office of the U.S. Trade Representative, from 1994 to 2000 increased exports accounted for approximately one-fifth of the U.S. economic growth, and nearly one-third of the U.S. growth between 1992 and 1997. For the decade ending in 1999, the Organization for Economic Co-operation and Development (OECD) reports that countries that are "more open" achieved double the annual average growth of other countries. Even developing countries have benefited from the greater international trade and investment as the Council of Economic Advisers reported in 1999:

> *Data from 1974-1985 and 1986-1992 show developing countries with inward-oriented economic policies experiencing less annual growth of GDP (Gross Domestic Product) per capita than those with outward-oriented economic policies.*

Governments and the import/export, shipping, logistics and transport communities have established an exhaustive, but by no means complete, range of agency and country-specific regulatory and operational requirements for international trade. International production fragmentation became realistic with the inception of the information and communications technology (ICT) revolution, which enabled the coordination of spatially dispersed complex tasks at a relatively low cost. In other words, the information flow has increased the speed and decreased the cost.

The inadequate and inappropriate usage of e-commerce technologies affects the development of the international trade. The development of instrumentation that allows evaluating the perspectives and opportunities of the application of e-commerce technologies is an important precondition in the development of international trade. Solutions which are oriented to the efficiency of the international trade and the increase of competition usually exploit in one way or another the opportunities provided by e-commerce technologies.

2.2   E-commerce

The term e-commerce is quite broad, but the definition is given alongside the context of the research. In the beginning, a historic overview is presented.

The fundament of e-commerce is the Internet. The origins of the Internet go back to the 1960s long before the days of the modern e-commerce. The predecessor of the Internet, APRANET was established as a research network linking only a few research institutions in the USA. (Andrews, 2013)

The commercial use of the Internet was only allowed from the early 1990. Thus, it is agreed that the evolution of e-services started around that time. Among the first large commercial parties taking advantage of the Internet possibilities were Dell, Cisco and Amazon. A few years later, however, many business organizations were attempting commercially onto the Internet, leading to an escalation of e-commerce.

The first wave of E-commerce was a little more than a "pamphlet" with static homepages. This provided the basic function of delivering content and contacts to the customers. The second wave of E-commerce was able to handle transactions electronically, such as buy and sell functions, over the Internet. It was a major milestone because there were many issues regarding the security of payments. The first company that managed to offer a secure payment method was PAYPAL. (Grabianowski and Crawford, 2005). The third wave of E-commerce was designed to integrate with the customers, suppliers, business communities and other stakeholders in real time for sharing and exchanging information (Fingar, 2000).

E-commerce includes any practice of electronic economic activities, such as Web services, or even merely a presence of web information with the possibility of leading to transactions with the help of telephone and fax machines (Coffee, 1998; Riggins and Rhee, 1998; Riggins, 1998). This understanding of e-commerce is quite outdated.

This study supports the following definition of E-commerce:

> *…E-commerce can be defined as the use of electronic networked computer-based technology to bring new products, services, or ideas to market, and support and enhance business operations…*

<div align="right">

Rob and Coronel, 2009

</div>

The only addition is that mobile-based technologies are also part of computer-based technologies.

Industry organization supporters and the economic efficiency theory suggest that E-commerce is able to reduce the transaction costs and search costs (Kalakota and Whinston, 1997; Tapscott, 2000; Janssen and Sol, 2000). It will further accelerate the shift of power toward the customers, which will lead to perfect competition, and therefore reduce the overall profitability of the firms and the industry as a whole (Slywotzky, 2001; Porter, 2001).

2.2.1 Classification of E-commerce Models

There are seven types of business models where e-commerce is present (see Table 2) (Rayport and Jaworski, 2001; Kinder, 2002).

Business to Business and Business to Customer are the key models in most of the markets. Customer to Business and Customer to Customer are consumer-centered models. Customer-to-Business refers to cases where individuals are forming buyer groups for better bargains with online suppliers, e.g. online courses and travelling tickets. Customer-to-Customer refers to a community formed to pursue special interests where they exchange ideas, services and products as individuals. For example, tori.fi and different topic oriented forums. The last three groups refer to government transactions among businesses, other authorities and consumers.

However, some scholars include Business-to-Government into the Business-to-Business category. The government is associated with a business contractor. This research makes this assumption and includes B2G into the B2B category.

Table 2. Classifications of E-Commerce Models. (Rayport and Jaworski, 2001; Kinder, 2002)

Types of E-commerce Models	Description
B2B – Business-to-Business	Estimated about 75% of E- commerce
B2C – Business-to-Consumer	Mainly for home shopping, banking, on-line brokerage, travel.
C2B - Customer-to-Business	C2B refers to a group of individuals forming as a buyer group to transact activities with businesses, e.g. Marcata.com, voxcap.com
C2C - Consumer-to-Consumer	On-line community for research, sales or any other exchange, e.g. tori.fi
B2G – Business-to-Government	Tendering via E-commerce, Customs declaration
G2G – Government-to-Government	Electronic Government, On-line school, Global ICT planning and implementation
G2C – Government-to-Consumer	Electronic votes, Travel information Kiosk, Electronic licenses renewal

This study focuses on the first two models: B2B and B2C. The reason for this is that these two models have the greatest impact on the markets and, hence, on global trade.

2.2.2 E-commerce logistics

The growth of e-commerce has a profound impact on the traditional supply chains, where the informational and material flows were combined. In the case of e-commerce operations, the informational and material flows are divided but operated dependently. This changes the supply chain from a "push" to a "pull" process. The physical places where this change is feasible are the distribution centers or

warehouses. They were previously structured to handle large and prearranged shipments at fixed times to fixed delivery addresses. The key factor is now a direct delivery to the consumers (B2C) and, as such, the fulfilment of consumer requirements.

Now consumers are placing their individual orders which have to be processed directly by the distribution center. Due to this change, the number of orders in the distribution center has increased substantially. Moreover, each order usually consist of small amount of products, which in turn affects the overall order lines parameters.

2.2.3   E-fulfilment

In e-commerce, the distribution process is no longer just an efficient logistics operation, but also a means to support the expectations of the customer. The Internet gives an option to change the decision to the competitor's side quickly. Thus, it is important to meet the customers' expectations.

Thus, E-commerce is changing the commercial channel into a distribution center. As a result, reliable logistics services are more important than ever. Errors in the logistics process will have a direct impact on the consumer and later on any other follow-up purchases.

In order to meet consumer expectations, many supporting activities have to be implemented. These include services that add value to the products, control shipments or fulfil administrative duties. These services, generally referred to as "Value Added Logistics" (VAL) and "Value Added Services" (VAS), have already increasingly been implemented in the traditional distribution centers, particularly when it comes to international operations. Such a distribution center with a high level of VAL/VAS activities has been named a Logistics Service Centre. In e-commerce, however, the scope and intensity with which VAL and VAS are needed are of a different magnitude. The direct impact on customer satisfaction and sales performance is the main reason for this. The result is the emergence of an enhanced type of logistics service operation, called e-fulfilment. The e-fulfilment center distinguishes such additional processes in comparison to a basic distribution center and the traditional logistics service center where VAL and VAS have already been

implemented. The application receiving most of the attention for real-time enterprises is the supply chain. For example, Hermes Fulfilment, a company that provides E-fulfilment solutions for Russian consumers, has installed a real-time enterprise software package for real-time supply chain tracking. Hermes Fulfilment uses a real-time system from Yantra Inc. to move data across payment processing, authorization and settlement systems and trigger alerts if packages do not arrive at their destination as promised. In addition, this system provides an opportunity to follow the reverse supply chain direction.

2.2.4   E-commerce barriers

Complicated customs clearance procedures are general difficult to all international trade. However, they can be even more problematic for B2C e-commerce traders as they send many small consignments. These companies are often small businesses and, as a result, they are more sensitive to the customs clearance costs. Some companies have stated that customs procedures have contributed to their decisions not to enter certain markets.

According to DIST (2005), the factors that tend to inhibit the adoption of information and communication technologies in production include:

- Resistance from management

- Tight profit margins which make it difficult to fund investment in an IT infrastructure

- Lack of IT awareness

- Lack of employee education and training

- Degree of organizational change required

- A belief that the industry is doing well without IT

Corruption is a major problem in the international trade as well, often in relation to the customs procedures, and it relates to anything from bribery to the disappearance of items. An increasing number of businesses believe e-commerce to be particularly

sensitive to corruption, as it is often many small consignments that are shipped, which are easier to lose, and small e-commerce companies often do not have enough employees to follow up all the problems.

Lack of standards is generally viewed as an impediment to the traditional trade, and the same applies to e-commerce. This impedes the adoption of various online solutions and makes the use of e-invoices difficult.

2.3   Supply Chain and Warehouse Management

2.3.1   Supply Chain Management

Before globalization forced companies to design transportation technologies, countries produced most of what they consumed. Bairoch (1990) gives an example of a feasible impact of feasible (material) innovations on global trade. However, efficient Supply Chain Management is a nonmaterial way to increase the productivity of trading operations.

Keith Oliver first coined the term "supply chain management" in 1982 (Heckmann, Shorten, and Engel, 2003). However, the concept of a supply chain in management had been there long before. This started already with the creation of the assembly line. Back then, organizations paid attention to internal operations only. Therefore, the supply chain of that era needed changes towards the global approach as well as re-engineering and cost reduction programs. In decades since, SCM has received considerable attention, initially starting within the business community. From the early 1990s, academic research started following supply chains and tried to establish some theoretical structure (Chen and Paulraj 2004).

The definition of Supply Chain Management according to Harald (1996) is the management of a network of interconnected businesses involved in the ultimate provision of product and service packages required by end-customers. The companies or organizations that participate in the supply chain are "linked" together through material and information flows. Material flow involves the transformation, movement and storage of goods and materials. Information flow allows the various

supply chain partners to coordinate their long-term plans and to control the day-to-day flow of goods and material up and down the supply chain (Handfield, 2011). Figure 3 shows the five basic components of SCM.

