Aalto University
School of Engineering

Logistics Megatrends and Their Potential Effects on Demand for Logistics Premises in Finland

Master's Thesis
Department of Built Environment
School of Engineering
Aalto University

Espoo, 2 November 2016

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Abstract of master's thesis

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Title of thesis Logistics Megatrends and Their Potential Effects on Demand for Logistics Premises in Finland

Degree programme Degree Programme in Real Estate Economics

Major Real Estate Management **Code** M3003

Thesis supervisor Professor Heidi Falkenbach

Thesis advisors D.Sc. (Tech.) Tero Lehtonen, D.Sc. (Tech.) Saija Toivonen

Date 2 November 2016 **Number of pages** 88+4 **Language** English

Abstract

In recent years, the increasing popularity of logistics assets as investment type has been evident both in Finnish and European property markets, meanwhile the logistics sector and the occupiers of logistics properties have been challenged by constant changes in their operational environments. Megatrends represent unavoidable forces of change affecting companies as well as the complete economic and social system, and the purpose of the thesis is to recognise and increase knowledge of the megatrends shaping the logistics industry and to study their potential effects on the future logistics space occupier preferences and logistics space demand in the Finnish market.

The research method of the thesis is environmental scanning, a method of futures studies. The environmental scanning process completed in the thesis consists of two parts: literature scanning and expert panel. The aim of the literature scanning is to recognise the logistics megatrends by reviewing existing literature and publications focusing on the subject. The expert panel verifies the results of literature scanning and finds out potential effects of the logistics megatrends on logistics space demand and occupier preferences in the Finnish environment. The expert panel consists of eleven experts, representing the players in the logistics property market, both logistics space occupiers and real estate investors.

As a result of the completed environmental scanning process, five logistics megatrends, eight megatrend subcategories and numerous of potential effects of the megatrends on the logistics space demand have been identified and analysed. The logistics megatrends covered in the thesis are (1) demographic changes, urbanisation and changing demand, (2) technological development, (3) collaboration and integration, (4) globalisation, re-shoring and changing global competition and (5) ecological drivers and sustainability. Also the probability and importance of each megatrends have been estimated, and in total seven potential futures themes created to represent the combined effects of the megatrends and the potential future developments of logistics occupier demand.

Keywords futures studies, megatrend, environmental scanning, logistics, logistics property, occupier demand

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Diplomityön tiivistelmä

Tekijä Maija Seppälä

Työn nimi Logistiikan megatrendit ja niiden mahdolliset vaikutukset logistiikkatilakysyntään Suomessa

Koulutusohjelma Kiinteistötalous

Pääaine Kiinteistöjohtaminen **Koodi** M3003

Työn valvoja Professori Heidi Falkenbach

Työn ohjaajat Tekniikan tohtori Tero Lehtonen, tekniikan tohtori Saija Toivonen

Päivämäärä 2.11.2016 **Sivumäärä** 88+4 **Kieli** englanti

Tiivistelmä

Logistiikkakiinteistöjen suosio sijoituskohteina on viime vuosina kasvanut sekä Suomessa että muualla Euroopassa. Samanaikaisesti toimintaympäristön jatkuvat muutokset ovat haastaneet logistiikka-alan ja sen toimijat, logistiikkatoimitilojen käyttäjät. Megatrendit edustavat yrityksiin ja niiden toimintaympäristöön vaikuttavia väistämättömiä muutosvoimia, ja tämän diplomityön tarkoituksena onkin tunnistaa ja lisätä tietämystä logistiikka-alaa muovaavista megatrendeistä sekä tutkia logistiikkatilojen käyttäjien tulevia preferenssejä ja tulevaisuuden tilakysyntää Suomessa.

Diplomityön tutkimusmenetelmänä on tulevaisuudentutkimuksen menetelmiä edustava toimintaympäristön muutosten tarkastelu. Toimintaympäristön muutosten tarkastelu toteutetaan tässä diplomityössä kaksivaiheisesti: kirjallisuustarkastelun ja asiantuntijapaneelin avulla. Kirjallisuuslähteiden tarkastelun tarkoituksena on tunnistaa logistiikan megatrendit tutkimalla aiheeseen keskittyviä kirjallisuuslähteitä ja julkaisuja. Asiantuntijapaneelin tarkoituksena on varmentaa kirjallisuustarkastelun tulokset ja tunnistaa megatrendien mahdollisia vaikutuksia logistiikkatilakysyntään ja käyttäjien preferensseihin Suomessa. Asiantuntijapaneelin 11 jäsentä edustavat logistiikkakiinteistömarkkinoiden osapuolia, sekä tilankäyttäjiä että kiinteistönomistajia.

Toimintaympäristön muutosten tarkastelun lopputuloksena tunnistettiin ja tarkasteltiin yhteensä viittä logistiikan megatrendiä, kahdeksaa megatrendien alakategoriaa sekä megatrendien lukuisia mahdollisia vaikutuksia logistiikkatilakysyntään. Diplomityössä tarkasteltavat logistiikan megatrendit ovat (1) demografiset muutokset, kaupungistuminen ja kuluttajakysynnän muutokset, (2) tekninen kehitys, (3) yhteistyö ja integraatio toimitusketjuissa, (4) globalisaatio, ”re-shoring” ja muuttuva kansainvälinen kilpailu ja (5) ekologiset ajurit, kestävä kehitys ja vastuullisuus. Lisäksi kunkin megatrendin todennäköisyyttä ja merkitystä arvioitiin ja kaikkiaan seitsemän mahdollista tulevaisuuden teemaa luotiin havainnollistamaan megatrendien osin yhteneviä vaikutuksia ja tulevaisuuden logistiikkatilakysynnän mahdollisia kehityskulkuja.

Avainsanat tulevaisuudentutkimus, megatrendi, toimintaympäristön muutosten tarkastelu, logistiikka, logistiikkakiinteistö, tilakysyntä

Acknowledgements

This thesis has been completed as an assignment to Jones Lang LaSalle Finland. I am sincerely thankful to my employer for providing me the possibility to finish my master's studies by researching this interesting and timely topic.

I am grateful to my skilled instructors Tero Lehtonen and Saija Toivonen for their time and valuable comments through the thesis process. Saija has given me a precious sight for futures studies in the field of real estate, while Tero has provided a valuable insight of logistics real estate market and given me the chance to focus on the thesis project. I also want to acknowledge my supervisor Heidi Falkenbach for her valuable comments and advice.

In addition, I want to thank my colleagues in JLL for encouragement during the thesis process. Especially my dear colleagues and friends Anna Katainen and Laura Korhonen deserve recognitions for their endless support and practical advice both in studies and work.

My special gratitude belongs to my family and friends for their continuous support. Valtteri, thank you for being a great example and for always pushing me forward. My very special thanks belong to my dear brother Veera Seppälä, the other one who was never supposed to become an engineer, for all the entertainment and memorable experiences throughout our studies. It has been a great journey.

Maija Seppälä

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1 Introduction

1.1 Background

"When the rate of external change exceeds the rate of internal change, the end of your business is in sight."

Jack Welch, former CEO, GE

The transport and logistics industry is significantly dependent on the economic cycles, booms and slumps, but among other industries, it also has to change in order to respond to larger phenomena affecting the global economy. During the last decades, the motion of the world has been rapid, the logistics sector has been facing changes in the surrounding environment and has thus been forced to adapt to the requirements of for example the transition from industrial to information technology driven society, accelerating the movement of goods, labour and capital, globalisation and new ways of consuming. The change occurring over the next decade is often predicted to be even more significant.

Predicting the future has always interested people and has even been necessary in all the fields of life, where human behaviour and decisions have affected the future development (Kamppinen et al. 2003, pp. 20-21). The branch of science dedicated to researching the potential futures is called futures studies, where the concept of megatrends, first introduced by John Naisbitt in the early 1980s (Naisbitt 1984) is often used to refer to large, global change-related, future-shaping phenomena. For industries, companies and individuals, megatrends represent unavoidable forces of change, having remarkable effects on the economic and social system as well as the operations of companies (Nurmi et al. 2012, p. 27), and in order to better prepare for the changes, studying the future has been popular also in the field of logistics. As a result, several market players tend to for example regularly collect and publish their views of the megatrends shaping the industry.

In the recent years the general interest in logistics assets as investment opportunity has been increasing in the real estate market, at both Finnish and European level. The increasing general interest in logistics properties has been explained for example by the globalisation of production, European integration, outsourcing and restructuring in the logistics market (Wagner 2010, p. 224) and by global attention attracted by supply chains (Antai & Ohlson 2013, p. 511). Simultaneously, logistics space occupiers increasingly favour rented premises, and also in the Finnish logistics property sector, traditionally dominated by owner-occupiers, the number of active players has increased as occupiers have in growing numbers sold their properties to investors (KTI 2016a, p. 56). Also some new investors focusing on logistics and industrial properties have recently entered the Finnish market through remarkable transactions.

For property owners competing for the best tenants it is necessary to recognise the features of the space demand and to fill the occupiers' requirements. Currently the logistics property demand in Finland is mainly concentrated in Helsinki metropolitan area and surrounding municipalities. At the moment, especially increasing foreign trade, changes in the retail sales structures and rearrangements of supply chains and logistics system are reshaping the demand, resulting in increasing demand for modern and efficient logistics space (KTI 2016a, p. 56). The megatrends of today will shape the space demand of the future, and as the

occupier demand is already showing marks of for example getting geographically more concentrated, it is possible that the current Finnish logistics property stock will not meet the future, constantly changing requirements of up-to-date occupiers. Due to these developments, this thesis is focused on recognising the megatrends shaping the logistics industry and studying their potential effects on the logistics space demand in Finland.

The future of the Finnish commercial property market has previously been studied for example by Toivonen (2011) and Toivonen and Viitanen (2014; 2016) with their focus on the forces affecting the office and retail sectors. At the same time, the future of the logistics sector in Finland has been studied for example by Nurmi et al. (2012), who have developed several future scenarios on the logistics route in southern Finland. However, there are no previous studies focusing especially on the future of the Finnish logistics property market and this thesis is therefore dedicated to observing the future development of the logistics sector in Finland especially from the real estate point of view by using the tools of futures studies.

1.2 Purpose of Research and Research Questions

The purpose of the thesis is to recognise and increase knowledge of megatrends shaping the logistics industry and to study how these megatrends may affect the future logistics space occupier demand in the Finnish market. The desired outcome of the thesis is to provide answers to the following research questions:

- What are the megatrends shaping the logistics industry and the business and preferences of logistics space occupiers?
- What are the potential effects of the megatrends on the logistics space demand in the Finnish market?

The megatrends shaping the logistics industry will be identified through an environmental scanning process, consisting of two phases, literature scanning and expert panel. More accurately, literature scanning will be used to recognise the megatrends mainly from global perspective and to answer the first research question, and expert panel to verify the existence of the megatrends, to observe their potential effects in the Finnish market environment and thereby to answer the second research question. The research methodology of the thesis will be further described in Chapters 1.3, 4.1 and 5.1.

1.3 Research Methodology

The aim of the thesis is to study the logistics megatrends and their potential effects on the logistics space demand in Finland through environmental scanning, which is a method of futures studies and a tool for observing the future and its potential developments by discovering the environment. The thesis will begin by providing the reader a methodological framework of futures studies and environmental scanning as a research method. In addition, the basic concepts of logistics as well as the dominant characteristics of logistics facilities and the Finnish logistics property market will be introduced in order to provide the reader a general understanding about the topic.

According to Gordon and Glenn (2003, pp. 4-9), the most common techniques of environmental scanning include database literature reviews, essays by experts, key person

tracking, conference monitoring and expert panels, where the participants are systematically asked observations and judgements about underway or expected developments. In the thesis, the environmental scanning process will be completed in two phases: literature scanning and expert panel. The aim of the literature scanning, focusing on ten main sources representing the existing literature and publications concerning the forces shaping the logistics industry, is to recognise and increase knowledge of the logistics megatrends. Also additional literature and publications will be reviewed in order to understand the recognised megatrends and their features in a comprehensive way. The findings of the literature scanning will be validated in an expert panel, which has been formed to include members to represent players in the Finnish logistics property market. The expert panel consists of eleven interviewees, seven of which represent logistics space occupiers and four real estate investors operating in logistics real estate business. In addition to verifying the results of the literature scanning, the expert panel will be used to recognise the potential effects of the megatrends on the logistics space demand in Finland and to analyse the potential probability and importance of each of the megatrend in the Finnish environment. The environmental scanning process will be further described in Chapters 4.1 and 5.1 of the thesis.

1.4 Research Scope and Limitations

The goal of the thesis is to recognise and increase knowledge of logistics megatrends and their potential effects on the logistics space demand in Finland, and in order to understand the basics of the topic, the reader will be provided a general view of the concepts of logistics, logistics facilities and the Finnish logistics property occupier market. However, as the aim is to provide the reader background information on the subject from the real estate point of view, the themes related to logistics and logistics facilities will be reviewed only lightly, and any deeper examination of for example logistics functions, dynamics and theories will be excluded from the thesis. Further in this thesis the term logistics property will be simply used to refer to the property types that companies operating in logistics industry occupy.

In Chapter 4, each of the recognised megatrends will be introduced briefly in order to provide the reader basic understanding about each phenomenon. However, due to the limited extent of the thesis, introducing and analysing the megatrends will be carried out only shortly and the focus will be kept mainly on issues with connections to logistics or logistics premises.

The purpose of the environmental scanning process, consisting of literature scanning and expert panel, is to recognise the logistics megatrends and to analyse their potential effects on the Finnish logistics space demand. Although literature scanning will observe the publications of logistics megatrends in global perspective, the main focus of the environmental scanning as well as the thesis will be in Finnish operational environment, and the focus of the expert panel will be on the existence and the potential effects of the megatrends in Finland.

Due to the purpose and extent of the thesis, the environmental scanning will focus only on analysing the logistics megatrends and their potential effects. Therefore scanning other marks of the future development, including weak signals or wild cards, will be excluded from the examination. The used sources in the literature scanning have been published between the years 2010 and 2016. Although the literature sources typically discuss the future of logistics in medium or long term, typically observing changes taking place in the following ten years, no time scope was defined for the discussions in the expert panel.

1.5 Research Structure

The thesis will consist of six chapters, starting with an introduction to the research topic, introducing and providing background information about the motivation and key concepts of the thesis, and defining the purpose of the research and the research questions. The second chapter will focus on providing the methodological background for the thesis, focusing on futures studies and related concepts, tools and techniques. The third chapter will focus on logistics, providing basic conceptual understanding about logistics and logistics facilities as supply chain parts and also views of the current Finnish logistics property market. The fourth chapter composes the first part of the environmental scanning process of the thesis: in the chapter, logistics megatrends will be recognised, grouped, briefly introduced and analysed based on existing literature. Also the potential effects of the megatrends on logistics space demand will be presented in case of the literature takes a stand on these matters. Chapter five comprises the second part of the environmental scanning process: the chapter will present the formation process and the results of the expert panel and combine and discuss the outcome of the expert panel with the findings of the literature scanning. The sixth chapter will summarize the final research conclusions and analyse the research quality and reliability. Furthermore, the sixth chapter attempts to provide potential research topics for possible future studies on the topic.

2 Methodological Background

This chapter will provide a methodological background for the thesis by introducing the general idea and concepts of futures studies and provide a view of environmental scanning as a research method.

2.1 Basic Characteristics of Futures Studies

The number of potential future scenarios cannot be limited to one, and the goal of futures studies is not to report certain futures to come true. However, some future scenarios can be named to be more probable and to have more potential. (Kuusi & Kamppinen 2003, pp. 118-119) The branch of science researching the potential future scenarios is called futures studies. In addition, the term has several synonyms, including foresight, futurism, futurology and futures research, the last of which is also commonly used in the academic field (von der Gracht 2008, pp. 1, 10). According to Rubin (2014), futures studies combine several branches of science in order to describe, explain and understand widely recognised social and nature related, continuously changing phenomena and related change and development processes in different fields of life.

The term "*futurology*" was first defined in 1943 by Ossip Flechtheim as the science of future systematically and critically examining future questions (von der Gracht 2008, p. 1). Flechtheim (1945, p. 461) stated that throughout the history, the future has been explored by prophets, seers, artists and poets, but after the centuries of growing secularisation, rationalisation and scientific progress, a futurologist of 1945 was finally capable of presenting the meaningful synopsis of the future based on a variety of sources from the fields of history, sociology, philosophy, psychology, political science and economics. Yet today, the goal of futures studies is to find out, value and explain the changes and to suggest possible and potential future scenarios (Rubin 2014; Bell 2003, p. 111). The changes and their reasons are connected with human behaviour, and the futurists seek to determine what can be changed, accelerated or prevented by individual or collective human actions (Bell 2003, p. 111).

Although there is a wide consensus that studying and understanding the future is necessary, the views of the general purposes of futures studies vary. Bell (2003, p. 73) has adopted the widest point of view and sees that futures studies are needed to maintain and improve the freedom and welfare of humankind, to make the world a better place to live. Also a narrower view of futures studies supporting the decision making of individuals and companies has generally been adopted: futures studies are seen to help people to recognise and understand the changes and to search for different options in order to make efficient plans to forward the best possible future (Rubin 2014). Kamppinen et al. (2003, p. 32) see that the methods of futures studies are suitable for improving the decision making of communities and one's position in competition, and Fawcett and Waller (2014b, p. 17) state that companies getting the greatest value in the competition are those who have the ability to quickly, correctly and constantly adapt to the changes in the world with accelerating speed.

As all the uncertainty can never be eliminated, the field of futures studies has also been subject to criticism: already Flechtheim (1945, p. 464) recognised the criticism of teaching the future as the certainty and concreteness with any statements of the future may be questioned, and studying the future can be seen as wasted time from established facts. The

main challenges of futures studies are related to recognising the important changes from the floods of information. Events and impressive short-term phenomena become news and headlines, but slower, wider and time-consuming changes can even be left unnoticed (Hietanen et al. 2003, p. 412). Another remarkable challenge is related to the views of what is important and valuable as all decision-making, risks, visions and missions are based on values. Futures studies describe and take a stand on these values although there are no universal criteria for ranking the values of different actors. Therefore futures studies related to for example business or warfare have been criticized for following "wrong" values, and studies following more multicultural and democratic values have been demanded. (Kamppinen et al. 2003, p. 39)

Future has widely been studied also in the fields of logistics and real estate. In the 1970s even a specific concept, "*Futurologistik*", was launched by Prof. Wagenführ to describe the science combining characteristics of both futurology and logistics (von der Gracht 2008, p. 1). The goal of futures studies on logistics environment is similar to the goals of studying the future in general: companies proactively examining the future can develop their plans further, and based on the collected information, they can also better prepare for future changes (von der Gracht 2008, p. 92). According to Toivonen and Viitanen (2014, pp. 472, 475), in the field of real estate, the future is strictly connected with the future development of the surrounding market environment, and by monitoring the environment, the actors in the real estate market are not only able to adapt their business and actions to the new phenomena in the surrounding environment but also they can benefit by their pioneer position. Despite this, it has been stated that real estate market actors have not yet fully understood or utilized the possibilities related to foreseeing the future. (Toivonen & Viitanen 2014, pp. 472, 475)

2.2 Concept of Megatrends

Futurist John Naisbitt was the first to widely introduce the term "*megatrend*" in his bestseller "Megatrends" in 1982. Naisbitt (1984, p. xxiii) presents that the society seems to be about events, "*just moving from one incident -- to the next*", and the individual events can only make sense by understanding the processes and large patterns underneath. Kamppinen et al. (2003, p. 33) define megatrends as emergent regularities connecting several lesser small-scale regularities, which are assumed to tell about future worlds more than individual, minor trends. According to Hietanen et al. (2003, p. 415), megatrends are the grand themes of development. They are wide, relatively predictable totalities of phenomena typically including several sub-phenomena. Although concurrent megatrends are reflecting the same future, they are often conflicted: for example currently the global population growth and simultaneously decreasing population in some eastern European countries are both topical megatrends (Kuusi & Kamppinen 2003, p. 149).

Especially in Finland future researchers have often presented their future views briefly as megatrend listings (Kuusi & Kamppinen 2003, p. 151), and the concept of megatrends has been widely used in the field of futures studies (Toivonen 2011, p. 29). In other parts of the world the used terminology varies: for example in the United States the term "*megatrend*" is widely associated with Naisbitt in a negative way, but instead the terms "*driver*" and "*trend*" are widely accepted and used in futures studies. Given the variable terminology, it is important to identify the major features of the concept to be able to recognise the megatrends despite the term that is exactly used. First of all, a megatrend is wide and

important, which separates megatrends from minor, individual trends. In addition to importance, another significant feature of a megatrend is that the phenomenon will likely and indefinitely continue, which separates megatrends from any occasional trends. However, the nature of megatrends often predicts them to become permanent. (Kuusi & Kamppinen 2003, pp. 148-149) An important feature of megatrends is that their directions can often be recognised but there are not many chances to affect them (Hietanen et al. 2003, p. 415), and Naisbitt (1984, p. xxxii) describes megatrends "*like horses, -- easier to ride in the direction they are already going*".

According to Kuusi and Kamppinen (2003, p. 149), the basic problem in studying megatrends is recognising the substantive tendencies. Environmental scanning, further introduced in Chapter 2.3, is the often-used method for studying the megatrends, of which the study by Naisbitt is an example. Naisbitt based his study on the idea that megatrends, substantive social changes, can be effectively recognised by scanning the media and analysing the contents. Naisbitt and his colleagues scanned more than two million articles of local newspapers and based their megatrends on these findings. (Naisbitt 1984, pp. xxiv-xxv) Later the study has been widely criticized, and it has been stated that all the megatrends were not "*mega*" or always even "*trends*" (Bell 2003, p. 293).

2.3 Environmental Scanning

Environmental scanning (also "*futures scanning*") is a tool for observing indications of future by discovering the environment. It is a method used for providing new perspective for the future, both its opportunities and threats (Gordon & Glenn 2003, p. 3) and it is defined to be "*searching for signals or indicators of events or processes in some designated environment*" (Bell 2003, p. 291). Basically environmental scanning is discerning, either in organised or in a less systematic way, "*what is constant, what changes and what constantly changes*" (Gordon & Glenn 2003, p. 3). The environment being subject to scanning is the complete socio-cultural, political, ecological and economical stage of actors and their actions (Rubin 2003, p. 902). This stage consists of resources, such as money and infrastructure, and actions and interactions between for example citizens, companies, authorities, academies, organisations and the media (Rubin, n.d.).

Environmental scanning is one of the most important steps of studying the future and the first and fundamental part of the wider monitoring process (Bell 2003; Rubin 2003). Monitoring is the complete methodological procedure of assessing events in process, including further steps such as projecting, evaluating and tracking, in addition to scanning for the signals. When using scanning as an independent method, some of the other aspects of monitoring have often been included in the process as well (Bell 2003, pp. 290, 295), and according to Rubin (2003, p. 902), as an independent method environmental scanning includes both tracking, recognising and analysing "*trends*", "*megatrends*", "*weak signals*", "*wild cards*" and "*driving forces*" in the environment. Scanning is used to find early indications of future developments that may be important, and the earlier the indications are found, the more lead-time can be gained for providing for changes (Gordon & Glenn 2003, p. 3). However, in the thesis the environmental scanning process will focus only on megatrends, as the other phenomena have to be excluded from the scope due to the limited extent of the thesis.

The widely used techniques of environmental scanning include database literature reviews, essays by experts, key person tracking, conference monitoring and expert panels, where the participants are systematically asked observations and judgements about underway or expected developments (Gordon & Glenn 2003, pp. 4-9). Effective environmental scanning has to manage in identifying trends and separating them into temporary and permanent (Fawcett & Waller 2014b, p. 21) and its effectiveness depends on the comprehensiveness of the scanning, the accuracy of the measurements of the monitored phenomena, the certainty of detecting the phenomena and the tools – both technical, conceptual and theoretical – for evaluating the meaning of the phenomena (Bell 2003, p. 295). The best results will be reached by defining what is wanted to know and why, and then setting up a continuous and systematic environmental scanning system (Gordon & Glenn 2003, p. 12). Monitoring, carried out competently, is an advisable method for studying especially phenomena being of constant interest (Bell 2003, p. 294).

Environmental scanning is a recognised and generally accepted method for studying megatrends. In addition, it has previously been utilised to study the future of commercial real estate markets (see Toivonen 2011; Toivonen & Viitanen 2014; Toivonen & Viitanen 2016) and it has therefore been chosen as the research method of the thesis. The environmental scanning process, consisting of a combination of literature scanning and expert panel, will be further introduced and examined in Chapters 4.1 and 5.1 of the thesis.

3 Logistics Properties as Essential Parts of Supply Chains

The focus of this chapter is on introducing the basics of logistics at conceptual level and on describing the most important features of logistics properties and logistics property market by introducing logistics property types, the most important characteristics, occupier types and the current supply and demand in the Finnish market.

3.1 The Concepts and Contents of Logistics

The conceptual diversity and multiple definitions and terms are strongly related to the literature covering the logistics industry. The term "*logistics*" is widely used to describe the transport, storage and handling of products, from raw material source to the point of sale or consumption through production systems (McKinnon et al. 2015, p. 3). The use of logistics and other comparable terms is often mixed and overlapping, and during the past decades, the concepts and contents of for example logistics management, supply chain management and physical distribution have widely been studied. The concept of supply chain management appeared first in the literature in 1982 (Cooper et al. 1997, p. 1), and since its introduction, a variety of definitions for the term have been proposed (Winter & Knemeyer 2013, p. 20). In the literature supply chain management is often used even as a synonym for logistics and logistics management, and according to Ballou (2007, p. 337), it is still being debated what exactly is supply chain management compared with physical distribution and logistics.

