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PROJECT DELIVERIES: BARRIERS & OPPORTUNITIES OF TRANSPORT LOGISTICS IN THE BARENTS REGION

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ABSTRACT OF THE MASTER'S THESIS

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Abstract
This research provides insights into project deliveries in the Barents Region. The aim of this research is to describe the project delivery process and to examine the barriers and the opportunities of transport logistics that are involved in project logistics in the Barents Region.

The research is conducted with qualitative research methods and it features two case examples of project deliveries. The literature review provides academic findings from transport logistics and project logistics sources. Theoretical framework is constructed of the project delivery process that encompasses a focus on barriers and opportunities of transport logistics. The data collection includes 8 interviews and observation.

The project delivery process consists of several phases: manufacturing, project cargo, transport mode choice, loading/stowing, transportation and final destination. This research provides also essential information of barriers and opportunities that are involved in project deliveries in the Barents Region. The project delivery process includes barriers that are: infrastructure, border crossing issues, distance, regulation and challenges with all-year traffic. According to the research findings, the best opportunities for project deliveries are road- and maritime transport. This research reveals that there are also difficulties in cross-border logistics between the Nordic countries, unlike the earlier academic findings suggest.

Clearly, this research provides both theoretical contribution and managerial implications. Earlier research of project deliveries is almost completely lacking, which means that new academic research is needed. Thus this research presents valuable and new theoretical contribution by describing and picturing the project delivery process in detailed fashion. The managerial implications are related to the findings of potential barriers and the best transport mode opportunities in project deliveries in the Barents Region. By clarifying the potential challenges of project deliveries, this research gives valuable information of what kinds of problems there might be, and most importantly this research gives instructions that are valuable for tackling those challenges. All in all, this research provides valuable findings of project logistics and cross-border logistics in the Barents Region.

Keywords
Project Logistics, Transport Modes, Cross-border Logistics

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1 INTRODUCTION

This chapter introduces research topic, research gap, research aim, research questions, research methodology and research structure. All in all, the introduction chapter gives insights into research focus and background information.

1.1 Introduction to the research topic

The role of logistics increased approximately 30 years ago, when the regulation of international trading began to diminish and thereby trading between nations became easier through free market focus. All in all, the free trade helped the competitiveness of transport logistics services, as the costs of logistics diminished. (Wood, Barone, Murphy & Wardlow 1995: 59; Gourdin 2001: 91; Hickey & Cassidy 2004.) Furthermore, the founding of EU in the 1990’s made transportation logistics a lot easier between the member states. Even though the world has faced significant changes in the past decades, logistics has been and still continues to be an important part of business. If compared to earlier days, logistics is nowadays seen as an integral part of the whole business model, rather than a separate function, which managers just have to deal with. (Gourdin 2001: 1-5; Hickey & Cassidy 2004.) One could easily state that the globalization of business has increased the importance of logistics operations (Karhunen, Pouri & Santala 2004: 28). Logistics efficiency is estimated to build 20 percent of the competitiveness numbers for the Finnish industrial companies (Paavola, Vehviläinen, Ojala, Antikainen & Ilkanen 2012). Logistics serves as a value creating driver for the customers (Gourdin 2001: 1-5) and the choice of right transport mode is seen as one of the key things in the logistics management perspective (Meixell & Norbis 2008). Fortunately, many companies have understood that the quality of logistics services creates the real value (Solakivi, Ojala, Lorentz, Laari & Töyli 2012).

Globalization has driven the logistics branch into a situation, where global customers demand quicker delivery times (Rondinelli & Berry 2000). D’Este (1996) sees that logistics includes three important aspects: time, cost and risk. These three factors are always present, and the delivery process has to be planned to meet these requirements. The shipments should be planned so that the time of warehousing is
diminished to minimum. (D’Este 1996.) To overcome these challenges, the logistics companies have to be able to offer efficient logistics services in global scale (Rondinelli & Berry 2000). However, Manuj and Mentzer (2008) remind that when conducting global logistics, one faces several risks. As a matter of fact, the increased role of globalization adds the risk factors for logistics remarkably (Solakivi et al. 2012). Manuj and Mentzer (2008) suggest that logistics companies should be ready to encounter these risks by proper risk management strategies. According to Bowersox and Calantone (1998), the fast development of both globalization and IT systems has driven logistics into a core competence in business management. However, the key question behind the emerging importance of logistics is: has the logistics itself changed, or has its role just become more and more important in our society? As a matter of fact, the research of Tavasszy, Ruijgork and Davydenko (2012) shows that the change process of logistics continues, as the role of information and technology increases in all industries, not only in logistics.

Transport logistics builds upon four different transport modes: Air Transport, Maritime Transport, Railroad Transport and Road Transport. These modes have pros and cons, which dictate their usefulness for transporting different kinds of cargo loads. In order to cope with the challenges driven from global transport logistics, there has to be profound understanding of how these different transport modes differ from each other. (Gourdin 2001: 85; Davidsson, Henesey, Ramstedt, Törnquist & Wernstedt 2005.) Transport logistics faces several barriers that harness the fluency of transportation processes (Aas, Halskau & Wallace 2009; Siuruainen 2010). When planning a transportation, there are different kinds of alternatives that are driven by surrounding opportunities of transport logistics (Valtioneuvoston kanslia 2013). If one thinks of the Barents Region for instance, the trading happens between four different countries: Finland, Norway, Russia and Sweden. Traditionally, it has been discussed that the logistics issues in this region are mainly related to transportations in Russia, but also the trade between these other nations could be harnessed by logistics related barriers (Ludvigsen 1999; Lorentz 2008). Barents Region offers multiple natural resources, and the demand for high technology solutions, especially in offshore business is rising (Liikennevirasto 2013; Valtioneuvoston kanslia 2013). Usually the products that are transported for these energy industries consist of massive and complex project deliveries (Norbury 2012). In order to do successful
project deliveries, both efficient logistics and expertise of dealing with the transport logistics barriers is needed. Furthermore, one has to be aware of suitable transport mode opportunities, when conducting project deliveries in the Barents Region.

This research focuses on project deliveries in the Barents Region. The research seeks to underline the prevailing barriers and opportunities of transport logistics for these types of project deliveries. The research topic is viewed through case examples of actual transportation processes in port of Raahe. The first case example focuses on project delivery of offshore crane from Raahe, Finland to Denmark. Whereas, the second case views the transportation project of windmill parts from Denmark to Raahe, Finland. These project deliveries are approached through focused interviews and observation. Although viewing the Barents Region as a whole, the research emphasizes the barriers and opportunities of transport logistics from the perspective of Northern Finland. The case studies of this research encompass the logistics chains of project deliveries, but also other forms of transportation logistics related issues are discovered. The research contributes especially in viewing possible challenges that are related to these kinds of international logistics projects. This research builds upon theoretical background of transport and project logistics. The empirical research is conducted with special focus on project deliveries and maritime logistics by examining real life case examples related to port of Raahe. This master’s thesis is part of the ENPI Kolarctic Barents Logistics II project in Oulu Business School.

1.2 Research gap

Although Finland has good knowhow of arctic conditions and technology (Valtioneuvoston kanslia 2013), it has been criticized in the media that the Finnish companies have not yet given interest on the great business opportunities of the Barents Region (see. Lehtiniemi 2013). One of the main reasons for this might be the difficulty of doing international business in these different cultural areas. Logistics issues and internationalization in general, can cause obstacles for the trading processes. Therefore, a research of the possible barriers and opportunities of transport logistics in the Barents Region is needed. The transportations are often linked to large projects, meaning that these transportations are often project deliveries and there is a clear need for understanding these types of processes.
Transporting goods to international markets is not easy, as there are lots different factors that might hinder the whole business process. Finnish companies for instance, have had a long history of doing business with Russian companies, but that does not necessarily guarantee any success for the transactions in general, although companies with lots of trading experience seem to do little better with the Russian trade (Lorentz 2008). Lorentz (2008) has found out that expertise and knowledge of the local business environment helps the companies to be more successful, when trading goods to Russia. Although the Swedish and Norwegian cultural backgrounds are very close to Finland, the foreign trade between these countries could also face some difficulties, which are caused from different kind of logistics barriers (Ludvigsen 1999). It is important to note that even similarities in culture might not guarantee successful implementation of business transactions. Transporting goods successfully to foreign countries demands knowhow of both possible barriers and opportunities related to transport logistics. There is a clear gap in academic research that would focus solely on project deliveries. Project deliveries are usually very complex in nature (e.g. size and weight), which separates them from general cargo transportations (Andersson, Duesund & Fagerholt 2011). Therefore, it would be important to add understanding of project deliveries, and at the same time; to give valuable contribution to both academic and managerial fields.

1.3 Aim of the research and the research questions

The aim of this master’s thesis is to describe the project delivery process. This research seeks to add the understanding of the barriers and opportunities of transport logistics that are related to the project deliveries in the Barents Region. The concept of barrier relates to challenge that might harness the transportation process. The barriers might vary from one country to another. In this research the transport logistics barriers are focused on challenges that hinder the project deliveries in the cross-border logistics between the Barents Region countries. The concept of opportunity means transport modes that are suitable for project deliveries. Transport modes have several pros and cons that have impact on their usefulness in transporting project deliveries in the Barents Region. The research questions are formed in a way that they encompass the focus on the project delivery process in the
Barents Region and highlight the role of transport logistics barriers and opportunities in this process.

The main research question is:

- *How is the project delivery process in the Barents Region?*

The sub research questions are:

- *What kinds of transport logistics barriers there are for project deliveries in the Barents Region?*

- *What kinds of transport logistics opportunities there are for project deliveries in the Barents Region?*

### 1.4 Research methodology

This research is conducted with qualitative research methods. The qualitative research methods are chosen, in order to gain rich data of the research phenomenon (Koskinen, Alasuutari & Peltonen 2005: 263-267). Case examples, focused interviews and observation will be used as a source for the empirical research material. The theoretical part of the research is created with literature review of transport and project logistics. Then a theoretical framework of research is constructed from literature review to further analyze the project delivery process and the potential barriers and opportunities of transport logistics in the Barents’s Region.

This research features two case examples that encompass real project deliveries in port of Raahe. The first case example builds upon Oy SteelDone Group Ltd, a company that is formed by a group off four steel workshops and one engineering company located mainly in Raahe area. The given case example consists of transporting a massive offshore special handling system (“offshore crane”) to Åsgard gasfield in the Norwegian Sea. The project delivery of the offshore crane will take place in summer 2014. The companies included in this offshore project are SME’s and together they form a project business network, which operates around this
offshore project. The second case examines the project delivery of 7 windmills, which took place in port of Raahe during summer 2013. The windmill case is approached through the Wasa Logistics Ltd., a company that is specialized in project logistics. All in all, these two cases provide valuable real life knowledge of logistics expertise and systems especially from the Northern Ostrobothnia region perspective. In general, this particular research gives important examples of logistics barriers and opportunities that are present, when conducting logistics projects in the Barents Region. The case examples are discussed in chapter 5.1. The reason for having these two case examples is to give the reader a detailed view of real project deliveries. More information of research methodology is provided in chapter 4.

1.5 Structure of the research

First an overview of this research is constructed with an introduction chapter. The first chapter includes also the research gap, the aim of the research, the research questions, and a short preview of research methodology. Second, based on academic literature review an overall picture of transport logistics is formed. The second chapter includes also information of Barents Region transportations and focuses especially on the Finnish logistics sector. Third, an exclusive insight into project logistics in the Barents Region is constructed and theoretical framework is presented. The third chapter provides information of transport logistics barriers and opportunities based on the literature review. Fourth, the research methodology is presented. The fourth chapter introduces what kinds of research methods are used and how the data is collected and analyzed. Fifth, an analysis of the empirical data is presented. The fifth chapter concentrates on empirical findings and it provides valuable quotes from the interviews and underlines the country related differences in project delivery context. The fifth chapter is constructed in the form of theoretical framework, in order highlight the relation between the theory and the empirical data. Finally the conclusions chapter sums up the whole research and provides theoretical contribution, managerial implications, limitations and suggestions for future research.
2 TRANSPORT LOGISTICS

In this chapter the theme of transport logistics is discussed through a literature review that encompasses theories from academic research in transport logistics. The chapter includes also information of Barents transports and Finnish transport logistics sector.

2.1 International transport logistics

Traditionally, transport logistics is seen as a process of delivering product from point X to point Y (Gourdin 2001: 1-5). However, logistics is not just moving goods; it is something far more complex. Naim, Potter, Mason and Bateman (2006) point out, that logistics adds value to the customer relationships. Logistics is needed in varying industries. This means that every case is somewhat unique. Actually, there are lots of variations, if comparing the logistics chains of different industries and companies. One company could focus entirely on manufacturing, whereas the other on the whole supply chain from the factory site all the way to the end customer. (Gourdin 2001: 1-5.)

International business occurs between cross national borders, which means that logistics competence is one of the key issues, when exporting goods to different locations. One has to remember that geographical distance has always been one of the most significant elements of transport logistics processes. From managerial point of view, it would be important to get the costs of logistic chain as low as possible, which means that the evaluation of different transport modes (e.g. air, maritime, railroad or road) is always a crucial decision from the financial perspective, when planning the supply chain management strategy. (Bowersox & Calantone 1998.) According to Hickey and Cassidy (2004), the real challenge for managers is simultaneously to both increase the level of logistic quality and to reduce the costs.

Due to the emerging globalization, the business environment itself becomes more complex. If compared to earlier decades, there are more international factors that cause problems to the business operations, including the transport logistics. Moreover, different cultures set their own challenges and the management has to be
aware of these challenges the foreign market entries bring with. (Dornier, Ernst, Fender & Kouvelis 1998: 1.)

Bowersox, Closs and Stank (2000) argue that global logistics has to deal with various political, labor, cultural and economic environments. Moreover Large, Kramer and Hartmann (2013) note that there should be a special focus of sustainability in transport logistics. Throughout the centuries the transportation has been essential part of global economy. In fact, many empires have been built upon superiority of transport logistics. This explains why logistics has become an integral part of national economies. The institutional role of logistics has meant that the transportation of goods has always been actively regulated with laws, which has also caused lots of bureaucracy. Unfortunately these regulations tend to barrier the trade process quite effectively. One of the main problems of this governmental bind in logistics is that, due to wide ranging regulations, the competitiveness of the branch suffers. To encounter this problem, there has been a trend of privatizing the logistics services out of governments’ influence. (Gourdin 2001:11; 91.) However, this deregulation process still continues in many countries. According to Tibben-Lembke and Rogers (2006), the deregulation of transportation has led to emergence of using third-party logistics services. By using third-parties in logistics, the companies will be able to better concentrate on their core business (Tibben-Lembke & Rogers 2006).

Transport logistics deals with the actual process of moving the products. Therefore, the transportation of goods is considered to be an integral part of the whole business transaction. Due to the earlier mentioned free trade, the logistics process has become easier to accomplish, and at the same time the development of more efficient logistics strategies and IT systems, has helped the logistics managers to plan the logistics chains more efficiently. Due to these developments, the cost of transport has diminished and the quality of service has improved. (Gourdin 2001:5.) One of the key things in transport logistics is the element of time (Morash & Clinton 1997). According to Murphy and Farris (1993), time is the most important dimension of logistics service, even more important than the quality or the costs. The schedules can be met with efficient supply chain management. Therefore logistics strategies, like JIT, have become key points for the logistics companies. Being a reliable and punctual partner creates value for the customer. It is essential that transportation
logistics focus is considered, when making supply chain decisions. (Murphy & Farris 1993; Morash & Clinton 1997.) According to Dobie (2005), some logistics companies have tried to build their competitive advantage through price reductions, but with light results. This type of strategy focus has led to diminished service quality, which causes lots of problems. In order to be competitive logistics operator, one has to create competitive advantage through different values (e.g. service quality) than price levels. (Dobie 2005.)