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PLAN  >  DEVELOP  >  MAKE  >  DELIVER  >  RETURN
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FIGURE 3. Five basic components of Supply Chain Management

Plan. A plan or strategy must be developed to design the way a given good or service will meet customers' requirements. A significant portion of the strategy should focus on planning a profitable supply chain.

This is the strategic portion of SCM. Companies need a strategy for managing all the resources that go toward meeting customer demand for their product or service. A big piece of SCM planning is developing a set of metrics to monitor the supply chain so that it is efficient, costs less and delivers high quality and value to customers.

Develop. It involves building a tight relationship with key suppliers. This phase involves not only identifying reliable suppliers but also planning methods for shipping, delivery, and payment.

Companies must choose suppliers to deliver the goods and services they need to create their product. Therefore, supply chain managers must develop a set of pricing, delivery and payment processes with suppliers and create metrics for monitoring and improving the relationships. And then, SCM managers can put together processes for managing their goods and services inventory, including receiving and verifying shipments, transferring them to the manufacturing facilities and authorizing supplier payments.

Make. At the third stage, product is manufactured, tested, packaged, and scheduled for delivery. This is the manufacturing step. Supply chain managers schedule the

activities necessary for production, testing, packaging and preparation for delivery. This is the most metric-intensive portion of the supply chain - one where companies are able to measure quality levels, production output and worker productivity.

Deliver. Then, at the logistics phase, customer orders are received and delivery of the goods is planned. This fourth stage of supply chain management stage is aptly named deliver.

This is the part that many SCM insiders refer to as logistics, where companies coordinate the receipt of orders from customers, develop a network of warehouses, pick carriers to get products to customers and set up an invoicing system to receive payments.

Return. During this stage, customers may return defective products. The company will also address customer questions in this stage.

This can be a problematic part of the supply chain for many companies. Supply chain planners have to create a responsive and flexible network for receiving defective and excess products back from their customers and supporting customers who have problems with delivered products.

A main issue that supply chains tries to solve is that these basic components from different organizations have to work together smoothly. Many organizations in a supply chain have their own objectives and these are often conflicting. Supply chain management is a strategy through which different functions along the supply chain can be integrated.

The purpose of SCM is to coordinate the activities of various players in the chain. According to Cooper and Ellram (1993), a supply chain management is a well-balanced and well-practiced relay team. Such a team is more competitive when each player knows how to be positioned for better overall performance.

To ensure that the supply chain is operating as efficient as possible and generating the highest level of customer satisfaction at the lowest cost, companies have adopted Supply Chain Management processes and associated technology. Supply

Chain Management has three levels of activities that different parts of the company will focus on:

- strategic
- tactical
- operational

Strategic. At this level, company management will be looking to high level strategic decisions concerning the whole organization, such as the size and location of manufacturing sites, partnerships with suppliers, products to be manufactured and sales markets.

Strategic activities include building relationships with suppliers and customers, and integrating information technology (IT) within the supply chain.

Tactical. Tactical decisions focus on adopting measures that will produce cost benefits such as using industry best practices, developing a purchasing strategy with favored suppliers, working with logistics companies to develop cost effect transportation and developing warehouse strategies to reduce the cost of storing inventory.

Benchmarking and making decisions regarding production and delivery would fall under the tactical category.

Operational. Decisions at this level are made each day in businesses that affect how the products move along the supply chain. Operational decisions involve making schedule changes to production, purchasing agreements with suppliers, taking orders from customers and moving products in the warehouse. The operational category includes the daily management of the supply chain, including the making of production schedules.

Entering into a new era, SCM is in a need for IT solutions for supporting decision-making on each level.

For operational decisions, the system must be able to handle day-to-day transactions and e-commerce. Across the supply chain and provide instant information on orders and daily scheduling.

For mid-term decisions, the system must facilitate planning and decision making, supporting the demand and shipment planning and master production scheduling needed to allocate resources efficiently.

For strategic value, the system must provide tools, such as an integrated supply chain network model, that synthesize data for use in high-level "what-if" scenario planning to help managers evaluate plants, distribution centers, suppliers, and third-party service alternatives.

2.3.2 Supply Chain Innovation

As the SCM matures and markets become more global, innovations in this industry are becoming more challenging. Nevertheless, there are several successful examples of multi-national corporations that gain benefits and maintain their competitive edge due to efficient SCMs. Some representatives of industry practitioners include Procter & Gamble (P&G), Wal-Mart, Coca-Cola, Hewlett Packard, Cisco, IBM. The market for SCM keeps growing due to the mergers among corporations, new e- commerce virtual enterprises, change/expansion in company focus, new customer demands and global competition (Wailgum, 2007).

The necessity to reengineer these issues was relieved by implementing ICT solutions. Electronic Data Interchange (EDI) is the computer-to-computer exchange of business documents in a standard electronic format between business partners.

Computer-to-computer— EDI replaces postal mail, fax and email. While email is also an electronic approach, the documents exchanged via email must still be handled by people rather than computers. Having people involved slows down the processing of the documents and introduces errors. Instead, EDI documents can flow straight through to the appropriate application on the receiver's computer and processing can begin immediately. A typical manual process showed on Figure 4, with lots of paper and people involvement.
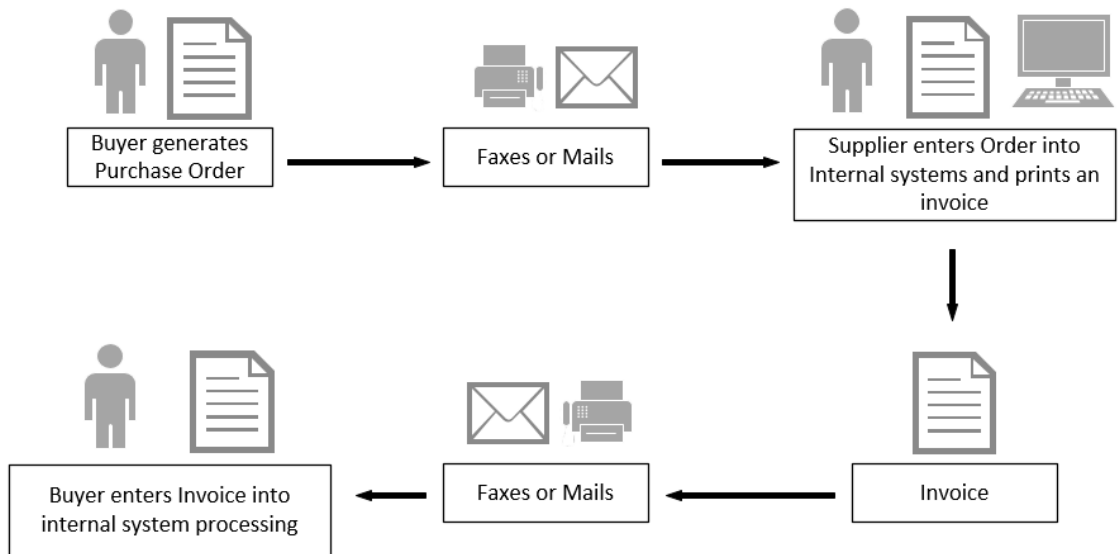
FIGURE 4. Manual EDI Document Exchange (Source: OpenText GXS)

Figure 5 shows the EDI process — no paper, no people involved
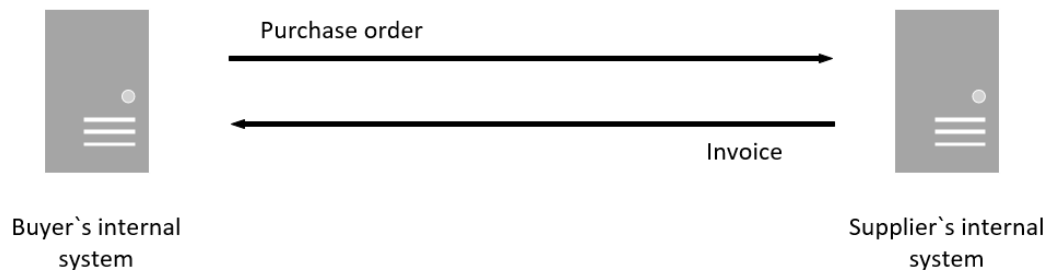
FIGURE 5. EDI Document Exchange (Source: OpenText GXS)

The most common documents exchanged via EDI are purchase orders, invoices and advance ship notices. Because computers must process EDI documents rather than humans, a standard format should be implemented, so that different platforms could exchange information flawlessly. There are several EDI standards in use today, including ANSI, EDIFACT, TRADACOMS and XML. The most common standard is XML, where XML stands for Extensible Markup Language. Main function of XML was

described above. However, XML supports extra features, such as encoding and translation of data. Additionally, XML standard supports less sophisticated, Internet based applications. This feature is great for smaller companies, who cannot afford complete EDI solutions.

Chabrow (2000) gives several interesting examples of how supply chains are working at global level by using a mixture of EDI and XML technologies. A specific example is the Lucent Technologies Microelectronics Group`s supply chain system that could deliver silicon chips halfway around the world in 2 days. This SCM was developed in collaboration with DHL – a global shipping company. Another example is the Stride Rite Corp., a $573 million retailer of athletic and casual footwear. This SCM cut by a third the time it takes to ship shoes from Asia to its distribution center in Louisiana, Kentucky. The retailer also cut its transportation cost by 30% and inventory turnaround time by 25%. Thus, less money is tied up in inventory and is freed up for other purposes. This was accomplished by using an Internet-based package that uses XML for overseas dealers. This supply chain management system keeps track of shipments and assembly operations from China to the warehouse in Lexington, Massachusetts.

The main characteristics of these global supply chain systems are:

- Web-based viewing and manipulation of information at all stages in the supply chain
- Heavy use of EDI technology between established large scale trading partners
- Use of XML to exchange data between less technologically sophisticated overseas partners that lack the resources to handle EDI

Another challenge for modern supply chain management is the omni-channel approach. Channels represent the ways of interaction between supplier and customer. Omni-channel approach might be used in several areas within the company. For example, in marketing, distribution or retail. However, the concept of this approach in customer oriented. Customer experiences services from different channels as one.