The Council of Supply Chain Management Professionals defines supply chain management to "*encompass the planning and management of all activities involved in sourcing and procurement, conversion and all logistics management activities*". In addition to logistics management activities, supply chain management includes manufacturing operations and coordinates activities in for example marketing, sales, product design, finance and information technology. (Council of Supply Chain Management Professionals 2013, p. 187) Supply chain management is also described to be an approach in charge of practically linking demand and supply (Fabbe-Costes et al. 2011, p. 229). According to Ballou (2007, pp. 338, 340), today logistics is being viewed as a subset of supply chain management, having scope limited to the boundaries of the function within a company, and the Council of Supply Chain Management Professionals defines logistics management as "*that part of supply chain management that plans, implements, and controls the efficient, effective forward and reverses flow and storage of goods, services and related information between the point of origin and the point of consumption in order to meet customers' requirements*". Logistics management activities include the traditional logistics activities such as transport management, warehousing and planning supply and demand. It also integrates logistics activities with other company functions (Council of Supply Chain Management Professionals 2013, p. 117), although still today logistics is often reduced to transport, handling and storage (von der Gracht & Darkow 2013, pp. 406-407). In general, the concept of supply chain management is more comprehensive and combines the old concept of logistics with new functions (Ballou, 2007, pp. 338, 340), although some, including Cooper et al. (1997, p. 4), have concluded that the contemporary understanding of supply chain management is not notably different from integrated logistics management, not depending on the extent that logistics is defined. Also the concepts of logistics and physical distribution often overlap. According to Hesse (2002a, p. 212), physical distribution comprises the entire

system of goods handling and movement, but today logistics often supersedes physical distribution as the identifying name of the system (Ballou 2007, pp. 338, 340).

The concept of supply chain management is strongly connected with the term under management, supply chain. According to Cooper et al. (1997, p. 9), all companies participate in a supply chain, starting from raw materials, leading to ultimate consumers. Supply chains have been described as complex relationship networks (Winter & Knemeyer 2013, p. 19) and moving conveyor belts on which several actors participate in moving goods from their global origins to final destinations (Spencer 2012, p. 5). How much supply chain needs to be managed is defined by the complexity of the product, the number of available suppliers and the availability of raw materials (Cooper et al. 1997, p. 9). The objective of a supply chain is to produce value as products and services delivered to a customer (Winter & Knemeyer 2013, p. 19), and this value, including both economic value resulting from low prices and market value from assortment and convenience, has historically been driven supply chain success (Bowersox et al. 2000, pp. 1-2).

According to von der Gracht (2008), in the past 50 years logistics has undergone several development steps and evolved from a traditional supply function into a global and strategically relevant discipline, and supply chain management has undergone a transition from tactical to strategic focus (Melnyk et al. 2009, p. 4632). Today in literature logistics and supply chain management have often been described as companies' strategic or competitive weapons (Ballou 2007, p. 341; von der Gracht 2008, p. 88; von der Gracht & Darkow 2013, pp. 406-407) and prerequisites of value chains (von der Gracht & Darkow 2013, p. 405). Supply chain management is rather seen to provide tools for maximising a company's contribution to profit instead of minimising the supply chain costs (Ballou 2007, p. 341). Christopher and Ryals (2014, p. 20) present that successful companies have a clear link between their stated value proposition and the logistics practices and supply chain processes delivering that value. According to von der Gracht and Darkow (2013, pp. 405-407), the overall importance of logistics is increasing, and the professionalization of logistics management and the conviction of logistics contributing to economic wealth and cost savings have changed the way logistics-related issues are viewed. Supply chains are developing into ones that are strategically focused, design-oriented, dynamic and driven by customer objectives, while the focus of supply chain management is shifting from cost minimisation to value generation through satisfying new emerging needs (Melnyk et al. 2009, pp. 4645-4648). At the same time supply chain management is challenged by the volatile and uncertain logistics business (von der Gracht & Darkow 2013, p. 407), and longer and more complex supply chains (Ballou 2004, p. 15).

Despite the described conceptual diversity, later in this thesis the industry covering functions related to physical distribution, supply chains and logistics will be referred to simply with the general concept "*logistics*". This choice originates from the common practice in the field of real estate, where the term is often used to describe the subject property sector and the type of premises.

3.2 Logistics Property Types and Occupiers

There are three basic alternatives for arranging the warehousing processes of a company. The most traditional solution is that the organisation invests capital in space and the owned logistics premises become part of the fixed assets of the logistics systems. The two

alternatives for property ownership and for lightening the balance sheet include leased premises and outsourcing the warehousing to third-party service providers. (Ballou 2004, pp. 479-485; Christopher 2011, p. 61) The similar alternatives can be generalised to apply also to other processes carried out in logistics properties. In recent years and decades, a shift towards leased premises and increasing popularity of third-party logistics services have been seen. Despite the development, the traditional practice of property ownership still holds on, and for example in Finland about 85% of the total industrial and warehouse property stock is still estimated to be owner-occupied (KTI 2016a, p. 56).

The actors in the demand side of logistics real estate market include industrial companies, distribution companies in wholesale, retail and core transport business and logistics service operators. Each of the occupier types has different needs related to the purpose of use, either for task and contract related or company related functions, features of the properties and the timeframe of occupancy, varying from short-term to long-term. (Hesse 2002b, p. 7; KTI 2016b)

The most of the reviewed literature related to logistics properties focuses on two main property types: warehouses and distribution centres (DCs). The concept of warehouse typically refers to traditional logistics facilities that are used for storing goods in advance of the demand. Traditional warehouses typically have a minimal level of automation and their functions are based on large and infrequent deliveries. (Bowen 2008, p. 380) Distribution centres have developed from traditional warehouses. According to the definition by Bowersox et al. (1968, as cited in Hesse 2004, p. 163), distribution centres are physical facilities used to complete the process of product line adjustment in the exchange channel. In contrast to warehouses, the focus of distribution centres is on keeping products on the move rather than storing them. Distribution centres are often relied on when some of the basic purposes of supply chain management are being achieved: accelerating the movement of goods, ensuring the right amount of right goods to the right place at the right time, or lowering the transport costs (Bowen 2008, pp. 379-380). In practice, DCs are huge routing centres where pallets of products are delivered, then split and redirected into new outgoing deliveries, either directly to consumers or to retailers (Wurman et al. 2008, p. 10). Despite their focus on moving the goods rather than storing them, due to challenges in predicting the demand, distribution centres still partly fulfil the traditional role of warehouses: they hold inventory and break bulk for customer orders (Baker 2004, p. 119; Hesse 2004, p. 163).

In addition to warehouses and distribution centres, several other concepts related to logistics property types were recognised in the literature. The term "*logistics centre"* is often used to refer to the similar concept as distribution centre, while Lahtinen and Pulli (2012, p. 17) instead define logistics centre generally as "*an area which includes transport and warehousing of goods and functions related to distribution*". In addition, they present the additional terms of freight villages, logistics parks, hinterland ports and terminals, all being subconcepts or other related concepts of logistics centres. (Lahtinen & Pulli 2012, p. 17)

The most common Finnish practice is to divide the logistics property types roughly in two, in warehouses and terminals. Terminal has been defined as point of access and interchange, where the interchanges either between different vehicle modes or different vehicles take place (Benson et al. 1994, p. 45). According to Lahtinen and Pulli (2012, pp. 17-18), as the incoming goods end up in terminals, their final delivery points are already known, and therefore warehousing function does practically not take place in terminals. Karhunen et al.

(2008, p. 403) instead have divided terminals further in two types: goods terminals (in Finnish "*tavaraterminaali*") and logistics terminals (in Finnish "*logistiikkaterminaali*"). Goods terminals refer to terminals where transported deliveries are collected and from where the deliveries will be further dispatched to customers. The functions carried out in goods terminals include unloading, sorting, loading and intermediate storing of goods. Logistics terminals instead refer to terminals in central locations, where either products or components are stored for short time in order to fulfil customer demand. (Karhunen et al. 2008, p. 403)

The term "*cross-docking"* appears widely in the literature, used both in relation to the terms distribution centre and terminal. Cross-docking means consolidating the incoming freight and moving it directly to outbound trucks for immediate shipping to final destinations (Hesse 2004, pp. 163-164). Therefore the focus of cross-docking is rather on transhipping than holding stock, but in practice some storing is required as accomplishing a perfect synchronisation of inbound and outbound vehicles can be complicated (Van Belle et al. 2012, p. 828). Although the concept of cross-docking includes by far the same features as the basic concept of terminal, in the literature logistics properties dedicated to cross-docking are also referred to with terms "*cross-dock"* and *"cross-docking terminal"*. However, the cross-docking facilities are not always separated to own property types, and they are often included under the wider concepts of terminals or distribution centres.

As the previous examples show, the conceptual variety in describing the different types of logistics properties is wide, as similar property types are being referred with several concepts and similar functions are carried out in different logistics property types. The literature focusing especially on the real estate aspect of logistics is very limited, the reviewed publications typically concentrate only on the features of certain logistics property types or concepts, and any comparison between the features of different types of logistics properties has rarely been carried out. Summarising on the previously presented range of definitions, distribution centres have developed from warehouses, and terminals can be seen as more developed versions of distribution centres as similar functions, excluding warehousing in terminals, are carried out in both property types. However, in the literature, distribution centres and terminals are often referred to with the same concept. Further in the thesis, the general concept of logistics property will be used to refer generally to the properties that companies operating in logistics business occupy, including warehouses, distribution centres and terminals.

3.3 Dominant Characteristics of Logistics Properties

Optimal layout, sizing, number and location of logistics properties have been extensively studied and as a result, the number of recognised strategies for ranking and analysing the characteristics of logistics properties is remarkable. As discussing these topics in detail is not viewed necessary considering the purpose and research questions of the thesis, the point of the following chapters is, instead of representing the different ways and techniques for making and justifying decisions of the characteristics of logistics properties, to briefly clarify why certain features of logistics properties are important.

3.3.1 Functions and Design

There are numerous of activities performed in warehouses and distribution centres. The major functions of warehousing include receiving, storage, order picking and shipping. In

addition to these, as one of the basic purposes of warehouses and distribution centres is to add value to the products moving through, the properties have developed into cross-docking points, value added service centres, production postponement points and returned good centres. (Maltz & DeHoratius 2004 as cited in Baker & Canessa 2007, p. 425; Strauss-Wieder 2001, p. 4)

According to Hesse (2004, p. 163), distribution centres may create added value either by post-production or pre-distribution processes, which may include activities related to assembly, customisation, packaging, ticketing, product return and repair functions. As the number of activities performed in warehouses and distribution centres has increased and diversified, they have even stated to become the final stages of production lines (Strauss-Wieder 2001, p. 6). An example of locations of warehouse and distribution centre functions is presented in the Figure 1.

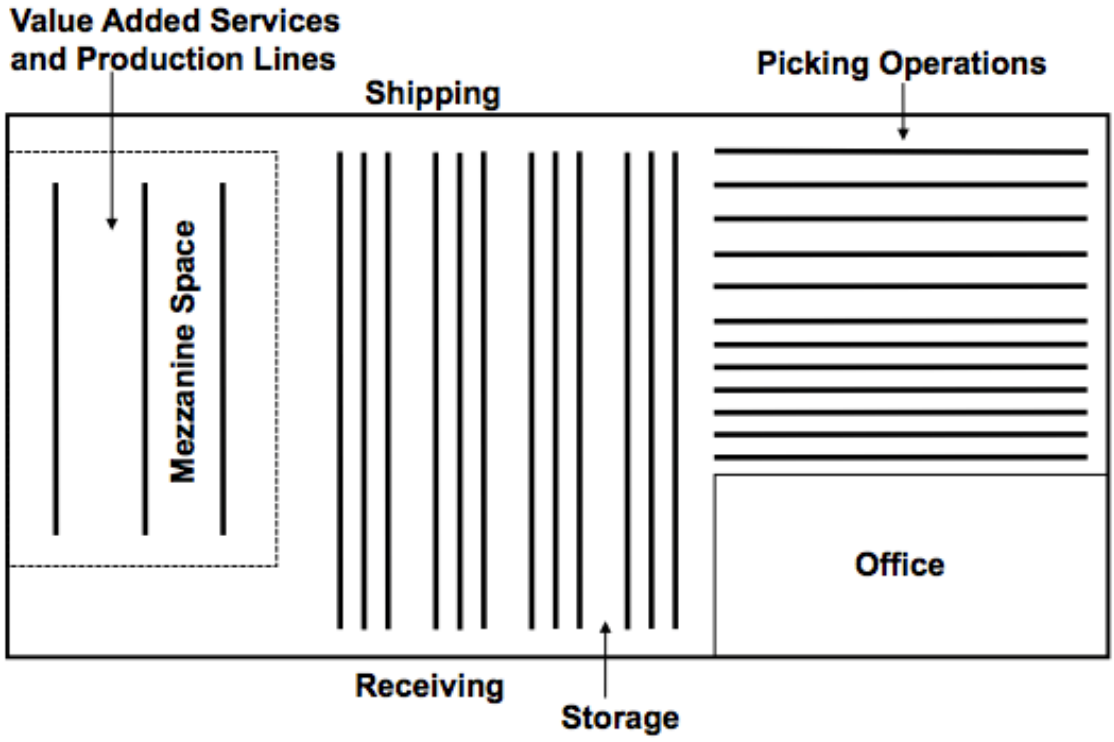

Figure 1 Components of warehouses and distribution centres (Strauss-Wieder 2001, p. 10)

The design of warehouses and distribution centres is optimized to support the efficient flow of goods to, from and in the warehouse. The flow of products typically starts from the receiving area, which can also be used for cross-docking functions. Within the warehouse or distribution centre, products are located based on the estimated time of how quickly they will be needed. Quickly moving products are typically stored close to picking and value added operations. Mezzanine areas, enabled by the high ceiling heights of warehouses, are typically used to increase the available floor space. Shipping areas may be used by several different actors of supply chain: outbound shipments can leave the warehouse either by customers' own trucks, trucks arranged by the warehouse or distribution centre, trucks of

external carriers, or in case of a direct railway connection to facility, goods can be directly loaded into railcars. (Strauss-Wieder 2001, pp. 10-13)

3.3.2 Size and Dimensions

The most important feature of a logistics property is its efficiency, and the efficiency of distribution depends by far on the location and size of freight terminals (Dablanc & Ross 2012, p. 433). In addition, the size of a warehouse or a distribution centre defines its warehousing capacity. Although the sizes of properties are typically measured based on floor areas, according to Stock and Lambert (2001, p. 405), cubic measurements often give a more realistic estimate of the sizes of warehouses.

In general, distribution centres are larger than traditional warehouses (Bowen 2008, p. 380), but the size of an individual distribution centre depends on its role, composition of the network, size of the market area and volume of transhipments (Hesse 2004, pp. 163-164). Based on the literature, the general conclusion is that the average size of distribution centres has been and is still growing. According to McKinnon et al. (2015, p. 198), the average size of newly built distribution centres increased even by 40% between the late 1990s and the beginning of the 2010s, and as a result, the capital invested in warehouse properties has risen. At the same time as the capacity of distribution centres has increased due to larger areas occupied, storage areas have also become taller and more compressed, and aisle widths have generally decreased (Strauss-Wieder 2001, p. 11). There are several reasons mentioned to be behind the growing size of distribution centres. Andreoli et al. (2010, p. 87) state that the joint effect of emerging technologies and globalisation has resulted in growing warehouses and benefitting from the economies of scale. According to Hesse (2004, pp. 163-164), the general trend has been towards more concentrated supply chain functions, which has been decreasing the number of distribution centres and simultaneously increasing the average sizes of facilities. Bowen (2008, p. 380) connects the increase with the trend towards third-party logistics, where manufacturers and retailers have outsourced their logistics activities to third-party logistics service providers. Also the number of large inventories of intermediate and final products has reduced, and at the same time, hub distribution centres have become more common (Dablanc & Ross 2012, p. 433).

Also very large distribution centres, so called "*mega DCs*" have recently become increasingly common. In addition to size, the concept of mega DCs refers to the geographic extent of the market being served (Andreoli et al. 2010, p. 76), and there are clear signs of the rise of mega-sheds covering national and regional markets (Colliers 2015, p. 16). The rise of mega DCs has been connected with the increased volumes of goods flows, the growth of big box retail, industry consolidations and emerging information technologies. The success of big box retail depends on competitive advantage in production, sourcing and distribution, and the needs of big box retailers have generated the incentive to build mega DCs. (Andreoli et al. 2010, p. 79) In United Kingdom, approximately 60% of the demand for large distribution centres came from retailers in 2004-2009 (McKinnon 2009, pp. 294-295).

In addition to the features related directly to the facility itself and the market being served, the demand for warehouses and distribution centres in general depends also on the state of economy, growth in international trade and the availability of land (Strauss-Wieder 2001, p. 2). A general assumption is that warehouse space demand grows roughly in line with GDP:

when GDP increases, more warehouse space is demanded. McKinnon (2009, p. 294) splits the correlation between warehouse floor area and GDP into two independently varying rations: GDP to inventory and inventory to warehouse floor area. Based on this split and the general assumption of the relationships, when GDP increases, average inventories and demanded warehouse floor areas increase as well. However, there are several developments affecting the relationship between inventories and floor area. The value density of inventory changes through time, and therefore increasing inventory value does not directly lead to increasing space needs. The storage capacity of warehouses does not only depend on floor area, but also the height of warehouses and in general, warehouses have been getting taller, increasing the storage capacity. Warehouses are also used for other functions than storage, including goods handling, picking, product customisation and recycling, and also the amount of vacant warehouse space varies due to both economic activity and commercial property cycles. Also several trends, including off-shoring, increasing costs of freight transport, transfer to sustainable transport models, e-commerce, advances in warehouse technology, restructuring of waste supply chain and adaptation needs created by climate change, are forecasted to distort the relationship between the level of economic activity and warehouse floor area in the context of United Kingdom. (McKinnon 2009, pp. 294-296)

3.3.3 Location

Location definitely matters in logistics business, and together with the size of logistics properties, it defines the efficiency of distribution (Dablanc & Ross 2012, p. 433). Therefore the optimal location of logistics facilities is one of the most important basic issues to be solved in logistics business. According to Hesse (2002b, p. 4), the five factors defining the distribution facility location decisions of companies in certain areas are proximity to customers, land cost and competition, supply of qualified workforce, strategic transportation access and transportation infrastructure provision, but the location decisions of a single company are however dependent on the industry, main products, customer relationships and regional differences.

For the efficiency of goods flows, transport connections and location close to airport, harbour and railway are essential (KTI 2016b), due to which logistics properties have historically been located close to city centres and railway stations. As the average size of distribution centres has been increasing, also the importance of land prices has grown, and logistics centres are today located close to highway networks and airports. Traffic requirements together with availability and low costs of land have also helped suburban and exurban areas to become attractive. Recently, logistics in cities has disrupted other urban functions, for example housing, which has also resulted in a shift towards suburban sites. (Dablanc & Ross 2012, p. 434; Hesse 2004, pp. 163-164) At the same time, older centrally located warehouse facilities are being converted to other purposes (Cidell 2010, p. 364). On the other hand, as presented in the upcoming chapters of the thesis, some of the logistics megatrends will increase the demand for urban logistics facilities, and it has been stated that in the United States especially the demand for urban facilities resulted in the lowest industrial vacancy rates in 15 years in the end of 2015 (Selko 2016). In addition to transport connections and factors related to land, availability and price, also economic development incentives, infrastructure provision and qualified workforce have their effects on the location decisions (Hesse 2004, p. 164).

The location decisions of logistics properties also depend on the market being served (KTI 2016b). Wagner (2010, p. 224) states that the locations of national distribution centres mainly depend on factors such as the logistics organisations of companies and centrality within the service area. Instead, in case of regional distribution centres, traffic volumes, land prices and availability, land use conflicts and access to infrastructure also influence location decisions. Cidell (2011, p. 835) states that warehouses are typically located based on the proximity of customers and suppliers, but location of distribution centres is defined based on their own spatial logics of transport access and available space.

3.4 Logistics Property Supply and Demand in Finland

The Finnish logistics property stock has developed rapidly in recent years due to new traffic connections and changes in space demand, and the supply has increased especially in surroundings of Helsinki metropolitan area in municipalities with good traffic connections (KTI 2016a, p. 56). However, the size of logistics property market in Finland cannot be accurately defined as for example logistics, warehousing and industrial functions may take place in same properties and the usage of a property may change over time (KTI 2016b). Currently approximately 28% of the total stock of storage, warehouse and logistics properties in Finland is located in Uusimaa region (Statistics Finland 2016a). According to Cushman & Wakefield (2016a), occupier focus is especially on good locations in Helsinki metropolitan area, and also locations such as Kerava and Sipoo are demanded due to their optimal trade-off between traffic connections and land prices.

In recent years, the vacancy rates of modern logistics properties have increased due to new space supply and limited demand resulting from weak general economic conditions (KTI 2016a, p. 56). In the second quarter of 2016, the amount of vacant industrial and logistics space in Helsinki metropolitan area was almost 480,000 sq. m, accounting for a vacancy rate of 6.2%, while the lowest industrial and logistics vacancy rates in Finland were recorded in Jyväskylä, where the vacancy rate stood at 2.3% (Catella 2016, p. 13).

Currently the main driver for logistics space demand in Finland is the trend of logistics service providers centring their operations on fewer, larger units (Cushman & Wakefield (2016a). Also modern and efficient logistics spaces are facing increasing demand due to increasing foreign trade, restructuring of retail sales and reorganisations of logistics systems and supply (KTI 2016a, p. 56). In the whole country, approximately 34% of the total warehouse and logistics stock has been constructed in the 2000s and later. The shares of modern property stock vary significantly in different cities, the shares being the highest in cities with moderate total stock and a few modern large-scale constructions. (Statistics Finland 2016a) According to KTI (2016b), the most of the logistics property construction projects in the 2010s have taken place in Vantaa and in the inner parts of Uusimaa region.

Limited occupier demand has had its effects on the rental development, and the rents of industrial and logistics properties have recently either remained relatively stable or decreased slightly (KTI 2016a, p. 56). In international comparison the Finnish rents are however high, and according to rental level databases by JLL (2016d), in the second quarter of 2016, the prime distribution warehouse/logistics rents in Helsinki were among the highest in Europe, being at the same levels with rents in Stockholm, and almost one third higher than rents in important logistics locations such as Rotterdam. The rental levels of some remarkable logistics locations in Europe are presented in Figure 2. In 2016, the expected GDP growth is

forecasted to support the occupier demand for logistics and industrial space. The attractive submarkets may gain from relatively low vacancy rates and limited number of new developments, and even some emerging rental growth may be expected. (JLL 2016c p. 21)

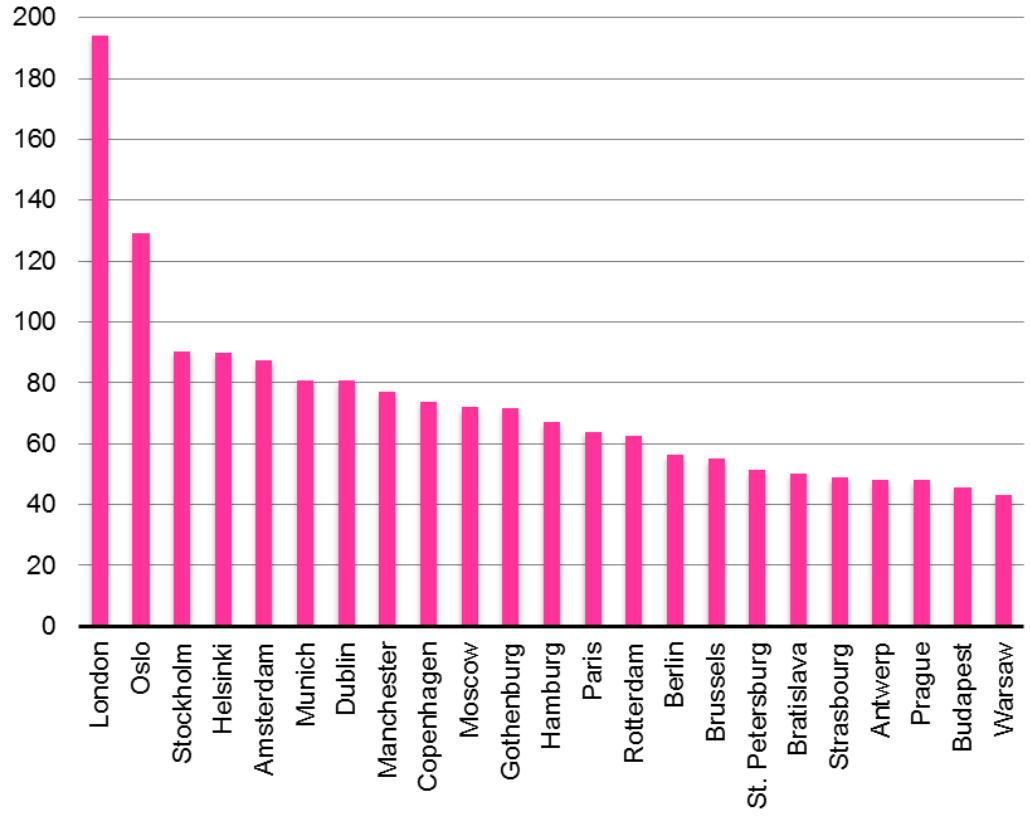

Figure 2 Prime distribution warehouse/logistics rents (€/sq. m/year) as in Q2 2016 (JLL 2016d)

4 Logistics and Supply Chain Megatrends

Representing the first part of the environmental scanning process completed in the thesis, this chapter will recognise, group, introduce and discuss the logistics megatrends based on the existing literature.