Gourdin (2001:24) has noted that, as the companies globalize, the costs of logistics operations increase. This means that companies need personnel, who can deal with this challenging international business environment. (Gourdin 2001:24.) One of the most significant changes in transport logistics in the past decade has been the trend of outsourcing logistics services. This evolution might be caused by the fact that the decisions concerning supply chain management demand lots of knowledge that has been lacking in many companies. Due to growing importance of logistics, the companies cannot afford making bad transport related decisions. Therefore some companies have made a strategic decision of outsourcing their logistics services for the professionals. (Hickey & Cassidy 2004.) Lehmusvaara, Tuominen and Korpela (1999) argue that the outsourcing of logistics has made the choice of right transport mode more important. This trend of outsourcing has actually helped some businesses to flourish. The research of van Laarhoven, Berglund and Peters (2000) shows that, the outsourcing of logistics services has worked well in many cases. Peters, Lieb and Randall (1998) discuss that outsourcing of logistics has become natural in many companies, as the companies have understood the benefits outsourcing creates. One of the key benefits of outsourcing has obviously been the cost cutting ability and increased satisfaction amongst customers (Peters et al. 1998). However, Sanders, Locke, Moore and Autry (2007) found out in their research that the problem of outsourcing logistics services is in managing the outsourcing relationship.

Dornier et al. (1998: 13) point out that technology has improved the quality of logistics by adding useful IT-tools for logistics, making the transports faster and the information more reliable. Wong, Lai and Ngai (2009) discuss that, when information technology is applied in transportation systems, the logistics companies gain significant efficiency and most importantly cost reductions. However, it is
crucial that there is a real cooperation mentality, when using information technology in transportation logistics, because the technology itself works only as enabler and the actors are the ones responsible for its effective use (Wong et al. 2009). According to Gourdin (2001:13), IT systems have indeed helped the monitoring of the logistics chains. Many technological solutions (e.g., GPS) have made possible to follow the logistics process in real time. One could easily use this kind of information to overcome some possible problems faced during the transport, and this information can be shared between the logistics chain partners. (Dornier et al. 1998: 360-361.)

When thinking about the role of supply chain management (SCM) for the transportation logistics, the global focus of managers has changed from logistics cost cutting to more flexible and specialized offerings. This kind of new approach opens better competitiveness for new market entries. In addition, the relationship between the companies and governmental bodies has a significant impact on the international and domestic trade, which means that decisions regarding social factors, environmental issues or simply SCM costs can affect the importing and exporting. (Ross, Parker, Benavides-Espinosa & Droge 2012.) Actually, the real challenge for freight carriers is to make the transportation with higher quality and at the same time to stay in schedule without any cargo damages. On one hand, the emergence of efficient IT-systems has helped to meet these high requirements. On the other hand, the biggest challenge still remains in environmental issues. Regulations, such as emissions and engine standards, set new challenges for the whole industry. (Dobie 2005.) At the same time, the transport industry deals with lots of competition, mainly driven by price-level fluctuations (Lammgård 2012). Logistics provider has to be ready to adapt to the changing customer needs. In general, this means that the supplier-customer -relationships has to be flexible to secure maximum value for the customer. When offering these types of flexible services, the logistics companies are able to gain competitive advantages. (Naim et al. 2006.) This means that the role of marketing activities increases in the customer relationships of logistics industry. One of the key things in logistic chain is that the supplier and customer cooperate already in the design phase of the products. All in all, cooperation in the early phases is needed to build and sustain successful logistics customer relationships. (Flint & Mentzer 2000.)
2.2 Transport modes & carrier selection

The choice of transport mode and freight carrier consists of air transport, maritime transport, railroad transport and road transport. When planning the mode of transport, many things must be taken into consideration. First, one has to remember that there is always a schedule which has to be met and at the same time the cost of transport should not be too high. Second, the goods must not suffer any damage during the transportation. Third, the service should be flexible and customer has to be able to trust the supplier. (Gourdin 2001: 85.) The choice of transport mode and carrier has great impact on both customer satisfaction level and costs (Lehmusvaara et al. 1999). Liberator and Miller (1995) discuss that these different transport mode choices have to be planned carefully, because the quality of logistics services can vary a lot. Murphy and Farris (1993) point out several factors that have impact on the transport mode choice (e.g. time, costs & reliability). They suggest that one should give greater importance on service quality, rather than costs approach in logistics management. However, there could be a problem of increased customer price levels due to the improvement of service quality. (Murphy & Farris 1993.) On the contrary, Gibson, Rutner and Keller (2002) argue that costs are still the most important determinant in carrier selection. Gibson et al. (2002) add that costs can be diminished by adding cooperation between the shipper and carrier. It would be important to remember that customers’ value preferences might vary and change a lot, which means that the logistics companies need to be ready to both identify those changes and to react as fast as possible (Flint & Mentzer 2000). In addition, different cargo types need different kind of service (Ludvigsen 1999). One of the most commonly used transport cargo type is container. The containers are very handful, because they can be used in several transport modes. (Gourdin 2001: 96-97.)

As discussed by Davidsson et al. (2005), different transport modes hold varying pros and cons. Davidsson et al. (2005) point out that maritime- and railroad transports are more commonly used, when transporting bulk materials. Both of these modes are quite cheap, if compared to air transport. In most cases one has to use road transport in some part of the logistics process. The pros of road transport mode are its quick and flexible service ability. The road transport is very competitive option, especially when the distance is not very long. If one wants the quickest delivery, the selection is
clearly air transport, but one has to remember that the costs of this mode are also the
highest. (Davidsson et al. 2005.) When comparing these four transport modes, road-
and railroad transports demand more infrastructure during the actual transportation,
than air- and maritime transport, which operate in air and water surroundings. Of
course air transport and maritime transport need infrastructure as well (e.g. ports and
airports), but the actual transport is more flexible in these settings (e.g. routing).
(Badger, Bugg & Whitehead 1993: 63-65.)

According to Liberatore and Miller (1995), logistics managers have to evaluate the
transport modes through different types of measures. This means for example
decisions of costs vs. service quality or delivery time vs. reliability –dimensions
(Liberatore & Miller 1995). Kent, Parker and Luke (2001) list that the most
important criteria for transport mode choices are: “quality, know-how & problem
solving, prices, reaction to complaints, accurate billing, equipment availability and
dependable transit times”. Kent et al. (2001) add that by giving great interest in these
factors, the logistics firms should be able to overcome the difficulties of not knowing
what creates value for their customers. According to Evers, Harper and Needham
(1996), the selection of transport modes depends on the perceptions the logistic
managers have on the modes. Thus, the decision of transport mode is made by
evaluating the possible transport modes with certain criteria formed through the
experiences and knowledge that managers have. For instance, they have to evaluate
“timeliness, availability, firm contact, suitability, restitution and cost of the transport
mode”. In particular, the timeliness and availability are seen as the most significant
determinants in the decision-making process. (Evers et al. 1996.) Premeaux (2002)
notes that the role of information in transport logistics has increased significantly.
One of the reasons for this kind of shift might be the increasing role of information in
the society itself. The carriers have also become more aware of the things the
shippers seek in the business relationship. There is also a growing need for better
service quality, customer relationships and availability. It is essential that both
shipper and carrier understand, what kinds of transport factors the other party
appreciates, and how those factors could be met. (Premeaux 2002.)

No matter what the transport mode is, it is crucial that the buyer and supplier use
collaboration in their relationship, when planning and managing the transportation
According to Esper and Williams (2003), the collaboration in transportation management reduces both logistics cost and risk and adds service quality and capability. Esper and Williams (2003) add that this collaboration should be coordinated somehow to avoid ineffective outcomes. Cooperation is equally important in carrier-shipper relationships, to gain lower costs and better service levels (Caplice & Sheffi 2003). For instance, IT systems can help the parties to share information and make the relationships more effective (Esper & Williams 2003). One of the key issues in collaboration approach is that the parties do not act for individual purposes. The parties have to be able to trust each other to gain the maximum value of the relationship. (Skjoett-Larsen, Thernoe & Andresen 2003.) Gibson et al. (2002) highlight that the carrier places high value for trust, effectiveness and flexibility in the relationship. Carter and Ferrin (1995) discuss that in certain situations the buyers show no interest towards the transportation process, because they feel that their involvement is either not needed or not appreciated. Carter and Ferrin (1995) point out that it would be important that the buyer is also involved, because effective supply chain management calls for cooperation from all parties. There has to be fluent communication between the logistics chain partners. By sharing information, each party knows what is expected from them, and the increased communication helps to build customized services. (Flint & Mentzer 2000.)

Each transport mode can be seen as competitive method, but actually they support each other (Wood et al. 1995; Gourdin 2001: 96-97). The whole logistics chain is rarely constructed of one transport mode (Gourdin 2001: 96-97). Especially containers are good example of these kinds of intermodal transports, because they can be transported easily with several carriers (Wood et al. 1995: 160-161). However, using several transport modes together could also face some difficulties (D’Este 1996). These problems might be encountered with coordination between different activities and cooperation of actors. In addition, technology plays a key role in building effective intermodal transport. (Rondinelli & Berry 2000.) According to Kelleher, El-Rhalibi and Arshad (2003), the intermodal transport calls for fluent information sharing between the operating parties. The supply chain members have to be able to follow the transport data and the ongoing delivery process with help of
IT-systems. By adding cooperation between the parties, unnecessary delays and costs can be avoided. (Kelleher et al. 2003.)

The research of Lammgård (2012) in Swedish logistics industry shows that intermodal transport cannot compete with single modal road transport in price levels, although this is mainly caused by current fuel costs and taxation. Lammgård (2012) reveals that the inadequate railroad infrastructure causes a great barrier for transport logistics branch in Sweden. Quite interestingly Ludvigsen (1999) discusses that it is more common to use single-modal routes than intermodal routes in Nordic countries. This might be caused by the fact that the shippers usually demand high quality transports and single-modal transport might deliver better overall quality in many cases. However, the most important intermodal transport criterion for the Nordic companies is operational excellence. Although having similar cultural background, the Nordic countries differ from each other in many ways, which casts a limitation for making generalization of logistics processes. All in all, one could say that the quality measures of transport logistics are far more important for the Nordic companies than the costs. (Ludvigsen 1999.)

One has to take into consideration that the infrastructure has impact on the use of several transport modes, because some modes might be impossible to combine due to undeveloped national infrastructure. All in all, the use of several transport modes together, as a one shipment, is more reliable, cost efficient and it ensures better safety for the cargo. (Gourdin 2001: 100-101.) The research of Regmi and Hanaoka (2012) shows that intermodal transportation in global scale could face several barriers deriving from: “infrastructure, border crossing process, interaction of transport modes at the borders, unavailability of wagons and frequency of freight trains”. Regmi and Hanaoka (2012) discuss that the use of information systems in transport logistics could help to deal with these kinds of barriers. The cargo for instance, has to be attached very carefully, because the circumstances are often quite of harsh. One of the problems concerning the attaching is the different level of quality. This means that the foreign customer and the supplier could have differing perceptions of how the cargo must be attached. (Gourdin 2001: 153-154.) Especially the maritime cargo faces lots of hard weather conditions and the cargo has to be stowed carefully to prevent cargo damage. Safety is actually very important part of every logistics
process. Fierce competition can drive the companies to limits, which can eventually mean reduced safety levels. The problems usually occur, when there is too small amount of workers handling the cargo. (Gourdin 2001: 120.)

2.2.1 Air transport

Air transport is not used very often, because it so expensive. However, air transport is quite reliable and the fastest of all transport modes. The choice of air transport might be best, when the cargo is small and valuable. Air transport uses different kinds of containers than maritime transport, because airplanes have a limited cargo space and the maritime containers are bit too heavy. Many times the distance itself makes the air transport the best choice available. (Badger et al. 1993: 62; Gourdin 2001: 90; 98-100.) Developments in airplane technology have made it possible to fly longer distances, which makes air transport even more competitive transport mode (Rondinelli & Berry 2000). Air transport can reach various locations all around the globe (Badger et al. 1993: 62). The earlier discussed trend of free markets and deregulation has been a good thing for air transport industry in general. The shift from regulation to open markets has made air transport a competitive alternative for transport mode choice. This has also led to changes in price levels. (Button, Costa & Cruz 2007.) Yuan, Low and Tang (2010) suggest that in order to create fluent intermodal transportation logistics, air transport industry should try to integrate with all the other transport modes in a way that provides best value for the customers. Yuan et al. (2010) remind that, when planning the cost reduction, one should also consider that these kinds of cost cuttings should not harness the customer’s delivery schedule and thereby diminish the overall value of service for the customer. Yuan et al. (2010) discuss that the airports could benefit from having a distribution center in the close distance of the airport, to gain better service level and competitive advantage.

2.2.2 Maritime transport

The maritime transport is often used, when the cargo is big. The use of maritime transport is in many occasions more cost efficient than the other modes. On one hand, one can move different cargo types easily through sea trade routes. On the
other hand, the maritime transport can take lots of time. Maybe one of the most essential core competences for maritime transport is the diversity, as one can transport all kinds of cargo from containers to big special freights. (Gourdin 2001: 90-91; 98.) Especially bulk materials are typically transported with maritime transports (Wood et al. 1995: 105). One has to acknowledge that the maritime transports are often conducted in line traffic maritime transports. Line traffic means the regular transportations that usually include containers and standard product deliveries. (Karhunen & Hokkanen 2007: 60-61.) Maritime transport competes mainly with railroad- and air transport. The edge of maritime transport is the largest cargo space. (Gourdin 2001: 90-91; 98.) Moreover, maritime transport can transport different types of cargo better than the other transport modes (Badger et al. 1993: 89).

The port choices often depend on reliability and speed. In other words, in order to attract cargo vessels, the port has to have efficient operations. The costs increase, if the vessel stays for long time periods in the port. (Tongzon 2009.) The more there is competition among ocean vessels in trade routes, the lower the price level gets. Thus, competition works as an important cost reducing force in maritime transport. Also the air transport has become a significant competitor for the maritime transport in global scale. (Hummels, Lugovskyy & Skiba 2009.) Tongzon (2009) identifies: “efficiency, frequency of ship visits and adequacy of port infrastructure” as core factors for port choices. Ports should focus on these elements, because they hold higher meaning for the customer, rather than costs, although costs are always important in big picture. Clearly, good geographical location and good connection with other ports pose important value as well. (Tongzon 2009.) Higher efficiency in port operations makes it possible for the port operator to raise the price levels. Better efficiency often cuts the stowing time, which inevitably means both cost and time savings for the shipment. Furthermore, better infrastructure and active private sector involvement help to cut the cost of transport. (Wilmsmeier, Hoffman & Sanchez 2006.)
2.2.3 Railroad transport

According to Badger et al. (1993: 63-65), the railroads need continuous infrastructure upgrades and upkeep, if compared to other transport modes. Different rail gauge standards harness also the efficiency of border-crossing railroad transports (Badger et al. 1993: 63-65). When compared to other transport modes, railroad transport is not very flexible (Karhunen et al. 2004: 147-148). Nielsen, Jespersen, Petersen and Hansen (2003) discuss that one of the recent changes in European transport has been the replacing of railroad transport carriers with road transport carriers. However, railroad traffic benefits from having the opportunity of transporting the cargo with faster speed than the road transport. On one hand, the railroad transport is more cost-efficient than the road transport, if the travelling distance is longer. On the other hand, railroad transport faces several costs that increase the total sum of railroad transports. One of the greatest cons is that railroad transport is often dependent on other transport modes (e.g. road transport). (Badger et al. 1993: 63-65.)