Figure 6 shows the different types of channeling.
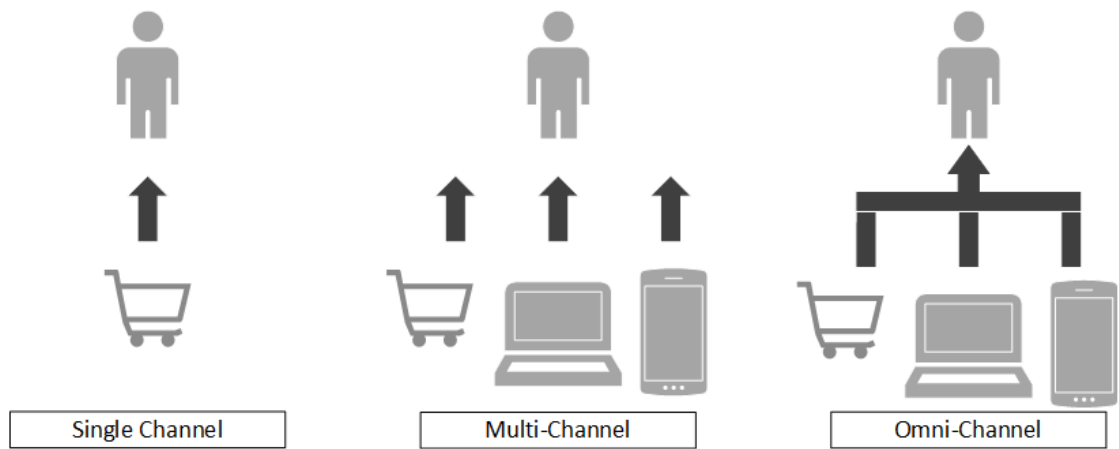
FIGURE 6. Example of channeling.

The great example would be an Aliexpress. Aliexpress is a Chinese analog of Amazon. Chinese manufactures and sellers are using this platform to find and sell their products abroad. Recently, Aliexpress launched mobile application with the same sets of tools as on the website, e.g. ordering, tracking, and customer service. Basically, there are two channels, however customers feel that he is just using Aliexpress`s services.

2.3.3   Warehouse management and Innovation

Warehousing history begins from the establishment of sea trade routes between Europe and other continents. Increasing amount of trading commodities required to build storing facilities. Later with the invention of steam powered trains, warehouses infiltrated deeper into the continent.

Twentieth century was crucial period in warehousing development. In late 20s and early 30s, first pallet was introduced. Later in 50s when, mass-production of forklifts started, pallets became essential in transportation and handling operations. In the end of the century, warehouse management systems helped to abandon paper-intensive warehouse coordination. Instead, IT solutions started performing these activities. Computer based solutions help to optimize full spectrum of warehouse

operations. In turn, it allowed to adjust to fluctuation in demand and to prepare for future changes.

Today there is a huge demand for logistics facilities and handling operations. Even though, demand is variable, this issue worth examining in the e-commerce context. Because, the e-commerce outcomes are pushing existing warehouse operations to its limits.

E-commerce business models that were analyzed in the E-commerce part of the report are varying in size of operations, product focus, and product value and retailer model. These business dimensions affect on which facility types and locations are required. As individual customer requirements evolve, consistent patterns are emerging. Requirements generally fall into one of four buckets, including:

Combined operations. At the outset, e-commerce fulfillment is a modest operation. The size and growth of the concept is only in its early stages. The requirement can reside alongside in-store distribution within a single logistics facility, leveraging existing supply chain investments. However, combined operations are an ad hoc approach that typically does not scale well as the e-commerce fulfillment requirement expands. For pure-play online retailers, the early-stage requirement typically takes the form of leased space within multitenant facilities.

Shared facilities. As demand grows, e-commerce fulfillment can become cumbersome and expensive within small and shared facilities. Many 3PLs bring existing physical infrastructure and have the specialized capabilities to grow the e-commerce fulfillment requirement.

Dedicated facilities. Once the e-commerce requirement reaches scale, fulfillment may require one or multiple dedicated facilities. Initially, a single fulfillment center may serve, often in centralized locations. Retailers using this model recognize that online fulfillment and distribution to stores have distinct needs and challenges. This strategy is particularly relevant for midsize and larger retailers, who have the scale to separate stand-alone in-store distribution and online fulfillment.

Distributed fulfillment. As the e-commerce concept grows, and fulfillment requirements increase, multiple facilities are needed. At this scale, retailers pursue a disseminated fulfillment strategy, using multiple facilities and locating closer to their customers, such as we see today with larger retailers. The benefits of this approach are faster delivery times, more responsive service and lower transportation costs. Alibaba, biggest Chinese e-commerce player, is searching for storage in Russian facilities. In order to deliver bestseller in the same region in shorter time. (Korotkin and Hachataryan, 2015).

In the former, where purchased items are typically distributed via a postal or parcel network, e-commerce logistics models have led to a wave of new demand for three distinct types of logistics facilities:

- Mega e-fulfillment centers where the merchandise is stocked and picked at item level. These facilities, which are either operated by the retailer or a logistics service provider.
- Parcel hub/sortation centers which sort orders
- Parcel delivery centers which handle the 'last mile' delivery to the customer (R-kioski, Matkahulto)

The products can no longer be stored on pallets, but are mostly kept in crates or boxes, or on shelves. The products must be readily accessible for order picking, so a floor location is preferred above storage in racks. The result is a strong reduction in the stock density, compared to traditional storage solutions.

3   Literature Analysis

The literature review is an important part of the qualitative research. In the previous chapter, theoretical basis provided an understanding of research topic development. The literature analysis is supporting the induction method approach. It helps to identify patterns in the data. The data for the literature review was collected using search engines for scholars. For example, *nelliportaali.fi* and *scholar.google.com*. In addition, articles from well-known publishers, such as Forbes, New York Times,

Bloomberg etc. were reviewed. Searched conducted in two languages English and Russian.

Following keywords were used to get find relevant literature:

- E-commerce
- Logistics
- E-commerce in International Trade
- E-commerce barriers
- Supply Chain Management
- E-business
- Warehouse innovations
- Etc.

The analysis was performed according to J.L. Galvan`s (2006) guideline featured in his book *"Writing literature reviews".* Main points of the guideline are following:

- Group the articles by categories.
- Take detailed notes on each article. Using the same format for all articles.
  - In this research format consisted of following notes:
    - Article title
    - Authors' names
    - Publication year
    - Main point of article
- Look for explicit definitions of key terms.
- Look for key statistics.
- Look for methodological strengths and weaknesses.
- Distinguish between an author's assertions and evidence in support of the assertions.
- Identify relationships among studies.
- Note how closely each article relates to the topic.

The list of researched literature with notes shown in Appendix 1.

The analysis of the literature synthesized the review into several topics. These topics form the essence of the theory development. Many articles related to e-commerce study modern barriers, that the businesses meet. The Swedish National Board of Trade studied the issues related to e-commerce activity of non-EU countries. Mainly their outcomes were focused on the Government influence in E-commerce activities. Identified risks associated with the lack of information, focuses on the authorities.

> *…lack of transparency in the information provided by the authorities in each of these countries with regard to the labelling of products and the rules of consumer information…*

E-commerce is pushing authorities to design regulations that will help to dissolve barriers for material and informational flows.

There is an evidence that E-commerce is shaping supply chain operations of many organizations. In the B2C sector, delivery companies are demonstrating new shipping options. UPS and Royal Mail introduced the Sunday Delivery option in the selected areas, in order to fulfill the demand on online shopping. Another trend appearing across several articles emphasized the role of global corporations in implementing new solutions. Oliver Wyman, business-consulting firm, provided statistics on international organization that launched the "same-day" delivery service.

In B2B sector, the delivery options are revised as well. Rolling warehouse is a solution that is described by Lee and Whang (2001). Making changes to order without delivery time restrains, achieved by refraining from specifying quantities in advance. Thus, product on the truck are not pre-assigned to a destination. Decision is postponed to the time of unloading. Since material flow is more expensive, substituting it with informational flow is generally good idea.

E-fulfilment is the next activity, that has its influence. Increasing demand and customer's expectations are resulting development of mega e-fulfillment centers and sorting centers. These new centers will implement new automation solutions, which decreases the pick to order time and mistake probability.

4   Interviews

Interviews are the primary data collecting technique in qualitative research. In order to provide an overview on the current situation in researched topic, the researcher interviewed several logistics, production and retail companies.
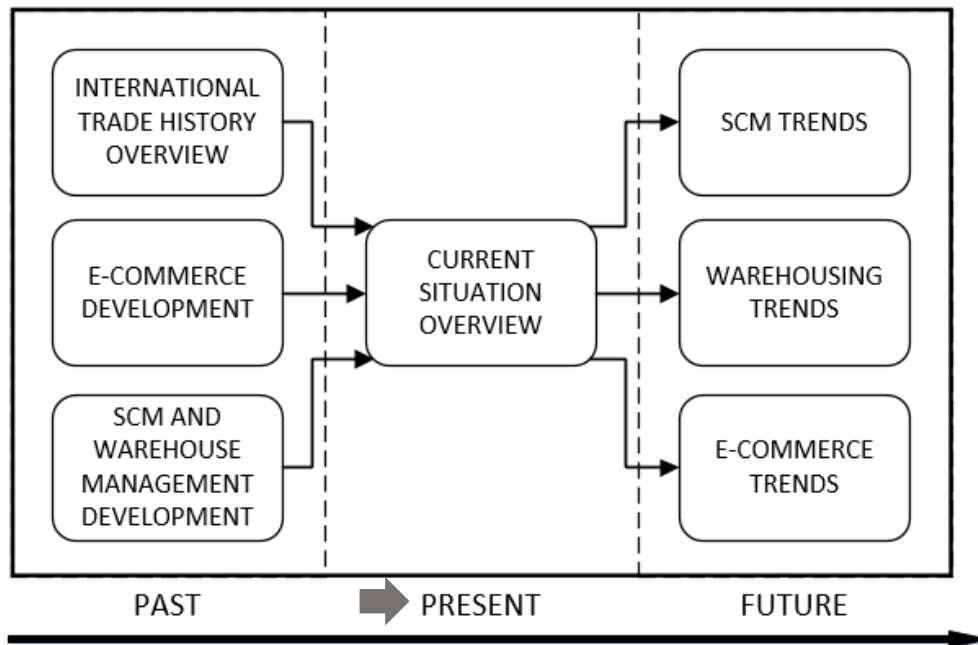
FIGURE 7. Current situation is analyzed.