4.1 The Process of Recognising and Categorising the Megatrends

Although it has been stated that logistics researchers often do not pay enough attention for studying the future of their field of study (von der Gracht & Darkow 2010, p. 46), today especially collecting and publishing opinions and definitions of logistics and supply chain megatrends has become common among researchers and other players. In addition to complete lists of megatrends, several authors have focused in their publications on one or a couple of considerable forces shaping the industry, its actors and practices. In this thesis, the logistics megatrends are recognised by scanning the existing literature focusing on the megatrends and future development of logistics and related fields. The megatrends recognised in literature and publications will be grouped and briefly introduced in the following chapters.

In the literature scanning, the used articles and other publications have been selected based on their focus on the megatrends and the future development of logistics, supply chains, transport or other related fields. The used sources have been selected quite freely, and in addition to articles published in academic journals, also other publications produced for example by logistics and consulting companies have been studied. The literature scanning has been completed between February and August 2016, and due to the recent rapid development of the industry and advances in related technology, only sources published in 2010-2016 have been included in the examination. No selection has been made based on locational issues and as a result, the focus of the used literature varies from Nordic and European to American business environment.

The final sources used in the megatrend recognising process included ten publications, focusing for example on logistics, supply chains, road freight and material handling. In addition to sources discussing exactly the concept of megatrend, also for example the terms of "*trend*", "*driver*", "*driving force*" and "*game changer*" appear in the literature. The final composition of the used sources is presented in Table 1.

Table 1 Used sources in literature scanning

Author	Year of publication	Title
Christopher, M.	2011	Logistics and supply chain management: creating value-adding networks
Colliers	2015	From first mile to last mile. Global industrial & logistics trends
DHL	2016	Logistics trend radar
Fawcett, S. E. and Waller, M. A.	2014	Supply chain game changers - mega, nano, and virtual trends - and forces that impede supply chain design (i.e., building a winning team)
Gue, K., Akcali, E., Erera, A., Ferrell, B. and Forger, G.	2014	Material handling & logistics U.S. Roadmap
JLL	2016	The new industrial (r)evolution: from supply chains to consumer-centric demand chains
Liimatainen, H., Hovi, I. B., Arvidsson, N. and Nykänen, L.	2015	Driving forces of road freight CO2 in 2030
Mazzarino, M.	2012	Strategic scenarios of global logistics: what lies ahead for Europe?
Stank, T., Autry, C., Bell, J., Gilgor, D., Petersen, K., Dittmann, P., Moon, M., Tate, W. and Bradley, R.	2013	Game-changing trends in supply chain
Stank, T., Autry, C., Daugherty, P. and Closs, D.	2015	Reimagining the 10 megatrends that will revolutionize supply chain logistics

In addition to the focus and used concepts, also the methods and techniques used in the reviewed literature vary. In his book of logistics and supply chain management, Christopher (2011) has studied the supply chain of the future and introduces briefly the emerging megatrends shaping the supply chains, focusing on the demographic and wealth distribution changes. The report by Colliers (2015), representing trend studies of consulting companies, focuses on examining the potential impacts of trends in key markets of global main regions. DHL (2016) publishes regularly their views of logistics trends and their potential impacts by identifying megatrends, observing microtrends and startups and by using the network of partners and experts and customers as sources. Fawcett and Waller (2014a) name and explore five emerging game changers having the potential to shape supply chain design. The roadmap by Gue et al. (2014) projects the future of material handling and logistics industry from the U.S. perspective. The timeframe of the examination by Gue et al. is the next ten years, to 2025, and the views have been collected from more than 100 industry thought

leaders in four workshops. The publication by JLL (2016a) focuses on the key changes shaping the future supply chains and driving logistics property occupier demand in Europe over the next 5-10 years. The methodology behind the publication includes a review of existing research on global megatrends, two expert workshops, 30 in-depth interviews and an online questionnaire survey. Liimatainen et al. (2015) gather the overarching trends of road freight CO2 in Finland, Sweden and Norway by 2030 based on international comparison of similar Delphi surveys carried out in each country. Mazzarino (2012) provides potential future scenarios for the development of logistics networks and assesses the impacts of the global developments on the EU area. As a result of literature review and group sessions among company representatives, Mazzarino presents and analyses five categories of key drivers of logistics, focusing mainly on macro drivers that the logistics actors cannot directly control. Stank et al. (2013) present game-changing supply chain trends that are both extremely impactful considering the company's profit and difficult to implement successfully. These game-changing trends are based on a previous study completed by Bowersox et al. (2000), and the trends have been revised based on responses from over 170 supply chain professionals. Stank et al. updated the megatrends also in a study in 2015, where the state of each megatrend in 2025 is predicted, and five new megatrends having the potential to revolutionize supply chain logistics are introduced.

In addition to the megatrend sources presented above, the studies by von der Gracht and Darkow (2010 & 2013) have been used to support the megatrend assessing process of the thesis as the authors have developed scenarios of potential developments of logistics service industry by 2025 based on a two-round Delphi survey. Also the forces of change of the logistics operational environment in the logistics industry of Southern Finland, collected by Nurmi et al. (2012, p. 28), have been utilised during the process.

The megatrends recognised in the reviewed literature differ by their extent and nature. During the examination, all of the recognised megatrends, related phenomena and their sources were collected and listed. Afterwards the phenomena were given keywords to describe their contents. The keywords were sorted to five main categories in order to combine individual phenomena under wider frames. The resulting five final megatrends are: (1) demographic changes, urbanisation and changing demand, (2) technological development, (3) collaboration and integration, (4) globalisation, re-shoring and changing global competition and (5) ecological drivers and sustainability. In order to analyse the megatrend "technological development" in a more comprehensive way, the megatrend has been further divided into five subcategories, which are The Internet of Things, autonomous vehicles, additive manufacturing, big data and predictive analytics and digitalisation of retail. Finally, the subcategory of autonomous vehicles has been further divided in three separate subsections: driverless cars and trucks, robotics and automation and drones. The final megatrends and their subcategories are also presented in Table 2.

Table 2 Recognised megatrends and their subcategories

Megatrend
Demographic changes, urbanisation and changing demand
Technological development
The Internet of Things
Autonomous vehicles
Driverless cars and trucks
Robotics and automation
Drones
Additive manufacturing
Big data and predictive analytics
Digitalisation of retail
Collaboration and integration
Globalisation, re-shoring and changing global competition
Ecological drivers and sustainability

After categorising the megatrends, additional literature focusing on each category has been reviewed in order to achieve deeper understanding of each phenomenon and for being able to describe and analyse the megatrends as comprehensively as possible. Each of the megatrend and the subcategories will be briefly introduced in the following chapters, each named after one megatrend. If the reviewed publications have recognised and named megatrends' potential effects on the logistics space demand, they will be presented later in each chapter as well.

4.2 Demographic Changes, Urbanisation and Changing Demand

Changes in demand and customer's requirements have often been included in the megatrends having significant effects on logistics industry. The authors of the reviewed megatrend literature refer to this changing customer demand with varying terms, but the idea of changing consumer habits and requirements was included in almost all of the reviewed literature sources, and for example Christopher (2011, p. 258) states that the most critical of all emerging trends shaping the future of supply chains are those doing with demographics and changes in global spending patterns. Demographic changes and urbanisation were most often identified as the key elements shaping the demand.

Demographics issues were reviewed in articles covering logistics megatrends with focus both on Europe and United States. Demographic changes, related to population, its structure and its locational distribution, have commonly been used for reasoning changes in customer requirements. Especially ageing of the population in developed countries and the simultaneously increasing world population are seen to affect consumption habits (Mazzarino 2012 p. 11; Liimatainen et al. 2015, p. 280). The EU population is forecasted to face significant changes in its age structure in the following decades as the baby-boom generations retire and average lifetime increases. By 2060 the old-age dependency ratio, referring to people aged 65 or above to people aged 15-64, will increase from its current approximately 28% to more than 50%, and at the same time the whole EU population is forecasted to grow slightly, by 3%. In Finland the share of elderly population (65 years and older) of the total population is projected to increase from approximately 19% to 26% by

2060. (European Commission 2015) Ageing population changes the previous market profiles and requires new types of products and services, while the globally growing population demands more and more resource flows worldwide. The rising demand for resources will challenge the current supply chains and imply a growing pressure on resource utilization and more efficient logistics chains. Also the cultural and ethnical changes resulting from European immigration policies have been stated to shape the demand. (Mazzarino 2012, pp. 11-13) As a result of increasing world population, changing age profiles and cross-border migration spending patterns will change, some markets expand and others decline (Christopher 2011, p. 258). In the context of the United States, Gue et al. (2014, pp. 18-19) see that the future workforce in material handling and logistics industry is a challenge as generations are decreasing and in certain sectors in the industry the typical age of workers is already relatively high. Simultaneously, the competition for skilled workforce will be tighter and requirements for workforce skills change. (Gue et al. 2014, pp. 18-19)

At the same time with changes in population structure, also relocation of population takes place. In 2007, the global urban population exceeded the rural population for the first time, and by 2050 the share of urban population is forecasted to grow to 66% (United Nations 2015, pp. xxi, 7). Also the economic power of cities has continuously increased, and in Europe cities already generate 85% of the continent's total GDP (European Commission 2013, p. 2). The continuing trend of urbanisation is seen to challenge supply chain systems in several ways. The lack of storage capacity in urban homes results in smaller quantities bought and more frequent need for buying. Simultaneously the demographic heterogeneity increases the variety of customer demand. Low car ownership rates shift the demand towards e-commerce and home deliveries. (Gue et al. 2014, p. 14) Also challenges related to urban logistics will become even more relevant: the existing freight and passenger transport systems in urban areas have been blamed, among other things, for congestions, inefficiency, polluting and emissions, producing waste, noise and harming public health (Anderson et al. 2005, p. 72), and managing environmental problems in cities leads to more expensive and complicated logistics processes (Colliers 2015, p. 18).

Demographic changes and urbanisation result in changing customer demand for goods and services. Stevens and Johnson (2016, p. 38) state that in the future customers will require more differentiation and greater levels of customisation from their products and services. Greater levels of customisation will be delivered by developing mass customised products and by creating new delivery methods. Mass customisation combines specific and varying customer requirements with the saving graces of high-volume production: short lead times, low costs and standardised quality (Beaty 1996, p. 217) and enables providing customised products at near mass production prices (Gue et al. 2014, p. 13). Also so called "*servitisation*" is a growing trend among Western companies responding to the changing demand: companies add a service wrapper in products and services in order to compete against producers located in emerging economies providing lower costs and lower services (Christopher & Ryals 2014, p. 30). In addition to the previous, Stank et al. (2013, pp. 6-7) state that customer segmentation and prioritisation will be needed in order to meet the variable and changing demand. Traditionally, all customers have been provided with standardised service and products, but the industry has moved towards segmented customers and managing unique service relationships. In-stock availability and on-time deliveries are

examples of supply chain performance that is critical to customers, or are even the prime-drivers for some customer segments. (Stank et al. 2013, pp. 6-7)

As the customer expectations related to deliveries are changing, logistics companies will increasingly have to compete on service, and future deliveries have to be both exact and fast - next day, same day, or even same hour (Selko 2016; von der Gracht & Darkow 2010, pp. 54-44; Gue et al. 2014, pp. 23-25). Liimatainen et al. (2015, p. 280) predict that the changes of consumer habits result in a shift towards the distribution of small shipments directly to the consumers. Also high-quality support services will be demanded. New delivery types and methods have often been connected to new technologies: according to DHL (2016, p. 28), the technologies related to location, routing and analytics will bring changes to parcel delivery business. It has been stated that by 2025, all shipments should be GPS trackable from order to delivery at a detailed and real time level, and arrival times should be estimated in a reliable way within 1% of remaining delivery time. Customers should easily be able to update the delivery point information, and to receive deliveries to their current locations. (Gue et al. 2014, pp. 11-12, 23-25, 38) Also new order and distribution channels and supporting systems and operations will be demanded and created. The future alternative last mile distribution channels include for example cargo cycles, petrol stations, self-service parcel delivery kiosks and lockers and local public transport (Colliers 2015, p. 21; Gue et al. 2014, p. 37; von der Gracht & Darkow 2010, p. 56).

Companies' ability to respond to the changing demand will define their future success and their logistics performance is highlighted to be the success factor for competitiveness and customer retention (von der Gracht & Darkow 2010, pp. 54-55). Stank et al. (2013, p. 7) see that close customer relationships help companies to become proactive with their customers and to recognise their long-term demands, expectations and preferences. On the other hand, investments needed in creating tailored customer value can be huge, and companies are therefore forced to choose the customers and segments to focus and compete. (Stank et al. 2013, p. 7) Also the increasing demand for fast and exact deliveries can significantly raise the supply chain costs: last mail deliveries have been stated to be the most inefficient and expensive part of the logistics chain and can account for a significant share of the total delivery costs (Selko 2016; Colliers 2015, pp. 18, 27).

Antai and Ohlson (2013, p. 512) see that the increasing demand for additional customized services, faster turn-around times, less storage time and storage space will result in supply chains requesting more of logistics centres. In order to respond to the changing customer demand and to reach the demanded fast delivery times, distribution centres have to be located near customers, and urban logistics will become a key issue of success. According to Selko (2016), in the United States the increasing demand for warehouse and distribution space in urban areas has already led to increasing rents and rezoning areas. For example former schools and government buildings have been redeveloped into distribution centres in order to reach the higher and better use. Changes in working style and collaborative behaviour are driving changes also in offices and older office buildings will increasingly be freed up for alternative uses. Even empty bank branch networks have been established as online grocery pickup and delivery locations. (Colliers 2015, p. 27)

4.3 Technological Development

New developing technologies received mentions in most of the reviewed literature sources. Some authors highlighted the technological development in general, some named one or several separate new technologies or new operations enabled by technological developments, shaping the future of logistics and supply chains. Due to the extent and multiple features of the megatrend of technological development, it has been divided to in total eight subcategories in order to describe and understand the phenomenon in a more comprehensive way. The technologies and their outcomes receiving the most mentions in the literature will be briefly introduced in the following chapters.

4.3.1 The Internet of Things

The Internet of Things (IoT) is the totality of everyday life things and objects that are able to interact with each other, becoming part of the Internet. The items connected to the Internet of Things include for example radio-frequency identification (RFID) tags, sensors, actuators and mobile phones, and due to the interaction, they are able to cooperate to reach their common goals. (Atzori et al. 2010, p. 2787; Zanella & Vangelista 2014, p. 22) New applications utilising the potential of the Internet of Things could be used to improve the quality of daily life related to for example home, health, sports and travelling (Atzori et al. 2010). In business the IoT is expected to transform the operations and roles of for example transport and manufacturing systems, and the role of the IoT in transport and logistics industries will be increasingly important (Da Xu et al. 2014, pp. 2233, 2238) as logistics industry will benefit from the integration of information and material flows (DHL 2016, p. 17).

In the reviewed literature, The Internet of Things received some mentions as phenomenon revolutionizing logistics. In addition to the characteristics and advantages of the IoT presented in this chapter, it lays the basic foundation and possibilities for the most of the following technological developments shaping the logistics industry presented later in the thesis.

RFID systems, composed of readers and tags, passive small microchips, are one of the key components of the IoT as they provide the possibility to monitor objects in real time (Atzori et al. 2010, p. 2790). In addition to RFID, also wireless sensor networks, using interconnected sensors to sense and monitor, are foundational technologies for the IoT (Da Xu et al. 2014, p. 2233). Gue et al. (2014, p. 17) forecast that by 2025, sensors communicating automatically with the Internet will be used everywhere, including all steps of the manufacturing process. The real-time information processing technologies enable monitoring almost all parts of supply chains: raw materials, production, transport, storage, distribution and sales, returns and after-sales as vehicles as well as roads, rails and the transported goods are being equipped with tags, sensors, actuators and processing power providing the possibilities to route the traffic, provide transport information and monitor the status of goods (Atzori et al. 2010, pp. 2793-2794). The possibilities of the IoT are not only limited to tracking of goods, but it also has capacity to help businesses to monitor and respond to potential supply chain risks and to improve asset utilisation and freight transport operations. In manufacturing the technologies provided by the IoT could increase the visibility of spare parts, early maintenance and replacement needs (JLL 2016a, p. 10), and

by adopting these technologies traditional companies could significantly reduce their reaction times and work with zero safety stock (Atzori et al. 2010, p. 2794).

The Internet of Things has potential to change the geographies by enabling so called Smart Cities, which have the general aim to use efficiently public resources, increase the quality of services and reduce the costs of public administrations. This could be pursued by the communication infrastructure, so called urban IoT, where public services such as transport, parking, lighting, garbage collection and surveillance and maintenance of public areas were connected to the Internet. (Zanella & Vangelista 2014, pp. 22-23) Smart Cities and urban IoT would improve for example managing traffic flows and parking, and logistics industry benefit from the optimising freight flows for example by traffic conditions (JLL 2016a, p. 10).

The increasing amount of sensors sets increasing requirements for the quality and features of the collected data. Today data from variable sources are typically coming in different formats, and work and human intervention is needed for utilizing the data. Also problems related to sharing the data have been recognised: although open and available supply chain data would support all attached businesses, the high competition in the market and resulting companies' attitudes restrain creating data sharing systems and agreements as data are mostly considered proprietary. (Gue et al. 2014, pp. 27-28) Atzori et al. (2010, p. 2801) include security and privacy among the open issues related to the feasibility of IoT: as the system is extremely vulnerable to attacks due to the unattended components, wireless communications and low capabilities of energy and computing resources, public concerns will appear and the system will be resisted as long as there is lack of public confidence.

4.3.2 Autonomous Vehicles

The basic idea of autonomous vehicles originates from the potential created by the Internet of Things. Autonomous vehicles are capable to move and act intelligently without need for guide or control and they are able to sense their environment, be aware of their position in the structure of the environment and plan routes to goal positions (Cox & Wilfong 1990, p. xix). The various types of autonomous vehicles include e.g. driverless cars, unmanned aircrafts, robots, autonomous trucks and drones.

Driverless Cars and Trucks

Driverless cars are the type of autonomous vehicles often receiving the greatest attention. The term "*driverless car"* itself does not take a stand on whether the car still has a driver on board (Gue et al. 2014, p. 39), and the term is used to refer both to situations where the car is moving independently although there is still a responsible driver and to completely self-driving cars without a driver on board. The technology behind driverless cars is based on both vehicle-to-vehicle and vehicle-to-infrastructure technologies. For example, driverless cars created by Google are standard passenger vehicles equipped with GPS receivers, mapping technology, radars, laser ranging systems, video cameras and on-board computers for processing the collected information and making decisions of behaviour of a vehicle in given situations. (Waldrop 2015, pp. 20-22)

The benefits of driverless cars include reduced congestions, reduced need for parking, improved safety in traffic, decreased costs and more efficient deliveries (Fawcett & Waller

2014a, pp. 159-160; JLL 2015b). Self-driving cars and trucks could safely keep smaller distances between vehicles, which would relieve congestions (Gue et al. 2014, pp. 39-40). Traffic and congestions could also be reduced due to car sharing, which is estimated to become more popular due to autonomous vehicles (JLL 2016a, p. 13). Vehicle-to-vehicle communication has been stated to provide significant safety benefits as vehicles are aware of the positions of other vehicles, can calculate risks, issue driver advisories and act to avoid crashes (Narla 2013, p. 22). Decreasing need for human labour would cut costs and improve safety in traffic as it would no longer be dependent on the vitality of a driver (Gue et al. 2014, pp. 15-16, 39-40). Also problems related to driver shortages and disruptions of driver turnover, which have been named to be the most pressing challenges in trucking industry, could be solved by driverless trucks (Fawcett & Waller 2014a, pp. 159-160). Longer driving hours extending the reach of daily transports would also enable more efficient deliveries and improved services (Gue et al. 2014, pp. 39-40).

Google has been a pioneer of driverless cars as it started the self-driving car project in 2009, and the self-driven cars by Google have driven already more than 1.5 million test miles on the streets of the United States (Google n.d.). Although most of the technologies for driverless vehicles already exist, the views of the moment when the driverless cars would become common vary. According to Waldrop 2015 (p. 22), it is yet unclear when driverless cars are smart enough to respond to all unlikely events in the traffic, but in general the driverless cars are predicted to become widespread in the 2020s. Instead, Gue et al. (2014, p. 40) state that by 2025 self-driving cars could not be allowed in normal traffic without having a licenced driver on board, and therefore self-driving trucks could have only minor effects on the logistics system as for example the achieved cost reductions would stay at low levels. Fawcett and Waller (2014a, p. 160) see that the widespread use of autonomous vehicles would require both advances in technology and changes in policies, and according to JLL (2016a, p. 13), issues related to technology, infrastructure, legal, insurance and labour, are likely to make the utilisation of autonomous vehicles a more distant outlook.

More common use of autonomous vehicles would also have effects on warehouse properties, including their design, size and location. According to JLL (2016a, p. 14), warehouses should be designed to make the use of automated vehicles possible for example by changing the design of yards and loading docks. The implementation of autonomous vehicles would increase logistics property development costs especially in urban areas, and investments in both infrastructure and IT would be required (JLL 2016a, p. 14; JLL 2016b). However, Gue et al. (2014, pp. 39-40) instead state that savings could be reached both in labour and property costs as the number of warehouses could be reduced as the same service level could be provided by a smaller number of larger warehouses.

Robots and Automation

Robots represent an older technology that has already been widely accepted and used in warehouses, but that today provides plenty of new opportunities for changing the logistics industry. Autonomous guided vehicles have been used in warehouses since the 1950s, primarily for moving large and heavy objects (Wurman et al. 2008, p. 9), and traditional material-handling vendors have been providing for example self-driven forklifts and pallet-manipulator arms (Guizzo 2008, p. 31) for moving pallets in warehouses. The use of robots in material handling and logistics applications is expected to increase as the costs of robotics have been decreasing (Gue et al. 2014, pp. 15-16) and the increasing requirements for fast

deliveries and order processing can be supported by robotics and automation technologies (DHL 2016, p. 42). For example robotic fulfilment system manufacturer Amazon Robotics' (formerly Kiva Systems) business is based on the idea that orders can be fulfilled faster when inventory items come to warehouse workers rather than vice versa. (Guizzo 2008, pp. 29-31). In the autumn of 2015, Amazon announced that the company was using up to 30,000 Kiva robots in 13 fulfilment centres, and that robots have significantly improved Amazon's shipping and packing efficiency and had a direct impact on the company's productivity (Kim 2015). Robotics pickers have been reported making the pick rate in warehouses over 500% faster, which is estimated to reduce the number of workers but set increasing requirements for their skills (JLL 2016a, p. 12).

Location decisions of distribution centres and warehouses are mainly based on land prices and distances to the point of final consumption, and as a result distribution centres and warehouses are today often located in metropolitan regions (Hesse & Rodrigue 2004, p. 178). As presented earlier in Chapter 3.4.3 of the thesis, among other things also supply of qualified workforce has an effect on location decisions. It has been stated that automation and robots have the potential to change the locations of logistics facilities as due to the reduced number of workers the warehouse locations would no longer depend on the workforce, and logistics facilities could therefore be located outside urban areas, on cheaper land (Colliers 2015, p. 27; JLL 2016a, pp. 12-13). Also setting up a completely new logistics facility is expected to become easier and faster as robots make the time-consuming building of large conveyor systems unnecessary (Guizzo 2008, p. 31). In addition to affecting the logistics and manufacturing locations at local or regional level, robotics could support the global relocation of production facilities away from low labour cost countries (JLL 2016a, p. 12). This "*re-shoring*" phenomenon will be further observed in Chapter 4.5 of the thesis.

Drones

Drones, unmanned aircrafts, represent a type of autonomous vehicles with rising general interest. Drones are already being used for certain deliveries, traditionally for example for guaranteeing medical deliveries in islands, and some commercial players, including Amazon and DHL have been testing delivery drones. According to Fawcett and Waller (2014a, p. 160), the potential of drones in supply chains is related to efficient deliveries and enabling deliveries to people with no access to modern road infrastructure. Drones provide a feasible option for package deliveries also from cost perspective (D'Andrea 2014, p. 648). Drones and their potential for faster and more effective deliveries could result in decreasing consumers' motivation to go to the brick-and-mortar stores, and therefore even change the competitive rules of retail (Fawcett & Waller 2014a, p. 160).

The challenges of practical use of drones are mainly related to technical issues. Drones have to operate in a reliable way in changing conditions and environments, which requires sensors and systems that are either in development or do not exist yet (D'Andrea 2014, p. 648). The challenges that are tough to overcome and as unsolved prevent the large-scale implementation of drones include regulations of air space and safety, public reactions and privacy and security concerns (D'Andrea 2014, p. 648; JLL 2016a, p. 14). In countries with fewer regulations related to airspace and weaker infrastructure conditions drones may break through in some deliveries, but in Europe their impact on logistics properties is expected to be only minimal within the next five to ten years as drones are not expected to become common in the consumer market over this timeframe (JLL 2016a, p. 14).

4.3.3 Additive Manufacturing

Additive manufacturing is the process of making three-dimensional parts from CAD models by adding materials layer by layer. Three-dimensional printing (3D printing) is one of the commercially developed processes of additive manufacturing. (Guo & Leu 2013, p. 215) In the reviewed megatrend sources as well as in other literature additive manufacturing and 3D printing are often used as synonyms. Also the terms direct digital manufacturing and rapid manufacturing are commonly used (Sasson & Johnson 2016, p. 93).