2.2.4 Road transport

Road transport has many pros, when compared to other transports modes. The logistics chain of road transport is more flexible, and in most cases trucks can deliver the goods directly for end customers. The road transport is very useful, when the cargo is valuable and the amount of it is quite low. (Badger et al. 1993: 65-66; Gourdin 2001: 87.) Road transports can be utilized for various types of cargo loads (Karhunen et al. 2004: 63). The easiness of road transport varies depending on the current country. One of the biggest challenges for international road transport is the varying transport weight regulations in different countries. (Badger et al. 1993: 65-66; Gourdin 2001: 87.) Many times road transports are seen as a supplementary carrier for air- and maritime transports, but actually road transports might work better in many cases. One of the greatest barriers for fluent road transporting is in many occasions the inadequate road condition. (Badger et al. 1993: 65-66.) Also the international and domestic regulation of road transports causes standard fluctuations that have impacts on cross-border road transporting (Karhunen et al. 2004: 45-47).
2.3 External forces in transport logistics

Logistics has changed many ways in last decades, as longer transporting distances have become possible and at the same time the infrastructure and technology have developed (Nielsen et al. 2003). Dobie (2005) discusses that transportation companies are nowadays surrounded by uncertainties, because the environment, where they are operating has become so unstable. Especially the market, competition, technology and government regulations are causing changes that have great impacts on logistics decisions (Dornier et al. 1998: 12-13). All of these forces act as a significant barrier sources in transport logistics.

Business markets change all the time, as varying factors (e.g. customer preferences) have instant impacts on the logistics process. The fierce competition of the logistics industry drives the firms to gain competitive advantage through SCM, which causes shifts in logistics strategies, as traditional means (e.g., price competition) are not effective anymore. This means that logistics decisions are in key role, when firms are trying to create competitive advantage. (Dornier et al. 1998: 12-13.) The problems in the environment are deriving from the urgency of the shippers, regulative restrictions and globalization. The fundamental problem is that the shippers demand higher quality of services with lower costs and faster delivery. Furthermore, the governmental bodies are making different demands for the logistics companies. This requires higher operational efficiency from logistics management. All in all, it would be crucial that freight carriers are aware of these issues and try to overcome them in their strategic transport logistics related decisions. (Dobie 2005.)

Lindholm and Behrends (2012) argue that urban environment itself acts as significant barrier for the transport logistics. Due to urban environment the quality of effective transport logistics is harnessed in many ways (e.g. inadequate infrastructure levels). There is a need for cooperation between authorities and other actors to coordinate all solutions concerning different transport modes. Efficient logistics creates crucial competitiveness, which means that all actors need to take this fact into consideration, when planning and making decision of urban transport logistics. (Lindholm & Behrends 2012.)
The governments have had long lasting bind to transport logistics. On one hand, the governmental involvement can be seen as a positive factor, because it creates jobs and wealth, but on the other hand it has also many down sides, which can affect the competitiveness of logistics branch very much. Many times the logistic companies are entirely or partly owned by the government, which means that the effects (e.g. laws and regulations) on the branch come directly from the owners of these logistics companies. By regulating these industries, the governments can affect various stages of logistics chain of transports. The costs of logistic services tend to be higher, when governments have connections to the logistics. The competiveness of each transport mode is strongly connected to current political motivations, such as environmentalism or taxation. In most occasions the governmental influence creates monopolies, which can have negative impacts on entire industries. It can be very hard for new companies to access these markets, because the governments can use regulations, which make the market entries a real challenge or nearly impossible. All in all, there are many negative factors that emerge from governmental regulation. From the logistics point of view the free market approach would be better in many ways. (Gourdin 2001: 94-95.)

The governments can affect the logistics process through laws and regulations. The traffic can be regulated to given hours of day, which means delays to schedules. The current trend of environmentalism means that the carbon dioxide regulations and other pollution related directives affect the whole business of these logistics companies. One of the key issues in logistics is of course the safety. The cargos are often very big or they contain hazardous materials. This means that governments must be able to regulate the transports to ensure the safety of environment and citizens. The customs and other governmental bodies can also increase the cargo costs with tolls. International trading often includes costs, which might not be present in domestic markets. However, free trade and nationwide cooperation can ease these kinds of cross-border logistics related barriers. (Gourdin 2001: 95-96; 121.)

2.4 Environmental impacts of transport logistics

One of the top trends in international transport is the effect of globalization to climate. In other words, the more there is transportation, the more there are
consequences on the surrounding environment as well. (Rondinelli & Berry 2000.) Eventually, this means that the growing levels of international transport have direct impact on the climate. In fact, the rising environmental regulations (e.g., carbon dioxide regulations) have driven some companies to move their operations to countries which have more flexible environmental regulations. This trend does not solve the problem, because the trend of relocation only adds traffic levels, which means more pollution and congestion. (Vöhringer, Grether & Mathys 2013.)

Mollenkopf, Stolze, Tate and Ueltschy (2010) argue that firms are often forced to focus on environmental issues in their supply chain management, because of the government regulation. The “green” approach in SCM might be an important value adding driver too (Mollenkopf et al. 2010). Environmental issues have become essential part of logistics, as the customers have started to place more value on environment in their business decisions. Environmental approach creates competitive advantage and corporate responsibility of logistics operators. (Goldsby & Stank 2000.) Although, there might be a dilemma of reducing transport levels and gaining growth in economical levels (Nielsen et al. 2003). On the contrary, the research of Large et al. (2013) shows that the buyers of logistics services might not place very high value on sustainability, when compared other values. Therefore one might think how much effort is devoted towards building sustainability for creating competitiveness. It is evident that the bigger customers appreciate environmental services more than the smaller ones. The transport logistics companies could diminish their carbon dioxide -levels by adding the use of intermodal transport services. Logistics companies should try to embed the environmental thinking to logistics planning in a way that reduces carbon dioxide by using information systems as a help to gain valuable data of the potential problem sources. (Lammgård 2012.) One has to remember that regulations are not really a solution for the problem, although they do control companies, because the companies have to be ready to take responsibility already in the pre stages of logistics processes, in order to build sustainable logistics in long-term (Rondinelli & Berry 2000).

One of the main problems in transport logistics is the growing amount of traffic. This trend causes lots of pressure to the infrastructure, which again causes problems like traffic jams and pollution. (Dornier et al. 1998:18-19.) The growing number of civil
Traffic has effect on the road transport business as well. The transport costs (e.g. fuel costs) have risen in all transport modes, which means also high price levels for the customers. (La Londe 2006.) Traffic jams cause big financial losses for the transport companies every year. Moreover, traffic jams increase other negative impacts such as pollution. Transportation causes also noise distraction to surrounding environment. Transport logistics causes also lots of waste in many ways. First, the cargo has to be packaged, which involves using lots of packaging materials like plastics. Second, the motor carriers use fuels, oils and different kind of fluids that harness the environment. (Karhunen et al. 2004: 114-115; 189.) Luckily, the recycling of the package materials has increased in recent decades. Due to the environmental trend, the companies have devoted lots of action to reverse logistics. This means for example, the recycling of the used packaging materials. However, there are issues, which are making the reverse logistics problematic (e.g. lacking know-how). Clearly, the governmental influence could help to make the reverse logistics process more effective. (González-Torre, Álvarez, Sarkis & Adenso-Díaz 2010.)

2.5 Barents Transports

The Barents Region consists of four countries: Finland, Norway, Sweden and Russia. The first three of these are Nordic countries, which relates to similarities in cultural background. However, Russia differs from the Nordic Countries a lot. On the contrary, Finland has had long business history with the Russians and also the Norwegians have conducted business with the Russians as well. Increased globalization and increasing cultural awareness might help to overcome some of the traditional barriers in cross-border logistics. So far Norway has shown the greatest interest towards the Barents Region’s business opportunities. (Siuruainen 2010.)

According to World Bank’s Logistics Performance Index (LPI), (see figure 1), Finland is top 3 logistics performer in the world. Finland (LPI: 4,05) offers great levels of logistics competitiveness, if compared to Norway (LPI: 3,68), Russia (LPI: 2,58) and Sweden (LPI 3,85). Thus, Finland provides excellent logistics opportunities for the Barents Region’s transports. Only Russia has somewhat low scores of logistics performance, if comparing the results in global scale. (World Bank 2013.)
Figure 1 Logistics Performance Index 2012, data source: World Bank (2013)

Figure 2 displays the Country Score Cards for different elements in LPI: Customs, Infrastructure, International shipments, Logistics competence, Tracking & Tracing and Timeliness. When these four countries are compared, it is clear that the issues of logistics are related to those in Russian markets. In all of the Score Card categories, the three Nordic countries represent good levels. Based on these facts, there might be only minor issues related to transport logistics in Finland, Norway and Sweden. However, this does not mean that there could not be some level of logistics barriers between these three Nordic countries. (World Bank 2013.)
Clearly the increasing role of Barents Region’s natural resources might act as an important driving force for developing the transport infrastructure. Investments are needed, in order to meet the future needs. Those investments have to be planned with international perspective in mind. For instance the Finnish road and railroad infrastructure is decaying. Therefore there is actual need for improvements. Not only the Finnish infrastructure, but also the role of Russian transport infrastructure has huge impact for the Barents logistics as well. (Paavola et al. 2012.) Effective exporting of services, calls for better air- and road transport connections (Liikennevirasto 2013). The sea routes work well at the moment, but the mine projects in Northern Finland might cause a need for deepening the shipping lanes in the near future. The ice conditions cause a need for ice breaking service in the winter times, which obviously causes some harm for the fluency of transportation. The ice-breaking branch needs lots investments in the near future, in order the guarantee the efficient maritime logistics in the winter times. (Paavola et al. 2012.) At the moment there are some problems with the current levels of railroad infrastructure in Northern Finland. The improvement of railroad track Oulu-Seinäjoki (ready in 2017) for example is one of the most important development projects, because the track suffers
from capacity problems. (Liikennevirasto 2013.) To mention some ongoing projects in Finland, there will be transport infrastructure developments in: E18 road improvement Seinäjoki-Oulu, railroad improvement Tuomioja-Raahe and the road improvements to E8 due to possible construction work of the nuclear plant (Paavola et al. 2012).

Also Russia and Norway have started to develop their coastal infrastructure with future investments in mind. The road transport infrastructure is one of the key barriers, when transporting between Finland and Russia. There have been some improvements to Murmansk road connections in Raja-Jooseppi and Kantalahti, but the long distances still cause lots of problems. (Siuruainen 2010.) If one evaluates the railroad transportations, there are two options for railroad connection from Finland to the Arctic Sea, either through Haaparanta to Narvik or from Vartius to Murmansk. The route from Vartius to Murmansk suffers from heavy traffic pressure, which might cause problems for efficient logistics. All transportation infrastructure developments call for cooperation between Finland, Norway, Russia and Sweden. Finland could have leading role in the Barents Region’s investments, due to excellent levels of expertise in offshore and maritime technologies. In addition, the service industries will have major role in the future as well. (Liikennevirasto 2013; Valtioneuvoston kanslia 2013.)

The arctic area is changing quite radically in the future, as the global warming has its effects on the environment. New logistic sea routes will be opened and the natural resources could be reached more effectively. (Valtioneuvoston kanslia 2013.) The business opportunities of the whole area are quite good, because massive investments are being planned for the future (see. Lehtiniemi 2013). These new investments will have huge impact on Finnish metal-, construction-, logistics and service industries. The Barents Region holds large amounts of natural resources, especially oil- and gas fields. One of the main problems in the area is the arctic conditions, which cause lots of logistics difficulties. (Siuruainen 2010.)

While transportation volumes in the Baltic Sea Region grow steadily, the negative impacts of traffic (e.g. congestion & pollution etc.) cast a challenge for the logistics industry (Lindholm & Behrends 2012). All in all, the future investments in the
Barents Region call for high technology solutions and knowhow of arctic conditions, which Finnish companies are ready to offer, as most of the oil and gas fields are located relatively close to Finland (Siuruainen 2010; Valtioneuvoston kanslia 2013). Unfortunately, one of the most important investment sites in Russia, the Shtokman gas field project, was ceased in 2012, which cooled down the investments for a while at least (Kaleva 2012).

There are lots of ports (e.g. Murmansk and Narvik) that are open all-year in the coastal areas of Barents Region, which naturally makes the maritime transports easier regardless of winter conditions (Liikennevirasto 2013). On one hand, the Finnish companies are eager towards Barents Region’s massive construction projects. On the other hand, there are lots of barriers that harness the trading to Russia. Finnish SME’s feel for instance that bureaucracy and border crossing procedures cause lots of problems. The low level of infrastructure barriers the transport logistics quite effectively, and different culture barriers (e.g. language) harness the effective business with the Russians in general. Finnish companies might face problems that are hard to encounter, if they have not had earlier experiences of Barents transports, or if they do not use intermediaries as consultants. (Siuruainen 2010.) All in all, the logistics competitiveness of Finland is good, if one thinks of the transport logistics opportunities for the Barents’s Region’s transport needs.

2.6 Transport logistics in Finland

Finland is one of the four Barents Region countries. This chapter gives insights into Finnish transport logistics sector and highlights the role of cross border-logistics between Finland and the other Barents countries.

According to Paavola et al. (2012), the Finnish transport industry works quite efficiently at the moment. The biggest problem at the moment is the railroad transportation (Paavola et al. 2012). Tighter environment regulations will have huge impact on the whole logistics sector in the coming years (Liikennevirasto 2013). The Finnish logistics industry is also highly dependent on the markets of the near areas, which causes market fluctuations. Because the logistics market is in constant change, there has to be efficient supply chain management systems that will help to forecast
and overcome possible problems. Furthermore, there are great differences, when comparing the availability and level of logistics services in different geographical areas of Finland. On one hand, the competitiveness of Finnish transportation industry is quite good. (Paavola et al. 2012.) On the other hand, one has to acknowledge that Finland is heavily dependent on exports, which means that fluctuations in global economy will have instant impacts on Finnish transportation industry (Liikenne- ja viestintäministeriö 2009).

In Finland the foreign export and import transports (based on cargo tons) are mainly done by maritime transports, whereas other forms together constitute less than 20% of the total transport volumes (see figure 3). In the year 2012, the foreign export transports from Finland were focused on maritime transports (88%) followed by road transports (9%), railroad transports (2%) and other transports (1%) The same trend is also evident in foreign import transports. However, there were some changes, if compared to the portions of foreign exports (maritime transports 79%, railroad transports 11%, road transports 5%, and other transports 5%). (Tulli 2013.)