Interviews are supporting outcomes of the literature review, by investigating current situation in Supply Chain Management and Warehouse Management. In addition, interviews help to foresee future trends.

In the following chapter different types of interviewing models presented, preparation discussed and interviews analysis done.

4.1.1   Qualitative interview types

There are three main types of interviews, which supports qualitative research method:

- Structured
- Semi-structured
- Unstructured

Structured interviews consist of a set of questions prepared in advance. Data collected by conducting this type of interview is assumed with high level of validity. Each interviewee is asked the same sets of questions, and therefore, there are fewer chances for favoritisms or prejudices. (Cohen, 2006).

Unstructured interviews do not have any pre-determined specific direction. This type of interview usually is conducted in an informal manner. However, there is a great potential for bias, and therefore this type of interviews lack reliability from research perspectives. Nevertheless, data collected through unstructured interview from the respected source, may provide a great insight. (Rubin, 2005; Cohen, 2006) The importance is on obtaining thorough knowledge and authenticity of personal experiences (Gubrium and Holstein, 2001).

Semi-structured interviews combine both, structured and unstructured interviews elements. Interviewer needs to prepare main questions in advance, to cover necessary topics during the interview. However, follow-up questions can be asked in interviews in order to clarify some points stated by interviewees, or to clarify any other related points. (Rubin, 2005; Cohen, 2006) This type of interview allows for the exploration of up-and-coming topics and ideas rather than relying on guidelines and questions defined in advance.

4.1.2   Preparation

Study required latest data to the researched topic in addition to the knowledge and experience of development. Based on these objectives, **semi-structured** and **unstructured** interviews were selected.

Certain pattern has emerged from literature review. Nevertheless, interviews were prepared and conducted in a way to avoid any biases. As Miles and Huberman (1994) point out:

> *From the beginning of data collection, the qualitative analyst is beginning to decide what things mean, noting regularities, patterns, explanations, possible configurations, causal flows and propositions. The competent researcher holds these conclusions*

> *lightly, maintaining openness and skepticism, but the conclusions*
> *are still there, inchoate and vague at first then increasingly explicit*
> *and grounded.*

According to Bernard (1988), the interviewer should have a paper-based interview guide that he or she follows. Since semi-structured interviews often contain open-ended questions and discussions may diverge from the interview guide, it is generally best to tape-record interviews and later transcript these tapes for analysis. (Bernard 1988)

Based on the literature review outcomes the guideline with main questions was developed (see Appendix 2). This guideline helps to stay on the main topic during the interview. In addition, there is space for follow-up questions notes and pre-determined answers for easing the interviewing process. The guideline was developed according to the Cohen`s (2006) vision:

> *The inclusion of open-ended questions and training of interviewers*
> *to follow relevant topics that may stray from the interview guide*
> *does, however, still provide the opportunity for identifying new*
> *ways of seeing and understanding the topic at hand.*

In the beginning, it was assumed that the interviews would be held in a video format with the representatives of international companies such as DB Schenker, Maersk. However, there were issues contacting representatives and receiving feedback.

Due to time and travel limitations, interviews were performed in a way to dodge those issues. In addition, Beiske (2007) warns that semi-structured interviews are best when you have only one opportunity to have an interview. Therefore, it was decided that the best solution is to visit professional exhibitions, where companies represent themselves. Such fairs are great place for gathering data because companies come there for benchmarking and sharing their future perspectives with the customers. In addition, during fairs, representatives are more open to the interviews.

Two venues were selected:

- Transportation Logistics Fair "Logistiikka – Kuljetus 2015" in Helsinki held between 11-13.06.2015
- Production, Import and Export Fair "Международная специализированная выставка «Импортозамещение» (International Specialized fair «Import substitution») in Moscow held between 15-17.09.2015

Before each event, short list of potential interviewee companies was prepared. In the next section it is discussed how the selection process was completed.

4.1.3 Interviewee selection

To ensure that interviews supported the literature outcomes without biases, it was important to develop credible interviews. According to Rubin (2005), the key for conducting credible interviews is to find **experienced** and **knowledgeable** interviewees. First-hand expertise and the reputation are the essence for experienced interviewees. Cases of the innovative operations and successful examples of implementing new solutions that affect the industry evidence the level of knowledge of the interviewee. Main requirement of this research was that interviewees ought to be supply chain participants. Thus, companies were chosen according to their participation in supply chain.

In order to expedite the selection process of suitable interviewees, following guide was created (see Figure 8).
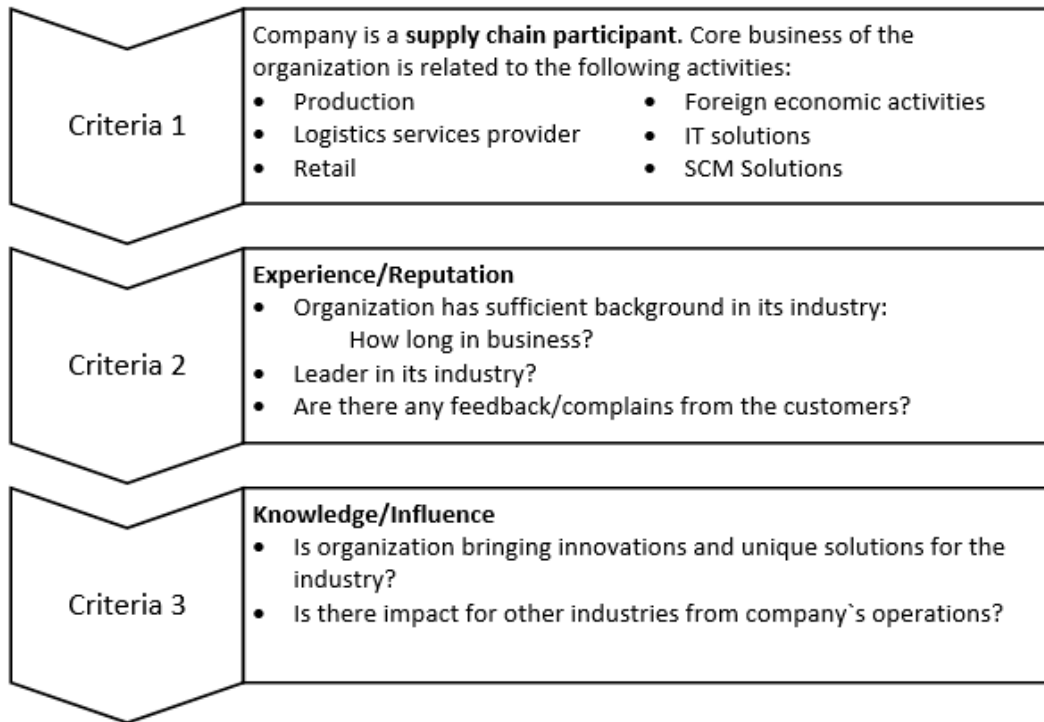
FIGURE 8. Interviewee selection guide.

The lists of exhibitors from the official exhibition website were analyzed using the selection guide. Following Table 3 shows the shortlist of suitable companies. List was compiled by decreasing the attractiveness of the companies. Information about the companies was collected through open sources.

Table 3. Short List of companies from two exhibitions.

No.	Company	Description
1	3PLogistiikka Group Oy	Logistics services provider
2	Ahola Transport Oy Ab	Transportation logistics
3	Blue Water Shipping Oy	Shipping
4	Constructor Finland Oy (Kasten)	Warehousing solutions
5	Dimex Oy	Professional clothing retail
6	eSend Finland Oy	Logistics Provider
7	Exclusive Logistics Finland Oy	City Delivery Solutions
8	GEFCO Baltic	Supply Chain Solutions
9	NFleet Oy	IT Solutions
10	Trimico Oy	IT solutions
11	United Parcel Service Finland Oy	Supply Chain Solutions
12	Vantaan Rahtikeskus Oy	Supply Chain Solutions
13	АВТОГАЗТРАНС, ООО (Avtogaztrans)	Liquid gas production and transportation
14	МЕТМАШ, ООО (Metmash)	Production
15	МТГ. БИЗНЕС-РЕШЕНИЯ, ООО (MTG. Business Solutions)	Consulting company, Supply Chain management
16	НАНОСОФТ (NanoSoft)	IT solutions
17	РИВ-ПАК (Riv-Pack)	Packaging Solutions
18	САНДВИК (Sandvick)	Service provider
19	ТЕПЛОСТАР, ООО (Teplostar)	Production
20	X5 Retail Group	Retail

Number of interviews effects reliability as well. According to Beizke (2007), 10 to 15 semi-structured interviews are enough for a phenomenality research.

4.1.4 Conducting interviews

Cohen (2006) agrees that semi-structure interviews can provide reliable, comparable qualitative data. Besides, aim of the semi-structured is to let informants express their views in their own terms.

The following three conditions of valid research interviews as specified by Hutchinson (2007) were met during semi-structured interviews:

- Interviewer should have an open mind. Even if the interviewer does not agree with interviewee he/she should stay objective and should not display disagreement with the personal opinions of interviewees regarding the research questions.
- Interviewers should ask questions effectively. Any questions should be avoided that could lead interviewees to specific answers
- The timing and environment for the interview should be effective. Interviews should be conducted in relaxed environment, and interviewees should be free of any kind of pressure whatsoever.

Before each interview, the researcher introduced himself to the interviewee and told about his research. The permission to record the interview was asked each interviewee due to ethic reasons. However, not all company representatives agreed to be recorded. In addition, the guideline of the interview was presented in order to ease the interview process. Some representatives even filled the guideline themselves. Overall, the interviewing process went well during both exhibitions. Interviews were conducted in an informal manner, so that the representatives and the researcher felt comfortable.

During the first exhibition in Helsinki, nine companies from the short list were interviewed. From the second exhibition, five companies were interviewed. See the Table 4 for the full list. Most of the representatives were open to the interview.