The new technologies related to additive manufacturing received some mentions in the reviewed literature considering logistics megatrends. According to DHL (2016, p. 7), 3D printing has the potential to cause a similar impact on goods transportation as email had on letters. Von der Gracht and Darkow (2010, p. 57) included the rise of additive fabrication technologies, including laser sintering and 3D printing as a wildcard scenario, a surprising but possible event or development with consequences in the logistics services industry. Also in other study by von der Gracht and Darkow (2013), the projection that decentralized production of goods on-site at small-scale factories would lead to substantial structural changes in the logistics industry by 2025 received a rate of probability of 51.2% from the expert panel, and the potential impacts of the projection on the logistics industry were rated as medium. Instead, in other reviewed literature the potential effects of additive manufacturing on logistics and supply chains were often highlighted, and according to Sasson and Johnson (2016, pp. 82-83), 3D printing has been called a new industrial revolution that will dramatically change supply chains, strategies, competition and industrial geographies.

Additive manufacturing has traditionally been used for rapid prototyping, which currently covers approximately 37% of the market (Gress & Kalafsky 2015, pp. 43-44), but the recent technological advances have enabled a shift to rapid manufacturing of tooling and end-use parts (Guo & Leu 2013, p. 237). The technologies are already widely used for example in healthcare sector (DHL 2016, p. 34). The benefits of additive manufacturing are related, among other things, to fulfilling the changing customer demand, covered earlier in Chapter 4.2 in the thesis. Customers will increasingly demand more differentiation and greater level of customisation. Additive manufacturing is a tool for delivering custom-design products (Gue et al. 2014, p. 53), and it provides conditions for increasing the number of available physical products and creates a market for manufactured goods that are less commonly demanded (Sasson & Johnson 2016, p. 85-86).

According to Christopher and Ryals (2014, p. 30), yesterday's supply chains were designed to optimise costs by bigger volumes. Tomorrow's supply chains will instead be geared more towards smaller quantities, and Christopher and Ryals predict a transition from make-to-stock towards make-to-order. Waller and Fawcett (2013a, p. 251) present that in some cases additive technologies make scale economies irrelevant as because of digitalisation, the first and every product from printer benefits from quality and efficiency. Lead times will be reduced, and home 3D production will reduce the time between production and consumption (Sasson & Johnson 2016, pp. 85-86). Additive manufacturing has also the potential to change the subject being delivered in supply chains as the technology would require handling and delivering the raw material to the new points of manufacture (Gue et al. 2014, p. 53) instead of delivering the final products to the points of consumption.

In the literature also spare parts supply chains are expected to face changes due to additive manufacturing. Due to new technologies, companies can reduce their replacement part stock quantities and start to produce them on demand (Gue et al. 2014, p. 53). On-site spare parts printing could also change the geographic of manufacturing and mean a pull away from the low cost manufacturing sites (Gress & Kalafsky 2015, p. 45). It has been claimed that 3D printing could cause the manufacturing jobs to return to wealthy countries, or instead increase manufacturing opportunities in remote locations (Gress & Kalafsky 2015, p. 43). Some authors forecast also a change in shopping behaviour: when a customer needs a single item, instead of making a trip to the store it will be easier to download the design from Internet and print the item at home (Fawcett & Waller 2014a, p. 159). Also the environmental impacts of 3D printing have been highlighted as no packing or packaging will be required (Gress & Kalafsky 2015, p. 49).

Currently most of the world's 3D printers and major 3D printer manufacturers are concentrated in major metropolitan areas in Western Europe and North America (Gress & Kalafsky 2015, p. 44). In addition to the current printing points, it has been forecasted that the existing manufacturers will develop 3D printing into on-demand, multiproduct regional supercentres. These supercentres would be large printing complexes with possibilities to single material printing and assembly operations for low volume parts. (Sasson & Johnson (2016, p. 91)

4.3.4 Big Data and Predictive Analytics

Companies are continuously capturing information about their operations, customers and suppliers through their daily business and social media. At the same time millions of sensors are embedded in devices in the physical world, and for example home appliances, surveillance cameras and vehicles are sensing, creating and communicating enormous amounts of data. (Manyika et al. 2011, p. 1; Zanella & Vangelista 2014, p. 22) It has been even stated that in 2014, 90% of all data created in the history of humankind was generated in the two previous years (Fawcett & Waller 2014a, p. 158). The term big data refers to these created exceptionally large data sets for which the ability of typical database software tools is not sufficient for capturing, storing, managing and analysing the data (Manyika et al. 2011, p. 1). In material handling and logistics, as well as in other industries, the goal of data is to help to make better decisions and the value of data is limited only to its capability of supporting decision-making (Gue et al. 2014, p. 29). Therefore the growing amounts of data would be useless without supporting analytics tools that can improve decision making, minimise risks and reveal otherwise hidden valuable insights (Manyika et al. 2011, p. 5).

Keywords related to big data were recognised in more than half of the reviewed literature sources. Big data has been seen to change the logistics industry and supply chains in several ways, and in all scenarios the implications were estimated to be remarkable. Waller and Fawcett (2013b, p. 77) state that big data, the growing combination of resources, tools and applications have deep implications in the field of supply chain management and also the potential to revolutionize supply chain dynamics. According to JLL (2016a, pp. 1-2, 9), big data will even enable the shift from traditional, production led supply chain management to new, consumer-centric demand chain management by improving the visibility of current and future end customer demand. Traditionally the supply chains have been viewed as production-led pipes where the end products are pushed out to the market, but big data is finally seen to provide the potential circumstances for the shift with focus on consumption

and consumers. (JLL 2016a, pp. 1-2, 9) Also Christopher and Ryals (2014, p. 29) see that during its 30-year history, supply chain management has been encouraging a supply-focused viewpoint, and the dominant logic has been production push rather than demand pull. Therefore the focus of also academic discourse has been around outsourcing, low-cost manufacturing and production efficiency instead of challenges related to delivering value in the marketplace, but big data could finally be one of the reasons helping to change the way of thinking from supply chain management to demand chain management. (Christopher & Ryals 2014, p. 29)

Big data provides organisations chance to create specific customer segmentations and tailor suitable products and services to meet these recognised needs (Manyika et al. 2011, p. 5). Fawcett and Waller (2014a, p. 158) see customer profiling to belong, in addition to correlation-driven decision-making instead of causality, to the main ways that big data is changing the supply chains. Also Stank et al. (2015, p. 10) recognise the accelerating use of analytics to conduct segmentation and optimise segment service levels. The emergence of data extraction tools and advanced analytical techniques is connected to new levels of customer service and service stratification, where customers are prioritized based on their expected lifetime value and customized service levels follow the segments. It is also predicted that in contrast to the previous one-size-fits-all thinking, a new logic of mass customisation is seen to rise. (Stank et al. 2015, p. 10) However, at the same time DHL (2016, p. 6) connects data to increasing security risks and vulnerability and sees that as supply chains are increasingly IT-rich, security risks elimination has become a priority.

In daily operations big data is used throughout supply chains. Carriers forecast delivery times and create optimal routes based on weather conditions, congestions and driver characteristics. Manufacturers forecast customer sentiment, gain from early responses to the feedback and manage inventories in real time. Also human resources can be effectively monitored in order to reach higher productivity and safety levels. Retailers base their forecasts on collected and analysed customer sentiment data and use of mobile devices in stores. (Waller & Fawcett 2013b, p. 82) Sales are recorded by location and by stock-keeping units, and the more visible and predictable demand is seen to reduce the inventory levels. Due to decreasing inventory levels and stocks, also the space needs of logistics companies are expected to become smaller. At the same time demand for facilities enabling handling a rapid throughput will increase. (JLL 2016a, p. 10)

There are numerous techniques for analysing big data and new techniques are continuously being developed to analyse new combinations of data. A certain technique, predictive analytics, received several mentions in the reviewed megatrend literature. Predictive modelling means techniques where the probability of an outcome is predicted by mathematical models: for example in customer relationship management the predictive models are used to estimate the likelihood that another products can be cross-sold to a customer (Manyika et al. 2011, p. 30). Predictive demand analytics have a clear connection to big data as available historical data is used to predict the future scenarios.

In supply chain management and logistics predictive analytics are typically used for demand forecasting and to support real-time decision-making. Increasing amounts of data enable increasing customer behaviour tracking and profiling to support for example product development, target promotions and price optimisation (Fawcett & Waller 2014a, p. 158), and possible supply chain breakdowns can be mitigated even before they occur (Stank et al.

2015, p. 22). Data of customer behaviour can be used also to so called predictive or anticipatory shipping, where goods are delivered to distribution centres closer to customers just before they are purchased. Predictive shipping practices enable faster deliveries and help to reduce inventory levels in all parts of supply chains. (DHL 2016, p. 19; Gue et al. 2014, p. 31) Amazon has been a pioneer of predictive shipping as the company announced already in 2014 that it may start to ship products in general directions based on previous orders and other factors even before actual purchase orders have been placed. The predictive shipping method was estimated to work well for example for popular books that customers want to have on their day of release. (Bensinger 2014)

Fawcett and Waller (2014a, p. 158) highlight that predictive analytics provide insight into correlation instead of causality, and therefore decisions have to be made based on the analytics without full understanding why certain things are connected. The authors state that this development will challenge the basic understanding about decision-making, and the risks related to moving based on "connections" should be examined further. (Fawcett & Waller 2014a, p. 158)

Big data and innovations in data processing enhance more accurate demand forecasts and supports transforming them into actual business and supply chain plans (Stank et al. 2015, p. 15). As logistics companies are increasingly benefiting from the opportunities created by big data, not using big data is even seen as a disadvantage (JLL 2016a, p. 9). Waller and Fawcett (2013b, p. 77) believe that the new tools related to data science, predictive analytics and big data will transform supply chain design and management and thereby present a significant challenge to logistics and supply chain management. Also Gue et al. (2014, pp. 18, 30-31) see that by 2025, standardized tools for supporting decision-making and assessing the state of supply chain, supply chain network planning, inventory optimisation and warehouse optimisation should be used by almost all companies operating or having interests in supply chains and logistics, but the technologies of predictive analytics, data mining and data visualisation will not have been fully exploited although they have developed further. A problem of utilizing the techniques is related to the availability of data and companies' attitudes: they are unwilling to share data in a way that other parts of the supply chain may benefit. (Gue et al. 2014, pp. 18, 30-31)

4.3.5 Digitalisation of Retail

The digitalisation of retail is one of the most obvious outcomes of the recent technological development, and as Gue et al. (2014, p. 10) describe, *"the retail landscape has been forever changed by electronic commerce*". Electronic commerce (e-commerce) means transactions between enterprises, individuals, households, governments or organisations, conducted over computer networks by methods that are specially designed for receiving or placing of orders (OECD 2013). Transactions can include services that are completed entirely in the Internet or goods or services that are purchased online but traditionally delivered to the buyer (Leinbach & Capineri 2007, p. 7). In general, the term "*e-commerce*" includes transactions both between companies and consumers (business to consumer, B2C), between companies (business to business, B2B) and between consumers (consumer to consumer, C2C). In 2014, the global B2C e-commerce sales of goods and services almost doubled comparing with the level three years earlier in 2011, and the total share of e-commerce in the global GDP was approximately 2.6% (Ecommerce Europe 2015a).

In the reviewed literature sources, the growth of e-commerce received less mentions than expected, which is assumed to result from the evident boom of online retail during the last a few years: the most significant changes have probably predicted to been already seen. Instead, for example Gue et al. (2014, p. 4), studying the megatrends from American perspective, describe that although the trend of e-commerce is well underway and moving towards maturity, some of the other listed trends are still in their early stages of development and only the beginning of the transformation in the consumer habits has already been witnessed. The reviewed megatrend literature was understood to focus especially on B2C e-commerce although the focus was not highlighted in the publications.

E-commerce took its first steps already at the beginning of the 1990s when the Internet was opened for commercial use. Currently e-commerce is going through a second transition as social networks are rising and the traditional platforms of desktop and Web browser are being replaced by mobile devices and apps, both together resulting in more time spent online and continuously growing volumes of e-commerce (Gue et al. 2014, p. 10; Laudon & Traver 2015, pp. 46, 71). In 2014, the e-commerce sales via smartphone increased by 48% in developed countries, and in the emerging countries the corresponding rate was simultaneously 164% (Ecommerce Europe 2015a). The technology of e-commerce is predicted to continue to develop and to result in increasing commercial activity. The number of goods and services sold online as well as the average purchase order size are forecasted to increase, and it has even been estimated that by 2020, e-commerce may account for 20% of all retail sales in Europe and United States (Laudon & Traver 2015, pp. 48, 77) as currently for example in Finland the current share of online retail in the total retail of goods is approximately 10%, being already clearly above the European average (Ecommerce Europe 2015b). At the same time, traditional retailers are increasingly investing in e-commerce and it has expanded to include also local goods and services (Gue et al. 2014, p. 10; Laudon & Traver 2015, pp. 46, 71) as well as grocery shopping.

The effects of e-commerce on logistics industry have been widely discussed during the 21st century. According to Cho et al. (2008, p. 337), the success of companies in the e-commerce relies on their distribution networks and their efficiency. The special features of B2C e-commerce challenging supply chains, logistics and transport include distribution concepts that differ from the traditional as direct, even same-day deliveries to consumers are critical to the success of e-commerce and special attention has to be paid on the packaging and presentation. E-commerce also changes the demand for goods both in terms of volume and in type of goods, and high number of stock-keeping units and small order sizes consisting of individual items instead of pallets make the work more complex and labour intensive. (Cho et al. 2008, p. 337; Gue et al. 2014, pp. 11, 32; Leinbach & Capineri 2007, p. 7) Even though the work in warehouses and transport is forecasted to become more automated and in general require smaller workforce (see Chapter 4.3.2, Autonomous vehicles), the amount of work is likely to increase in some parts of e-commerce supply chains. At the same time the growth of both B2C and B2B e-commerce is expected to grow the importance of externalised logistics and third-party logistics providers (Leinbach & Capineri 2007, p. 9).

As the trend of e-commerce has been visible for years, even for two decades, the connections between e-commerce, logistics space demand and real estate market have been studied. The e-commerce boom has given rise to several new waves of interest in logistics properties: already in the late 1990s an increasing interest in logistics properties was connected to e-

commerce (Hesse 2004, p. 164), and over the recent years of slow economic growth, e-commerce has been one of the wider supply chain changers driving the demand and keeping logistics as one of the most vibrant sectors in the European real estate market (JLL 2016a, p. 3; PwC & the Urban Land Institute 2015, p. 11).

In addition to increasing the investment demand, e-commerce is seen to create occupier demand for new property types as according to Spencer (2012, p. 9), the configurations and locations of demanded logistics facilities clearly differ from the features of traditional distribution centres. The availability and cost of land are the key challenges when creating a platform of logistics facilities (Colliers 2015, p. 27), and in case of large-scale distribution centres, these challenges are even more evident. Online retailers have been claimed to demand three times more warehouse space than traditional retailers, and a wide range of facilities is required as companies are developing even smarter strategies for their distribution (PwC & the Urban Land Institute 2015, p. 61). Parcel delivery companies carrying e-commerce shipments have already established mega-scale intermodal hubs for being able to process the parcel flows and created hub-and-spoke-type networks where parcels from multiple origins move to multiple destinations via a small number of hubs (Lim & Shiode 2011, p. 733). According to Colliers (2015, p. 26), in the following years three types of distribution centres will be dominant: mega-sized regional or national distribution centres, mid-sized, cross-docked city distribution centres and small and flexible urban warehouses or access centres. Mega-sized distribution centres are automated or semi-automated, and they are critical to major road access. Mid-sized facilities are located around main arterial routes, are typically highly automated and built for quick transfer of goods. Urban warehouses are located in urban communities, outside CBDs and the operations are typically hand-picked. (Colliers 2015, p. 26) In addition to aforementioned, JLL (2016a, p. 8) recognizes parcel sorting centres, return processing centres and warehouses for online grocery fulfilment among the demanded warehouse property types. PwC and the Urban Land Institute (2015, p. 71) state that rather than seeking expensive modern buildings, e-commerce businesses adapt to traditional logistics facilities, from which certain features, including high quality, high ceiling heights and great locations typically near large metropolitan areas, are required.

Fast same-day deliveries are expected to drive the demand towards smaller facilities located close to the customers, and the number of alternative last mile distribution channels, including click and collect kiosks and parcel lockers is expected to increase (Colliers 2015, pp. 21, 26; JLL 2016a, p. 8). However, these facilities require urban logistics warehouses (Colliers 2015, p. 27) and therefore the problem related to land costs and availability is not solved with alternative delivery methods.

Free shipping has been stated to be a critical element in successful e-commerce, and selected store-distribution centres and active overnight transport services will help retailers to meet the demand for free shipping without added costs (Spencer 2012, p. 9). Currently the business model based on free shipping is not profitable for retailers, and it may be possible that in the future the last-mile delivery operations will be located in secondary cities with lower property costs and close enough to service the major cities in order to make the function profitable (Selko 2016). Gue et al. (2014, pp. 34-35) predict that by 2025, omni-channel distribution centres, supporting several activities, including e-commerce fulfilment, returns processing and store deliveries, will be increasingly common as the current practice

that retailers may have separate facilities for e-commerce and brick-and-mortar retail store fulfilment has in many cases led to excessive inventories and high costs.

4.4 Collaboration and Integration

The tight competition in logistics has led to a situation where companies have to increasingly focus on their overall value chain processes with their suppliers and customers, in addition to improving their own internal operations (Prajogo & Olhager 2012, p. 515). Increased collaboration between supply chain participants is generally believed to support the main target of supply chain management: maximising customer service at the lowest possible costs. In research logistics integration has also been linked to increased efficiency and productivity. (Stank et al. 2001, pp. 29, 31) The basic idea of supply chain integration is the existence of an information flow through supply chains in addition to the physical flow of goods. Both flows are equally important, and integrated supply chains consist of both information and material. (Prajogo & Olhager 2012, p. 514) The two main categories of supply chain collaboration include vertical collaboration with different functions of a company, with customers and with suppliers, and horizontal collaboration with for example competitors and other organisations (Barratt 2004, p. 32). Traditionally, the collaborative relationships have been limited by for example the lack of trust between parties, limited information sharing and aspiring short-term firm-specific benefits (Stank et al. 2013, pp. 10-11).

Keywords related to different aspects of collaboration, integration and sharing between companies were identified in almost half of the reviewed literature sources, while the megatrend listing by Stank et al. (2015) includes even four separate megatrends that can be grouped under collaboration and integration. The first megatrend listed by Stank et al. (2015, pp. 10-11) related to collaboration and integration is called *"functional focus to process focus to system focus",* meaning that companies have already successfully moved their focus from single internal functions to wider processes, and the next step, integration within multiples processes between companies and supply chains, is predicted to take place. Also DHL (2016, p. 31) brings up the new concept of supergrid logistics, where a global supergrid would integrate the parties of multiple supply chains and bring possibilities for providing collaborated modular services that would enable higher efficiency and flexibility.

Also the transformation to information synthesis, meaning sharing of strategic and tactical information with customers and suppliers, and the development of collaborative relationships between buyers and sellers are included among the megatrends by Stank et al. (2015, pp. 13-15). Information sharing through a supply chain between manufacturer and retailer has previously been connected with lower costs reached through reductions in inventories and shortages (Lee et al. 2000), and the relationships between buyers and sellers have already been used to optimise processes and workflows and reducing work duplication (Stank et al. 2015, p. 14). Exchanging strategic supply chain information in addition to transactional data consisting of for example product orders is a requirement for valuable information sharing (Prajogo & Olhanger 2012, p. 516). The most recent rise of information synthesis is connected to the recent technological developments as for example big data is seen to offer potential for examination of the total supply chain network, and the capability of achieving competitive advantage by using collected data is forecasted to increase. Also the collaboration between buyers and sellers is now predicted to move to the next level, to the so called vested relationships, where the parties are predicted to build relationships based

on shared goals and values and thereby increase the potential for win-win situations. (Stank et al. 2015, pp. 13-15) These win-win situations have already resulted in for example higher in-stock fill rates, reduced lead times, improved forecast accuracy and increased inventory turnover (Stank et al. 2013, pp. 10-11).

Fawcett and Waller (2014a, pp. 160-161) include the trend of borderless supply chains among their supply chain game changers. Borderless supply chains are described to provide corporations greater leanness and agility as the synchronisation enables team members seamlessly to come and go as needed and to response to arising needs and consist of variable freelancers, their built relationships and defined general working arrangements.

Von der Gracht and Darkow (2010, pp. 54-55) highlight the quality of companies' global networks and relationships, which are predicted to become key factors of competitiveness in 2025. During the recent decades, companies have been getting more focused on their core business and competence (Prahalad & Hamel 1990) and supply chain activities have been outsourced in order to maximize value and quality and to minimize risks and costs. Outsourcing material and service providers has helped companies to decrease the financial burden of capital investments and opened access to skilled labour and management (Stank et al. 2015, pp. 17-18). For example in Finland approximately 93% of industrial enterprises had outsourced at least part of their domestic transports in 2014. For industrial enterprises the most significant motivators for outsourcing were improved customer service and flexibility of costs, as for companies operating in trade sector were by most motivated by the flexibility of logistics functions and by improved customer service. (Solakivi et al. 2014, pp. 78, 82) Prajogo and Olhager (2012, p. 516) state that the current trend in outsourcing is to build long-term relationships with fewer suppliers instead of keeping a large base of suppliers for short-term contracts. At the same time the relationships with suppliers have become more strategic and suppliers are today considered as integral parts of the operations of a company (Prajogo & Olhager 2012, p. 516). Stank et al. (2015, pp. 17-18) forecast the outsourcing trend to continue, and during the next decade, companies will increasingly select and create constellations of partners to optimise the total system value. Also according to Solakivi et al. (2014, p. 81), in 2014 Finnish logistics service providers generally forecasted the outsourcing of logistics functions rather to increase than to decrease. Von der Gracht and Darkow (2010, pp. 55-56) see that small and medium sized specialised logistics service providers will merge into global networks by 2025 in order to offer services in a wider scope and benefit from the financial power and cost optimisation.

In addition to being listed as a megatrend, collaboration received mentions as being a field that should be developed in the logistics sector. For example in the study by Gue et al. (2014) the members of the expert panel were asked which capabilities the material handling and logistics industry should develop in order to respond to the major trends shaping the future of the industry. The cost reductions as well as positive environmental impacts of collaboration and sharing were highlighted: in practice collaboration could help to avoid empty truck miles and make the use of facilities more effective. The most significant obstacles of sharing and collaboration were seen to relate to data sharing and security. (Gue et al. 2014, p. 5)

Gue et al. (2014, pp. 41-44) also see that collaboration is one of the major areas that the material handling and logistics industry has to develop in order to support the needs of economy and society with logistics system operating at low costs and having the least

possible negative impacts on society. For example sharing trailer capacity is stated to be the opportunity with the greatest potential as avoiding empty travel would help to reach savings in fuel, labour and capital costs, and decrease congestions. Another type of industry level collaboration, logistics parks, are forecasted to become common by 2025 and provide benefits as cost savings from the better utilisation of equipment and the economies of scale. Still, some actors in the industry see that the fulfilment of wide collaboration is unlikely due to the aggressive competition. (Gue et al. 2014, pp. 41-44)

4.5 Globalisation, Re-shoring and Changing Global Competition

The concept of globalisation has been connected both to the world getting smaller and to the increased consciousness of the ambient world. Use of the term itself has spread after the second half of the 1980s (Robertson 1992, p. 8), and globalisation was realised also in supply chains during the 1980s and 1990s while especially car, computer and clothing industries relocated their operations internationally (Meixell & Gargeya 2005, p. 531). In the 2000s especially China and also India, Brazil, Russia and South Korea benefited from the offshore manufacturing phenomenon (Stank et al. 2015, p. 24). In general, relocating production facilities has been providing companies, in addition to lower labour costs, benefits related to for example tariff and trade concessions, capital subsidies and accesses to new markets. Also reliability throughout the supply chain can be improved due to the short distance between factories and suppliers. (Meixell & Gargeya 2005, p. 533) At the same time as production functions have been relocated in low cost countries, strategic functions, including for example management, R&D and finance, typically remain in wealthy urban areas with skilled workforce available (Fujita & Thisse 2006, p. 812). As a result of globalisation and internalisation, the importance of logistics has increased as the share of logistics costs of the total cost structure has simultaneously grown, mostly resulting from costs related to increased transport and inventories (Ballou 2004, p. 16).

Keywords related to globalisation and associated trends were recognised in more than half of the reviewed literature sources, which makes it one of the megatrends receiving most mentions in the literature. As the connection between globalisation and longer and more complex supply chains is evident, according to Ballou (2007, p. 341), the trend towards increasing globalisation, free trade and outsourcing has also contributed a growing interest in logistics and supply chain management. Although the megatrend of globalisation has been visible for the last decades, it is forecasted to continue intensifying, and most of the markets and value chains worldwide are predicted to adopt the practices of global sourcing, production and distribution by 2025 (von der Gracht & Darkow 2010, pp. 54-55).

In general the most significant drivers of manufacturing locations choice include factors related to product, costs, labour, logistics, supply chain interruption risk, strategic access, country risk and government trade policies (Ellram et al. 2013, p. 17). By contrast to the benefits of offshoring, for example increasing lead times, increasing transport costs, different cultures, practices and languages, limited worker skills, supplier quality and uncertainty of the operational environment have occasionally made the international supply chains difficult to manage and even challenged the competitive advantage of global supply chains (Meixell & Gargeya 2005, p. 533). As the real benefits and challenges of global supply chain optimisation are realised and the awareness of risks increase, companies are increasingly predicted to re-evaluate their global supply chain strategies (Stank et al. 2015, p. 24). In general developing countries are forecasted to become less attractive manufacturing

destinations due to their industrialisation, increasing wages and falling cost benefits, and the term *"re-shoring"* refers to a location decision where supply and manufacturing networks "are brought back home" from a current location – either from an offshore location or an offshore supplier (Gray et al. 2013, p. 28; Stevens & Johnson 2016, p. 38). Especially production of goods with high material value and content are seen to return to near-shore production locations (Spencer 2012, p. 5).