![Transport Modes of Foreign Export](image1)

![Transport Modes of Foreign Import](image2)

Figure 3. Transport modes of foreign exports and imports in Finland 2012, data source: Tulli (2013)
Finland’s Ministry of Transport and Communications has listed the external factors, which are affecting the competitiveness of Finnish Logistics Industry at the moment, as follows: Legislation and its supervision, International Regulation of Environmental Issues, Scope & Level of Transportation Infrastructure, Availability of Resources and Labour, Contracts of Labour Markets, Fuel and Energy Taxation, Taxes and Payments from Traffic Routes, Actions of Competitor Countries, Efficiency and Predictability in Customs Clearance, Amount of Tariffs and Other Tax Related Payments. These factors play key role for the whole Finnish economy, because effective transportation is a basis for successful trading processes. (Paavola et al. 2012.)

According to Paavola et al. (2012), the competitiveness of Finnish logistics sector is influenced by several barriers. These barriers are: High taxation of traffic and continuous traffic tax raise, Decaying Transport Infrastructure, Tight evaluation of licenses and statutes, Problems with all-year traffic (e.g. weather conditions), EU decisions concentrating on Middle Europe, Lacking level of international lobbying in public and private sectors, Cost level of Finnish logistics labour, Big amount of illegal strikes (when compared to competitor countries), Dependence on maritime transports, Long distance to main markets, Low streams of goods in domain & international markets. All in all, there are lots of factors that are harnessing the competitiveness of Finnish logistics sector. (Paavola et al. 2012.) It seems that these barriers are mainly caused by EU or the Finnish society itself, which means that the competitiveness could be increased through diminishing bureaucracy and making political decisions that support the transport industry. Moreover, it seems that more attention towards the development of transportation infrastructure is needed.

The Finnish transportation sector faces regulation from both domestic and international levels. In Finland the main regulations concern taxes and land use, which have direct influence on the transportation. If one thinks of the most significant tax sources, those would be: the taxation of fuels and traffic related taxes. The regulation focuses often on environment and safety issues. Regulation of competition plays a key role, because the competitiveness of transport modes depends heavily on regulations. Most of the regulations are done by international regulators, which might cause problems also for the domestic transport logistics.
Especially air transport is regulated in international level, whereas railroad transport faces usually domestic regulation. One of the key problems for Finnish transport industry is the absence or inadequate level of lobbying forces in international cabinets. Finland’s role in international politics is somewhat small, which inevitably makes it hard to achieve decisions that would benefit the Finnish transport sector. (Paavola et al. 2012.) One of the future challenges for the Finnish transportation industry is the emission regulation, as almost every transport mode still uses oil based fuels. The new regulation directive concerning the sulphur emissions casts a dark shadow upon the Finnish maritime transport, which could lead to reduction of competitiveness. The solution for this problem could be achieved by using LNG as a power source in cargo vessels. On one hand, these regulations harness other nations as well, not only Finland. On the other hand, there will be huge developments in fuels in the future. The train transport differs already by using electricity as the main power source and there is also some level of biofuel -use in other transport modes as well. (Rautavirta & Jääskeläinen 2013.)

As mentioned earlier, infrastructure plays an important role in the transport logistics, both as a barrier and as an enabler. In addition, the Finnish transport logistics companies have to be able to deal with the changing weather conditions. Fortunately, The Finns have good know-how of dealing with ice and snow. Especially the maritime sector is heavily dependent on the efficient ice breaking service in the winter time. The biggest problems of Finnish transportation infrastructure are in rural areas. Quite interestingly the political decisions do not often times correlate very well with the business life needs. Overall, the level of infrastructure is sufficient at the moment. In the future there should be an emphasis on improving the border crossing infrastructure and port infrastructure, because the foreign trade is heavily dependent on them. (Paavola et al. 2012.)

Although having lots of challenges, the Finnish transportation industry is also very competitive in certain sectors. Especially knowledge of arctic conditions is top class in Finland and these skills could play a vital role as source for creating competitive advantage in the future. The strengths of Finnish transportation sector are mainly driven by efficient society, which creates suitable business environment. Finland is one of the least corrupted countries in the world and high education and
technological know-how help to build efficient logistics services. Although, there are some problems with current level of transport infrastructure, Finland offers good conditions for transportations in general. One of the key pros is that Finland is located near to Russia, which opens opportunities for transporting goods to/via Russia. The WTO-membership of Russia is estimated to increase the transports to Finland. (Paavola et al. 2012; Liikennevirasto 2013.)

2.6.1 Air transport sector

The Finnish air cargo levels have increased remarkably in the last decade, mainly due to emergence of JIT–logistics trend, which has reduced warehousing and increased the role of fast deliveries (Liikenne- ja viestintäministeriö 2009). The aviation business is free for competition in the EU, which gives fluent access for markets. The most important Finnish airport is the Helsinki-Vantaa airport, which works as a hub for Asian traffic. The hub position has made it possible to offer good flight connections from Finland to other countries in Europe. Although being led by civil traffic, this development has had a significant impact for the freight transport as well. One has to acknowledge that in Finnish air transport most of the air freight is transported in the cargo space of civil traffic air planes, which means that civil traffic is directly connected to freight flows in air transport industry. Most of the imported air freight crosses the Finnish border by road transports later on. The overall situation of Finnish air transport infrastructure is sufficient to meet the demands of air freight at the moment, thus there is no need for urgent developments. (Paavola et al. 2012.)

The logistics distance of Finland is somewhat large, which means that air transport offers the fastest way to access the global markets, when transporting goods from Finland to the main market areas. Even though the total amount of air transport is relatively small, air transport offers the best option for meeting tight schedule constraints with high quality services. Finnish air transport sector operates with relatively small traffic amounts, which means that the traffic is concentrated on main airports. For example, air transport routes from Northern Finland to Barents Region are lacking. The air transport industry is built upon tourism, which means that it is impossible to open only cargo flight connections in cost-efficient level. (Liikenne- ja viestintäministeriö 2009.) To access the Russian areas of Barents Region from
Finland, one has to use flight connections through St. Petersburg or Moscow (Siuruainen 2010).

The most significant volumes of flight traffic in Northern Finland concentrate on Oulu airport. There are also other airports (e.g. Rovaniemi, Ivalo), but these airports are heavily focused on tourism due to Lapland’s tourist flows. In Northern Finland, the number of flight passengers is quite small, which means that it is not rational or cost-efficient that several airplane companies would offer multiple flight routes. Because the traffic levels are so low, the flight connections from Northern Finland to Norway, Sweden and Russia are almost completely lacking. Thus, transporting air cargo directly from Northern Finland to Barents Region is very difficult. However, there is a possibility of transporting the goods through Helsinki-Vantaa airport, which offers better flight connections. (Liikenne- ja viestintäministeriö 2009, Siuruainen 2010.)

2.6.2 Maritime transport sector

The Finnish ports have been traditionally connected to factory sites. Usually the owner of the port is either the company that owns the factory or in many cases the municipality. (Karhunen et al. 2004: 261.) However, there is new legislation, which changes the ports into private companies in the near future. The maritime transport industry will face lots of challenges in the coming years. These difficulties are mainly caused by international environment regulations. (Paavola et al. 2012.) One of the biggest challenges for the maritime transport industry in Finland is the emergence of new sulphur emission levels (in 2015) and other environment regulations, which might harness the whole branch very dramatically by diminishing the competitiveness of maritime transports and at the same time turning the scale towards other transport modes (Henttu & Hilmola 2011; Paavola et al 2012; Utriainen 2013; Liikennevirasto 2013). Paavola et al. (2012) discuss that Finland could suffer the most from these environment regulations, if compared to other European countries. Eventually these regulations might lead into a situation, where large vessels would be used as main carriers instead of small cargo vessels. The number of ports can diminish, because smaller ports cannot compete with the larger ports anymore. Especially the ports of Northern Finland will face lots of challenges.
(Henttu & Hilmola 2011.) As the costs will increase, the number of foreign cargo vessel visits will reduce, causing cancellations of certain trade routes (Paavola et al. 2012). However, there are lots of planned mine projects in the Northern Finland that could mean increased transport flows for the ports of the Bothnian Bay. These new mine projects (e.g. Sokli) could have positive impact on traffic volumes. The mines might increase the transport flows especially in the ports of Kemi, Kokkola, Oulu and Raahe. The ports of the Bothnian Bay are already used for transporting mining goods from Russia. For instance, a significant number of products from Kostamus’ mine travel with train transports through Vartius to port of Kokkola. (Utriainen 2013; Liikennevirasto 2013.)

The role of government regulation is quite low in Finnish port industry, because the governmental bodies can affect mainly on building and sustaining the logistic trade routes. The role of industrial factories is quite remarkable for most of the Finnish ports. This is why the global market forces have huge impact on the Finnish ports. The logistics efficiency of Finnish ports does not correlate with the size or the traffic flows of the port, as smaller ports might be able offer more efficient logistics services than the bigger ones. Over half of the goods transported to/from Finnish ports are bulk materials. Maritime transport mode is the most cost-efficient way of transporting heavy and big cargo loads. Especially the use of the nearest port by minimizing the distance would be the most rational choice in these kinds of transports. The container flows are not so dependent on minimizing the road transport as bulk materials. When transporting containers, the service efficiency plays more vital role. (Paavola et al. 2012.)

The future of maritime transports looks quite challenging in Finland. Also the actions of neighbor countries will affect Finnish maritime sector a lot. Especially Russian port infrastructure is developing in fast pace, which might increase competition with Finnish ports. The development of Russian transport infrastructure could also be a good thing for Finnish transport sector, if the export and import processes between Finland and Russia become more fluent. The increasing role of Europe-Asia route could also increase the traffic levels significantly in the future. (Utriainen 2013.) If the challenges of arctic conditions could be solved effectively, new sea routes, like the Northern Sea Route, will have positive impact on the whole logistics industry
This particular route will diminish the distance between Europe and Asia significantly. It is estimated that the Northern Sea Route reduces the distance of Europe and Asia with 40 percent. (Liikennevirasto 2013.) However, there are lots of uncertainties concerning the Northern Sea Route, as it is difficult to forecast how it would change the transportation routes, thus many companies have been skeptical towards the competitiveness of this route. Moreover, the natural resources in the arctic areas might lead to an increase in transportation levels in the future. (Utriainen 2013.) The Northern Sea Route is not going to replace the current routes completely, but it could work as a complementary route option for the transports of mine-, oil- and gas industries (Liikennevirasto 2013).

The maritime transports play a key role for Barents Region’s transport cluster. If one thinks of the maritime transportation opportunities in the Bothnian Bay, there is a good variety of ports, which guarantees good opportunities for different types of transports (Liikennevirasto 2013). Figure 4 summarizes the import and export flows of largest ports in the Bothnian Bay. If one compares the four largest ports in Northern Finland (Kemi, Oulu, Raahe and Kokkola), one could see that port of Raahe had the first position in import cargo in 2012 and at the same time the port of Kokkola was clearly the largest export port of these four (Satamaliitto 2013). All of these ports are very important for the logistics competitiveness of Northern Finland. These ports have good railroad connection and land reserves for possible infrastructure developments. (Liikennevirasto 2013.)
The cargo of port of Kemi consists mainly of forest industry products and fuel transportations. Port of Kemi offers good opportunities for the mining industry as well. Port of Oulu specializes in container transports and offers also transportation services for forest- and mining industry. The transportations in Port of Raahe are connected to nearby steel factory. This means that transportations in port of Raahe are mainly chalk stone and iron ores for steel production and the transportation of the final steel products from the factory. The most southern of these four, the port of Kokkola has expertise in transportation of bulk materials (especially mining industry). The port of Kokkola offers the deepest shipping lane (13 meters), followed by Kemi, Oulu and Raahe (10 meters each). All in all, these four ports have important role for the Barents Region’s maritime logistics. (Liikennevirasto 2013.)
2.6.3 Railroad transport sector

The Finnish railroad transport sector is dominated by one operator. The lack of competition, both in domestic railroads and in railroad connections to east (Russia), harnesses the competitiveness of railroad logistics in Finland. Inevitably, this kind of market structure causes a situation, where availability of railroad transport service is weaker and the freight costs are higher. The developments of railroad infrastructure have focused on the needs of civil traffic sector instead of cargo traffic. New competitors will face lots of barriers, when accessing Finnish railroad transport industry. This is mainly caused by the fact that the Finnish railroad standards differ remarkably of those in Middle Europe (e.g. the width of railroad differs). Luckily, Finnish railroads have gauge similarity with the Russian railroads, which offer good transport connectivity to Russian markets. (Paavola et al. 2012.) There has been a discussion that the increasing role of Barents Region, calls for better railroad connections from Finland. Especially a railroad from Rovaniemi, Finland to Kirkenes, Norway has been proposed as a possible future transport connection option (see. Kaleva 2013). There might be also railroad infrastructure improvements for the Murmansk railroad track in Russia in the future (Liikennevirasto 2013).

The railroad traffic from Finland to Russia is easier than from Finland to Sweden, due to similarities in gauge standard (Liikennevirasto 2013). There are four main railroad border crossing stations in the border of Finland and Russia. These are Vainikkala, Imatrankoski, Niirala and Vartius. If one thinks of the railroad transports from Northern Finland’s perspective, Niirala and Vartius are the most significant border stations. The train transports from Russia through Niirala go in most cases to areas in Eastern and Northern Finland. The most important border crossing station for Barents Region is the Vartius station. New railroad improvements in Russia will connect the Murmansk region through Vartius to Europe. The railroad traffic between Finland and Russia is dominated by imports from Russia. However, the Russian railroad network enables to export goods from Finland to other countries in the East. Clearly, the current railroad infrastructure in Finland enables a good access to hub positions in Finland, but the connections to Russia are not adequate, especially if one thinks of the access to Northern parts of Russia (e.g. Murmansk Region); only Vartius is the possible border crossing station at the moment. (Karhunen et al. 2004:
When transporting goods from Finland to Russia, one has to always use the Russian transport equipment (Karhunen & Hokkanen 2007: 116). The railroad connection from Vartius to Murmansk suffers from heavy traffic volumes and would benefit from having dual railroad track (Liikennevirasto 2013).

Lapland could have more railroads; mainly due to increasing transport needs of the mining industry. Railroad transports from Finland to Sweden are very low if compared to Russian trade volumes. The biggest problem for Finland-Sweden railroad trade is the differences of railroad gauge standards. However, the use of intermodal transport has increased the railroad transport between Finland and Sweden. All in all, the biggest challenge of future investments for the railroad transportations is the capacity constraints. (Karhunen et al. 2004: 184-185; Liikennevirasto 2013.)

2.6.4 Road transport sector

The road transport sector of Finland faced a big change after the collapse of the Soviet Union. Especially the transit transports from Eastern Europe have increased significantly in the past two decades. (Karhunen et al. 2004: 61-62.) The Finnish road transport sector faces both domestic and international competition and the business income levels are quite low at the moment. This has led to a situation, where many Finnish transport companies are forced to end their business and at the same time the level of foreign transport firms increases. The costs have risen significantly in the road transport industry in recent years, when compared to other transport modes. New standards for using bigger trucks/truckloads could help to reduce both costs and time. (Paavola et al. 2012.) Clearly there is a need for better roads, because of the new mine projects in the Northern Finland (Liikennevirasto 2013).
3 PROJECT LOGISTICS IN THE BARENTS REGION

As discussed earlier, Barents Region possesses a huge amount of natural resources and there is a need for investments in the oil and gas fields. This means that the Finnish companies will have business opportunities in both manufacturing and transporting the orders for the oil- and gas industry customers in the Barents Region. These types of investments often include the transportations of large project cargoes. Finland can offer excellent logistics services in these types of project deliveries. However, there are lots of challenges concerning these types of project deliveries and it would be essential to have profound understanding of those prevailing challenges in these type processes. This chapter focuses on project logistics. First, project deliveries are discussed. Second, follows a discussion of offshore projects in the Barents Region. Third, the barriers and opportunities are presented. Finally, a theoretical model of project delivery process is formed.