Nevertheless, some interviews were quick and capacious and some were a little lasting.

Table 4. List of interviewed companies.

No.	Company	Description
1	3PLogistiikka Group Oy	Logistics services provider
2	Blue Water Shipping Oy	Shipping
3	Constructor Finland Oy (Kasten)	Warehousing solutions
4	eSend Finland Oy	Logistics Provider
5	GEFCO Baltic	Shipping/Supply Chain Solutions
6	NFleet Oy	IT Solutions
7	Trimico Oy	IT solutions
8	United Parcel Service Finland Oy	Supply Chain Solutions
9	Vantaan Rahtikeskus Oy	Supply Chain Solutions
10	АВТОГАЗТРАНС, ООО (Avtogaztrans)	Liquid gas production and transportation
11	МЕТМАШ, ООО (Metmash)	Production
12	МТГ. БИЗНЕС-РЕШЕНИЯ, ООО (MTG. Business Solutions)	Consulting company, Supply Chain management
13	РИВ-ПАК (Riv-Pack)	Packaging Solutions
14	САНДВИК (Sandvick)	Service provider
15	Rostek North East	Warehousing
16	Vetna Ltd	Wholesaler/ Retail

Both exhibitions were attended on the second day of opening. Unfortunately, some of the companies did not exhibit on the second day. Some companies were hard to

find due to the size of both events. However, in addition to the semi-structured interviews, two unstructured interviews were conducted. Both of the companies are previous practical training placements for the researcher. Nevertheless, both companies fulfill the selection criteria. Rostek North-East is a customs service provider for importers and exporters. The company has rich experience in warehousing and supply chain management. Second company, Vetna Ltd is the biggest pet retaier in the Ural area in Russia. Company has more than 20 years of experience in retail. Today company is heavily investing into warehouse automation technologies and e-commerce.

Overall interviewing goals were achieved. Appendix 3 displays the list of interviewed representatives. Appendix 4 shows the transcript some of the interviews.

4.1.5   Analysis of interviews

Qualitative comparative analysis along with constant comparison analysis were used to examine the interview data.

Table 5. Description of implemented analysis of the interviews (Leech and Onwuegbuzie, 2008)

No.	Type of Analysis	Short Description
1	**Constant comparison analysis**	Systematically reducing sources to codes inductively, and then developing themes from the codes. These themes may become headings and subheadings in the literature review section.
2	**Qualitative comparative analysis**	Systematically analyzing similarities and differences across sources, typically being used as a theory-building approach, allowing the reviewer to make connections among previously built categories, as well as to test and to develop the categories further.

Interviewing analysis process based on the framework, described by Dr. John Schulz from the University of Southampton. Framework includes five stages. Figure 9 describes the adapted process of interview analysis.
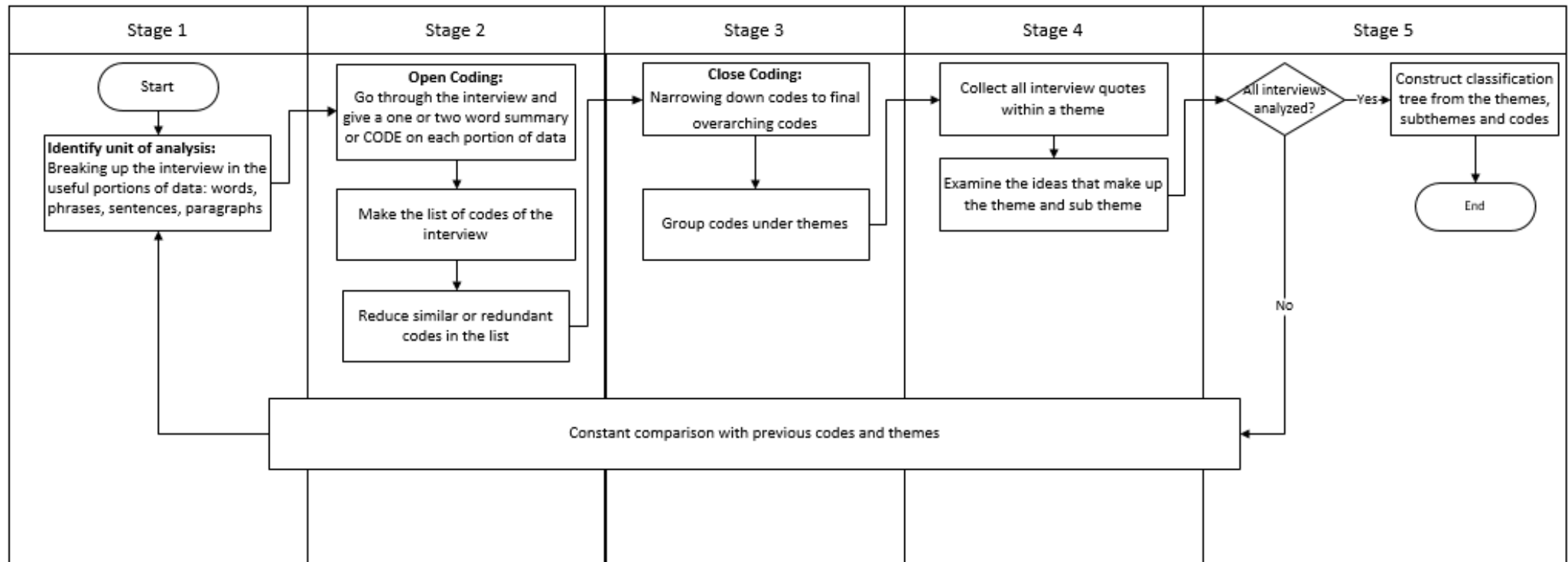
Stage 1	Stage 2	Stage 3	Stage 4	Stage 5

Start

Identify unit of analysis:
Breaking up the interview in the useful portions of data: words, phrases, sentences, paragraphs

Open Coding:
Go through the interview and give a one or two word summary or CODE on each portion of data

Make the list of codes of the interview

Reduce similar or redundant codes in the list

Close Coding:
Narrowing down codes to final overarching codes

Group codes under themes

Collect all interview quotes within a theme

Examine the ideas that make up the theme and sub theme

All interviews analyzed? —Yes→

Construct classification tree from the themes, subthemes and codes

End

No

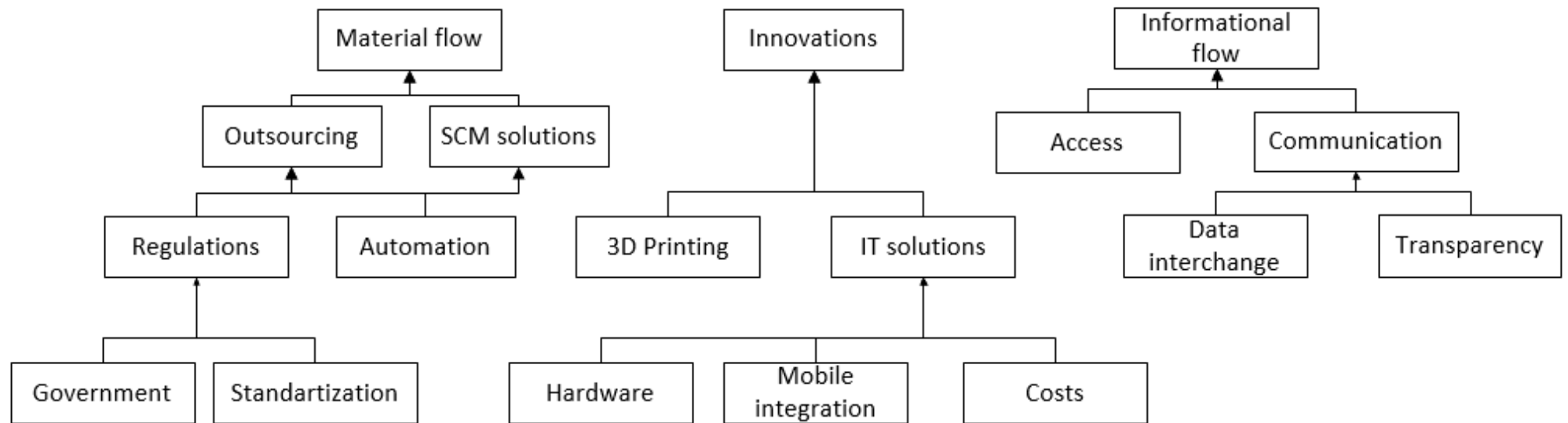Constant comparison with previous codes and themes

FIGURE 9. Interview data analysis process map

Product of interview analysis is the classification tree, shown on Figure 10.

FIGURE 10. Analysis Classification Tree

Interview data analysis was performed using the qualitative analysis techniques. Result of data analysis is the classification tree. Classification tree was organized in a way that the lower categories support the upper ones. Data analysis represented in three main themes:

- Material flow
- Innovations
- Informational flow

Material flow. Outsourcing and SCM solutions are subcategories of the material flow. Many companies stated that in order to optimize their operations, they outsourced some of them. For example, Blue Water Shipping Oy has subcontracted warehouse operations to a partner with bigger facilities. It allowed them to increase the amount shipments that they could not handle before. However, this measure is increasing the stress on existing SCM. Due to new participants in supply chain, management requires solutions to control material flow. Great solution is automation. Most of the interviewees noticed that they are looking forward to see cheaper warehouse automation solutions in the near future.

Government importance and international standardization are supporting Regulation category. Companies do not have big concerns regarding government regulation. Since all regulations are the same for competitors. However, companies are eager to take part in refining standards in the industry. For example, Riv-Pack, the packaging producer, was interested in the improvement of Russian packages standards. The interviewee said that their production technologies are on the European level, thus they have an experience to share.

Innovations. This theme includes the elements of material flow and informational flow. Companies see IT solution as necessity to run operations smoothly. It is recognized that hardware is increasing the speed and the range of data. Trimico Oy representative claimed that smartphones are the easiest way to bring innovation to the small companies. However, costs of implementation is still a stumbling stone. An

unexpected theme was 3D printing. Ironically, few interviewees predicted that 3D printing technology could damage logistics industry.