In addition to cost and risk issues, re-shoring phenomenon has also been connected with the potential created by the new rising technologies. The increasing use of robots in logistics makes the locations of logistics facilities no longer dependent on the workforce and its locations and robots could therefore support the re-shoring activities away from low labour cost countries (JLL 2016a, p. 12). Also additive manufacturing has been stated to be one of the reasons for manufacturing jobs and facilities to return to developed countries, or instead increase manufacturing opportunities in remote locations (Gress & Kalafsky 2015, p. 43). In addition, new supply chain innovations are forecasted to emerge in order to respond to the unpredictable and widely distributed demand shaped by customers located worldwide, even in areas that have previously been considered being unlivable (Stank et al. 2015, p. 21). DHL (2016, p. 20) connects the similar phenomenon to the increasing demand for personalisation, which is seen to lead to companies establishing micro-production sites located closer to demand.

In the literature, the concepts used as opposite to offshoring are heterogeneous, and in addition to re-shoring, also concepts "*near-shoring*" and "*back-shoring*" are commonly used and even the terms "*near-reshoring*" and "*back-reshoring*" have been defined. Near-shoring, back-shoring as well as back-reshoring all refer to locating a manufacturing plant within the company's headquarters region or home country (Ellram et al. 2013, p. 15; Fratocchi et al. 2014, p. 56; Holz 2009 as cited in Fratocchi et al. 2014, p. 55) In addition to these definitions, some, including a number of the authors of the reviewed megatrend literarture, have brought out that the re-shoring phenomenon is about moving the production closer to the large demand markets and the points of consumption (Stank et al. 2015, p. 24) by companies seeking reasonable but not the biggest cost savings associated with lower risks (Slepniov et al. 2012, p. 6), instead of locating the production back to the headquarters countries.

Re-shoring has been shaking the previous roles and positions of countries and continents, and several assumptions of their future have been presented. For example Mazzarino (2012, p. 6) states that in the future the major markets will be in the emerging economies of BRICS countries (Brazil, Russia, India, China and South Africa) instead of Europe or United States. Also von der Gracht and Darkow (2010, p. 54-55) state that the winners of globalisation come from developing and emerging countries as they have increasingly narrowed the gap to the industrialised countries. JLL (2016a) instead sees that the interest in re-shoring industrial activities in Europe and North America has been evident and Europe has a chance to benefit from this development. According to the survey by Boston Consulting Group (2015) focusing on senior manufacturing executives in companies with annual revenues at least one billion dollars, even 31% of the respondents agreed with the proposition that their companies are likely to add production capacity in the United States within the next five years.

In Europe the focus of re-shoring, in context of relocating the production closer to the demand markets instead of relocations to the home countries of companies, has mainly been

on Central and Eastern Europe (CEE). During the 2000s, CEE countries have been destinations especially for service sector offshoring – or re-shoring for companies that have first located their services in India (Gál 2010, pp. 2-4). According to JLL (2016a, pp. 15-17), the CEE countries have the potential to benefit from re-shoring due to the optimal relationship between labour costs and distance to the large markets of the UK and Germany. In addition, the Central and Eastern European markets have lower tax burdens and provide foreign companies several incentives (Slepniov et al. 2012, p. 9). There is a very limited amount of literature considering the Nordic countries as re-shoring destinations. Instead, Liimatainen et al. (2015, p. 280) forecast that especially heavy export industries will leave the area due to the structural change of the economy, while for example environmental industries and service sectors are predicted to see growth.

According to JLL (2016a, p. 17), the overall effect of re-shoring on European industrial property demand is expected to be positive, depending on countries and sectors. Also the demand for logistics facilities is predicted to increase as the need for handling inbound and outbound supply chains increases with the growing production. As re-shoring would cause the inter-regional trade volumes to decrease, port volumes could fall and properties located close to the ports become less demanded. At the same time, international rail freight has already become more important in European deliveries, which would increase the demand for properties located in major intermodal hubs. (JLL 2016a, p. 17) In United Kingdom a significant growth in rail traffic was seen already in the 1990s, since the privatisation of British Rail. This resulted in growing demand for land at strategic locations on the rail network and increasing development of rail-connected factories, warehouses and intermodal terminals. (McKinnon 2009, p. 296) In the Nordic countries, industry, trade and logistics are predicted to centralize to a few large metropolitan areas (Liimatainen et al. 2015, p. 280), which would result in increasing property demand in these metropolitan areas, and respectively decrease the demand elsewhere.

4.6 Ecological Drivers and Sustainability

The most often stated definition of sustainability by Brundtland Commission defines sustainable development as meeting "*the needs of the present without compromising the ability of future generations to meet their own needs*" (United Nations 1987). Although new definitions and alterations have emerged, this perspective from almost 30 years ago is still prevalent (Brockhaus et al. 2013, p. 167). Keywords related to resource consumption, energy supply, ecological drivers and sustainability were identified in approximately half of the reviewed literature sources, meaning that the significance of sustainability issues in the logistics sector has been widely recognised also in futures studies. Today the logistics sector is a significant source of emissions and environmental impacts: in 2013 transport and storage activities were responsible for 10.9% of emissions of three greenhouse gases, carbon dioxide, nitrous oxide and methane, in European Union (Eurostat 2016). The figure includes only the emissions of businesses whose main activity is transport, and therefore the total share of logistics is greater. At the same time, increasing demand for sustainability is seen to create logistics companies new possibilities by providing services which both generate revenue and improve the welfare (DHL 2016, p. 23).

Sustainability issues related to logistics and supply chain management are often being referred to with term "*sustainable supply chain management*" (SSCM), which has been defined as integration and achievement of an organization's social, environmental and

economic goals in order to improve the long-term economic performance of company and its supply chains (Carter & Rogers 2008, p. 368). This definition refers to the three dimensions of sustainability: ecological, economic and social (see for example Carter & Rogers 2008, p. 365). Academic research of SSCM has appeared over the past two decades, and for example green purchasing, purchasing ethics, remanufacturing, safety management, supplier certification, carbon footprint and reverse logistics have been studied (Winter & Knemeyer 2013, p. 19). During the 1990s and 2000s, the focus of SSCM research has been mainly on environmental aspects, and the use of the terms "*sustainability*" and "*environment*" has been mixed and overlapping. Similar focus was identified also in the reviewed megatrend literature, mainly concentrating on the environmental dimension of sustainability, in addition to the potential economic benefits.

The general growing concern of limitation of resources, global warming, greenhouse gases and health issues has led companies increasingly to adopt sustainability practices into their strategies. Companies have also become conscious of the potential to brand value damages caused by any hidden unsustainable supply chain practice. (Dey et al. 2011, p. 1238) Adopting sustainable practices is typically driven by economic goals, and there is a consensus among supply chain management researchers that sustainability-focused activities can help companies to achieve competitive advantage (Brockhaus et al. 2013, p. 168). Especially concerns related to the pricing and availability of fossil fuels have been driving the interest in energy and environment (Liimatainen et al. 2015, p. 280). Carter and Rogers (2008, p. 371) state that the highest economic performance level can be reached at the intersection of the three dimensions of sustainability, and companies maximizing their performance of all the three dimensions will outperform organisations focusing only on economic performance.

Sustainability can be implemented throughout key and support activities of the supply chain. Key activities include warehousing, material handling, purchasing, protective packaging design and information maintenance, which together contribute the most of the total logistics costs. (Dey et al. 2011, pp. 1244-1245) Cost savings related to sustainability in logistics can result for example from reduced packaging waste, safer warehousing, transport and improved working conditions, higher levels of labour motivation and productivity, and improved reputation making the organization attractive to customers, suppliers, potential employees and shareholders (Carter & Rogers 2008, pp. 370-371). In 2010, von der Gracht and Darkow (2010, pp. 54-55) predicted that transport costs and operating costs of logistics properties continue to rise due to increasing energy costs, and in general logistics services were predicted to become even more cost-intensive. Although we have seen a significant drop in oil prices after 2010, logistics costs have still remained a hot topic, and the economic view of sustainability will unlikely lose its relevance for logistics companies.

Freight transport is responsible for approximately 90% of the total greenhouse gas emissions originating from logistical activities (McKinnon et al. 2015, p. 4) and the environmental impacts of a single activity depend by far on the vehicle used for transport. Currently road transport is responsible for over a half of trade-related freight CO2 emissions (International Transport Forum 2015, p. 8), while airfreight is the most carbon intensive freight method measured with the tonne-metre relationship (Dey et al. 2011, p. 1245). By 2050 the share of air transport of the total international trade-related freight emissions is forecasted to grow due to the growing trade volumes and airfreight's competitive advantage to carrying high-

value goods. At the same time, the share of road freight of the emissions is forecasted to grow by 3 percentage points to 56% while the share of maritime freight is estimated to fall from 37% to 32% and rail freight to remain stable at 3%. (International Transport Forum 2015, pp. 8-9) In Finland instead the share of overall freight made up by road freight is estimated to decrease slightly, by 2 percentage points by 2030 (Liimatainen et al. 2015, p. 278).

Recently the increased demand for more frequent and smaller shipments (see Chapter 4.2 Changing demand) has led to empty running and increased use of rapid and energy-intensive transport, including airfreight (International Transport Forum 2015, p. 2). The importance of last mile distribution is forecasted to continue to grow as the popularity of home deliveries increases, which may result in even smaller shipment sizes. However, transport costs and environmental pressure counteract these trends and companies may be forced to cooperate and consolidate loads. (Liimatainen et al. 2015, pp. 278-279) Also EY (2015, p. 43) predicts that practices such as sharing logistics may become popular. Currently collaboration with players in the logistics and transport industry is not widespread although collaboration plays a key role when achieving environmental sustainability goals (Colicchia et al. 2013, p. 205).

It has been stated that the material handling and logistics industry could benefit from new vehicle technology and reduced energy consumption (Gue et al. 2014, p. 52), and due to technological development, environmental pressure and rising costs, the average fuel consumption of road freight is forecasted to decrease. Alternatively fuelled vehicles are already available, although these options are discouraged by higher purchase prices and operating costs, limited range and lack of refuelling infrastructure (McKinnon 2015, p. 175). However, renewable energy is forecasted to become more popular as the research and development and distribution networks of biofuels will increase, and their wider use will also be promoted by the provided tax incentives and rising costs of fossil fuels. Also EU regulations on the maximum CO2 emissions for trucks are expected, following the examples of Japan and USA (Liimatainen et al. 2015, p. 279). In Japan the exhaust emission limits for vans were introduced already in the 1970s and the limits have continuously been tightened (McKinnon 2015, p. 175). Despite these expected improvements, the global carbon dioxide emissions originating from international trade-related freight transport are forecasted to grow by 290% by 2050, even when assuming simultaneous technological development and efficiency improvements (International Transport Forum 2015, p. 8).

Sustainable logistics is more than cutting carbon emissions (McKinnon et al. 2015, p. 4). Other aspects of environmental sustainability in logistics include for example the role of other strategic natural resources than oil: many production and logistics processes are based on water consumption, and the availability and spatial distribution of rare materials and water will be among the most important factors of future logistics scenarios (Mazzarino 2012, p. 6). Sustainable packaging contains and protects products throughout supply chains and supports responsible consumption, uses materials and energy efficiently, is made up of continuously cycled materials minimising material degradation and does not pose risks to human health or ecosystems (Ciliberti et al. 2008, p. 92). Reverse logistics, referring to recycling, reusing and reduction materials and new reverse material flows from the user back to producers, is a widely studied field and leads to higher environmental efficiency. Reverse logistics is often economically motivated, in addition to which also government legislation and company imago may encourage companies for these activities. (Dey et al. 2011, p. 1248;

Fleischmann et al. 1997, p. 2) Also the rise of the trend of so called responsible sourcing has been evident as suppliers and third-party logistics providers are increasingly required to implement sustainability through the supply chains (Dey et al. 2011, p. 1247).

Also logistics facilities play a role in the sustainability of the industry. In 2010 logistics buildings were responsible for approximately 10% of all greenhouse gases originating from logistical activities (McKinnon et al. 2015, p. 4). Mainly in order to cut the property costs, several ways for reducing the energy consumption of logistics facilities have been adopted. According to Colicchia et al. (2013, pp. 200-203), many logistics service providers have adopted the practices related to eco-friendly warehouse design, including energy-efficient heating and lighting systems, using renewable energy sources, creating sustainable workplace for employees, reducing waste and using alternative or recycled construction materials. Also keeping inventory levels at minimum can affect positively on a company's carbon footprint as smaller inventory quantities reduce the need for logistics facilities and property-related energy consumption (Dey et al. 2011, pp. 1246-1247). According to Ciliberti et al. (2008, p. 92), sustainable warehousing activities include also terminal and warehouse location, proper storing and disposing of hazardous materials and safety training when using forklifts.

Social responsibility in logistics takes into account issues of diversity, environment, safety and human rights (Carter & Jennings 2002, p. 167). Social sustainability in logistics has been studied for example in purchasing and transport functions. In general, purchasing social responsibility means including social issues in purchasing decisions. Purchasing function has the potential to transfer the social and environmental standards of a company to its suppliers by for example defining certain economic, social, ethical or environmental criteria in selecting suppliers and training suppliers. In transport the social issues include for example the safety issues and promotion of minorities. (Ciliberti et al. 2008, pp. 91-92, 97) The potential consequences of logistics social responsibility include increased job satisfaction, improved employee motivation and trust, improved stakeholder and supply chain relationships and improved financial performance (Carter & Jennings 2002, pp. 157, 166).

Although there is a significant number of academic studies considering sustainable supply chain management and sustainability issues have widely been adopted by companies at strategy level, Brockhaus et al. (2013, p. 178) state that the implementation of SSCM is still at its early stages of development. Especially for companies headquartered outside Europe sustainability remains an issue for analysis and discussion instead of being already in action (Stank et al. 2015, pp. 26-27). The future is expected to be brighter, and based on the reviewed megatrend literature, the importance of sustainability issues will continue to increase. As the urbanisation rate of the world continues to grow, the challenges related to sustainable development will increasingly concentrate in cities, being the fastest in lower or middle-income countries with the fastest pace of urbanisation (United Nations 2015, p. xxi). Gue et al. (2014, p. 20) predict that by 2025, the standard methods related to sustainable development in material handling and logistics industry have been developed into business plans and operating strategies. Stank et al. (2015, pp. 26-27) state that companies who will achieve the greatest returns on sustainability will be companies going one step further on sustainability by not only reducing the environmental and social damage, but also by improving the status of each while remaining economically viable. At the same time the

concerns of energy and environment will also increase GDP as new opportunities for environmental business are expected to rise (Liimatainen et al. 2015, pp. 280-281).

5 Logistics Megatrends in the Finnish Environment

This chapter will present the second part of the environmental scanning process of the thesis and will focus on the formation, execution and results of the expert panel, which is used to provide empirical data to support the environmental scanning process. In addition, the chapter will combine the results of the expert panel with the findings of the literature scanning and discuss the outcome.

5.1 Formulation and Goals of the Expert Panel

In this thesis an environmental scanning technique, expert panel, is used to collect empirical data and to "*look out for changes on the horizon*", as Gordon and Glenn (2003, p. 3) describe. More specifically, the environmental scanning process, consisting of the literature scanning and expert panel, focuses on recognising and analysing the logistics megatrends and their potential effects on logistics space demand from the Finnish perspective. The expert panel was carried out by interviews, which are among the most used techniques for data collection in qualitative research (Saaranen-Kauppinen & Puusniekka 2009, p. 52). The focus of expert panels is on systematically asking the participants for observations and judgements about underway or expected developments (Gordon & Glenn 2003, p. 4), and in the thesis, the aim of the expert panel is to verify the megatrends identified in literature scanning, to find out whether there are any additional megatrends in the Finnish logistics market and to look into the potential effects of the megatrends on the logistics space demand in Finland.

In general, interviews vary based on their structure: how the questions are formed and how the interview situation is structured, and according to Eskola and Suoranta (1998, p. 87), there are four different types of interviews. In structured interviews the questions, response alternatives and the order of questions are same with each interviewee. Half-structured interviews instead have the same questions with in each interview but no response alternatives are prepared or provided. In thematic interviews the themes of the interview are defined beforehand, but the order and extent of the themes varies in each interview. The interviewer may have a list of the themes but no exact questions are defined. (Eskola & Suoranta 1998, p. 87) Hirsjärvi and Hurme (2004, pp. 47-48) instead see that thematic interviews belong to the wider group of half-structured interviews, as the reviewed themes stay same with all the interviewees. In open interview the parties discuss the topic freely and same themes do not necessarily have to be discussed with each interviewee (Eskola & Suoranta 1998, p. 87).

In Finnish studies especially thematic interviews have become popular, resulting from the form of the interview, giving the interviewee a possibility to speak freely. The defined themes still give the interview a framework and each interview focuses at least partly on the same topics. (Eskola & Suoranta 1998, p. 88) As thematic interviews move on based on defined themes instead of detailed questions, the focus of the interviews stays on the interviewees and the perspectives of the researcher do not define the course of the discussion (Hirsjärvi & Hurme 2004, p. 48). Some methods of future studies, including Delphi method, tend to aspire to consensus. In this thesis, the goal of the expert panel and data collection is, in addition to seeking for similarities, to find new opinions, diversity and differences on the discussed themes. Based on their advantages, thematic interviews have been used in the expert panel in order to achieve the purpose of the thesis. Thematic interviews were seen to give the experts enough space to present their views and the possibility to bring up

unexpected opinions as in qualitative research the researcher should be free of presuppositions or hypothesis (Eskola & Suoranta 1998, p. 19) and although the researcher most likely has previous experience of the topic, these experiences or expectations should not restrict the study or data (Saaranen-Kauppinen & Puusniekka 2009, pp. 13-14).

According to Gordon and Glenn (2003, p. 4), important qualifications of participants in an expert panel include their discipline, experience, work and interests. In addition to these features, also "creative thinkers" should be sought out. In the thesis, the expert panel was formed to collect data for environmental scanning process and to support on estimating how the megatrends, defined and recognized based on the literature scanning, exist in the Finnish environment and on finding out how the megatrends may affect the preferences of logistics space occupiers and the demand for logistics premises in Finnish market. In order to collect diverse views of these topics and to extensively respond to the research questions of the thesis, the expert panel was formed to include experts to represent both companies occupying logistics space and real estate investors having their focus on logistics properties in Finland. The potential companies for the interviews were identified through scanning the most significant actors in Finnish logistics real estate market and logistics operators and trading sector companies operating in Finland. Recommendations for suitable interviewees were received from the instructors of the thesis, other contact persons of the author and also by contacting the companies and asking for suitable persons for interview.

The final composition of the expert panel includes in total eleven interviewees. The selected logistics companies include both Finnish and international logistics companies operating in Finland, and in order to collect comprehensively the insights of the occupiers in the market, the logistics space occupiers include companies operating in transport, third-party logistics services and parcel delivery business as well as logistics companies providing logistics services for grocery and consumer goods retailers. In total seven representatives of logistics space occupiers were interviewed, and they were selected from persons either participating in developing logistics operations in the company or participating in the decision-making processes related to space use and real estate. Four of the interviewed representatives of logistics companies are responsible for both business development and space-related decision-making. In addition to space occupiers, four representatives of real estate investors were interviewed. The experts representing real estate investors were selected to include persons working in customer interface and being aware of the preferences of logistics space occupiers. The full list of the members of the expert panel can be found in Table 3.

Table 3 Members of the expert panel

Interviewee	Current position	Company	Type of company
Tomas Lehtinen	Country IT Manager	DHL Express	Logistics company
Jukka Iloheimo	Director of Business Development, Quality and Environment	DSV Road	Logistics company
Mikko Kymäläinen	Logistics Manager	Inex Partners, part of S Group	Logistics company
Simo Halkosaari	Production Director	Keslog, part of Kesko Group	Logistics company
Jarkko Ämtö	CEO	Posti Kiinteistöt, part of Posti Group	Logistics company
Hannu Tapio	Vice President, TPL	PostNord	Logistics company
Katri Kostiainen	Director, Head of Contract Logistics / Supply Chain Management	Schenker	Logistics company
Ville Laurila	Letting Manager	Ilmarinen	Real estate investor
Joonas Partanen	Chief Customer Officer	Logicor	Real estate investor
Jani Nokkanen	Partner	Nordic Real Estate Partners	Real estate investor
Jaakko Vehanen	Managing Director	Sagax Finland Asset Management	Real estate investor

The experts were contacted individually by phone or email between June and August 2016. The eleven interviews took place in August and September 2016, and nine of the interviews were conducted in personal meetings in the offices of the interviewees in Helsinki, Vantaa and Espoo. One interview took place at Jones Lang LaSalle Finland's office in Helsinki, and one interview was conducted as phone interview. The lengths of the interviews varied between 45 and 90 minutes, and ten out of eleven interviews were recorded. One interview was analysed based on the notes made during the interview, as due to rapid change of the interview mode from face-to-face meeting to phone interview, the researcher did not have a possibility to record the interview. In addition, due to problems with the technical quality of one recording, analysis of another interview was completed based on the notes made by the researcher.

In expert panel the list of participants should be available to everyone but the individual responses should be anonymous (Gordon & Glenn 2003, p. 5), and therefore each interviewee's approval for publishing their names was requested in the beginning of the

interview. The interviewees were also promised anonymity, and that any comments or opinions cannot be linked to a person.

Two theme frameworks were generated for the thematic interviews of real estate owners and occupiers. The basic purpose of the interview framework was to support collecting opinions of the megatrends and their potential effects on the logistics industry and logistics space demand. Also other remarkable trends affecting the logistics industry and business, in addition to the megatrends recognized in the literature scanning, were sought in the expert panel as the experts were asked to name any other trends affecting the future of logistics in addition to the listed megatrends. The experts were asked to comment the importance and probability of each megatrend while they were asked general opinions of the megatrends and their potential consequences. Also other expectations for the future of the logistics industry, logistics space demand and in case of real estate investors, also logistics property stock, were sought. In addition, some of the interview themes were created to find out the background of each expert and the basics of the current business and logistics space demand of the companies the experts represent. Real estate investor representatives were also asked to assess the current logistics space demand and its recent development in general.

When first contacting the interviewees, they were provided a brief description of the subject of the thesis and discussed themes. A more detailed interview framework was provided to one interviewee who had requested to see it beforehand. The other experts were not provided additional information beforehand, as one of the purposes of the interviews was to collect spontaneous answers and speculation instead of receiving answers planned in advance. After each interview, the used framework and questions were considered and also enhanced, if needed. Although the frameworks gave the basic structure and themes for the interviews, they were not strictly followed in all cases, mainly due to the differences in the focus of the expertise of the interviewees. The latest versions of the basic frameworks used in the interviews can be found as Appendices 1 and 2 of the thesis.

In general, instead of reaching statistically generalizable results, the purpose of qualitative research is to describe an event, understand behaviour or give an interpretation of a phenomenon (Eskola & Suoranta 1998, p. 62) by comprising previous studies and theories, empirical data and own thinking and deduction of the researcher (Saaranen-Kauppinen & Puusniekka 2009, p. 6). Based on the basic nature of qualitative research, the results are not statistically significant, and they represent only the opinion of the particular group of respondents (Gordon & Glenn 2003, p. 5).

In qualitative research, the most important criterion for the material is its quality (Eskola & Suoranta 1998, p. 18). Due to the extent of the master's thesis, the number of experts in the panel remains relatively small, and the quality of the data and value of the panel depend on the knowledge and cooperation of the experts. However, increasing the number of experts in the panel would mainly improve the possibilities for statistical analysis of the outcome of the panel, while the quality of data from each interview does not depend on the number of interviews. According to the instructions by Gordon and Glenn (2003, p. 5), the discussed themes were directed to experts. However, the interview framework as well as the range of expertise of the panel members were relatively broad, and therefore each of the interviewees was let to focus on the subjects they had the most to give.

The purpose of the environmental scanning process and the interviews was to collect data for the research process, and in order to provide answers to the research questions of the thesis, the collected data was analysed. Analysis has been stated to be the most problematic part in qualitative research (Eskola & Suoranta 1998, p. 138) as the goal of analyses is rather to find results instead of verifying certain hypothesis defined in advance (Saaranen-Kauppinen & Puusniekka 2009, pp. 13-14). In the thesis, the analysis of collected data was completed by using thematising as analysis method. Thematising means dividing the data into themes by searching for certain characteristics which more than one interview has in common, based on the interpretations made of the data by the researcher (Hirsjärvi & Hurme 2004, p. 173). However, as one of the goals of the expert panel and data collection was to find new opinions on the discussed themes, thematising process was not used to exclude any "unsuitable" opinions from the examination. In order to provide comprehensive views of the discussed themes, the following Chapter 5.2 will not focus only on similarities found on the data, but also on dissenting views, which were seen to provide potential indications of future developments and interesting perspective on the themes under discussion.

5.2 Results of the Expert Panel

This chapter will present the results of the eleven expert panel interviews, completed as the second part of the environmental scanning process of the thesis. As already described in Chapters 3.1 and 3.2, the conceptual diversity related to logistics properties is wide, which appeared to be evident also during the interviews. During the interviews, the interviewed experts were mainly discussing the subject by using the terms warehouse and terminal, according to the common Finnish practice to describe the different types of logistics properties. As the used concepts were seen to be consistent during all the interviews, the similar division to warehouses and terminals will be adopted further in this chapter.