3.1 Project deliveries

According to Andersson et al. (2011), the transportation of project cargo is more complex, if compared to standard cargo. Project cargoes pose different kinds of transportation challenges than normal cargo types (e.g bulk and container) and each delivery is different from one another (Fagerholt, Hvattum, Johnsen & Korsvik 2013). Typical project cargoes include windmill parts or massive components for the oil- and gas industries (Norbury 2012). The size and weight of project cargo varies a lot, which means that it is hard to make any generalization for the transportation procedures. Project deliveries tend to have certain time frames for shipping schedules that set their own challenge for the logistics service. Project cargos usually consist of several parts that have different shapes, weights and heights, which cause variation for the stowing for instance. One could easily state that each project delivery is somewhat different, when compared to earlier experiences. (Andersson et al. 2011.)

Clearly, there are lots of challenges that occur, when dealing with specialized freight. For example lifting the cargo could be very complex and therefore a good planning is needed to prevent possible cargo damage. Not only the stowing poses a challenge, but also the selection of best logistics route for the shipment. On one hand, regular
shipments are not comparable to project shipments. On the other hand, there are also similarities in the actual cargo handling that help to plan the transportation. The shipment consists of certain quantity of cargo to be transported within certain timeframe (e.g schedule). Inside each project delivery, there are various sub processes that have to work efficiently and in time, to guarantee that each component is delivered at the right moment. Actually, if one thinks of the stowing in the port, it would be important that everything works accordingly with the shipping plans, because the time the cargo vessel spends in the port should be minimized to avoid extra costs. Before the shipment happens, one has to know, what type of lifting equipment is needed to stow the cargo and most importantly to decide, what kind of cargo vessel would suit best for the given project cargo. The weight and shape of cargo set certain parameters for both stowing and selection of cargo vessel. In some cases the project cargo is coupled (e.g. combined) with other cargos, which obviously changes the schedules and other transportation related procedures. These kinds of cargo couplings are used, because a cargo ship that does not carry a full cargo load would not be wise from financial perspective. However, transporting other cargo has to fit the project delivery schedules in a way that they can be included rationally in the same route. (Andersson et al. 2011; Fagerholt et al. 2013.)

There are some critical stages in project deliveries. The actual handling stage is very complex and one has to ensure that the cargo suffers no damage during the stowing. (Nodar 2006.) To avoid possible stowing problems, there should be special emphasis on planning the stowing process in advance (Fagerholt et al. 2013). The massive weight of project cargo can make problems for the transportation, and project deliveries tend to feature heavy lifts, which set challenges for the transportation (Badger et al. 1993: 194-195; Norbury 2012). When the cargo is stowed to the cargo vessel, one should make sure that the cargo does not move during the transportation. There are many ways for securing the cargo load carefully and often there are multiple methods that are used together. Obviously the given cargo load defines what kind of methods will be used. For example, welding could be used for maximizing the cargo security. There has to be careful stowing plan to keep the vessel in balance during the maritime transportation. (Badger et al. 1993: 194-195; 208-209.) It is also important that there is a special emphasis on the transportation already in the designing phase of the complex products (Inbound Logistics 2011; Fagerholt et al.
2013). Stowing is one of the most difficult phases in the entire transportation process. If one thinks of the stowing of huge project cargoes, clearly the placement options are either on deck or in hold. One has to plan these placements carefully, because deck cargo loads have to be unloaded first, thereby affecting on the logistics route decisions. (Fagerholt et al. 2013.)

When the cargo is delivered to the final port location, there could be challenge of finding enough space for the unloaded cargo. This is why logistics planning should focus on punctual delivery schedules. (Badger et al. 1993: 194-195.) The transportation of large size cargoes is often conducted with the help of freight forwarding professionals. Obviously one of the greatest problems is caused by changing weather conditions and geographical distances. Transports concerning cross-border logistics could face several difficulties that have to be considered already in the planning stage. Safety issues are often present, especially, when transporting in risk areas. Maybe the most significant point is that project cargo delivery stays in schedule. There is also a possibility to divide massive cargo components into smaller shipments and transport the parts in containers. Transporting bigger amounts as a one shipment has significant benefits in reducing the costs and delivery times. From the customer’s point of view it would be important that the logistics processes are included in the order. (Guzman & Norgaard 2000.)

Badger et al. (1993: 195) discuss that maritime transportation suits best for the complex project cargoes. Nevertheless, the longer distances and harsh conditions could pose a challenge for secure cargo transportation. On one hand, rail road transports can be used for these types of large scale cargo transportations. On the other hand, rail transportation suffers from limitations in capacity constraints and cargo dimensions. All of these complexity factors are also evident in road transportations, which are often used for shorter transportations. (Badger et al. 1993: 195.) Sometimes the project cargo could be so large that transporting it with road transports is not even possible (Norbury 2012). Transporting huge project cargoes on the road demands careful advance planning and collaboration with the authorities to ensure fluent transport (Guzman & Norgaard 2000). If road transports are used for large cargo movements, there could be a need for special arrangements and bigger
trucks. Complex road transports are often done in a convoy that consists of freight forwarding professionals. There are varying regulations in different countries that are restricting these types of special cargo road transports. (Karhunen & Hokkanen 2007: 152-153.) The fourth opportunity would be using air transportation for project deliveries. Although using air transportation for project delivery is one possibility, it is not used very often, because there are lots of difficulty factors (e.g. limited cargo space). (Badger et al. 1993: 195.)

The planning of project delivery itself takes lots of time, if compared to normal freight planning (Norbury 2012). There is a trend of transporting bigger and heavier cargoes, which increases the complexity level (Canadian Sailings 2011). This is why; there is a need for cooperation, amongst the project actors, that ensures fluent transportation (Inbound Logistics 2011). When transporting large scale project cargoes, using outsourced logistics operators (e.g. freight forwarders) is almost a necessity for the transportation success (Branch 2009:88-89; Dubin 2010; Saeed 2013).

According to Branch (2009:88-89), it is important that one stays in schedule, and implements the project very carefully, when conducting massive installation projects. Especially every single phase of the project delivery process has to be made in way that it supports the overall requirements of the whole project. There could be a problem, if multiple actors are conducting the transportation process together. This means that potential failures could be caused by lacking collaboration both in the installation and transportation phases of the project. To avoid failures, it would be crucial to have an efficient combination of plans, schedules, cooperation, communication, risk management and professional work force. International project deliveries tend to construct of logistics chains that involve cross-border transportations, which mean that possible problems might evolve also from external forces as well. These types of deliveries are usually transported with several different transport modes, and therefore the entire transportation should be planned carefully, by considering the possibility of failures deriving from several mode variations and actors involved. If one thinks of the actual loading or unloading stage, there is need for planning the cargo movement in advance, thus eliminating the possibility of
unexpected transportation failures and cargo damage. (Branch 2009:88-89; Saeed 2013.)

It is very common to use road transports for small transportation distances at first and to do the main transport with cargo vessel (Saeed 2013). Therefore, it is important to have integration between the different carriers to ensure fluent project delivery. It is crucial that all parties are both committed and cooperative towards the project. Because the projects differ from each other so much, there has to be customized attention towards project implementation, rather than using same procedures for every delivery. Projects last only certain time periods, and the real challenge is to gain trust with all actors in such short time frames. Working in demanding projects, calls also for efficient and regular collaboration between project actors, which is driven by the mutual experiences from earlier projects. There is a need for collaboration that is not limited to internal firm level, but utilizes the communication of all the actors involved in the project. If the project actors have low levels of mutual experiences, it is much harder to build effective project collaboration, which inevitably has direct influence on the fluency of final project delivery. (Martinsuo & Ahola 2010.) It is essential for the project delivery success that the collaboration begins already in the beginning of a project and continues till the end of it. With collaboration, the project outcomes are better, the costs are lower, and there will be time savings and better customer satisfaction. (Heidemann & Gehbauer 2011.)

3.2 Offshore projects in the Barents Region

The importance of offshoring has risen significantly in recent years (Solakivi et al. 2012). Oil- and gas industries demand constant offshore project deliveries. On one hand, the circumstances (e.g. arctic environment) in the Barents Region often set barriers for the offshore projects, creating logistics management much more difficult. (Aas et al. 2009.) On the other hand Finland has good knowhow in offshore industry and maritime logistics (Valtionevoston kanslia 2013). Olsen, Haugland, Karlsen and Husøy (2005) argue that projects in Norwegian oil- and gas industry are often very complex in nature, and therefore collaboration is essential for the project success. In the offshore environment, especially difficult weather sets a barrier for fluent supply (Aas et al. 2009).
It is typical that offshore projects are done with project alliances. Usually there are lots of subcontractors which have to work in coordination to be able to meet the high standards. (Halman & Braks 1999.) Olsen et al. (2005) have found that there are four different elements for offshore projects: “engineering, fabrication, installation and commissioning”. There exist lots of different contracting types for these kinds of offshore projects. Project could be carried in individual contracts (e.g. certain work) between the buyer and supplier or the parties could agree that the whole EPCI process (“engineering, procurement, construction and installation”) is conducted and monitored by the main subcontractor. Project alliances are very efficient because they combine the skill sets of different companies to work as one, in order to create collaborative work effort towards common project goals. (Olsen et al. 2005.) In the best case scenario, the alliance partners share information and collaborate in a way that ensures the high quality for the end customer (Halman & Braks 1999). These kind of offshore alliance projects have huge impact for the Finnish steel workshops, as the demand for traditional workshop products has diminished during the economic crisis. The transports of offshore products are usually done with special project shipments, and because the size of cargo is in most of the cases usually big, maritime transports are most often used for this type of project deliveries. (Liikennevirasto 2013.)

3.3 Barriers of transport logistics in the Barents Region

Based on the literature review, there are several potential barriers that might cause problems, when transporting goods in the Barents Region. These barriers are presented in table 1.
References

Barriers of transport logistics

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<thead>
<tr>
<th>References</th>
<th>Barriers of transport logistics</th>
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<tbody>
<tr>
<td>Gourdin (2001: 100-101); Tongzon (2009); Siuruainen (2010); Regmi &amp; Hanaoka (2012); Lammgård (2012); Lindholm &amp; Behrends (2012); Paavola et al. (2012)</td>
<td>Infrastructure (e.g. Undeveloped infrastructure, decaying infrastructure, lacking infrastructure, bad road conditions)</td>
</tr>
<tr>
<td>Bowersox et al. (2000); Gourdin (2001: 91-95); Nielsen et al. (2003); Mollenkopf et al. (2010); Lindholm &amp; Behrends (2012); Lammgård (2012); Paavola et al. (2012)</td>
<td>Regulation (e.g. Both international and domestic, governmental regulation, bureaucracy, local authorities, legal institutions and political pressure)</td>
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<tr>
<td>Siuruainen (2010); Paavola et al. (2012); Regmi &amp; Hanaoka (2012)</td>
<td>Border crossing issues (e.g. customs, tolls &amp; tariffs)</td>
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<td>Carter &amp; Ferrin (1995); Flint &amp; Mentzer (2000); Gibson et al. (2002); Esper &amp; Williams (2003); Caplice &amp; Sheffi (2003); Skjoett-Larsen et al. (2003); Kelleher et al. (2003); Davidsson et al. (2005); Olsen et al. (2005); Wong, et al. (2009)</td>
<td>Lacking Collaboration (e.g. issues with coordination, information sharing, trust)</td>
</tr>
<tr>
<td>Rondinelli &amp; Berry (2000); Gourdin (2001: 95-96); Nielsen et al. (2003); Mollenkopf et al. (2010); Henttu &amp; Hilinola (2011); Lammgård (2012); Lindholm &amp; Behrends (2012); Vöhringer et al. (2013); Large et al. (2013)</td>
<td>Environmental regulation (e.g. carbon dioxide- and sulphur directive, pollution and waste)</td>
</tr>
<tr>
<td>Bowersox &amp; Calantone (1998); Tongzon (2009); Siuruainen (2010); Paavola et al. (2012)</td>
<td>Distance (e.g. lacking transport connections and geographical location)</td>
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<tr>
<td>Murphy &amp; Farris (1993); Hickey and Cassidy (2004); Dobie (2005); Tavasszy et al. (2012)</td>
<td>Customer demands (e.g. Demands of higher quality &amp; faster delivery with lower costs)</td>
</tr>
<tr>
<td>Aas et al. (2009); Paavola et al. (2012)</td>
<td>Challenges with all-year traffic (e.g. due to weather and arctic conditions)</td>
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Table 1. Barriers of transport logistics in the Barents Region

Clearly, one of the most significant barriers is caused by *infrastructure*. It is almost impossible to do transportation effectively, if infrastructure does not exist. Infrastructure poses a problem especially in undeveloped areas, but also the current infrastructure that is decaying is problematic for the transports. In the Barents Region, there are lots of infrastructure related issues that harness fluent transportation. (Gourdin 2001: 100-101; Tongzon 2009; Siuruainen 2010; Regmi & Hanaoka 2012; Lammgård 2012; Lindholm & Behrends 2012; Paavola et al. 2012.)

Transportation branch faces lots of different *regulation* both from international and domestic levels. Different regulations have added the level of bureaucracy, which obviously has direct impact on the fluency of transportation processes. Regulation is a force that does not necessarily work as a barrier in every transportation process, but it surely has a direct influence on the entire logistics branch by giving certain frame for business. (Bowersox *et al.* 2000; Gourdin 2001: 91; 94-95; Nielsen *et al.* 2003;
Mollenkopf et al. 2010; Lindholm & Behrends 2012; Lammgård 2012; Paavola et al. 2012.)

As discussed earlier, Barents Region trade includes border crossing issues. Especially the problems related to Russian border are challenging for transportations. Clearly different kinds of tolls and tariffs add their own complexity for implementing efficient logistics. (Siuruainen 2010; Paavola et al. 2012; Regmi & Hanaoka 2012.)

Different actors that are involved in different stages of transportation process, have to be able to collaborate together. Collaboration combines coordination, information sharing and trust for achieving greater benefits in logistics process. Therefore lacking collaboration reduces the success levels of transportation. (Carter & Ferrin 1995; Flint & Mentzer 2000; Gibson et al. 2002; Esper & Williams 2003; Caplice & Sheffi 2003; Skjoett-Larsen et al. 2003; Kelleher et al. 2003; Davidsson et al. 2005; Olsen et al. 2005; Wong, et al. 2009.)

One of the greatest challenges for logistics industry is posed by environmental regulation. This type of regulation has huge impact on the transport mode choices, because different kinds of carrier options depend on the cost effectiveness of each mode. For example sulphur directive is going to be a real challenge for the maritime transportation industry in the Baltic Sea area. Transportation causes lots of negative impacts for the surrounding environments that have to be taken care of properly. Obviously environmental regulation is a good thing for the environment, but one has to acknowledge its direct influence on transport modes. (Rondinelli & Berry 2000; Gourdin 2001: 95-96; Nielsen et al. 2003; Mollenkopf et al. 2010; Henttu & Hilmola 2011; Lammgård 2012; Lindholm & Behrends 2012; Vöhringer et al. 2013; Large et al. 2013.)