Informational flow. Main parts of this topic are Access and Communication. Under the Access subtheme, the problem of the information availability is reviewed. Representatives from Vantaan Rahtikeskus Oy claimed that it was common that information is not at the right time at the right place. In addition, some might have access to unnecessary information that floods the working process. For instance, current e-mail system provides huge amount of messages daily. There is a big chance that the important information will be missed.

Communication subtheme discusses similar topic. However, the accent is on the data itself. New technologies are providing new solutions for data interchange. Computers are interacting between each other without human involvement. The director of Vetna Ltd, noticed that their partners do not share much information with transportation companies, which leads to misunderstanding and delays. Information flow transparency may solve this issue. Because it will lead to the transparency of the systems. Which leads to greater information interchange and optimization of operations.

The researcher tried to stay unbiased during the interviewing. However, after each interview there were different impressions. Thus, when analyzing the interview data using constant comparative analysis researcher was under the influence of those impressions. Therefore, in the analysis process some interviews unwillingly been better handled.

5   Results

Main goal for businesses stays the same: generate profit. Many companies still think that IT solution is something expensive and not much useful. However, costs of technologies are dropping rapidly. Thus, there is a positive shift related to IT solutions implementation. Fortunately, there are pioneers that take risks and bring innovation to the market. Industry leading companies have huge resources to experiment on different concepts. For instance, Amazon have presented their idea

on delivering parcels using drones. However, innovative companies are not necessarily industry leaders. Kiva systems, recently acquired by Amazon, introduced the robotic solution for order picking operations.

Another trend in the industry is to stick to the company`s core business and outsource other operations. Companies can focus on bringing innovations to their part of the supply chain. However, the issue of communications rises. Many representatives are complaining that customers or suppliers are intentionally hiding non-precious information. Representative of Trimico Oy, the IT solutions provider for transportation logistics says:

> *…Subcontractors don't get the full information. If they would get more information, subcontractors could optimize their operations…*

Today companies are generating lot of data, however only few know how to handle it. This ability brings them the competitive edge. The UPS representative described their Supplier Management System increases their competitiveness:

> *…It is called suppliers management and that includes software on different levels, where you can integrate customers on how they want to react with suppliers through us…*

Still many barriers need to be overcome, in order to bring innovations to the mass. However, the biggest problem is seeming to be in people themselves. Employee are getting used to handle operations in certain manner. Which makes them incapable to comprehend new ideas. For example, interviewee from MTG Business Solutions confessed, most of their client looking for solutions based on the existing operations. Motivating it, that it is expensive to teach employees. It makes companies very careful, when decide on fulfilling new solutions to the businesses. Technologies may have dropped the price; however, implementation is still costly.

6 Discussion

There are three major outcomes from the literature review.

- E-commerce has increased the material flow in international trade
- SCM has to consider e-commerce, by implementing IT solutions for each level of activity (strategic, operational, and tactical)
- E-commerce has a tangible influence on warehouse operations

E-commerce is a product of Internet revolution. E-commerce is an inevitable modernization of current business models. It is changing traditional supply chain and bringing omni-channel approach for customers.

In 2014 Amazon and Alibaba have generated 88.99 billion U.S. dollars and 12.29 billion U.S. dollars net revenue respectively. Finland has GDP of 267.3 billion US dollars in 2013 according to World Bank. Which means that two major e-commerce corporations earned 4,5% of Finnish GDP.

That means that the e-commerce is increasing the pressure on logistics operations. Especially on warehousing.

According to Annunziata (2013) there were two major waves of innovation: Industrial Revolution about 1760-1903 and Internet Revolution between 1980 and 2000. Means of delivering information has changed and are changing rapidly. Today customers want to control the process of delivery and manufacturing. However, current systems allow doing so. During the Industrial Revolution, the concepts of manufacturing were introduced. Obviously, Industrial Revolution had a major effect on the material flow of that time. However, we should not forget that before that there was revolution in informational flow, when Johannes Gutenberg first introduced paper press in the West. The press allowed printing 3600 pages per day (Wolf, 1974). This innovation is rated as the most influential in second millennium (A&E, 1999).

According to Moore`s Law (1965) each two years the capacity and the performance of electronic computing machine will increase twice. Indeed, from 1975 to 2012 the law did work. However, since 2010 the pace started to decline. And in 2015 Gordon Moore predicted the that in the next decade the Moore`s law will slowly decease.

Gordon Moore described the trend of his time back in 1965. Today trend is different; however, pattern stays the same. Judging the outcomes of the research, there is a certain pattern that is emerging. Informational and material flows are bind together. However, they are developing according to certain form even though their catalyst factors might be different or same.

Result of the research is a theory, which explains the links of the past, present and the future development of researched topic.

With introduction of innovative technology, the first to change is informational flow, material flow changes later. Alternatively, there is a rotation of the effect from innovations.

Today we are probably living in the era of another most influential innovation of our millennium. The Internet Revolution had a major impact on informational flow in the world.
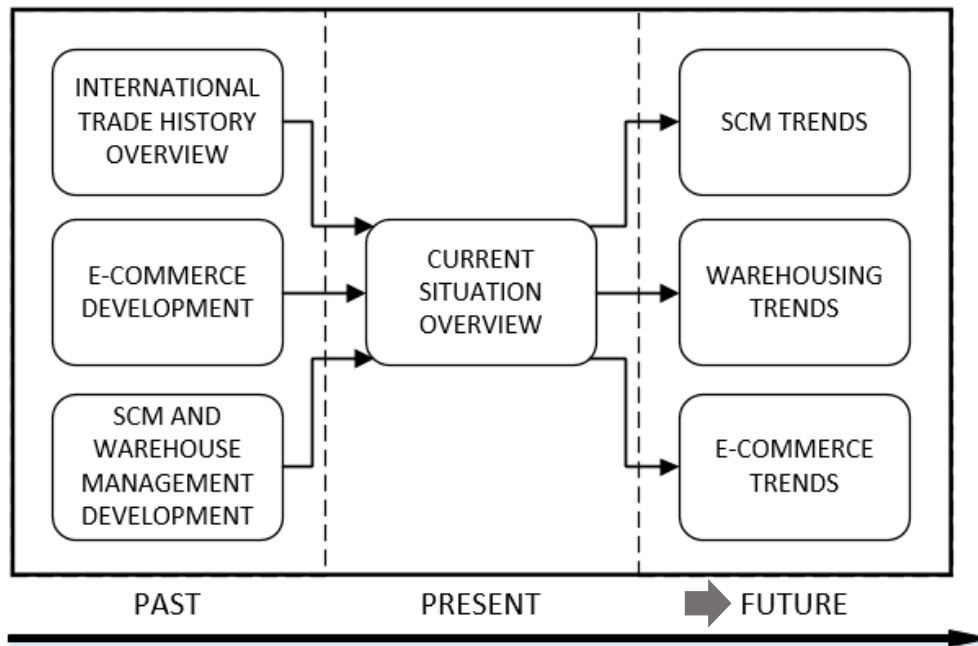
FIGURE 11. Trends are predicted.

E-commerce depends on the Internet. Thus, the future growth of e-commerce is based on the development of the internet. Next milestone in internet progress is its worldwide expansion. Leaders of the industry such as Google and Amazon has introduced their projects for internet spreading out. E-commerce will implement the hardware solutions as well. The most promising is 3D printing. Once customer has 3D printer in its facilities, the material flow will narrow down to supplying raw material.

Supply Chain Management however has many options to change as well as obstacles to face. Interviews showed that people are used to performed operations the way they did all the time. However, implementing IT solutions on the deep level can provide proactive and preventive approach. Systems have capacities to perform big calculations in minutes. Based on the results people can make decisions. However, in the future systems will be able to communicate, discuss and make decisions between each other. Nevertheless, people still have to perform as creators to teach those systems.

Warehousing however, most probably will not need any human assistant. Today there are already automation processes present in the warehouse. Nonetheless, the trend will continue to grow in this direction. Today it is common to store goods in automated storages. Technologies are helping to save the space. In the future,

robotic solutions will be implemented. There are many sets of different sensors that already in use for automations. The next milestone for warehousing is to implement the identification system, which can work autonomously, without human's interference.

The research forecasts that next Revolution will influence the material flow. Most promising example is 3D printing.

7 Conclusion

The study researched the influence of e-commerce in international trade on supply chain and warehouse management. In order to study this phenomenon, inductive approach and qualitative method were implemented. However, according to inductive approach, the study was performed on specific phenomenon. The outcome is general concept, pattern. Through this pattern, it is possible to answer the research questions.

I.   What is the influence of e-commerce on international trade?
- E-commerce provided an opportunity to expand the markets for SME at a low cost.
- However new barriers are emerging. Main issues are related to the interaction with authorities.
- Delivering and sharing information with a click of a mouse is putting pressure to the logistics activities. In turn, it affects the international trade regulations. For example, new solutions for customs clearance.

II.   Can E-commerce managerial skills bring competitive advantage?
- Definite answer is yes. Supply chain managers should understand the new principals that are emerging. For example, customers are becoming more fastidious. Thus, those companies, who can manage both material and informational flow to satisfy their customers, are better off.

III. What is the effect of E-commerce on global supply chain?
- Each company has its own supply chain. However, e-commerce set a trend for outsourcing activities for 3PL. The main reasons of that is the development of material flow. Increasing demand and decreasing lead-time lead for the need

of new solutions in supply chain. New, bigger facilities, automated processed are the solutions, which require investments. Consequently, only big companies, whose core activity is logistics, supply chain, can implement whose solution.

IV. What is the effect of E-commerce on supply chain management and warehouse operations?

- Warehouse operations are on the verge of huge development. As warehousing represents the material flow, it`s changes are inevitable. New mega e-fulfillment center, e-commerce hubs are the future of warehousing.

Nowadays, we are witnessing the effect of Internet revolution in many businesses. Access and ability to share information instantly are game changing parameters that burden existing supply chain operations. In turn, it stimulates innovations and optimization of existing solutions in material flow. Many innovations are already existing and now been implemented as prototypes. However, it will take time to make a significant leap forward and expand innovation to the industries. Globalization is making industries interconnected. Thus, basing on the theory, one can predict what innovational impact new technologies will have on different industries.