5.2.1 Megatrends and Their Potential Effects on the Logistics Space Demand

During the interviews, the experts were showed a list of the megatrends, drawn up based on the resulting megatrend categories of the literature scanning, and asked to freely comment on the megatrends and their potential effects on the logistics industry and the logistics space demand and to estimate the probability and importance of the megatrends. The English version of the megatrend listing used in the interviews can be found as Appendix 3 of the thesis. In general, the interviewees were relatively unanimous of the existence and importance of the listed megatrends. The experts' comments and opinions for each megatrend or megatrend subcategory will be introduced below. As the interviewed experts agreed for the most parts with the megatrend listing produced based on the literature scanning, the titles of the below chapters follow the names of the megatrends. The megatrend of technological development will be covered in the subcategories of the megatrend.

The experts were also asked about the timeframe of their decision-making and planning processes in order to understand how the future is being predicted in the daily business. Most of the representatives of logistics operators agreed that the planning of business operations can be done on a maximum timeframe of five years, and the experts saw that recently the timeframe has become shorter. Five years was seen as a timeframe during which the development and events can be forecasted at some level, and at the same time the timeframe was seen to provide possibilities to develop the operations a sustainable way. In decision-

making related to real estate, the timeframe was stated to be longer, and the answers of the experts varied from 5-10 to 15 years, by far depending on the length of their lease agreements.

Demographic Changes, Urbanisation and Changing Demand

The demographic changes, meaning changes in the population and its structure, were mainly self-evident to the interviewees. The interviewees agreed that the Finnish population is growing, ageing and certain areas and cities are becoming more powerful, but the connections between the demographic changes, logistics sector and space demand were not paid much attention. One interviewee stated that the population growth has to be taken into account in all decisions related to logistics space: the premises have to enable future growth, either by their size or extension possibilities. Some of the interviewees noted that as a result of ageing Finnish population, the transport and logistics sector would face challenges related to labour and its availability. According to one interviewee, the transport companies are already facing problems with the availability of truck drivers as the average age of Finnish truck drivers increases, the general popularity of the career declines and increasing requirements set by authorities for drivers, their skills and licences are making it more difficult to start as a truck driver. Another interviewee described that the employees in the logistics sectors in general are ageing, and a challenge will be whether the employees will be able to handle the changing consumer demand, as currently the turnover of workers in the logistics sector is low and the sector may not have skills to react to the future trends and develop the business further. Therefore, as the interviewee stated, the industry has to succeed in attracting future professionals in order to develop the sector and businesses.

The interviewees saw urbanisation to have remarkable effects both on the logistics sector and its space demand and requirements. Urbanisation was also widely connected to other megatrends, including drones, collaboration and integration and e-commerce, mainly being a driving force behind the demand for new delivery methods and the need for new ways of cooperation. Although one of the interviewees stated that the largest changes caused by urbanisation have already been seen, urbanisation was generally stated to challenge the logistics sector in two ways: growing urbanisation increases the challenges related to urban logistics and at the same time, the problems with deliveries in rural and sparsely populated areas have to be solved.

Some of the interviewees concentrated on the challenges in deliveries in rural areas resulting from the decreasing population. Deliveries in rural areas were not seen to be profitable, but logistics operators however stay responsible for deliveries in these areas. One interviewee mentioned that in the long run it could be advisable that parcel deliveries from different operators were consolidated in rural areas, which would set new requirements for logistics premises and warehousing, as the deliveries have to be physically consolidated somewhere. This would require either warehouses for consolidating the deliveries or suitable information systems of different operators, able to communicate with each other in order to arrange the last mile distribution.

Most of the interviewees agreed that the logistics volumes will increasingly concentrate on urban areas, especially in Helsinki metropolitan area, and some of the representatives of real estate investors mentioned that urbanisation is a driving force affecting their investment strategies. One interviewee stated that the space supply in urban areas, especially in Helsinki

metropolitan area within Ring Road III, is forecasted to stay relatively unchanged in the future and therefore investing in good urban locations now will provide potential for completing real estate development projects in the future. At the same time, both the representatives of real estate investors and logistics space occupiers forecasted that space demand in remoter locations will to continue to decrease. One interviewee described the potential results of urbanisation as follows:

> *"[Urbanisation] drives the market as we and other investors do not want to invest in smaller towns, or if we do, we want a clearly higher profit for the increasing risks, which pushes the rents upwards, which means that it is no longer as competitive, which means more demand for the growing locations, it is a self-fulfilling trend."*

Urbanisation was also seen to shape the consumer demand and habits. One interviewee saw urbanisation and smaller size of apartments and kitchens to lead to changes in consumer buying behaviour: consumers will get used to visiting groceries more often and buying food only for the instant need. As a result, the availability of items in stores will become more critical, deliveries from warehouses to stores have to be fast and the warehousing processes have to take place closer to the final consumer. The interviewee described:

> *"The supply chain will be like, the shelf system or the point-of-sale system informs that damn, we only have six cans of Elovena left so it has to leave quite fast [from the warehouse]. Also from this point of view, the warehouse has to be located closer to the final consumer as you cannot assume that this Elovena will depart from the factory, it has to be somewhere quite near Ring Road III."*

There were significant variations in interviewees' attitudes towards urban logistics and its problems in the scale of Finland and Helsinki metropolitan area. Some of the interviewees recognised the general challenges of urban logistics, including demand for urban warehouses in order to respond to the requirements for fast deliveries and cities limiting logistics operations, but stated that in Helsinki the challenges of urban logistics are still minor and the problems and limitations related to urban logistics take place only in large metropolises. One interviewee forecasted that in the future the city of Helsinki might restrict logistics operations in the city centre but simultaneously saw that the problems in Helsinki will stay small comparing to the large metropolises of the world, whereas another interviewee stated that the situation in Helsinki will not change remarkably in the following 50 years. However, one logistics company representative described that urbanisation and increasing traffic near their logistics locations have already made their business more difficult.

In recent years, the changing consumer demand has been visible and affected especially the business of companies having their origin in postal services. As the letter volumes have continued to decrease and parcel volumes have simultaneously turned to a remarkable increase, postal services companies have been forced to find out new business models and service segments in order to keep their market positions. As one interviewee stated, for companies that have based their business models and infrastructures on letter deliveries, it is a huge challenge to make their operations to fit also in parcel delivery business.

Almost all of the interviewees recognised the increasing demand for fast and exact deliveries. These requirements were often connected to the rise of e-commerce and they will

therefore be analysed in the chapter focusing especially on the subject phenomenon. In addition to e-commerce, changes in customer demand and requirements were predicted to take place especially in the food sector. One interviewee saw that customers will increasingly demand a wide selection in groceries. As the possibilities for increasing the number of available products are limited, in the future the selection should be increasingly based on the real demand and preferences, connecting the changing demand to another recognised megatrend, big data and predictive analytics. The interviewees also forecasted the demand for different temperature areas in warehouses to increase in the future: an interviewee predicted the future consumers to demand more of high quality convenience food, resulting in an increase in the demand for freezer warehouses. Another interviewee described that for logistics service providers following the food expiration dates is critical and the role of cold transport remarkable, and as a result warehouses should have several temperature areas from freezer storages to room temperature, increasingly challenging the building technologies.

The Internet of Things

During the interviews, most of the experts did not pay much attention on the Internet of Things. Some of the interviewees recognised the potential of the Internet of Things at some level but despite that, reviewing the phenomenon during the interviews was typically left thin. Instead, two of the representatives of logistics operators highlighted the potential effects of the Internet of Things, and called it to have potential to revolutionize both everyday routines and logistics and simultaneously simplify information processing as for example fridges could independently proceed food orders based on their contents and typical purchasing behaviour, or machine units could report of spare parts needs. One interviewee pointed out that in the future, if fridges or washing machines had the skills to process e-commerce orders, delivering these orders would become a real challenge. As a result, residential buildings would perhaps need common logistics rooms or other solutions for incoming deliveries. Based on the literature scanning, the Internet of Things has the potential to provide even better possibilities for monitoring deliveries but according to one interviewee, the existing structure for tracking the goods is already sufficient, and at the moment customers are more interested in deviation information rather than knowing exactly the journey of their deliveries. All in all, based on the interviews, the Internet of Things has potential to shape the logistics industry in Finland, but it will take time before the effects of it will realize and most of the actors in the logistics business have not started to prepare themselves for the possible changes yet.

Driverless Cars and Trucks

In addition to the Internet of Things, self-driving cars and trucks were seen to have the potential to be further realized in the future. Most of the experts agreed that self-driving trucks and cars have potential to affect the future of logistics, but the details and extent of these potential effects remained mainly unclear. One of the interviewees stated that self-driving vehicles have the potential to make transport more round-the-clock business as working and resting times of the drivers would no longer limit the operations, but speculated whether it would really be more affordable for companies to invest in self-driving technologies instead of paying the wages of truck drivers. Many of the experts highlighted especially matters complicating the introduction of self-driving cars in Finland. The interviewees did not see self-driving vehicles as flexible transport method as the current

trucks with drivers on board. The four seasons and variable weather conditions in Finland were also stated to have significant negative effects on the usability of self-driving vehicles.

Self-driving cars and trucks were seen to affect more on the features of logistics properties than the amount of space demanded and the future logistics buildings have to enable the use of self-driving vehicles. The opinions of the optimal locations of logistics properties varied: one expert stated that logistics centres could be located in remoter areas, where the traffic of autonomous vehicles would not disturb the environment. One expert instead saw that logistics buildings would still have to be centrally located as transport costs would stay high despite that human labour would no longer be needed. One interviewee speculated that need for control centres, where the moves of the vehicles were controlled, would rise, but also stated that the basics of logistics business would stay quite unchanged.

Robotics and Automation

Robotics and automation represent a development that has already made inroads in the logistics sector. The trend of increasing levels of automation has been seen both internationally and in Finland, and most of the experts, representing both logistics operators and real estate investors, agreed that automation level in logistics continues to rise. The interviewees highlighted that automation systems can be utilised especially in handling daily consumer goods, parcels and other high volume products that need to move fast throughout the supply chains. However, automated warehouse systems were seen suitable only for certain types of businesses and operations, and for example third-party logistics service providers' businesses were not seen to support automated warehouses: robots can handle efficiently only products with certain measurements, and the required investments are often too extensive compared with the average length of customer relationships in 3PL business.

According to the experts, the benefits of robotics and automated warehouse systems are related to increasing efficiency: automated warehouse systems may help to reach extensive savings in personnel costs and in some property-related costs, such as in lighting. The disadvantages or challenges of automated warehouse systems were related to high investments – the investments required for automated warehouse system and warehouse property may even be equal – and as a result of which, setting up an automated warehouse system was seen profitable only in large warehouses handling high volumes. If the future technologies provide economic solutions for automated systems in smaller-scale warehouses, automation was seen to have potential to become even more popular. One expert brought up a problem related to different lifetimes of automation systems and warehouse properties: when updating or replacing automated warehouse systems, the production has either to be stopped or moved to temporary premises.

The experts recognised several effects of the increasing number of automated warehouses on the logistics property demand. They were unanimous that automated warehouses will require higher warehouse buildings, and the free height of an automated warehouse may be even two or three times more than in traditional warehouses. As a result, the existing traditional warehouse properties were not seen suitable for automated warehouses. There were several opinions among the interviewees what the increasing level of automation does on the demanded amount of logistics space: one interviewee presented an example of a situation where the occupied square metres dropped to one third of the original as a tenant

moved their businesses to an automated warehouse, but by contrast another interviewee described:

> *"Automation is the ideal situation for real estate investors as they are, or those automated warehouses are often like, the property has to be larger than in case of manual work although you could suddenly think that when you have automated systems, the premises decrease but they usually do not. The demanded amount of floor space is likely to increase as the level of automation increases."*

Both real estate investors and logistics operators brought up the lack of flexibility of automated warehouse properties. One expert presented:

> *"If you have a very high, for example a 30 metres high warehouse, it is very difficult to see how the property should be valued, it is so specific, it is actually only a shell of a warehouse, also as an investment type it is completely different than these traditional warehouses."*

The interviewees mainly did not take stands on the optimal location of automated warehouse properties. One interviewee stated that automation does not change the definition of good warehouse location. Some experts saw instead that as a result of increasing automation levels, the warehouse locations have a wider choice as the availability of workforce does no longer need to be considered when making location decisions. Due to the decreasing number of employees, automated logistics centres were also seen easier to relocate than traditional warehouses.

Drones

Most of the interviewed experts looked on drones to have potential in the future. The general opinion was that the drones will not affect the decision-making of today as their potential effects could take place in 10-20 years. Especially representatives of real estate investors and companies operating in parcel delivery business were paying attention on drones during the interviews, meanwhile experts working in logistics companies operating mainly in other logistics business segments than parcel deliveries, did not concentrate much on drones. The interviewees saw drones to have potential to alter logistics and parcel deliveries especially in areas currently suffering from weak accessibility, including sparsely inhabited areas and in areas with undeveloped infrastructure. One interviewee pointed out that the current laws of availability of products may change significantly as drones, together with affordable smartphones, have the potential to change the current supply in distant areas and undeveloped countries.

On the other hand, drones were seen to have potential also in dense and congested cities with heavy traffic and slow car deliveries. The experts found drones to have potential especially in extremely fast and critical deliveries, for example in delivering instruments in hospitals. The experts' opinions on drones and their future potential in dense and urban areas were by far connected with their general attitudes towards urban logistics in the Finnish environment. Although one interviewee stated that a delivery drones hub and a parcel warehouse could be located in Helsinki city centre in order to respond to the demand for fast deliveries, the more

common opinion among the interviewees was that Helsinki will probably not develop into a metropolitan with urban logistics problems that could be solved with drones.

Additive Manufacturing

The general opinion among the interviewed experts was that additive manufacturing (3D printing) has the potential to change warehousing needs and even to revolutionise the nature of logistics industry and supply chains. Most of the experts saw the development to be both significant and probable although the timing of its future breakthrough was still unclear. One expert described additive manufacturing as following:

> *"We will go until that point whether logistics or warehousing will be needed anymore at all. The basic idea will change."*

The experts found unanimously 3D printing to decline the need for both transport and warehousing. Goods, especially spare parts, expensive and rare special components and other critical or logistically challenging products will be produced near the point of consumption, when they do not have to be stored or transported in a similar way than in the current supply chains. Also the capital tied in inventories could be released in other purposes. However, some interviewees highlighted that the raw materials used in 3D printing still need to be transported and stored before use, and although the subjects and volumes of transport and warehousing would change, the basic idea would stay.

Although some interviewees stated the common opinion to be that 3D printing would decrease transport volumes as it is logistically more efficient to carry raw materials than final products, one interviewee pointed out that the most of the volumes in logistics origin from products that cannot be produced by 3D printing, including food and other daily consumer goods. The possibilities of 3D printing were seen to put increasing pressures on the speed of deliveries: as 3D printing makes certain items available fast, also deliveries have to be extremely fast so that the traditional supply chains, consisting of producing and transport phases, would be able to compete with 3D printing.

Big Data and Predictive Analytics

The interviewed experts saw big data and predictive analytics as useful tools, which will be increasingly important for the future logistics and supply chains. Based on the interviews, some companies have already both data and the tools and knowledge for utilising it. Some were currently taking their first steps with the issue: they might already have data but not yet the knowledge or skills for using it. Especially logistics companies operating in close cooperation with retailers are already taking the advantage of new possibilities related to big data. Instead, some other interviewees stated that their use of big data is taking its first steps, for example due to the fact that transport and logistics networks are by far based on subcontracting and the supply chain systems and networks are therefore still relatively disconnected and non-transparent, which makes collecting the data challenging.

The representatives of companies already utilising big data named several of its benefits, including more accurate forecasting, more efficient administration of supply chains, more efficient planning and use of resources, cost savings, shorter lead times, higher security of

supply and better timing of orders and deliveries both in stores and warehouses. An interviewee described the importance of forecasting as following:

> *"The better the preferences of the end customer can be forecasted, the better for the business. However, forecasting the preferences may be difficult."*

In addition, many experts highlighted the potential for better transparency by utilising big data. The interviewees saw big data to provide possibilities for becoming a more essential part of customer's supply chains. An interviewee described predictive analytics as a necessity in logistics:

> *"Without it [predictive analytics] you cannot live or get transparency to the customer or develop the operations. It is not related to real estate but the data, the bit flows, they need to be managed and forecasts and data got to the customer."*

Based on the interviews, forecasting will become even more important in e-commerce, where the operators have to be able to forecast the demand and pass the forecasts on backwards the supply chain to production and suppliers. Also the demand for more accurate supply chain information grows, as customers will increasingly demand details of origin, production and deliveries of for example food. In parcel delivery business it could become possible to forecast the end customers' physical location based on for example their calendar entries. Also marketing could be increasingly based on locational data. An interviewee stated that due to the increasing importance of big data in the logistics sector, companies including Google and Amazon, already owning and utilising data, may take advantage of the data also in the logistics sector and thereby beat the traditional players.

Despite the increasing significance, none of the experts named any potential effects that big data or its applications might have on logistics property demand or logistics facilities.

Digitalisation of Retail

The digitalisation of retail, referring to e-commerce, can be stated as an ongoing development that is already affecting the business and everyday activities of the logistics industry. Despite that, the most of the interviewed experts were unanimous that the importance of e-commerce will continue to grow in the future and its largest effects have not been seen yet. Although some interviewees saw that they had lost some of their clients due to the rise of e-commerce and challenges of traditional retailers, especially representatives of parcel delivery companies highlighted the potential created by the increasing volumes of e-commerce.

The interviewees saw that as a result of rising e-commerce, the logistics volumes in general may increase but the average size of deliveries was forecasted to decrease as e-commerce business is by far based on small parcel deliveries. E-commerce deliveries were mainly forecasted to come to Finland from abroad as the current number of major e-commerce players operating in Finland is limited, and no remarkable changes were expected to occur in the future.

E-commerce has visible connections to several other megatrends and megatrend subcategories. For example the megatrend of changing demand, connected to the increasing need for fast home deliveries, has an evident link to the rise of e-commerce. During the interviews, fast deliveries and instant availability were seen as essential parts of e-commerce business, and some of the interviewees mentioned that the speed of deliveries is the lifeblood of the future success of e-commerce. According to the experts, the current operations models do not support same day deliveries, but there were different opinions on how fast deliveries consumers will demand in the future. Some experts saw that the standard delivery time of 1-2 days will remain demanded, while some wished the demand for even faster deliveries to increase. One interviewee stated that when ordering online, the product should be available as fast as from the brick-and-mortar store, one instead described that the speed requirements depend on the price of the product: the more expensive the product is, the faster the consumer wants to receive it.

Based on the interviews, the growth of e-commerce has already challenged the business of logistics companies: the companies are used to operate in B2B environment, but as e-commerce is based on home deliveries and final customers becoming the points of delivery, the companies have to increasingly learn to operate in B2C environment. According to one interviewee, in B2B deliveries the operations are structured but in case of B2C, arranging delivery times, required customer service and different legislation become challenges. In Finland people are not typically at home during days to receive deliveries, and logistics costs are often raised by unsuccessful delivery attempts. One expert saw that when the baby boomer generation will retire, the home delivery services will face even bigger challenges as the new pensioners may spend more time away from home. One interviewee described the current situation of home delivery services as following:

> *"At the moment this operations model is completely unstructured. As people are not at home, arranging delivery times is a damn challenge for the whole industry."*

In addition, several interviewees discussed the connection between the rise of e-commerce and the future role of brick-and-mortar stores in Finland. One interviewee stated that the structure of retail will continue to change, and in the future retailers have to support all the retail delivery channels: brick-and-mortar stores, pickup points and home deliveries. Some experts saw that the role of brick-and-mortar stores will increasingly turn to showrooms, where the goods will first be fiddled, tried on, and afterwards ordered online. However, one interviewee highlighted that the currently successful online clothing stores, for example Zalando, have not needed showrooms to achieve successful business.

According to the experts, the current number of returns is a challenge for the e-commerce business. Most of the interviewees did not take stands on whether e-commerce companies will increasingly start charging for the returns. Some interviewees saw the free returns to be a precondition for the business and that the number of returns would turn to decrease at the same time as the number of regular customers, familiar with the sizing and other characteristics of the products, increases. However, one interviewee stated that in the long run it would be sustainable for the world economy that for the returns would be charged, as customers should increasingly be in response to the extra work they have caused. Nevertheless, the current business model, typically based on free return policies, may create demand for new space types: one expert believed that the model where fitting rooms are

located next to parcel pickup points would accelerate returns processing and make the process easier for customers as they would have the chance to try the product immediately and return it if needed.

Due to the nature of e-commerce, as deliveries are mainly shipped to Finland from other countries, the interviewed representatives of real estate investors were unanimous that the e-commerce growth has not affected much the parties demanding logistics space in Finland. Based on the interviews, the future demand for logistics space in Finland depends by far on the requirements set by e-commerce customers. Most of the interviewees stated that Finnish consumers are patient and will be satisfied with the delivery times of 1-2 days in the future. In this case, no significant demand for e-commerce-related warehouse premises will rise in Finland as the requested delivery times can be managed also by storing the goods abroad and delivering them to Finland order by order. In addition, the interviewees saw the Finnish market to be too small to attract large e-commerce operators or warehouses in the country – instead the interviewees saw especially Poland and Sweden as attractive locations for large e-commerce warehouses serving Northern Europe and Nordics. Nevertheless, the demand for distribution terminals was forecasted to grow simultaneously as the number of upcoming e-commerce deliveries in Finland is expected to grow. If consumers increasingly demand faster deliveries, the current delivery infrastructure will need changes, and in order to respond to the demand, products have to increasingly be also stored in Finland. However, the most of the respondents saw this to be unlikely, and in general they did not believe that any large international e-commerce players would locate their warehouses in Finland. The experts' opinions on the need for smaller e-commerce warehouses in Finland varied: some experts supposed that the increasing e-commerce volumes might create demand for intermediate storages in large cities, but some instead claimed that as the size of Finnish cities already enables fast delivery times, it is unlikely that demand for last-mile delivery centres located within cities would rise.

As the growth of online retail has changed the logistics business more to B2C, the requirements for logistics buildings are forecasted to change as well. Terminals will increasingly be used as customer pickup points and therefore moving in the surroundings of logistics centres has to be easy and safe also by private cars or on foot, which will set increasing pressures on the safety issues in the terminals and their yard areas.

Although online grocery shopping has not experienced a breakthrough in Finland, all the interviewees discussing online grocery shopping saw that it will become more popular in the future. Although the general opinion was that the greatest e-commerce volumes will come to Finland from abroad, the interviewees saw that online grocery will be mainly managed domestically, having the potential to generate new demand for logistics premises.

Based on the interviews, there are currently two ways for arranging the logistics of online grocery shopping. The goods flows from retailer to customer are either managed via grocery stores, when the goods are stored in and delivered from brick-and-mortar grocery stores, or via specific dark store facilities used especially for warehousing the online grocery items. The interviewees pointed out advantages and problems related to both options: one interviewee stated that warehousing will increasingly be arranged via brick-and-mortar due to the simplicity of processes and the costs generated by having separate dark store warehousing facilities, some instead claimed the brick-and-mortar-based delivery model to be inefficient. However, the warehousing needs of grocery retailers were in general

forecasted to grow, and the experts mainly saw that online grocery does not require any special characteristics from warehouses comparing with ordinary warehouses used for storing food.

The interviewees saw grocery home deliveries to become increasingly popular although the development will be complicated by the recognised problems related to for example delivery time arrangements. At the same time pickup points, located both in stores and in other suitable locations were forecasted to become more common, and one interviewee saw potential for setting up specific mobile grocery pickup points by the main access roads of Helsinki.

Collaboration and Integration

Increasing collaboration and integration belongs among the megatrends that are already visible in the logistics industry, but based on the interviews, the megatrend will continue to intensify and will affect the industry also in the future. During the interviews, the megatrend of collaboration and integration was often connected to other megatrends and megatrend subcategories, including big data and globalisation.

Seen as a vital part of collaboration, the transparency of supply chains and operations was highlighted in relation both to data sharing and organizational behaviour. The interviewees saw that in recent years, the integration with suppliers has become deeper, and cooperation, openness and transparency were seen the preconditions of successful business. Information sharing was seen for example as a tool for recognising the hurry of the customer. The more transparent and tight the cooperation is, the better results will all the parties gain. Combined information flows were also seen as tools for higher efficiency, as they will remove the need for manual data processing.

Although the importance and potential of information sharing were widely recognised, there are some features restricting the sharing of information, related both to technical issues and the attitudes of actors in the industry. The current possibilities for electrical data processing were seen limited especially in small and mid-sized companies, which slows down the progress as the logistics industry is fragmented, supply chains are long and complex and the number of small operators is large. Although the interviewees highlighted that information sharing does not mean sharing trade secrets, the development is slowed down by the fact that in the short run, companies benefit from all the information they have and their competitors do not have. Higher transparency was therefore seen to require a change of thinking in the market.

The representatives of logistics companies saw that the requirements for transparency will increase in the future and companies even have to be able to keep their whole supply chain transparent. Based on the interviews, in the long run, all the actors will be forced to cooperate in order to reach general efficiency in the logistics business. One interviewee described the current situation as follows:

> *"We share all the information we are able to share. All business secrets or price information, those we have to keep by ourselves, but everything else we share, without question. And this will increase."*

Increasing transparency was also seen to affect the need for warehousing. When the parties are not aware of others' state of operations, part of the stocks are stored just to be on the safe side, often resulting in non-optimal stock sizes. If cooperation was more transparent, the actors could trust on each other, the warehouse network could be smaller and the amount of warehouse space demanded would also decrease.

Increased outsourcing and subcontracting have been visible trends in the logistics industry during the recent years, even decades, and the interviewees brought up several positives of outsourcing, including increasing flexibility, efficiency and decreasing costs. However, according to one interviewee, in Finland outsourcing warehousing is not as common as in other countries, and it is often difficult to make to customers to give up their own warehouses.