Distance is one of the key elements in transport logistics. If the Barents Region is thought from geographical point of view, one understands that the distances are long and due to lacking transport connections the time needed for transportation is very long. This is why the distance acts as a barrier for transportation logistics. (Bowersox & Calantone 1998; Tongzon 2009; Siuruainen 2010; Paavola et al. 2012.)
Logistics branch faces high customer expectations. Customers demand high quality services with low cost and usually tight schedule constraints. *Customer demands* are actually a universal theme that has effect on global scale is not only in the Barents Region. As a matter of fact customer demands are not directly barriers, but they act as a challenge, when transporting goods. (Murphy & Farris 1993; Hickey and Cassidy 2004; Dobie 2005; Tavasszy *et al.* 2012.)

As the Barents Region is located in the northern arctic areas, there are *challenges with all-year traffic*. On one hand, these challenges harness the transportation logistics fluency especially in winter times. For example, ice breaking services are needed in the Finnish ports to keep the cargo ships moving in winter. On the other hand, the people in the Northern areas have good knowledge of dealing with hard arctic conditions. (Aas *et al.* 2009; Paavola *et al.* 2012.)

### 3.4 Opportunities for Barents Region transports

The opportunities for Barents transports consist of alternatives in air-, maritime-, rail- and road transports. Table 2 summarizes both pros and cons of alternative transport modes by combining them with the Northern Finland perspective and the project delivery transportation context. The findings presented in table 2 are based upon literature reviews in chapters 2 and 3.
<table>
<thead>
<tr>
<th></th>
<th>Air</th>
<th>Maritime</th>
<th>Railroad</th>
<th>Road</th>
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<tbody>
<tr>
<td>Cons</td>
<td>-Expensive</td>
<td>-Slow delivery</td>
<td>-Lacking competition</td>
<td>-Small cargo amounts</td>
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<tr>
<td></td>
<td>-Limited cargo space</td>
<td>-Port infrastructure?</td>
<td>-Rail gauge variations</td>
<td>-Congestion</td>
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<tr>
<td>Pros</td>
<td>+Fast delivery</td>
<td>+All cargo types</td>
<td>+High amounts</td>
<td>+Door to door</td>
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<td></td>
<td>+Long distances</td>
<td>+Lots of cargo space</td>
<td>+Quite cheap</td>
<td>+Flexibility</td>
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<td></td>
<td>+Free competition</td>
<td>+Cost-efficient</td>
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<tr>
<td>Northern Finland</td>
<td>-Few flights</td>
<td>+Good ports in the Bothnian Bay</td>
<td>+Similar rail gauge with Russia</td>
<td>+Logistics expertise of Finnish road transport companies</td>
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<td></td>
<td>-Absence of Barents connection</td>
<td>+ Finnish ports are connected to railroads</td>
<td>-Need for railroad improvements</td>
<td>-Decaying road infrastructure</td>
</tr>
<tr>
<td></td>
<td>-Based on tourist flights not business needs</td>
<td>+ Sulphur emission</td>
<td>-Rail gauge variation with Sweden</td>
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<td></td>
<td></td>
<td>+Shipping lane depths</td>
<td>-Capacity constraints</td>
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<td></td>
<td></td>
<td>-Harsh ice conditions</td>
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<tr>
<td>Project Delivery</td>
<td>+Spare parts</td>
<td>+Best option for massive project cargoes and long distances</td>
<td>+ Good option for longer project cargo transportation</td>
<td>+Used often for short distances</td>
</tr>
<tr>
<td></td>
<td>-Limited cargo space</td>
<td>+Cargo space</td>
<td>-Capacity constraints</td>
<td>-Special arrangements for big cargo loads</td>
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<td></td>
<td>-Expensive</td>
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<td></td>
<td>-Chartering spot cargo flight</td>
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Table 2. Comparison of transport logistics opportunities in the Barents Region
The *Air Transportation* is not very useful for transportations in the Barents Region, simply because flight connections between the most important cities are almost completely lacking. The nature of project cargo itself and the high costs of air transport make constraints for the transport mode choice. On one hand, air transports could be used for smaller and quicker deliveries, like spare parts. On the other hand, the current level of flight connections would call for using chartered flights, which obviously raises the costs for such transports. If the costs are not an issue, air transport provides fast delivery for long distances. One has to knowledge that since the traffic demand is so low in these northern areas, it would not be cost efficient to provide better flight connections, although business life would certainly benefit from having those connections. (Badger *et al.* 1993: 62; 195; Gourdin 2001: 90; 98–100; Davidsson *et al.* 2005; Liikenne- ja viestintäministeriö 2009; Siuruainen 2010; Paavola *et al.* 2012; Liikennevirasto 2013.)

*Maritime Transport* offers good opportunity for transporting different kinds of cargo types in the Barents Region. There are several ports in Northern Finland that can be used for project delivery needs. The ports are connected to railroad- and road networks, providing a good opportunity for intermodal transportations. All in all, maritime transport holds various pros, if compared to other transport modes. One has to acknowledge that as Finland’s distance to market areas is quite large, the ship transportation might not be the fastest delivery mode. Challenges with winter conditions can make other transport modes a better option. Clearly new sulphur emission regulations might add the costs for maritime transports especially in Finland, making the other modes a better choice. (Badger *et al.* 1993: 89; 195; Gourdin 2001: 90-91; 98; 120; Davidsson *et al.* 2005; Hummels *et al.* 2009; Henttu & Hilmola 2011; Paavola *et al.* 2012; Liikennevirasto 2013; Utriainen 2013.)

*Railroad Transports* from Northern Finland to other Barents Region areas are limited due to lacking connections in the north. At the moment the main options to Barents Region connection are Vartius (to Russia) or Haaparanta (to Sweden). The connection to Russia benefits from having the similar railroad gauge with Finland. However, railroad transports to Russia must be conducted with Russian railroad equipment and the railroad to Murmansk suffers from heavy traffic levels. The connection to Sweden suffers from having different railroad gauge, but this fact does
not make railroad transports from Finland to Sweden impossible, it just harnesses the fluency of those transports. There has been a discussion of building new railroads in Northern areas that could provide a better connectivity from Northern Finland to the Arctic Sea. To summarize, railroad transports provide good cargo space for project deliveries and the cost effectiveness makes them a real alternative for transporting project cargoes from Finland to the Barents Region. However, there are capacity constraints that limit the possibility of carrying the heaviest cargoes. (Badger et al. 1993: 63–65, 195; Karhunen et al. 2004: 184–185; Davidsson et al. 2005; Karhunen & Hokkanen 2007: 116; Paavola et al. 2012; Liikennevirasto 2013.)

Road transport is used very often in project deliveries. The pros of road transport are its flexibility and door-to-door service availability. However, standard trucks can carry only limited cargo amounts. Thus the massive project cargo loads have to be transported with special transports that demand lots of different arrangements in advance. Furthermore, transporting project cargoes on the road might not be the most fluent option, especially when the distances are long. Nevertheless, road transport is very useful as a supplementary transport mode in some part of the transportation process. Lacking levels of road infrastructure might limit the possibility of using road transport for project deliveries. On the contrary, the road transport companies in Northern Finland can provide good services and knowhow for demanding project deliveries. (Badger et al. 1993: 65-66; 195; Guzman & Norgaard 2000; Gourdin 2001: 87; 96-97; Karhunen et al. 2004: 63; Davidsson et al. 2005; Karhunen & Hokkanen 2007: 152-153; Siuruainen 2010, Norbury 2012; Paavola et al. 2012; Liikennevirasto 2013; Saeed 2013.)

3.5 Project delivery process model

Figure 5 displays a model for the project delivery process in the Barents Region. This model combines project delivery with the transport logistics barriers (see. table 1) and opportunities (see. table 2). This model works as a framework for the research.
The barriers cause challenges for the transport logistics both in universal level and especially in the Barents Region. The Barents Region related barriers include: *infrastructure, border crossing issues, distance, environmental regulation and challenges with all year traffic*. Furthermore there are barriers that are very universal challenges in transport logistics, these are: *Regulation, Lacking Collaboration and Customer demands*. Some of these mentioned barriers are more critical for the transportation than the others, whereas some of these just cause a minor challenge rather than barrier the process. To understand the meaning of these barriers in the project delivery context, the model combines also the opportunities feature as an opposite force. The opportunities consist of possible transport mode alternatives and embed specific features for the project deliveries in the Barents Region. Both of
these two forces, the Barriers and the Opportunities, set their own limitation for the project delivery process. Although, there might be some overlapping in themes, figure 5 provides insights into project delivery process in the Barents Region.

The framework displays the different phases of project delivery process. First, there has to be an emphasis on transportation already in the manufacturing phases of given project cargo. In general, this means close collaboration of different actors in the project, both in internal company level and also between different companies. Second, the cargo varies a lot in shape, size, weight and height, which means that each cargo is somewhat unique. Third, there has to be a careful planning of transport mode choice. Traditionally project delivery combines different transport modes. Especially maritime transport suits well for delivering complex cargo loads due to large cargo space and the ability to travel long distances. Railroads are also an option for these types of transportation processes and one uses often road transportation for shorter deliveries. Road transportation has to be planned carefully, and for the big cargo loads there has to special arrangements and collaboration with local authorities. Fourth, the cargo has to be loaded or stowed into carrier. This phase includes cargo handling, securing cargo and heavy lifts. This phase is very critical, because massive cargo loads are far more complex to lift and handle, if compared to traditional cargo loads like containers. Project cargoes are often coupled with other cargoes, which cast its own challenge for fluent transportation and scheduling. Fifth, when the cargo is being transported, problems could occur with current weather conditions, and if there is any level of cargo movement, the cargo could be damaged during the transportation. Routing the transportation plays a key role for both costs and time dimensions. Sixth, when the project delivery reaches its destination, the cargo has to be unloaded, which includes similar challenges as the loading phase. After unloading, follows the final installation part. During all of these mentioned phases, there has to be a special focus on Logistics Efficiency, Schedule, Collaboration, Planning, Costs and Special Arrangements. Although the different phases are presented in linear order, the actual process involves constant cohesion between layers, and the project deliveries are rarely similar.
4 METHODOLOGY

This chapter introduces the research methodology. The chapter justifies the use of qualitative research and describes the data collection and the analyzing methods.

4.1 Qualitative research

This research has been done with qualitative research methods. Qualitative research suits especially well for this given research, because the aim of this research is to describe the different phases of project delivery process. However, a high level qualitative research is not just describing things, as it seeks to rise above it (Koskinen, et al. 2005: 32). In order to highlight the transport logistics barriers and opportunities, there has to empirical data that encompasses valuable and rich information of real life project deliveries. Therefore qualitative research method suits perfectly for this research. The qualitative research is especially useful for research that includes data collection of real life cases like the project delivery examples in this research. From the data collection point of view, it would be important that the researcher does not have too strong personal impact on the data, when conducting the interview, as he/she should solely work as a data gatherer. (Koskinen et al. 2005: 32; 263-267.) This research features 8 interviews that were conducted by using semi-structured interviews and more specifically with focused interviews (Metsämuuronen 2008: 18; 41).

Before the actual gathering of empirical data is usually feasible, the researcher gathers a literature review that works as a basis for the research. The literature review shows that the researcher has established an understanding of the research phenomenon. Good literature review reveals potential research gaps in academic research, thus offering a direction for the current research. (Hirsjärvi & Hurme 2010: 13.) This research includes detailed literature review that combines academic findings of transport logistics and project deliveries. The key thing for academic research is to try to build an interaction between the theory and the current research, when creating new knowledge of the research phenomenon (Koskinen et al. 2005: 38).
4.2 Case study method

The qualitative case study method is used in this research. The research features two detailed real life transportation examples. Case studies are used very widely in qualitative research. In case study method the researcher can choose some specific company that is studied or the case can focus on some particular event. For example in this research, the case examples are used for presenting the project delivery processes. The key benefit of case study research method is its ability to describe the real life phenomenon more detailed, if compared methods that rely solely on academic theories. (Koskinen et al. 2005: 154-157.) The reason for having two cases is to provide better understanding of the real life project logistics. However, the empirical research does not consist solely of case study method, as the two cases are used only for introducing project delivery examples.

4.3 Data collection

The data of this research is collected with interviews and observation. The empirical data consisted mainly of interviews. Some level of observation was included, as the researcher had actual work experience in maritime logistics. This research includes 8 focused interviews. Each of these interviews was made in face-to-face meetings during November 2013 and January 2014. The total duration of these interviews was 8 h 35 min. The data was collected by using voice recorder, and the interview material was littered afterwards. The interview language was Finnish and the interview material was also littered in Finnish. The quotes that are presented in chapter 5 were translated from Finnish to English very carefully, in order to ensure that the original message of the interviewee stays the same. The specific details of interviews are presented in table 3.
<table>
<thead>
<tr>
<th>Interview</th>
<th>Company</th>
<th>Title</th>
<th>Date</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Port of Raahe</td>
<td>Port Director</td>
<td>7.11.2013</td>
<td>1h 3min.</td>
</tr>
<tr>
<td>2.</td>
<td>RKT Group, Raahe</td>
<td>Logistics Manager</td>
<td>8.11.2013</td>
<td>1h 3min.</td>
</tr>
<tr>
<td>3.</td>
<td>RKT Group, Raahe</td>
<td>Business Manager</td>
<td>8.11.2013</td>
<td>20 min</td>
</tr>
<tr>
<td>5.</td>
<td>Oy SteelDone Group Ltd., Oulu</td>
<td>Project Coordinator</td>
<td>12.12.2013</td>
<td>1h 1min.</td>
</tr>
<tr>
<td>8.</td>
<td>Havator Oy, Oulu</td>
<td>Logistics Manager</td>
<td>21.1.2014</td>
<td>1h 16min.</td>
</tr>
</tbody>
</table>

**Table 3. Interview details**

The interviews of this research are conducted with focused interview technique. When using this kind of technique, the researcher specifies the questions to certain themes. Instead of following some strict order, the focused interview is built upon thematic sections. Thus the interviewees own thoughts are connected better in interaction to various themes. As a matter of fact, focused interview is one form of semi-structured interview, but it is definitely closer to unstructured method than to structured method. The interview questions might be different for the interviewees, but the themes are the same. All in all, focused interview is very flexible method. One of the greatest benefits of focused interview is the rich data it can provide. (Hirsjärvi & Hurme 2010: 47-48; 135.)

At first, a couple of interviewees were selected carefully, in order to ensure relevant and rich data. The quantity of interviews was not decided strictly in advance. As a matter of fact, the first interviewed company personnel gave good contacts for possible future interviewees and this way the process continued from one interview to another, until the saturation point was reached. By using this type of structure for
the interviews, it was easier to decide how many interviews are needed and when to stop doing further interviews. (Hirsjärvi & Hurme 2010: 59-60.)

Planning plays a key role in focused interviews. The researcher has to think carefully of the most relevant themes that are going to be discussed with the interviewee. Even though focused interview is very flexible, it is beneficial to have some kind of framework to follow, in order to gain more significant data. The selected themes present fields that are driven from literature review. Clearly, the researcher has to specify these themes with questions, but these questions are not strict in nature. By this type of flexible structure, the interviewee can reveal new valuable information of the related themes. (Hirsjärvi & Hurme 2010: 65-67.)