Even though, research has a big scope on the issue, the economic, monetary and political perspectives are not analyzed. Thus, the outcomes might provide inaccurate real application. Study was conducted using qualitative research methods. It assumed to study peoples experience and practices. Even though the author tried to be unbiased, the analysis results have more subjective attitude than objective.

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9 Appendices

9.1 Appendix 1

Appendix 1. List of analyzed literature.

No.	Article Title	Author/ Year	Main point of article	Source
1	Purchasing must become supply chain management	Peter Kraljic, 1983	Purchasing operations take important part in companies' core activities. Managerial skills are the key to success. Guide to managing supply chain weaknesses	https://hbr.org/1983/09/purchasing-must-become-supply-management
2	Inside the Global Supply Chain: e-Commerce and a new demand model for logistics real estate	Prologis, 2014	Omnichanneling concept effecting fulfilment operations. New types of facilities are required for e-fulfillment	http://www.prologis.com/docs/research/supply_chain/E-Commerce_Logistics_Real_Estate_Final_July2014.pdf
3	Winning the Last Mile of E-commerce	Lee, Whang, 2001	Logistics concepts and strategies for optimizing material an informational flow.	http://www.feg.porto.ucp.pt/docentes/rsousa/Files/Le%20Havre%20Files/S4_1.pdf
4	Logistics and E-commerce	CBRE, 2013	Warehouse operations adopting to a fast pace of e-commerce. E-fulfillment development creates challenges for facility management. New types of warehouse are required	http://www.cbre.nl/portal/page/portal/nl_en?_piref1143_51836251_1143_1_1.tabstring=Tab2
5	E-Commerce Logistics: The Evolution of Logistics and Supply Chains from Direct to Store Models to E-Commerce	Robinson, 2014	E-commerce raised the demand for smaller order. IT solution for warehousing helped to adapt to those changes. For SME it is hard to compete against giants like Amazon	http://cerasis.com/2014/04/30/e-commerce-logistics/
6	Maximizing Productivity in E-commerce Warehousing and	Graves, 2012	Current distribution operations are the key for successful customer experience. Retails turned for 3PL solutions. They provide better experience for customers than in-	http://www.inboundlogistics.com/cms/article/maximizing-productivity-in-e-commerce-

	Distribution Operations		house fulfillment. However, in order to stay competitive, 3PL should invest into automation.	warehousing-and-distribution-operations/
7	E-commerce- New opportunities, new barriers	The National Board of Trade, 2012	Survey of Swedish companies, regarding e-commerce. Analyzed indirect barriers that effect operations of Swedish companies abroad.	https://www.wto.org/english/tratop_e/serv_e/wkshop_june13_e/ecom_national_board_e.pdf
8	Disruptive Logistics The New Frontier for E-commerce	Oliver Wyman (Lierow,Janssen, D`Inca)	Future trends of logistics. 3PL innovations brought by international players such as Amazon, Alibaba, DHL. Fast moving goods operations analyzed.	http://www.oliverwyman.com/content/dam/oliver-wyman/global/en/2014/sep/MUN-MKT20101-011_screen12.pdf
9	E-commerce boom triggers transformation in retail logistics	Jones Lang LaSalle, 2013	As e-commerce logistics models develop, they will drive huge changes in physical distribution networks. This will give rise to a new class of logistics and distribution properties such as mega e-fulfillment centers.	https://www.jll.com/Research/eCommerce_boom_triggers_transformation_in_retail_logistics_whitepaper_Nov2013.pdf
10	China proposes to create in the free port of Vladivostok hub of e-commerce	TASS, 2015	China and Russia are investing into huge e-commerce hub in the port of Vladivostok.	http://www.newsvl.ru/far_east/2015/08/25/138360/
12	Alibaba opens office in Russia	Korotkin and Hachataryan, 2015	Alibaba, the giant of e-commerce, sees Russia as a huge market. It opens its office to coordinate operations closely. As an example, popular products will be stored in Russian facilities.	http://www.gazeta.ru/tech/2015/06/02/6743269/alibaba-opens-russian-office.shtml

9.2 Appendix 2

Appendix 2. Semi-structured interview guideline.

Company:_____Date:_____
About:_____
Contact:_____

1. How do you receive and process customer and supply orders?
   a. Email
   b. OMS (order management systems) software
   c. Internet platform

   _____

2. Which software do you use:
   a. Name?
   b. SAP
   c. Logility
   d. Infor

   _____

3. Do these programs fulfill your functionality needs? If not, which functionality missing?

   _____

4. Do you agree that information flow is much faster then material flow. What actions do you attempt to improve material flow?
   a. Improve warehouse operations
   b. Implement new strategy for supply chain

   _____

5. Have you done any modifications/ improvements in supply chain or warehouse operations in recent 5 years? which?

   _____

6. Which automation technologies are using in your warehouse nowadays?

   _____

7. Do you have any international partners/customers? What is the percentage of them?

   _____

8. Which of these problems are most frequent when dealing with international partners?
   a. Lack of information
   b. Long time for decision approval or information flow
   c. Supply chain limitations
   d. Physical order mistakes
   e. Ambient factors

   _____

9. Which problems occurring when ordering and receiving goods or services from other countries?
   a. Transportation / Shipping
   b. Customs related
   c. Intellectual property rights

   _____

10. Do you want to increase the percentage of international partners/customers?

    _____

11. Which of these ways you find more relative to your companies vision?
    a. Marketing campaign in other counties
    b. Improve internet platform to attract and process more partners
    c. Improve operations of you company, so that partners would notice

    _____

12. How would you improve information flow to increase partners?

    _____

13. How would you improve material flow to increase partners?

    _____

14. In your opinion, how logistics industry will develop in order to change the difference in informational and material flows.

    _____

9.3 Appendix 3

Appendix 3. List of representatives who were interviewed.

No.	Company	Place, Date and Time of the interview	Company representative
1	3PLogistiikka Group Oy	Helsinki,12.06.15, 1pm	Jussi Kammonen
2	Blue Water Shipping Oy	Helsinki,12.06.15,2pm	Seppo Rautanen
3	Constructor Finland Oy (Kasten)	Helsinki,12.06.15,4pm	Jarkko Suomalainen
4	eSend Finland Oy	Helsinki,12.06.15, 4pm	Hannu Peltomäki
5	GEFCO Baltic	Helsinki,12.06.15, 5pm	Richard Keirans
6	NFleet Oy	Helsinki,12.06.15, 12pm	Tuukka Puranen
7	Trimico Oy	Helsinki,12.06.15, 11am	Janne Lausvaara
8	UPS Finland Oy	Helsinki,12.06.15, 6pm	Antti Lahtinen
9	Vantaan Rahtikeskus Oy	Helsinki,12.06.15, 3pm	Marco Pohjalainen
10	АВТОГАЗТРАНС, ООО (Avtogaztrans)	Moscow, 16.09.15, 1pm	Ekaterina Maryana
11	МЕТМАШ, ООО (Metmash)	Moscow, 16.09.15, 12pm	Dmitry Kopeykin
12	МТГ. БИЗНЕС-РЕШЕНИЯ, ООО (MTG. Business Solutions)	Moscow, 16.09.15, 11am	Vladislav Bortsov
13	РИВ-ПАК (Riv-Pack)	Moscow, 16.09.15, 12pm	Igor Lebedinski
14	САНДВИК (Sandvick)	Moscow, 16.09.15, 2pm	Yulia Kandratieva
15	Rostek North East	St. Petersburg, 25.06.15, 1pm	Pavel Polyakov
16	Vetna Ltd	Ufa, 28.08.15, 2pm	Jamil Valishin

9.4 Appendix 4

Trimico Oy

What is your company`s core business?

We provide software solutions for logistics companies, especially for transportation companies.

What kind of solutions you are providing?

Whole package for transportation companies. Usually solutions for drivers, like the route planning and the mobile integrated solutions.

Where are your customers from? Do you have any international customers?

No, only in Finnish companies. In addition, our customers are small transportation companies that work as subcontractors.

How do you handle orders from your customers?

Basically we are using e-mails. Since our customers are small companies, they cannot afford full ERP solutions. So we operate in little sector of the market. So we don't have any CRM system neither. However, our solutions does not require complex ERP systems, it can be based on mobile application.

Are you familiar with Informational and material flow? How your software solutions comply with these issues?

It fastens payment. When delivery is done, information goes to the office directly, thus fastening the operations. Route planning is increasing the efficiency of transportation.

You mention mobile application. What features it has?

Well, for example, if there is a difference in actual delivery, it easily can be changed through the mobile applications. In this case the delivery will be performed and the information will be sent to the office, where people can solve the mistake.

In your experience, was there any innovation in the industry?

Yes, I think that mobile tech is the one. Because, it is always increasing, when the technology is getting more affordable. Before, only big companies could afford expensive equipment such as barcode scanners and so on…now mobiles are taking the lead.

What do you think about RFID systems?

I think that there are still certain limitations, however soon we might see its hype. I've been reading about it. Now it is costly, in 5 years, when the cost drops, they will become popular.

What are the problems of the industry today and what is direction of the future development?

Now you can get lots of data, but most of them is not processed. So I guess in the future, companies will make software that will analyze more data. So called Big Data. However, the problem is to understand this data and how to use it. And in my opinion that it peoples work.

What problems do you personally face?

Companies don`t trust each other, and they don't share information much.

How will it change in the future?

For example, now there is a problem of transparency. Transportations companies cannot know what they are transporting. When the transparency comes, you could plan ahead. Subcontractors don't get the full information. If they would get more information, subcontractors could optimize their operations. So the transparency should increase the efficiency.

What do you think about warehouse operations?

I have been reading about 3D printing, and I think it will make a huge difference soon. There will be still logistics operations, since the raw material need to be transported and stored. And I think it will effect warehouse operations.

What companies could do to satisfy their customers?

Information flow is a key part of that. Sending information of the delivery progress to the customer makes difference on satisfaction

What will change in logistics in next 10 years?