Especially companies in transport business were stated to have global networks and relationships. However, as one of the experts stated, none of the players in the market has a completely extensive global network, and the number of companies having a relatively good network is limited as well. For example in warehousing services the solutions are increasingly not made on national basis: in global warehouse networks the goods may be relocated overnight and the focus on warehousing can be changed very fast. The fast nature of the global business affects remarkably the regional warehousing needs and the logistics space demand.

The interviewees had very different opinions of the current trend of the length of relationships. According to the interviewees, long relationships were ideal but at the moment they are not reality. One interviewee stated that due to the nature of outsourcing and subcontracting, customers favour short contracts as they are primarily searching for cost savings. The customers were also seen to easily change their contractors based on pricing. Another interviewee instead saw that after a seek for the lowest prices, logistics customers have now returned to searching for accuracy and security of supply, and customer satisfaction has become a vital part of logistics business. After unsuccessful relationships with the cheapest operators, customers nowadays increasingly demand accuracy and secure deliveries. However, the representatives of real estate investors saw that logistics operators still lack the courage to commit to long lease contracts, and saw this to result from the lack of long relationships in the logistics industry in general.

Globalisation, Re-shoring and Changing Global Competition

Globalisation and international activities are essential parts of logistics business and everyday operations and behind a remarkable share of the total logistics volumes in Finland. In even more international environment, companies as well as countries have to continuously prove themselves competitive, and during the interviews, some of the experts took stands on the current state of the competitive position of Finland. The focus was mainly on the negatives of Finnish business practices and the state of economy, which in general were seen to weaken the current and future competitive position of the country. The interviewees highlighted especially the problems related to the size of the market and country's geographic location: the market was seen to be too small and the country too distant to attract for example new production. Several interviewees also brought up problems related to the current balance of goods flows in Finland: in general, the incoming and outgoing goods flows should be equal in order to reach logistics productivity and a reasonable level of total

logistics costs. The current situation is however that as heavy industries have been relocated from Finland and goods flows to Russia have dried up, the Finnish exports have been suffering and the transport is currently far from being bidirectional or balanced. International political fluctuations and especially the situation in Russia were stated as future question marks also in relation to logistics industry.

In the interviews, two different development scenarios considering the future of international operations, in relation to imports of food and groceries, were noticed. In general, the imports of food and groceries were forecasted to increase, as a result of which the logistics challenges will simultaneously grow: when buying goods from more distant locations, the batches sizes are typically larger and more warehousing is needed in order to respond to the requirements set for the immediate availability of goods. On the other hand, recently the demand for local products has significantly increased in Finland and groceries have managed to increase their sales by promoting local and Finnish goods. For the Finnish logistics industry this development is optimal as food logistics typically means volumes, and the production of goods with the highest volumes, including for example dairy and brewery products, is forecasted to stay in Finland. However, at the same time for example fruits and canned products are increasingly being imported to Finland.

As already presented in the chapter considering e-commerce, the interviewees believed that large central warehouses will be increasingly located in for example Poland, which gains from optimal location, cheap labour and affordable property costs. According to the interviewees, in case of warehouses were increasingly located in countries like Poland, the demand for warehouses in Finland would decrease but at the same time new demand for terminals would rise. One interviewee also saw that the future logistics space demand would concentrate on smaller remote warehouses in optimal locations as a part of the operators' wide international networks.

Most of the experts did not believe that re-shoring, referring to the phenomenon that companies relocate their production back to locations near their final consumer markets, would have potential to become evident in the Finnish market. The common opinion among the experts was that mass production or heavy industries will not return to Finland, and re-shoring was stated to be an issue of countries with larger home markets. The Finnish market was not seen large enough to drive the demand, the current cost level was seen to limit the attractiveness of the country and according to an interviewee, higher transport costs can easily be compensated by lower staff costs in more distant production locations. One interviewee described the situation in Finland as follows:

> *"Here we should first find a national drive, we can do everything we want to and so on. But this current situation does not give that kind of a message yet."*

Although in general the potential for re-shoring in Finland was stated to be low, the experts named some potential matters increasing the attractiveness of Finland. Increasing quality problems may lead the companies to reconsider their production locations, and new technologies, including 3D printing and increasing level of automation, were seen to create some new potential for re-shoring. One interviewee also brought up the point of sustainability: the expert believed that at some point the emissions will be increasingly controlled, and as currently the share of transport of the total global emissions is remarkable,

it might become possible that increasing emission control would lead companies to relocate their productions to shorten the distances between production and the point of consumption.

Ecological Drivers and Sustainability

Ecological drivers and sustainability represent a megatrend that is already visible in logistics business, and for the majority of the interviewed experts, the increasing importance of ecological and sustainability issues represented a self-evident truth. In general, the respondents were aware of the environmental effects of logistics and especially transport business. However, among the interviewed logistics operators, the views of the current state of the demand for sustainability in logistics varied significantly. During the interviews, a clear difference was noticed between companies operating in B2B and B2C environment. Most of the experts working in consumer business stated that today, sustainability issues are systematically required from the operators. Instead, the representatives of logistics operators offering their services primarily from company to company saw that ecological issues may become a topic, but they are typically forgotten when the talk goes to pricing of logistics services. Some of the operators did not see that their customers would be willing to pay for sustainable practices as the customers are still seeking for costs minimisation. Some also saw that the nature of their business limits the possibilities for sustainable operations, as customers mainly demand efficiency, exact and fast deliveries. One interviewee described their relationship with sustainability issues as following:

> *"This still has a price tag, I have told that [the company] cannot independently save the world, we are doing this on the business, our own environmental work is done on the conditions of the business. We have not yet found that we would get more customers with environmental-friendly equipment."*

Most of the interviewed real estate investors stated that logistics operators are interested in minimizing costs, and especially in case of smaller operators, any sustainable choices related to logistics properties are typically driven by the search for cost savings. Large, international operators were instead generally seen to demand sustainable practices also from logistics real estate. However, some of the real estate investors' representatives stated that currently environmental or sustainability issues do not add value on logistics space leasing, and a typical view was that investments in sustainability could only be justified based on clear costs advantages.

Many of the experts highlighted the importance of laws and regulations in the field of environment and sustainability, and some of them saw that regulations are the best tools for driving the development towards sustainability in the industry. Some of the experts stated that a change to more sustainable practices will unavoidably come sooner or later, either because of a wide awakening and increasing requirements set by the players of the industry themselves or forced by external regulations. However, some of the experts highlighted that if companies want to stand out in a positive way in the market, they have to actively search for solutions to reach sustainability and higher efficiency. The interviewees also highlighted the importance of good reputation in relation to the megatrend as sustainability and ecological issues were seen to have potential to affect company's reputation and its future success possibilities. One interviewee described:

"In the media we bring up that this is an ecological solution but at the same time it is often cost-efficient."

Some experts saw a connection between the demand for ecological and sustainable solutions and the current general economic state of the country. According to the experts, as recent years have been relatively difficult for the players in the logistics sector, their focus has mainly been in costs minimisation, but during economically better times, demand for sustainability was seen to rise. Some interviewees saw that the future sustainability of logistics industry has a clear connection to technological development, especially developments in vehicle technology. Some stated that the investments in more sustainable equipment are currently limited rather by the lack of available options than the interest in investing.

Based on the interviews of logistics operators, some demand for sustainable choices in logistics properties exists, especially in case of solutions that can be proofed to be economically profitable. Most of the logistics operators named sustainable solutions they have taken into use in their premises, including LED lighting, solar panels, wooden structures, free cooling and geothermal heat, and some stated that they have achieved significant savings due to for example energy saving projects. Some of the interviewees had also adopted the practices of certified environmental assessment methods, especially BREEAM, in the construction phase of their new logistics properties.

Additional Phenomena Affecting Logistics Industry and Space Demand

For the most parts, the interviewed experts agreed with the megatrend listing produced based on the literature scanning. In addition to the listed megatrends, the experts were asked to bring up any additional trends and developments they saw remarkable either in relation to the logistics industry or logistics space demand in Finland. Although the scope of the thesis is in logistics megatrends, the additional phenomena which are not recognised by all the market actors are interesting for the future of logistics industry and future space demand, and will therefore be introduced below.

Although in the thesis the megatrend of technological development has been divided in several subcategories, the interviewees also paid attention on the megatrend in general. Technological development was stated to be a very unforeseeable trend, and as unexpected changes were seen to have potential to take place also in short term, the megatrend was seen to increase the risks in operating in the logistics industry. Some interviewees brought up the trend towards electric communication and electrification of processes. Increasing electric communication would improve the efficiency of logistics industry and provide the whole sector better chances to control supply chains and react in changes. One interviewee stated that despite that Finland has traditionally held a pioneer position in electrification, in logistics the development has not been as fast as preferred and the final breakthrough in electrification has not been seen yet. A further scenario of technological development was brought up in relation to so called uberisation: one interviewee stated that new ways of delivering could rise in modern, smart cities. In the scenario everyone, moving in the carless city from a location to another, could provide delivery services and become parts of the supply chains, which would become as a loss for the current business of logistics operators. However, the interviewee doubted that the legislation and level of regulations could prevent uberisation to really become an issue in Finland. The regulations were considered also in

relation to processing, transporting and warehousing chemicals, as one expert highlighted the increasing attention paid on chemicals and forecasted the regulations, set by both Finnish and European authorities, to increase and increasingly to define the features of logistics properties.

The interviewees had doubts about the future role of wholesale trade companies. Recently a trend towards more direct supply chains has been visible especially in the food sector, where the actors have been increasingly seeking for lower prices and higher efficiency, and one interviewee believed that in the future the system would increasingly be based on direct contacts between the producers and retailers. At the same time, another interviewee forecasted the field of wholesale trade to become more concentrated. However, the demand for terminal premises was forecasted to stay high despite potential changes in the sector.

5.2.2 Additional Views of the Future of Logistics Industry

In addition to taking a stand on the megatrends and their potential effects on the logistics industry and space demand, the future expectations of the logistics industry in general and in case of real estate investors, also their predictions about the future logistics stock in Finland, were discussed with the experts.

The experts were not unanimous about the future development of the logistics volumes in Finland. In general, the basic structure of logistics was forecasted to face changes, as the goods flows will increasingly consist of parcel deliveries going straight to consumers. Some experts forecasted the total logistics volumes to increase, mainly basing their views on the potential created by e-commerce, in addition to which some saw the consumer demand to grow and increase the demand for logistics. At the same time, some experts did not see growth potential in the total logistics volumes. One expert described:

> *"I don't believe that at least anything exponential growth would rise. I don't know what could be behind the growth."*

The future economic structure of Finland was seen to affect the future of logistics. Some experts believed that the future growth of Finland would increasingly be based on services, as a result of which the general demand in logistics services would decrease. However, some interviewees stated that the geographically spread Finnish population will demand goods in all parts of the country also in the future, and as long as some production exists, certain demand for logistics will stay.

The number of employees in the logistics sector was generally forecasted either to decrease or stay at its current levels due to the improvements and implementation of automation and robotics systems as well as increasing cooperation and efficiency in the logistics business. The decreasing number of employees would also decrease the total costs of the logistics sector, in addition to which also the demand for office spaces in the logistics sector was forecasted to decline.

The experts' opinions of the future actors of the logistics business varied significantly. Some experts stated that the average size of logistics companies would increase as companies are increasingly searching for efficiency either from size and volumes or from local agility. Some experts saw that the role of local small logistics companies will remain remarkable as

large, international companies were seen to increasingly focus on global supply chains, as a result of which small companies would manage the local deliveries. The benefits of local companies were stated to include flexibility and local expertise, in addition to which they were seen capable to compete with prices. However, at the same time, the general requirements set for the logistics were forecasted to tighten: in the future logistics has to be faster, more efficient, more precise and goods have to increasingly be traceable, and some experts doubted how long local companies can respond to the increasing requirements set by both customers and authorities. Some interviewees also believed that there would be space for new types of actors in the logistics market. For example, one interviewee stated that in the future all the terminal services could be managed by one large operator, benefitting from its position and therefore being able to produce the terminal services in such an efficient way that there would no longer be space for other operators in the market.

As a result of changes in the nature of logistics, demand for terminal properties was expected to increase. Instead, some experts forecasted essential changes to take place in the warehousing sector, resulting from both changes in the warehousing strategies of international companies and the current competitiveness of Finnish warehousing. In case of groceries, the changes in warehousing were not seen as probable. As presented in the chapter discussing on globalisation and related issues, several interviewees saw as a potential scenario that warehousing will increasingly be located away from Finland, for example in Central Europe as for example the current rental level of warehouse properties and the high labour costs were seen to cause difficulties for logistics companies operating in Finland to fare in international competition and comparison. One expert described the current situation as follows:

> *"It is totally unbearable. We can think about the decision-making processes of international companies, what are the transport costs and the costs of local warehousing. It will increasingly lead to a situation where warehousing in Finland is so expensive that at this current price level the warehousing volumes will rather go out than in. And in general, this whole pricing model and Finnish planning politics, here the market is small and long lease agreements are required, the structures are badly behind the other parts of Europe."*

The interviewed logistics property investors instead saw that the continuing general uncertainty and the tenants' unwillingness to commit to long lease agreements limit the development of logistics stock. Also new IFRS lease standards were seen to limit the demand for long lease agreements. Resulting from the lack of new stock, the existing properties were not seen to completely meet the current logistics property demand, tenants were seen to make compromises and the vacant logistics stock not to meet the customer demand. The limited new supply has protected the current rental levels of the existing stock, which has led to a situation where there are no remarkable differences in the rents of older and modern properties. An expert representing a real estate investor stated that the demand for new logistics properties should be higher, supported by the current logistics property market situation, rental levels and the potential for cost savings created by modern efficient premises.

The interviewees believed the current trend of consolidation and more centralised logistics units to continue. The demand for square metres was not forecasted to grow but instead, the

share of high and efficient modern stock was expected to increase, connected, among other things, to the increasing number of logistics property investors in the Nordics, decreasing investment returns and higher willingness for setting up new product. Speculative logistics development has been rare in Finland in recent years, and no significant change was expected to come although continuing economic growth of a few years was seen to have potential to release some speculative development. As a result of increasing new supply, the rental levels of the existing inefficient stock were forecasted to drop dramatically and still, the future demand for especially smaller, outdated warehouse properties expected to be almost non-existent. In good locations the out-of-date stock was seen to have potential to be developed into other purposes, but for some properties there was no hope in sight:

> *"Those old quite low buildings, which are too small on their other measurements, making them unsuitable for terminals, they are suitable only for bulldozers."*

5.2.3 Estimated Probability and Importance of the Megatrends

During the expert panel interviews, the experts were asked to estimate the importance and probability of the megatrends and their subcategories in Finland at the same time when they were generally discussing the features and consequences of the phenomenon. As the reviewing process of megatrends and their potential effects with each expert was relatively free-form, the most of the experts did not directly comment the importance or probability, but the opinions were typically however registered from their responses. In addition, as any common scales were not generated for estimating the probability and importance of the megatrends during the interviews, the analysis of the results considering the probability and importance was made based on the discussions with the experts in their entirety, combining also the views originating from the literature with the opinions of the experts. A summary of the megatrends and the subcategories, representing their current visibility in the logistics industry as well as their probability and importance in Finland, can be found in Table 4.

Table 4 Megatrends and their estimated probability and importance in Finland

Megatrend	Current effects on the logistics industry	Estimated probability	Estimated importance for the Finnish logistics industry
Demographic changes, urbanisation and changing demand	Yes	Unavoidable	Very high
Technological development: The Internet of Things	No	High	High
Technological development: Driverless cars ands trucks	No	Moderate	High
Technological development: Robotics and automation	Yes	High	High
Technological development: Drones	No	Moderate	Moderate
Technological development: Additive manufacturing	No	Moderate	High
Technological development: Big data and predictive analytics	Yes	High	High
Technological development: Digitalisation of retail	Yes	High	Very high
Collaboration and integration	Yes	High	High
Globalisation, re-shoring and changing global competition	Yes	Very high (globalisation); Low (re-shoring)	High
Ecological drivers and sustainability	Yes	High	High

Most of the megatrends have already recognised effects on logistics and the industry, and only four of the megatrend subcategories, including the Internet of Things, driverless cars and trucks, drones and additive manufacturing, were seen to represent phenomena taking place further in the future. However, although the most of the megatrends and megatrend subcategories are already seen to affect the logistics industry at some level, their potential effects as well as their importance were mostly forecasted to change during time.

5.3 Potential Future Developments of Logistics Space Demand in Finland

During the complete environmental scanning process, several connections and cause-and-effect relationships were recognised between the megatrends and their subcategories. The findings follow the observations of the study by Toivonen and Viitanen (2014, p. 474), where the recognised forces of change shaping the future commercial real estate market were linked to each other and formed a network of reasons and results. Each of the studied megatrends and subcategories was connected at least to one other megatrend or subcategory. The phenomena that were estimated to be already visible in the logistics industry had typically more connections and relationships than the ones still moving towards maturity, which could be explained by the general uncertainty related to the future megatrends and their potential effects. On the other hand, quite surprisingly, any conflicts between the megatrends – causing doubts on whether the megatrends could take place in the same future – were not observed. The recognised relationships between the megatrends and their subcategories, based on the complete environmental scanning process, both on the literature scanning and expert panel, are presented in Figure 3.

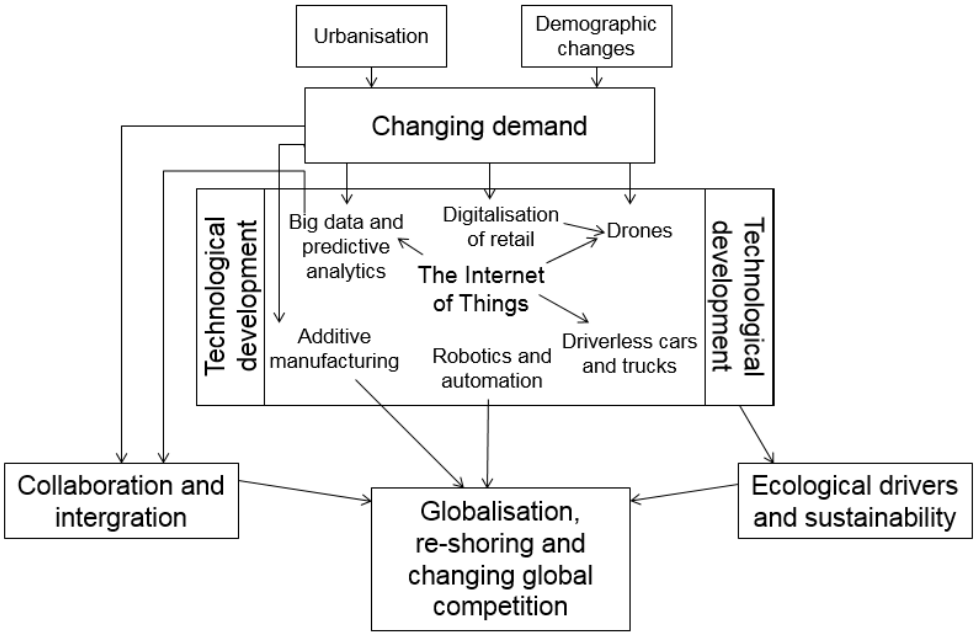

Figure 3 Relationships between the megatrends

The following Table 5 instead summarizes the outcome of the environmental scanning and presents examples of potential effects of each logistics megatrend on logistics space demand emerged in the study. In order to demonstrate the consistency and differences of the outcome of the two parts of the environmental scanning process, the findings are presented both at general level, based on the literature scanning, and in Finnish environment, based on the results of the expert panel interviews. The table presents the potential effects rising from the environmental scanning, without taking stands on the probability of the effects.

Table 5 Examples of potential effects of the megatrends on logistics properties and space demand

Megatrend	Examples of potential effects of the megatrend on logistics properties and space demand (based on literature scanning)	Examples of potential effects of the megatrend on logistics properties and space demand in Finland (based on expert panel)
Demographic changes, urbanisation and changing demand	- Rising demand for alternative last mile distribution channels - Demand for logistics centres in good locations increases - Increasing rents of logistics premises - Redevelepment of other property types into logistics use	- Demand for logistics premises focuses on urban areas - Rents of logistics premises in secundary locations increase due to growing risks - Demand for urban warehousing increases - Growing demand for cold storages - New property solutions are demanded to manage with the deliveries in rural areas
Technological development: The Internet of Things		- Need for common logistics rooms in residential buildings
Technological development: Driverless cars ands trucks	- Increasing requirements for yard design and building features - Increasing property development costs - Demand for smaller number of larger warehouses	- Increasing requirements for yard design and building features - Increasing demand for logistics properties in remoter areas - Demand for control centres rises
Technological development: Robotics and automation	- Increasing demand for suburban/rural locations on cheaper land - Setting up a new facility becomes faster and easier - Increasing demand for logistics facilities in developed countries by re-shoring	- Decreasing property costs (e.g. lighting) - Demand for higher warehouse buildings - Increasing lack of flexibility in automated warehouse properties - Wider location choice for logistics properties
Technological development: Drones		- Demand for delivery drones hubs in Helsinki city centre
Technological development: Additive manufacturing	- Increasing demand for facilities in re-shoring destination countries	- Declining demand for warehousing, transportation and logistics properties
Technological development: Big data and predictive analytics	- Reduced inventories lead to decreasing demand for warehouses - Demand for properties enabling rapid throughput increases	
Technological development: Digitalisation of retail	- Increasing demand for logistics space in general - Demand for new logistics property types - Demand changes towards smaller urban logistics facilities - Rising demand for alternative last mile distribution channels	- Increasing demand for distribution centres - Rising demand for alternative last mile distribution channels - Demand for intermediate storages in urban areas - Increasing requirements for the features and safety issues of terminals - Growing warehousing needs of grocery retailers
Collaboration and integration		- Higher transparency decreases warehouse networks and the demand for warehouse space - Confidence in relationships affects the courage for committing to lease agreements
Globalisation, re-shoring and changing global competition	- Increasing demand for logistics facilities located close the demand in re-shoring destination countries - Decreasing demand for port locations - Increasing demand for major intermodal hubs locations	- Decreasing demand for warehouse properties - Increasing demand for distribution centres - Occupiers increasingly consist of local players
Ecological drivers and sustainability	- Increasing demand for energy efficiency of logistics facilities - Decreasing demand for logistics facilities	- Increasing demand for energy efficiency of logistics facilities - Increasing demand for sustainable solutions providing costs savings

Due to the multiple connections and relationships between the megatrends and their subcategories and the assumption that the megatrends will together and simultaneously affect the future of the logistics industry, the future logistics space demand in Finland will be affected by the total, combined effects of the megatrends. Therefore in reality, the actual effects of a single megatrend cannot be separated from the simultaneously occurring effects of another developments. In order to represent the connections of the megatrends and to demonstrate the outcome of the environmental scanning and the diversity of the potential effects the recognised megatrends may have on the logistics space demand in Finland, examples of future themes of logistics space demand in the Finnish market were created by observing and connecting the similarities in the data collected during the environmental scanning process. Based on the conclusions from the data, in total seven potential future themes were created. The themes were formed by the researcher and due to the extent and timetable of the thesis, they were not verified in the expert panel. The themes could therefore be developed more comprehensive and their probability could be better assessed by completing another expert panel, where the themes would be evaluated, confirmed and further enhanced.

The created themes represent examples of potential future developments and they should be seen as an additional summary of the outcome of the completed environmental scanning process of the thesis. As the themes represent only the completed literature scanning and the opinions of the selected experts in the expert panel, any other potential futures cannot be excluded from the potential future developments. Although the megatrends themselves were not recognised to have conflicts or mismatches, the potential effects of the megatrends however may be and very likely are conflicted. The created themes are presented and further described in below chapters.

Demand for warehouses decreases

The world will continue to become smaller, and the warehousing decisions of international companies are nowadays made rather on regional than local basis. As goods as well as warehousing locations can today be moved and relocated fast from a country to another, the attractiveness and competitiveness of Finnish property stock and rental level will by far define the future of the warehouse space demand. In a situation where an international company has a chance to choose between warehousing locations, the current warehousing rents combined with the small home market and geographical location of Finland may not support the decision of locating warehousing operations in Finland. As a result of these developments, also the possibility that Finland would increasingly attract for production or warehousing operations is seen unlikely.

The unfavourable competitive position of Finland is combined with several recognised logistics megatrends and megatrend subcategories, which may affect negatively on the demand for warehouse premises. 3D printing has the chance to decrease the demand for warehouse space as the final products could be produced instantly based on the demand, without need for storing the final products. 3D printing would also decrease the spare parts warehousing needs although the materials for printing would still have to be stored.

Big data and related tools provide the possibilities for more accurate forecasting and supply chain optimising. As a result, the inventories may decline and decrease the demand for warehousing and warehouses. In addition, improving cooperation and higher transparency

and trust between the logistics actors may decline the inventories as the need for extra stocks may be declined by the better knowledge of the plans and actions of customers, suppliers and other partners. Also self-driving vehicles, having the potential to make logistics more round-the-clock business and to extend the geographical reach of a truck, may decline the need for warehouses.

Although e-commerce retailers have been stated to demand more warehouse space than traditional retailers, the increase in e-commerce may not affect positively the demand on warehouse space in Finland as the large e-commerce warehouses are expected to be located in countries benefitting from the optimal relationship between geographical location and labour and property costs. However, the demand for e-commerce-related warehouses in Finland depends by far on the future development of customer expectations: as long as customers are satisfied with delivery times of 1-2 days, new demand for e-commerce warehouses in Finland is not expected to rise. If the requirements change towards faster deliveries, which based on the environmental scanning seems unlikely, new demand for e-commerce warehouses in Finland might rise.

However, an opposite development may be observed in grocery warehousing, where the space demand is forecasted to increase. This development will be further analysed in the chapter “Food and grocery sector stays as interesting source of demand”.