Interviews are good method of gaining profound knowledge of the research phenomenon, because they are very useful in various research settings. By doing the interview, the researcher is able to gain valuable information of interviewees own perceptions concerning the research theme. Interview is especially useful in a situation, where people share their own ideas and react with each other in close interaction. Research interview always includes some specific focus and meaning. However, there are also some problems related to these types of interviews, because the researcher might find it hard to profoundly understand the gathered information and to be able to create relevant scientific findings by analyzing the huge amount of data. (Hirsjärvi & Hurme 2010: 11-12; 135-136.)

This data collection includes also some level of observation. The observation was used especially for the case 2, as the researcher was actually involved in the project delivery as a worker. Observation was also done in visits to port of Raahe and port of Oulu in November 2013. The observation did not include any specific documentation, but the researcher used his own knowledge of project deliveries, when doing the analysis. In qualitative research the researcher observes the research phenomenon in different types of surroundings (Koskinen et al. 2005:77). However, by the time the researcher was involved as active participant in the project delivery, the researcher was not doing the research, thus the earlier observation was not done on purpose for this research.
4.4 Analyzing the data

The analysis of interviews begins often already at the interview stage, as the researcher makes perceptions of the research phenomenon. Very often the researcher uses the inductive method in qualitative research. In inductive method the data has very significant role. The other possibility is to use abductive method, which highlights theoretical presumptions that are being evaluated with the interview data. This research was done by using the abductive approach. In the analysis the researcher classifies the data. After the analysis, the researcher makes his/her own synthesis by providing new perspectives to the given research phenomenon. Good synthesis demands profound understanding of the gathered data, in order to create new perceptions of the whole phenomenon by providing new theories. (Koskinen et al. 2005: 31-32; Hirsjärvi & Hurme 2010: 136; 143-144.) The collection of research data and the analysis takes usually place simultaneously. However, the gathered data has to be collected into some kind of form, before the profound analysis can be started. This collection of data can be done with littering the data into written form. (Metsämuuronen 2008: 47-48.) In this research the interviews were first littered and after that the material was analyzed.

The classification of data was not done separately, as the interview questions were already made into clear classes that helped the researcher to classify the data without doing some additional classification for empirical data. These classes consisted of general information, transport logistics in Northern Finland, transport modes, transport logistics barriers, transport logistics opportunities, transportation cases, Barents transports and project deliveries. In this research the theories derived from academic literature were combined with the data gathered from the interviews. For example hypothetic barriers and opportunities, presented in chapter 3, were evaluated with the interview data. The project delivery process model (see figure 5.) was analyzed, in order to clarify the different phases of project deliveries. By applying these principles, the researcher was able to make his own synthesis of the research phenomenon.
5 PROJECT DELIVERIES IN THE BARENTS REGION

This chapter presents the empirical analysis and discussion of the research. Further understanding of project deliveries based upon real life case examples is provided and analyzed within this chapter. The analysis follows the structure of the theoretical framework that was pictured in figure 5. Barriers and opportunities are not examined in separate chapter, because they are so strongly connected to this project delivery process model and therefore present all the way during this whole chapter 5. However, a more specific focus on transport logistics barriers and opportunities is provided in chapter 5.3 that discusses the country related differences. Finally the chapter 5.4 summarizes the findings of the analysis and provides a revised project delivery process model.

5.1 Case examples

This research presents two real life project deliveries. Case 1. features the project delivery of Offshore Crane. Case 2. is built upon the project delivery of 7 windmills. These cases are done through port of Raahe and both include maritime- and road transportation. All in all, this research gives good insights into project deliveries in the Barents Region, as the research focuses on transport opportunities (air transport, maritime transport, railroad transport and road transport) and possible transport barriers, when delivering goods in the Barents Region. Although viewing every transport mode as realistic opportunity, this research highlights the role of maritime logistics and road transportation for project deliveries, especially from the port of Raahe’s perspective. The special focus on port of Raahe was chosen for this research, because the case examples that worked as a starting point for this research take place in port of Raahe. And as the port is located in the Barents Region, it was natural to examine project deliveries in this particular port. The port of Raahe has specialized in project deliveries, which established a great opportunity for researching real project deliveries.
5.1.1 Port of Raahe

Located in the Northern Ostrobothnia, on the coastal line of Bothnian Sea, Port of Raahe provides a good connection for transporting cargo to multiple destinations in Europe and all over the world. About 600 freight ships visit the port of Raahe regularly within a year. The port is located in the close proximity of big steel factory and therefore the transportation flows are mainly dominated by imports for steel production and the exports of final steel products. The port specializes also in transporting sawn goods and containers. Also project deliveries are transported through port of Raahe, usually consisting of massive steel products or windmills. However, one has to acknowledge that project deliveries don’t take place on regular basis, as only small portion of the yearly cargo volumes are project delivery related goods. If thinking about the delivery process of complex cargo load, the port has to have good accessibility and connection by road and railroad. Port of Raahe has these both. Considering the big cargo loads, port of Raahe provides excellent expertise of handling these types of cargo loads. The service is fluent and there is a possibility of storing the cargo in dry and warm warehouses.

The interviews brought up that there are currently new planned projects that could increase the amount of project deliveries in the port of Raahe. Especially the possible construction of Hanhikivi I in Pyhäjoki is one of the projects that would create a need for massive transportation flows, and port of Raahe is seen as one of the potential import ports for this construction project. Furthermore, Mustavaaran Kaivos Oy has planned to build a smelting plant to the port area in the near future. Both of these projects would also increase the daily traffic, thus creating a need road infrastructure development (e.g E8 highway). The railroad (Raahe-Tuomioja) that is connected to the port suffers from weight restriction capacity and would benefit from improvements to meet the similar standards as the main track. However, the railroad transports does not play a very important role for project delivery cases, because the railroad is mainly used for transporting the iron ores to the steel factory.

As well as other ports in the Bothnian Bay, also the port of Raahe has to deal with hard winter conditions. However, the current ice-breaking capacity works excellent, giving the cargo ships a fluent passage in and out of the port. Moreover, the
condensation water from the steel factory helps to prevent the wharf from freezing. If planning a delivery of project cargoes in winter time, there are no barriers blocking such endeavors, however the freight ships must have certain ice classification.

“Winter 2010-2011...One cargo ship was transporting a cargo to the port X and it was delayed...After the unloading, the ship headed to other port, but there was a massive ice block in the Kvarken and the icebreaker had to escort every ship one by one through that block. It became problematic for everyone....The ice conditions are especially hard, when the wind blows from southwest and the ice gets packed to the Kemi direction.” (Int. 1)

One of the greatest challenges for the port of Raahe will inevitably be the emergence of sulphur regulation directive. Due to this regulation, the ports of Bothnian Bay have planned to establish a LNG terminal in Tornio, in order to meet the future requirements. All in all, this directive might have dramatic effects on the whole maritime logistics business in Finland. On one hand, sulphur emission regulation is good thing in environment sense. On the other hand, it casts a shadow upon the maritime logistics branch as the cargo costs will grow higher.

“I think that this sulphur directive will have huge impact on the transportation systems and branch both in the Baltic Sea and Bothnian Sea areas. And what will happen to the paper and metal industry. These are horrible models if one looks 5-10 years ahead to the future” (Int. 1)

5.1.2 Case 1. Offshore Crane (Oy SteelDone Group Ltd.)

The Offshore Crane is a special handling system for subsea modules that will be used in the gas field in the Norwegian Sea. The project started in summer 2013 and the crane will be shipped in summer 2014. The crane will be transported to Denmark, where it is installed to a supply vessel that operates in Åsgard gasfield in Norway. The Offshore Crane weighs 700 tons and has total length of over 30 meters. The manufacturing has been conducted by 4 steel workshops and one engineering office.
The Offshore Crane transportation takes place after this master’s thesis has been published, which means that the information provided might not be as accurate as possible, as there tends to be changes in these types of projects. However, this case gives insights into actual project delivery process.

The offshore case offers a good opportunity for viewing the whole logistic chain from local workshop construction work-level to maritime logistics. For example, this particular offshore project is very important for the steel workshops, because it could open new business opportunities for the future. Given the fact the Norwegian end customer is the biggest oil company in the Nordic Countries, being successful in this project could give an access to big markets and help to establish a key role as a reliable supplier, when thinking about the future of these SME’s. When considering all these facts, the offshore project is remarkable for these workshops, especially in this current economic situation.

The transportation of the crane is a demanding project delivery. The delivery consists of two separate transportations. The first transportation took place in November 2013 as one steel construct, where the actual crane will be installed in the supply vessel, was transported to Denmark. Like in every project delivery in general, the goal is to transport the crane as big as possible, this means that single cargo pieces can have significant size and weight, which obviously causes challenges related to stowing and handling the crane. The biggest single construct in the crane weighs 400 tons. The crane consists of multiple parts and these parts are first transported with trucks to port of Raahe, where the parts are being assembled into bigger units, before they are stowed into cargo ship. This means that there are multiple special transportations between the port and the steel workshops.

As mentioned earlier, it would be important to take logistics issues into consideration already, when the order is being manufactured. This offshore crane project has made no exception, as the logistics was considered as an important part already in the workshop level. One of the key things in logistics focus is the cooperation and information flow between the manufacturing parties (workshops), freight forwarder and with the customer side. The customers have been active in monitoring the whole project, as the quality is very essential in this particular case. In fact, the quality
expectations are always very high in offshore business, which set certain parameters for quality management of the project.

“The customer has high quality expectations...They have raised the quality of each workshop to whole new level. Beginning from work safety and those kinds of issues, I find it spectacular. But the most significant thing is that people have been able accept these high requirements so well. There have not been any problems.” (Int. 6)

The customer is also responsible for the engineering of the offshore crane, which means that they have strong role also in logistics planning that relates to manufacturing.

“The customer does the planning, provides the engineering documents, thereby giving input to transport positions, lift points and such things that have impact on the transportation.” (Int. 5)

Like in almost every big project delivery, there is a freight forwarder, who handles the actual transportation arrangements. These freight forwarders are experts of dealing with project logistics, thereby providing the needed expertise for this type of cross-border transportations. The freight forwarder is responsible for arranging the cargo ship, routing, and other arrangements that are needed in the maritime transportation.

One of the key things in project logistics is the schedule. One has to make sure that the schedule is met both in manufacturing and transportation. This particular offshore project has been quite challenging from the beginning, because there have been tight schedule constraints. Although SteelDone Group has had lots of earlier deliveries to offshore markets, this particular crane project is maybe the most diversified project. However, this is not their biggest delivery.

The stowing process will include the heavy cargo handling and therefore a well detailed planning is going to be needed to avoid failures. Because the biggest structures are so heavy, there will be no heavy lifting. The crane will be shipped by
pushing the cargo into the cargo ship that is on the lower dock position. Although steel structures are not as fragile as some other cargoes, there will be no space for any harsh handling, because this type of cargo cannot sustain any hits that would cause cargo damage or scratches to painted surfaces. As mentioned earlier, the trend in project logistics is to ship bigger and heavier cargo loads, and this type of approach is also evident in this case.

“The tower of the crane...is the 400 tons structure and then there is another structure that goes inside the tower which weighs 100 tons, 2 big winches both about 80 tons, and then there are smaller structures and some goods packed in containers.” (Int. 5)

5.1.3 Case 2. Transportation of 7 windmills (Wasa Logistics Ltd.)

In the summer 2013, a windmill project delivery took place in port of Raahe. The 7 windmills were transported with maritime transports from Denmark to port of Raahe. Although Denmark does not belong to Barents Region, this case was chosen, because it provides valuable information of project deliveries. In addition, the port of Raahe is located in the Barents Region, thus the case is relevant from the research phenomenon perspective.

The transportation was done in several lots and the total amount of cargo tons was around 6000 tons. The transportation part of the project was completed approximately in 3 months. The first transports were done with full-chartering, which means that there were no other goods in the cargo hold. The last shipments arrived separately with other cargo vessels in deck-cargo.

When the windmills arrived to the port of Raahe, the cargo was unloaded using 2 cranes. Especially the biggest single parts, the windmill blades that were 55 meters long and weighed 13, 5 tons, posed a challenging lift process. The cranes had to lift simultaneously the blade and move it to the truck that was waiting in the dock. The windmill parts are very fragile as there are glass fiber materials. Therefore the cargo had to be moved very carefully, because the windmills parts cannot sustain any harsh
contact. For example, windy conditions can make the transportation process a bit harder as the parts might start to swing in the air while lifted.

The transportation to the construction site was done with trucks, involving also the special cargo trucks as the blades were so long. The road transportation was done predominantly right away, as the cargo was unloaded from the freighters. However, some blades and modules had to be stored to the port area for some time being, as the site was not able to take the cargo in such short time frame. This triggered a need for available storage space in the port area. Fortunately the storage time was quite short and there was enough space to store the cargo. In some other case this type of delay could have been a bit more problematic, if the port had not been able to store the items. Therefore it is important to take this type of things into consideration, when planning the port choice for the transportation project.

Port of Raahe had enough crane capacity to operate with the windmill parts, as they did not weigh that much. And as stated earlier, the port has had earlier experiences of demanding project deliveries, which meant that the personnel were experienced with handling these types of cargo loads. The maritime transportation went well and the journey from Denmark from Finland was relatively easy to complete in summer time.

“The windmills are so big cargo loads that one does not usually get permissions for cross-border road transports. So basically one uses always the maritime transport that is combined with the road transport at the ports.” (Int. 7)

The windmill project site was located quite close and the road transportation took around one and a half hour. However, there were challenging parts on the road that caused fluency problems. For example, narrow roads were a bit challenging. All in all, the transportation was quite fluent as the route was planned in way to avoid the trickiest parts. There were two railroad crossings and a couple of difficult traffic circles, but there was no need for portal removals, which made the process quite effective.
“The road transportation went well. The cargo stayed on the road and nothing was broken. Actually there was not a single delay on the road part. Of course the transportation of a windmill blade was the most challenging one. The first transportations were good rehearsals with the cross roads.” (Int. 7)

The project stayed in schedule and no major problems occurred. The planning part was done carefully, which avoided the potential failures. However, like in any project, there are things that one cannot be foreseen. There were some minor delays and the truck capacity was a bit difficult to combine with the actual need as the site as the schedule fluctuated. However, the freight forwarding company took good care of all the arrangements in detailed fashion and the end customer was really satisfied with the project delivery.

5.2 Project delivery process

Project delivery is a unique process that combines multiple phases, actors and activities. Although one can separate clear distinctive work phases, in reality the project delivery process pictured in figure 5. is not linear, because there are some overlapping phases and variation amongst each step. If comparing the model derived from theoretical findings (see figure 5) with real life project deliveries, there are some levels of varying issues. Next, each step of figure 5. is analyzed with the findings of interview material.

5.2.1 Transportation focus in design and planning

Most of the companies highlighted the importance of involving logistics focus already, when the product is being manufactured in the work shop. However, there was some level of uncertainty concerning the planning, because the product has some function and one cannot really make any major changes to product details to make the transportation easier. Therefore the transportation focus in project delivery cases often involves only some level of cooperation and information sharing among logistics personnel and the engineers. It is understandable that, when the cargo is large-scale steel structure, the transportation focus limits to deciding the points,
where the cargo can be lifted and to planning of how to attach the cargo in to carrier. One of the most crucial decisions in logistics sense is the position, in which the cargo will be transported. The product can be cut into separate modules in the workshop to make the transportation easier.