The information will be shared more open. And less small companies will be there. Big 3PL contractors such as DHL and UPS can analyse big data, thus they will share the market.

eSend Finland Oy

How would you describe the innovations in material flow?

Well, material flow is quite fast currently. They have very fast delivery systems nowadays. It will only take one day from whatever part of Europe. However, the facilities have to be close to the final destinations.

What are problems of information flow?

You have to prior the information you get to your email. You receive hundreds of new messages daily. You have to take only that is important for your business. Because time is the most important resource, you have.

Which direction material and informational flow will develop?

I think it will be equal in the future. Because you have those 3D scanners, so you will have the material immediately. Therefore, it is will be made right away.

Constructor Finland Oy (Kasten)

What challenges your company is facing when dealing in supply chain?

Our problem is that we should get better information delivered to our customers about our products, about availability, capacity.

How your warehouse operation limitations affect your supply chain?

There is a possibility of errors, since most of the warehouses are not automated. Some products need to be unpacked before collecting the order, which decrease the order picking time, as a result the whole lead time.

What threats you see from the global corporations such as Amazon?

I think these big companies will take the share of the market. However, in our case, situation is a little different. However, we only pack and store.

Vantaan Rahtikeskus Oy

What differences between material and informational flow you see in daily operations?

The delivery speed is not that important. It is important to share information regarding the status of the delivery.

Is e-commerce affects the material or informational flows?

The most important incentive is that our customers want products and services cheaper and cheaper. Therefore, they force us to develop these things: informational technologies and material flow solutions. Because our competitors are also in need for development, so if we stop, they will not. Sometimes I have heard that logistics business is slow moving, but it is not true. Because we constantly develop different solutions.

What do you think is the future development of logistics?

I don`t know how much logistics companies will develop information services by themselves or they would buy it.

How do you handle lack of information in supply chain?

The problem is that required information is not at the right place at the right time. If I know something, it is not enough, because other people should know the same information that I have. We still have the email and phones but still people that need information do not have it, whereas people who do not have it. This thing happens all the time in real life.

How to make key people to get right information at right place and right time?

If key people in the company receive information at right place and right time, they could make quick and often right decision regarding material flow. If you take an example of global companies such as DHL, DSE (which is our customer), and whey have thousands of people employed. If they have big project, people can be from different countries with different time zones. In this case, flawless communication might become a problem.

How would you feel if the information was process by computers?

I think that computers and systems should support the decision-making. However, sometimes computer systems can`t analyse. There are certain limitations to the system anyway. So we can depend on them completely.

United Parcel Service Finland Oy

How do you handle customer and supplier orders?

We mainly using e-mails, we receiving orders from customers. Then also we can use internet platforms, to take care of our suppliers or customers since we have order management systems. It is called suppliers management and that includes software on different levels, where you can integrate customers on how they want to react with suppliers through us. So they can use consideration services, better tracking services, or things like that.

How do you handle material and information flows?

Many times information follows material. Sometimes information gets delayed. Only for warehouse operations. Warehouse is like a small piece from the whole basket. I mean when the cargo comes, material comes from somewhere, usually it comes from the warehouse, some platforms and things like that. And on the way there are many checkpoints: ports, airports, drivers. At each checkpoint, the cargo is scanned and that information goes through internal system, which goes to the customer.

How do you manage informational and material flows in your company?

For this question. Recently, we basically made a new supply chain for one of our customers to Australia from Finland. We knew, where we are going to aim. All we had to do is to put all our subcontractors together. And we had the information flow with them to the customer, to us. Then we showed the solution to the customer, they accepted it and they it started to work.

What international partners do you have?

We use many different airfreight companies, like KLM, Singapore Airlines, and Finnair. I can count that our international subcontractors are our international partners. We have outsourced our warehouses. In Finland, we are using special parcel distribution vehicles.

What challenges your company is facing when dealing in supply chain?

Companies want to protect their business, thus sharing information is still quite reluctantly. When we star meetings with the buyers of our services, we got used to the role of annoying party that wants to find out any kind of information. Even if there is nothing valuable, some companies behave irrationally, by not letting us use that information. Therefore, we treat it like normal sales negotiation process. However sometimes this process can take a long period.

How do you improve informational and material flows in your company?

We are always trying to improve existing solutions for our customers. We looking for new solutions, but also check the cost factor. If we can see that in our pipeline the cost might be less with certain solution, then we send the solution for the customer.

Do you have any particular examples?

Well, almost all information is classified. However, I can give an example of simple solution. When the customer has LCL cargo coming in from somewhere Far East. And they have volume there in the port. So we see, that the volume goes with the LCL and the LCL is more expensive then we should put this cargo to Full container, so we consolidate this whole shipment to one container and ship it. Then we send the information to the customer that we saved roughly 1000 euros on the delivery.

What innovations your company is bringing to the industry?

Yeah of course, big companies are setting new frontier in the development direction. They have the resources to investigate different innovation and if some of them will show perspective, other will catch up. What we are trying to do is to get involvement with our customers, suppliers. When customer have 30-40 different suppliers in one country, we try to get them all and the customer. Then we negotiate with the customer; if you let us into your business, we will help you to discover the pain points of the logistics supply chain. Then we try to consolidate material flow, or integrate our own systems with the supplier`s. It goes to through our own systems back to the actual consignee. Because in many cases when consignees have discussions with suppliers, the actual information flow is usually done by emails.

Because many suppliers don't have necessary systems. Where our systems can integrate this flow into the organization. And our service can make real-time following.

Blue Water Shipping Oy

Me: How do you handle orders from your customers and suppliers?

The orders we get from clients are concerning transportation. They want to place an order from us to carry their cargo to Finland. These are the orders we are receiving. Most of them are coming by e-mail. We are not using any Internet platforms. However, sales department have different systems. We are using software for making transport quotations and customer management.

What system limitations you have to deal daily?

For instance, system doesn't show amount of jobs for a particular client. If I want to check how many shipments was processed for particular client, I need to make a request for this information through another department. I am not updated with my client's volumes.

How do you think this information could help you?

For example, I had a meeting with my biggest client. I didn`t know how many of their shipments we carried. But I should know that. As I said, I need to make a request for that information. However, this information I should get quickly.

How do you manage informational and material flows in your company?

Sometimes information is coming faster than the actual material. However, sometimes it is vice versa. For example, one pallet from Italy to Finland to our client. The goods came earlier, then the information. And there is no systematically regularity.

What innovations you have experienced in the past 5 years in your company?

Our aim was to improve the cargo flow, for instance. And all the supply chain management. On the other hand, the company has grown. So someway, we have been forced to change since we were a smaller company. Because our volumes are so much higher. So these changed have been necessary.

How you company is improving its warehouse operations?

We have many trailers coming to our warehouses. And the amount is increasing. We have moved loading and unloading operations from our terminal to our subcontractors, who has 10000sqm compare to our 1000sqm with few workers. Whereas subcontractors have tens and hundreds. So they can process more trailers in shorter time.

In whole Finland demand has increased. Economic reasons; freight transportation companies; nobody is having their own terminal actually, except big players. However, their terminal workers are hired for short term. It allows them to adjust for demand fluctuations.

What challenges your company is facing when dealing in supply chain?

The main challenges are in information flow between our company and the subcontractor's terminal. We started using this terminal at the beginning of this year, so everything is quite new for us. First months were quite challenging. I think that information in our business is always number one. It is always the most important matter. Whatever happens, information must come first and after that cargo. But the time gap between this information and actual physical process must not be too long. The information must come on Monday for instance, that tomorrow you will receive one pallet from Italy from this and this supplier. Not vice versa, that pallet comes first and then the information.

What kind of IT solutions you use in your supply chain?

Barcodes systems, these are what we are using. And for instance, the order information we sending to the terminal concerning each trailer, which consists of 20-30 different shipments. We have to send the information to the terminal, what cargo there is and what they have to do with this cargo. Sum of it must be unloaded, sum of that must be left inside the trailer, because this is, for instance, very heavy, or it is big consignment which we deliver right away. This is transferred with EDI automatically! After the job is done they are sending confirmation. If there is damage or missing goods, they will inform that. We have to read this message that some cargo was missing, then we have to do something to find it.

What issues you have with partners and how you are dealing with them?

Well, the partners we have we are on weekly contact. Unfortunately, lack of information happens sometimes, which is more of a misunderstanding. Usually, the main problem related to the partner is a money problem.

What other issues you have to deal with in your supply chain?

It doesn't happen often, but sometimes our partners in other countries can make mistake, which can lead for delays in delivery. Sometimes it can happen that in our trailer there is no space enough. So part of the shipment stays in the warehouse.

Outside EU. When talking about container shipping. Containers do not belong to us. They belong to shipping companies. There is shortage of containers in Finland.

Concerning customs clearance. If you import food from China, customs take samples of it. Which may result for a delay. Since the whole shipment is waiting the clearance. However, this is part of the business, and we are not worse or better in this comparing to our competitors. We can't make changes to this matter.

There are so many outside factors that can affect the operation; there is storm in the sea, or there is some hazardous cargo that is not sufficiently secured for instance or the papers are not correct. As long as people are doing this job there is always a risk of something going wrong.

How to improve information flow of daily operations?

For example, there is a traffic operator in Italy, Verona, who is type the information about the shipment. And then, by EDI this information comes to our office. And our traffic operator does not need to type it again. So our systems are talking to each other. If there are mistakes or missing information, we complete or change it.

How to improve material flow of daily operations?

Get more volume, make bigger shipments. In our region, there is environmental limitation on the speed of ships. Only 0.1% of Sulfuric is allowed. Another problem is the schedule of the deliveries. In the example of Italy, there are not departures to Finland early in the week (Monday, Tuesday) you can`t get that one pallet. Because there is no many shipments. Thus the shipments will leave Thursday, Friday. So speed is not the main problem. However, if the shipment is FLC, we can send the trailer right away.

How do you see the development of logistics industry?

It tech will improve a lot. Automation is the next step of the development. Some of our competitors provide customer access to their informational systems. But it not necessary helping cause, it there is no information there is nothing to see. If the cargo is not yet in Finland, it is in Italy still. It doesn't help if cargo is not moving.