Demand for terminals increases

A general outcome of the environmental scanning process is that the demand for terminal properties in Finland is forecasted to increase. The development results from expected changes in the basic nature of logistics: as an outcome of growing e-commerce volumes, the future goods flows will increasingly consist of international parcel deliveries. While the large e-commerce warehouses are forecasted to be located in other countries than Finland, the number of incoming deliveries is expected to increase, resulting in growing demand for local terminals and distribution facilities in order to deliver the goods in all parts of the country. Also the decreasing inventory levels, caused by better possibilities for tracking and analysing sales and predicting demand, will create demand for facilities enabling fast throughputs.

Upcoming developments limit the flexibility of the future stock

The height of traditional warehouses is limited by the lifting capacity of forklifts as well as the special regulations concerning high buildings. As a result of the increasing popularity of automated warehouse systems, the occupier demand for very high logistics properties has been evident in recent years. Based on the environmental scanning process, automated warehouse systems are nowadays suitable for certain logistics types, including logistics of daily consumer goods, parcels and other high volume products, and the expert panel mainly agreed that the automated warehouse systems may become more common in these fields of logistics. As the lower traditional warehouse property stock does not support height-demanding automated solutions, the need for new stock seems existent. However, the number of new potential occupiers in automated warehouses is relatively limited, as several companies have already adopted the automated solutions, the required investments are substantial and the solutions are suitable only for certain business types and high volumes. If the future technological solutions provide automation possibilities also for smaller

volumes and goods with variable sizes and other features, automation may become even more common.

Despite the potentially growing occupier demand, high warehouse properties may not be that optimal investment opportunities for real estate investors as they are seen to lack flexibility related to alternative purposes of use. High warehouses were rather seen as shells of warehouses as the technology inside can be as valuable as the property, and due to the potential challenges related to re-letting, they represent a different investment type than the traditional warehouses. However, the occupier commitment is seen to be stronger than in case of traditional warehouses, as the occupier has to make substantial investments in the automation systems.

Based on the completed environmental scanning, the general conclusion is that the average size of distribution centres is growing, and a recent visible trend in the logistics occupier market has been that logistics operators are increasingly searching for centralized solutions: the operations are moved under one roof and the additional premises are being given up in order to reach cost savings and higher efficiency. The similar development is expected to continue, having the potential to result in future logistics space demand increasingly focusing on large units.

The flip side of the increasing demand for larger units is decreasing flexibility, which, based on the discussions with the experts, is currently one of the most important features for the occupiers. The premises should flexibly enable both increasing and decreasing volumes. Increasing volumes require extension possibilities, while declining volumes can be handled in decentralised logistics solutions by giving up some additional units. As single units are getting larger and the operations more concentrated, the occupiers' possibilities for making changes in their premises to better respond to changes in the handled volumes will decrease, while the operators have to handle one large property and its capacity. In case of logistics, the possibilities for giving up part of the facilities are low. Therefore, the general lack of flexibility might slow the general development into larger units and centralized solutions.

Food and grocery sector stays as interesting source of demand

The future of the Finnish food and grocery sector will be supported by the expected population growth. Two different but not exclusionary scenarios for the future of food logistics were recognised during the environmental scanning: food imports in general are forecasted to increase, while simultaneously the demand for local products continues to grow. As a result of both the scenarios, the logistics sector will benefit as food logistics means volume logistics, and the production of goods with the highest volumes, including brewery and dairy products, is expected to stay in Finland.

The sector of food and daily consumer goods is also expected to be rather safe from negative consequences of several developments, including 3D printing and globalisation, and as a result of the increasing popularity of online grocery shopping, new demand for logistics premises may rise from the sector. Also the requirements set for the features of logistics properties and building technologies may tighten, as changes in consumer demand and the critical need for logistics operators for meeting the demand may result in growing demand for temperature controlled warehouses.

Mix of logistics space occupier types will change

Several additional scenarios for the future players in the logistics market were brought up during the environmental scanning process. In general, the average size of logistics companies was forecasted to increase. However, international occupiers were also forecasted to increasingly focus on global supply chains, as a result of which the final distribution in Finland could increasingly be managed by the local operators, gaining from flexibility and local knowledge. This would result in the outcome where the logistics space occupiers would increasingly consist of local logistics players.

Demand for remote logistics locations decreases

In general, no remarkable changes are forecasted to occur in the currently preferred logistics locations. However, the general trend is that the space demand is getting more focused on large concentrated logistics units, often located in or at least near the most optimal logistics locations. The potential consequence is that the demand for secondary logistics locations may continue to decrease, even though some experts stated that in case of concentrated operations, the location can even be not that optimal as the achieved cost savings achieved in one location are so remarkable.

Although some logistics property occupier types are prioritizing the logistics property costs over location, their demand may not be sufficient to support the current stock of non-optimally located logistics properties. The views for the future rental development in remote logistics locations varied during the environmental scanning process. Some interviewed experts saw that the rental level of secondary locations will increase while the risks incurring to the investors grow, resulting in lower occupier demand in these locations. An alternative conclusion is that the decreasing occupier demand will decline the rental levels, but especially the logistics properties with other outdated features in addition to location, may still be left with non-existing occupier demand, even with the lower rental level.

On the other hand, the location decisions of logistics properties are affected by the level of automation as the higher the automation level of a warehouse is, the more flexible location decisions can be made as the locations of automated warehouses are less dependent on the workforce and its availability. Therefore automated warehouses could be located on secondary logistics locations and cheaper land. However, as transport still generates a remarkable share of the total logistics costs and the facilities increasingly have to support responding to the requirements set for delivery times, the demand for remoter locations may still remain limited. As the current property stock is rarely suitable for automated warehouse solutions, the potential future demand created by automated warehouses might still be primarily focused on new stock, and therefore automation may not bring solutions for the imbalance between the existing stock and future demand.

Demand for new logistics property types and features rises

Based on the expert panel and reviewed literature sources, the logistics property demand is getting more concentrated on modern and efficient properties, and the future demand is forecasted to focus especially on modern and functional properties. Some of the interviewed occupiers were flexible with the features of logistics properties as long as the rental level is right comparing to the other property characteristics. However, as the total logistics property

demand is forecasted to stay roughly at its current levels and new constructions may be completed to respond to the demand for modern stock, any improvements in the demand for the out-of-date stock may not be in sight.

In order to respond to the changing consumer requirements, the increasing demand for fast deliveries and the growth of e-commerce, alternative last mile distribution channels, including self-service parcel delivery kiosks, lockers, mobile grocery pickup points by the main access roads and other pioneering solutions, are expected to be demanded.

The more improbable scenarios related to urban logistics include growing demand for logistics premises in urban areas. As a result of growing urbanisation rates, the consumer demand will continue to become geographically more concentrated, and increasing requirements set for deliveries together with growing e-commerce volumes may get the logistics operators to demand more central logistics locations and intermediate storages in urban areas. Also the future use of drones in parcel deliveries could create demand for delivery drones hubs for example in Helsinki city centre. However, as the urban logistics challenges are forecasted to stay limited in the Finnish scale, any notable new demand rising for urban logistics solutions might not be expected.

In addition to size and location, the megatrends also have potential to affect the demand for other features of logistics properties and thereby increase the number of mismatches between in the future occupier demand and the current logistics stock. As a result of the growth of e-commerce, terminals will increasingly be used as pickup points, which may set increasing requirements for the safety issues in the terminals as the traffic will include not only logistics traffic but also private vehicles and pedestrian traffic. Introduction of self-driving vehicles would require new logistics property design, which might result in an increase in the costs of building and property development. Also the growing demand for sustainable and eco-friendly practices in logistics companies may increase the demand for energy efficient logistics facilities and sustainable solutions providing cost savings.

A common view of the expert panel was that the current logistics property stock has too much office space, which is often seen almost completely unnecessary in logistics buildings. As the logistics sector is generally forecasted to become more electric and efficient and the number of employees in the sector to decrease, also the demand for office space in logistics premises may continue to decrease.

6 Conclusions

This chapter will summarize the findings of the research. In addition, the quality and reliability of the study will be observed and topics for further research will be proposed.

6.1 Key Findings of the Research

The purpose of the thesis is to recognise and analyse the megatrends shaping the logistics industry and their potential effects on the logistics space demand through environmental scanning, a method of futures studies and a tool for observing the future by discovering the environment. Based on literature scanning of existing publications focusing on logistics megatrends and related phenomena, in total five megatrends, shaping the future of logistics industry, have been identified. The megatrends covered in the thesis include (1) demographic changes, urbanisation and changing demand, (2) technological development, (3) collaboration and integration, (4) globalisation, re-shoring and changing global competition and (5) ecological drivers and sustainability. The megatrend of technological development has further been divided into eight subcategories: the Internet of Things, autonomous vehicles (driverless cars and trucks, robotics and automation, drones), additive manufacturing, big data and predictive analytics and digitalisation of retail.

The recognised megatrends were verified and their potential effects on the logistics space demand in Finland observed in an expert panel, formed to consist of eleven experts representing players in the Finnish logistics property market. The expert panel mainly agreed with the existence and significance of the recognised megatrends. The megatrend of demographic changes, urbanisation and changing demand is the most probable of the megatrends and also very important considering the future of Finnish logistics industry. Demographic changes and urbanisation are identified to be the key elements shaping the demand, while changing demand is observed to be the basic force driving the most of the other megatrends, being behind of for example increasing demand for new delivery methods and cooperation. In addition to shaping the future demand, demographic changes are expected to challenge the logistics sector in relation to the future availability of workforce, meanwhile the growing population will secure a certain need for logistics in Finland in the future. Urbanisation drives the industry both in cities and in rural areas: logistics volumes will increasingly concentrate on urban areas, growing cities will face challenges related to increasing urban logistics, while unprofitable deliveries to rural areas with declining population still have to be managed. However, comparing with global metropolises, the urban logistics challenges in Finland are forecasted to stay limited. Changes in consumer demand and habits will emerge requirements for the instant availability of goods, additional customised services and speed and accuracy of deliveries. Changing demand, together with demographic changes and urbanisation, has been stated to be even the most critical of all the emerging trends, and the logistics companies' capability to respond to these changes will by far define their future competitive positions. As a result of the megatrend, logistics space demand has potential to increasingly focus on urban areas and to create demand for new logistics property types and distribution channels. In secondary locations and rural areas the rents might increase due to growing risks for investors, while new property solutions may be demanded in order to manage with the deliveries in areas with declining population.

As new technologies may revolutionise the current practices in a very short time and the final breakthroughs of some of the listed technological megatrend subcategories still remain

uncertain, technological development, including its several subcategories, is estimated to be the most unpredictable megatrend, increasing the general risks of the whole logistics industry. In addition, technological development can be included among the most remarkable megatrends considering the future of logistics. In general, the forecasted technological developments and increasing amounts of data will enable better tracking possibilities, higher efficiency, more accurate forecasting, smarter communication and better possibilities to respond to customer demand. Technological development is forecasted to make the logistics industry less dependent on the workforce, and as a result, the number of employees in the logistics sector in Finland is forecasted to decline. The megatrend may affect the logistics space demand by creating demand for new property types and features, and it also has the potential to shape the future location preferences of logistics occupiers.

Although the most of the subcategories of technological development are recognised to be significant in relation to the future of the Finnish logistics industry, e-commerce received the greatest attention especially in the expert panel interviews. E-commerce has been visible already for years, and therefore its potential future consequences may be easier to predict than the outcomes of the phenomena that are expected to break through in the future. The potential effects of increasing e-commerce are expected to be limited to the delivery side of logistics as the number of deliveries is forecasted to grow, while for example warehouses of e-commerce companies are expected to be located elsewhere than in Finland. E-commerce has already had visible effects on the logistics space demand also in Finland, and in the future new demand for distribution centres and alternative last mile distribution channels may rise, while the megatrend may also to change the requirements set for the features of logistics properties.

The megatrend collaboration and integration is forecasted to intensify especially in form of higher transparency in the logistics sector. Due to increasing cooperation and transparency, the efficiency of the industry is expected to improve. Higher efficiency and lower costs will be sought also with outsourcing, which is a visible trend forecasted to continue. Higher transparency in the sector may have potential to decrease the warehousing needs in general and therefore also the demand for warehouse properties.

At the same time, global networks and relationships are expected to become even more important. However, the world getting smaller may affect negatively the development in Finland, and the current competitive position of the country was paid a lot of attention especially in the expert panel. The current situation in Finland is seen relatively weak and the size of the market and the country's geographical location not to support attracting more economic activities related to production or warehousing in the country. Question marks are related especially to the future development in Russia – whatever happens in the country will significantly affect the future of logistics in Finland. In the expert panel the potential for re-shoring in Finland was seen light, although some technological developments, including 3D printing and increasing level of automation, were stated to create some, yet light, potential for relocating activities in Finland. The potential effects of globalisation, re-shoring and changing global competition on logistics space demand in Finland include decreasing demand for warehouses, while the demand for terminals is forecasted to increase. Also the current mix of logistics space occupier types might face changes due to the megatrend.

The demand for sustainability is expected to grow in the industry in the future, either by a wide general awakening of the actors of the logistics industry or forced by increasing laws

and regulations. The megatrend of sustainability has an evident connection to several other megatrends: for example technological development is seen to enable sustainable practices and help them to become more efficient and attractive. In the expert panel the general demand for sustainability in logistics industry was connected also to the general economic state in Finland and as a result of future potential growth of the Finnish economy, new demand for sustainable practices may rise. However, the future demand for sustainability in logistics industry can be stated to depend on the general development of attitudes and regulations in the surrounding environment, and it is unlikely that any demand for sustainability would rise especially in logistics or among logistics actors. Currently the demand for sustainable features in logistics properties is mostly driven by costs savings.

During the environmental scanning process, several connections and cause-and-effect relationships were observed between the megatrends, and the phenomena already visible in the logistics industry had typically more connections and relationships than the other megatrends. Due to these relationships, the actual effects of single megatrends cannot be separated from the simultaneously occurring effects by another developments and the future logistics space demand in Finland will therefore be affected by the total, combined effects of the megatrends. The common themes of the potential future developments of logistics space demand in Finland, recognised during the environmental scanning process, include increasing demand for terminals and new logistics property types and features, while the demand for warehouses and remote logistics locations may decrease. At the same time the flexibility of the future logistics property stock may become more limited and the mix of logistics space occupier types may change.

6.2 Research Quality and Reliability

The aim of the thesis was to provide answers to determined research questions by using environmental scanning as the research method. The completed environmental scanning process consisted of two parts: literature scanning and expert panel. The purpose of the literature scanning was to recognise, group, introduce and discuss the logistics megatrends based on the existing literature. The expert panel was formed to analyse the existence of the recognised megatrends in the Finnish logistics business environment and to identify the potential effects of the megatrends on the demand for logistics premises in Finland.

The thesis is estimated to succeed in its aim to recognise and add knowledge of the logistics megatrends and their potential effects on the logistics space demand in Finland. The outcome and results of the thesis can further be utilised for example by real estate market players and other actors having an interest on the future moves and wishes of the logistics space occupiers and to develop the existing and future logistics property stock to better respond the preferences in the market. As the logistics real estate market in Finland has not previously been studied by using the tools of futures studies, the thesis adds knowledge in a field that has not previously been paid attention in the research.

When scanning the literature to recognise the megatrends, the examined literature sources were defined based on their years of publication and their focus on logistics and supply chain megatrends. Some potential challenges were recognised before starting the literature scanning process. The conceptual diversity of terms related to both future studies and logistics had been identified, and the researcher aimed to avoid any problems related to the terminology. The final ten sources used in the megatrend recognising process included

literature and publications focusing on the megatrends, trends, drivers, driving forces and game changers of for example logistics, supply chains, material handling and road freight. The definitions of both "*megatrend"* and "*logistics"* were kept in mind during the scanning process, and the suitability of the sources was estimated also based on the used terminology. The conceptual diversity may however have caused some inaccuracy on the results of the literature scanning.

The number of used literature sources could have been extended in order to reach even more accurate results. However, despite that the reviewed sources were focusing on different markets and the timeframes of the examinations varied, the results of the literature scanning were supported by multiple relatively unanimous sources, and no need for making any compromises in for example grouping or discussing the megatrends arose.

During the environmental scanning process, the timeframe of the inspection varied: the used literature sources were mainly studying the logistics megatrends in medium or long term, typically on a period of ten years, although approximately half of the used sources did not take a stand on the timeframe of the inspection. In the expert panel interviews, however, the discussed timeframe was not defined as any limits on the time period were seen to restrict the discussion and the opinions of the experts. Nevertheless, the timeframe of the discussions with the experts may be assumed to at least generally follow the time periods of their decision-making and planning processes. According to the interviewees, the maximum timeframe of logistics business operations planning is typically up to five years, while the real estate related decision-making is typically based on time periods from 5-10 to 15 years. Therefore the assumed time periods of the discussions are estimated to be relatively short for future studies.

During the environmental scanning process, the scope of the thesis appeared to be relatively wide and the researcher was not able to focus on all the phenomena in the desired extent. Nevertheless, no reasons for limiting the number of analysed megatrends were recognised, and making any limitations on the number of megatrends would have impaired the overall quality of the thesis although now the examination of each megatrend was left quite superficial and general. However, as the thesis focuses especially the potential relationships between the megatrends and logistics space demand in Finland, this level of examination was seen sufficient.

The frameworks for the thematic interviews were created based on the results of the literature scanning and the functionality of the frameworks was tested before the first interview. In expert panel, the quality of the results is by far defined by the quality of the interview framework and the asked questions. The quality of the discussed megatrends is estimated to be decent as the final megatrends were defined based on relatively coherent scanned literature sources. Also the interviewed experts were unanimous of the existence and importance of the listed megatrends, which supports the assumption that the discussed megatrends were correct and relevant. The structure of each interview varied based on the expertise and special knowledge of the experts. After each interview, the functionality of the interview framework was assessed and the framework enhanced, if any needs appeared, related to for example the clarity of expressions. Although revising the interview framework was not optimal considering the analysis process of the outcome of the expert panel, changes in the framework were seen to be necessary in order to avoid misunderstandings and to collect data of all the required subjects. Enhancing the framework between the interviews

may have had effects on the results of the expert panel, although effects were not recognised during the analysis process.

The validity of the interviews should be increased by the fact that the interviewees included only experts of their own field. Also the selection of the experts was paid attention in order to create a competent expert panel, and the number and competence of the interviewed experts was seen to support the purpose of the thesis. All the interviewed experts were familiar with the megatrends under discussion and the experts were let to focus on the subjects they were familiar with in order to avoid answers they were not completely certain of. However, the interviewees of the expert panel create a sample for the study and the results of the study defined based on the expert panel represent only the opinions and results of the certain sample. Therefore the results cannot be taken as the general views of logistics space occupiers or real estate investors and they are not statistically significant. The fact that one expert was given the interview framework beforehand while ten of the experts did not receive any detailed information of the discussed themes before the interviews, may have affected the outcome of the expert panel.

The concept of megatrend reflects to wide, relatively predictable and important phenomena that are likely to continue and typically include several sub-phenomena. Trends represent phenomena that are already generally recognised, as a result of which knowledge of the existence of trends does not provide any advantage for example from the pioneer position (Toivonen 2011, p. 31). Similar circumstances can be associated with megatrends. As the focus of the study was especially on megatrends, it can be assumed that the interviewees were honest in their answers, as knowledge of the megatrends themselves is not estimated to bring advantages in the competition. However, it is possible that the potential effects of the megatrends have not been recognised by all the market actors, and therefore the interviewees may have had some knowledge or opinions of the future developments that they were not willing to share in the interviews.

Ten out of eleven interviews were recorded. One interview was analysed based on the notes made during the interview, as due to a rapid change of the interview mode from a face-to-face meeting to phone interview, the researcher did not have a possibility to record the interview. In addition, due to problems with the technical quality of one recording, the analysis of another interview was completed based on the notes of the researcher. However, the lack of recordings did not bother the analysis phase as the contents of the interviews had been written down.

The conceptual diversity related to logistics property types has earlier been introduced in Chapter 3.2 of the thesis, and it was estimated to form one of the major challenges of the analysis of the outcome of the expert panel. As a result of the differences in the used concepts related to different types of logistics premises in literature sources and the common Finnish practice, the outcomes of the literature scanning and expert panel differ by the used conceptual framework. With hindsight, the interviewer should also have defined more specifically the content of the concept of logistics property in the interviews. The term logistics property was used to refer to all the property types companies operating in logistics business occupy. However, it came up that during the interviews, at least some of the interviewees associated the term logistics property only to logistics terminal properties. Therefore, resulting from the conceptual uncertainty considering the definitions of logistics premises, any ambiguous answers or results were excluded from the examination.

An additional round of the expert panel could have been organised in order to discuss, verify and analyse the developed future themes. At the moment the outcome of the potential future themes depends completely on the capability of the researcher as well as the quality of the completed analysis, which may restrict the quality of the themes.

According to Gordon and Glenn (2003, p. 12), in environmental scanning the best results can be reached by setting up a continuous and systematic scanning system. Also Toivonen and Viitanen (2014, p. 476) recommend that scanning should be completed as a continuous process. However, due to the nature and extent of the thesis, the methodological background lays on a once-only completed environmental scanning process. Therefore the reliability of the study could be improved with a continuing the scanning process and by continuously enhancing the research outcome based on possible new findings.

During the expert panel interviews, the experts were asked to estimate the importance and probability of the megatrends and their subcategories in Finland at the same time when they were generally discussing the features and consequences of the phenomena. As the reviewing process of megatrends and their potential effects with each expert was relatively free-form, the most of the experts did not directly comment the importance or probability, but the opinions were typically registered from their responses. In addition, as any common scales were not generated for estimating the probability and importance of the megatrends during the interviews, the analysis of the results considering the probability and importance was made based on the discussions with the experts in their entirety, combining also the views originating from the literature with the opinions of the experts. However, the lack of unite concepts and scales in assessing the importance and probability of the megatrends may have caused inaccuracies or uncertainties related to the outcome.

6.3 Further Research

The scope of the thesis was on studying the potential effects of logistics megatrends on demand for logistics premises in the Finnish market. Based on the completed literature scanning, in total five megatrends and eight megatrend subcategories were created. As a result of the number of the studied megatrends and megatrend subcategories, the characteristics as well as the potential consequences of each megatrend were studied in quite a narrow way, and the focus was kept on the connection between each phenomenon and logistics space demand. Therefore, future research might have potential to focus on each of the megatrends and their potential effects in a more detailed and comprehensive way. The future research could be completed by choosing one or a few megatrends and by observing the views of logistics actors having any special relationships or connections to the chosen megatrends or their potential future consequences. Additionally, the more precise timing and probability of each of the megatrend could be studied.

In order to further improve the outcome of the thesis, the results could be verified by setting up a continuous environmental scanning system, where the megatrends and their potential effects would be scanned in deeper and more constant way. Also the potential future themes created in the thesis could be developed into more comprehensive and their probability could be better assessed by carrying out another round of the expert panel, where the created future themes would be assessed, confirmed and further enhanced.

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List of Appendices

Appendix 1. Interview framework for real estate investors

Background of the expert

- Job description
- Logistics assets owned by the real estate investor
- Timeframe of planning and forecasting

Current logistics space demand

- Tenants' requirements for location and features of the properties
- Recent and ongoing changes in the tenants' requirements
- Types of tenants currently seeking for new premises

Megatrends (see Appendix 3)

- The importance and probability of the listed megatrends
- The expected potential effects of the megatrends on the logistics industry and logistics space demand
- Other potential trends or phenomena affecting either the logistics industry or logistics space demand

Expectations for the future of the logistics industry and logistics space demand

- Future size of the logistics industry
- Future actors of the logistics industry
- Future logistics space demand
- Expectations of the development of logistic stock
- Factors enabling or limiting the future development of the logistics stock

Appendix 2. Interview framework for logistics space occupiers

Background of the expert

- Job description
- Participation in business development
- Participation in decision-making considering logistics facilities
- Logistics assets of the company
- Timeframe of planning and forecasting

Development and changes in the business operations

- Recent changes in the operational environment of the company
- Recent changes in the business

Current logistics space demand

- Factors affecting the preferences for logistics premises and their locations
- Recent and ongoing changes in the preferences
- Challenges and problems related to the current logistics premises

Megatrends (see Appendix 3)

- The importance and probability of the listed megatrends
- The expected potential effects of the megatrends on the logistics industry and logistics space demand
- Other potential trends or phenomena affecting either the logistics industry or logistics space demand

Expectations for the future of the logistics industry and logistics space demand

- Future size of the logistics industry
- Future actors of the logistics industry
- Future logistics space demand

Appendix 3. Megatrend listing used in the interviews

Changes in consumer demand

- Demographic changes – changes in population, population structure and its regional distribution
- Urbanisation
- Increasing requirements set for products, services and deliveries

Technological development

- The Internet of Things – the internetworking of physical devices
- Autonomous and automated vehicles
    - Driverless cars and truck
    - Automation and robotics
    - Drones
- 3D printing
- Big data and predictive analytics
- E-commerce

Cooperation and integration in supply chains

- Cooperation with suppliers and customers
- Data flows in supply chains – sharing data and information through supply chains
- The increasing importance of global networks and relationships
- Transformation to long-lasting relationships with few suppliers

Globalisation, re-shoring and changing global competition

- Re-evaluation of global supply chains – risks and benefits
- Re-shoring refers to the opposite phenomenon of offshoring, to relocating production closer to markets or company's headquarters
- The location of future markets?

Ecological drivers and sustainability

- Increasing knowledge of global warming, the limitedness of natural resources and greenhouse gas emissions drives companies to change their operations
- Costs savings reached by sustainable and eco-friendly operations
- Increasing external regulations