“Well, it is cooperation. It (the logistics planning) usually begins, when we get the information that something like that is going to be transported and then we discuss about them...we go through these things already in the early stages of each project. In earlier deliveries the plans concerning the lift points and attachment points were made, when the project was already running (not at the beginning).” (Int. 2)

“We have had meetings already at the early manufacturing stages... The customers are aware of these things and they have the needed know-how of the regulations and measures. They know how to manufacture the product in way that the transportation is cheaper and more efficient.” (Int. 8)

Because it is easier to assemble the product already in the work shop, the companies are trying to reduce the amount of work in the site to minimum. Therefore the transportation involves bigger sized cargoes. When the product can be finalized already in the work shop, the costs are lower and the quality of product is better, but at the same time the transportation becomes more complex. All in all, the bigger the cargoes, one can deliver to the final destination, the more cost efficient is the project delivery process. Clearly, paying attention to logistics issues already in the early stages of project saves money. More importantly, logistics decisions made in the planning phase, can prevent the transportation problems later on.

One interesting finding was that there is a clear variation in logistics focus, if comparing different industries. For example, windmill producers have very profound transportation focus in their production; one could probably say that they are the number ones, when considering transportation related manufacturing planning. On one hand, there was no clear variation among smaller SME’s and larger companies in logistics focus. On the other hand, the smaller firms might be even more interested of
the delivery process, as logistics focus is found a key thing in creating value for the customer and thus for sustaining the key customer relationships. Clearly, the logistics focus in project deliveries is a little different thing than for the more standard type of products. In project delivery cases the logistics focus involves basically decisions related to lifting and attaching the cargo. The ideal thing would be that products are planned to ensure fluent transportation, but this type of approach is more a dream than reality; in most of the cases the product comes first and after that the transportation.

"The windmill manufacturers might be the best ones, if one thinks of the transportation focus of different industries. It is caused by the fact that the windmill components are so big. The windmill blades can have the length of over 60 meters and the weight of 120 tons nowadays. They have to have so strong logistics focus, because the windmill parks are often situated in places that do not have road connections and everything has to be built from scratch. They have to think carefully about the height, width, length and weight measures...and they have to be able to create competitive advantage, if compared to their competitors. Some manufacturers are more successful in this sense, but there is no clear way to say what would be the best alternative, as there are different type of solutions (for logistics focus). (Int. 7)

The benefits of logistics focus in manufacturing relate to costs and efficiency. It is important to understand that these types of decisions can create value, if the planning helps to make the transportation more efficient. The cooperation between the manufacturing party, freight forwarder and customer side enables to detect potential problem sources and by reacting to those, the transportation becomes more cost-efficient and the difficulties faced in the transportation day can be prevented early on. Many times the transportation itself costs more than the product that is being transported. This means that the transportation plays very big role in total cost structure of each transaction. Usually the seller cannot make the product too cheap, which means that the efficient transportation planning can both save costs and add the logistics efficiency. Thus focusing in logistics can create the needed competitiveness for getting this type of project.
Sometimes things that might seem small issues in the production phase might become very big, when the transportation takes place. There are things that are hard to predict and even the experienced logistics professionals might face unexpected surprises during project deliveries. To prevent these kinds of problems, one needs careful planning in advance. As a matter of fact, one element rises above all others; work safety. By securing safety both for the people and the cargo, one can avoid lots of problems related to costs, schedules and such things. When planning a transportation process, the key thing is to understand what is going to be done, where it is going to be done and when it is going to be done. By establishing a profound understanding of these 3 points, the transportation process is easier to accomplish.

5.2.2 Project cargo

Project deliveries often occupy cargo loads that have heavy weight, large size, and usually each cargo differs from one another, thus presenting challenging unique aspects. Although one can learn from earlier experiences with such cargo loads, the planning of project delivery is key thing for making the transportation process successful. In fact, the weight is not biggest the challenge, because very often big size poses the biggest problems for transportation. Nevertheless, even the smallest cargo loads can be problematic, if they are extremely heavy. In cases 1 and 2 the project deliveries consisted of massive cargo loads, posing a challenge for handling.

5.2.3 Transport mode choice

The transport mode choice of project delivery plays a key role in transportation planning. One has to able to pick a transport mode that suits best for the given project delivery. This means that the criteria for each transportation mode choice are very case sensitive including time, cost and efficiency measures. The usefulness of different transport modes varies depending on the country where the transportation is taken place.

"Costs, delivery time...and reliability are the most important measures (in transport mode choice)." (Int. 8)
Based upon the opportunities table, presented in chapter 3.4 (see Table 2.), the transportation alternatives are often limited to maritime transport, railroad transport and road transport. The conducted interviews revealed that railroad transportation is not used very often, when doing project deliveries. One of the most significant finding was that the road transportation is equally important as the maritime transportation, when doing project deliveries. Many times road transport is the best solution due to its flexibility and cost-efficiency. One has to remember that maritime transportation and railroad transportation have to be combined usually with road transport, but road transportation gives direct access to the customer. For instance in case examples 1 and 2, the companies combined road transports and maritime transports. The cases were actually quite similar in project delivery sense, as both included big cargo loads, special truck transports and cargo vessels.

When asked about air transportation possibility, it became clear that the interviewees had very limited experiences of air freight in project deliveries. However, air transportation can be used for spare part transportations and sometimes even for bigger cargoes, if the delivery schedule is very tight and the high costs are not an issue. If one considers the human aspect of project deliveries, it would be good for the business, if more flight connections would be available in the Barents Region. All in all, air transportation is selected very rarely for project deliveries in the Barents Region; basically it is usually the last option.

Like mentioned earlier, maritime transportation offers lots of pros, when the project cargo is big and heavy. Maritime transports are usually very fluent and work quite efficiently all over the world. However, maritime transports can suffer from delays caused by hard ice conditions in the winter times. The interviewed company personnel mentioned that ice-breaking service is working very well at the moment, but sometimes the ice causes delays that have immediate impacts for every port in the Bothnian Bay. The pros of maritime transport are basically driven by its large cargo space. Unlike mentioned in the literature review, maritime transportation is actually quite fast, especially when the ship travels in the Baltic Sea. The usefulness of maritime transportation might be harnessed by the higher freight costs in the future, mainly because of the emerging sulphur regulation directive.
“If one calculates the percentages (of transport modes), the road transport is the most significant one, because of its flexibility. But when the geographical challenges pop out, we have used, and we will use the maritime transports, because they are essential in certain scenarios” (Int. 8)

“When using the maritime transport, the border crossing is clearly easier than in other transport modes...In maritime transports the foreign exports and imports are simple. For example in road transports the border crossing stations can suffer from traffic jams... I would say that the cross-border road transports are much harder than the maritime transports.” (Int. 7)

If thinking about the project deliveries in the Barents Region, the railroad transportation offers good opportunity for Russian transports, but the connection from Finland to Sweden is not used. This is mainly due to the similar railroad standards between Finland and Russia. The cons of railroad transportation in project deliveries are connected to restrictions concerning the transportation of large sized and heavy cargos on railroads. For example, the width of cargo is very limited in railroad transportation. The interviewed companies had faced problems with cargo attachment issues in the Russian border stations. The challenges also relate to costs, because railroad transport has to be combined with road transport, so many times the cost of using road transport instead of railroads, makes the decision easy. Clearly, railroad transport is a better option for standard products than for the large-scale project deliveries.

“We use them very, very rarely (the railroad transportations). If the width of the wagon is exceeded...there will be lots of problems immediately and we are aiming for the bigger and more massive project cargoes, so it is not an option.” (Int. 6)

“There is always that possibility (railroad transport). Especially for the Russia transports, there the railroad transport plays a big role.” (Int. 8)
Unlike mentioned in literature review, the road transport can also be very useful in longer distance journeys. Although the cargo space is limited, also the large sized products are often delivered by trucks. The interviewees seemed to use road transportation as their main transport mode. The benefits that the interviewees mentioned were mainly the same as pictured in academic literature: flexibility, door-to-door and low costs. The road transportation also happens to be easier for cross-border deliveries, if compared to railroad transport for instance. However, the biggest problem in road transportation is the restriction concerning the transportation of heavy and large size objects. Due to these restrictions, one needs lots of special arrangements that cost a lot. One has to have escort and permission for the big project deliveries. In some cases one has to hire a person for monitoring the bridge crossings. According to the interviewees, this restriction policy seems to be very complex and it has country specific variations. Some of the interviewees find these kinds of restrictions very annoying, but especially the freight forwarders seemed to be quite satisfied with the current regulation policies. The road transportation faces also challenges that are caused by natural infrastructure obstacles (e.g. bridges, railroads, tunnels, portals etc.). These types of obstacles cause the need for specific permission protocols that cause both costs and lots of paperwork. For example in Finland, one has to apply permission for each bridge crossing separately, instead of having permission protocol that would allow the transportation for multiple project deliveries during certain time frame for instance.

One of the interviewees gave a good example of the challenges related to road transportation.

“Some weeks ago we transported a construct...it was 125 tons, the diameter was 6.5 meters and the length was 21 meters...The construct was transported from here (li) to Pori. The cost of the transportation was about 6000 euros and all other costs were around 10 000 euros. And these other costs are caused especially by portals, bridges, railroads and monitoring. One should be able to cut 2/3 of these costs immediately!” (Int. 6)
In this previous transportation example the delivery took about 24 hours and almost 1/3 of the transportation time was spent passing the obstacles in the city of Oulu. This very case is a good example of the barriers that one faces, when doing project deliveries on the road.

5.2.4 Handling the project cargo

For handling the project cargo, there are some key points that one has to take into consideration. First of all, the nature of the cargo often defines which transport modes are possible for the transportation. Usually the biggest and heaviest cargo loads are easiest to transport with maritime transports. Road transport is also a good option due to its flexible door-to-door ability. The handling procedures often demand large-scale crane capacity, which might end up being an issue in some ports. Although the use of mobile cranes is often possible, the costs can become high, if one has to use additional cranes. There are differences in port’s capability of dealing with massive project cargo loads. In addition to crane capacity, one needs professional work force that has expertise of handling such cargoes. Very often there is a need for temporary warehousing in the port areas, because the construction site might not be able to receive all of the cargo loads at the same time.

The interviewed companies did not find the handling of project cargo particularly challenging, but the risk of such project deliveries is higher, if compared to standard deliveries. Clearly, experienced companies and freight forwarders already know what the critical stages in project deliveries are, but still detailed delivery planning and careful monitoring is needed to make sure that everything goes well. It is also very important that the different actors involved in handling the cargo can share information to avoid failures. The best case scenario would be that the same parties are responsible for both loading and unloading, but unfortunately this is not often possible. It would be beneficial, if the freight forwarder takes overall responsibility of each lift during the process to avoid potential problems. All in all, the first handling challenge is caused by the moving process from workshop to delivery place. One of the most critical parts is the heavy lift and after that, one has to make sure that the cargo is attached and secured carefully to prevent any movement during the transportation.
“Well if considering bigger components, the challenge is to get cargo moved for the transportation. One has to always think what is being lifted and where the lifting is taking place...When the cargo has been lifted, one has to know how to attach it. If there are painted structures, one has to make sure that there is no damage, when the cargo reaches its final destination. The paint corrections made afterwards are bad thing, because those cannot replace the original one.” (Int. 2)

On the transportation day, there has to be an efficient handling process to ensure fluent loading process. For example, cargo ships cannot wait for days in the port, because it is very expensive. Therefore, one has to make sure that every actor is capable to do their own part as planned. When doing very massive heavy lifts, there is sometimes a need for additional large sized cranes. It could be hard to book these cranes for certain time frames, because these types of cranes are often needed in various locations. The customers tend to value the transportation certainty and they have usually very strict project deadlines that cannot sustain any delays caused by transportation or handling issues. Therefore one of the key things in successful project delivery is that the plans are realistic.

5.2.5 Transportation

The actual transportation phase is very critical for every project delivery. The opportunities and barriers defined in chapters 3.3 and 3.4 have their own impact on the transportation as well. As mentioned earlier, in project delivery cases the freight forwarder is usually responsible for arranging the transportation. The key points for efficient transportation process are security, time and cost dimensions. The transportation day is challenging, because the time and capability to react to unexpected circumstances is limited. For example, weather conditions are hard to predict in advance and can cause delays. There are usually challenges that no one had thought, when planning the transportation. The weather poses a huge challenge for massive cargo transportation in almost every transport mode. The most radical problems are caused by storms and winter conditions. If thinking about the ship in hard storm conditions, in worst case scenario the deck cargo could end up into the bottom of the sea, if the cargo is not attached properly.
Routing plays very key role in successful project delivery. The freight forwarders usually have good knowledge of possible routes, but sometimes, especially when operating abroad, the routing takes lots of time and resources. Routing has direct impact on both costs and timetable. The road transportation is the most challenging transport mode in routing sense, because there are lots of obstacles that block the way for transporting big sized and heavy cargo loads. The authorities can help the routing by providing detailed information of possible challenge spots (bridges, portal heights etc.). However, this type of well detailed information is not available in every country. Therefore the freight forwarder must do the routing in advance by actually driving the route and making sure that the route is possible. For instance, it is harder to do the routing in Sweden than it is in Finland, because there are more obstacles blocking the project deliveries.

“(In Sweden) you have to make the route planning alone by driving there and marking the roads. You can drive dozens of kilometers to one way, and if the route is not possible, you have to drive back and to start looking for new route all over again. Then you have to apply for transportation permission from the authorities...then they check it and approve it. And even after that, everything is on your own responsibility.” (Int. 8)

5.2.6 Unloading & Installation

When the cargo is transported to the project site, it has to be first unloaded. One of the key issues in unloading is to repeat the handling and lifting protocols used already in the loading phase. This might be problematic, because often times the people, who are doing the unloading might be unaware of right lift points and such things. This is why; there is a need for one person, who takes care of the whole delivery during the project. This person is the project manager, who coordinates, shares information and makes sure that everything goes as planned.

Most of the project deliveries include also the installation work in the final site and the work force is often provided by the manufacturer side. For example in the windmill transportation case, the windmills were assembled by the Danish work
force. To be able to do the installation, one needs also transportations of tools, equipment, personnel and cranes. And when the product has been installed, the equipment that was needed for the installation has to be transported back. In case 2 there were lots of reverse logistics transportations after the windmill park was ready, as the installation equipment was shipped back to Denmark.

5.3 Country related differences

Each country has its own transportation systems and regulation policy, which of course have direct impact on the project delivery process. According to the literature review, the estimated challenges in the Barents Region were mainly related to the issues in Russia transports. Although the interviewees agreed the problems of Russia transports, the research revealed that are also challenges in Finland, Norway and Sweden that were not mentioned in the academic literature review.

One of the most significant finding was that the Nordic countries have differences that cause problems for the cross-border project deliveries. Especially cross-border road transportation in project deliveries can end up being problematic.

“Sweden is very different than Finland and of course Norway is also different, but Sweden is especially the most difficult one. In Sweden one has to know where to get the permissions and one has to try to get them early on in advance. Every Nordic country differs from one another in that sense.” (Int. 7)

5.3.1 Finland

All in all, the transportation branch in Finland works quite efficiently at the moment. Nevertheless, there are some minor issues that cause challenges for making cost-efficient and competitive transportation project deliveries. According to the interviews, in Finland the major transportation barriers are related to regulation, infrastructure, distance and all-year traffic.
Regulation is actually a two-edged sword in the Finnish transportation system. This system causes bureaucracy and regulations that don’t support business needs. Most of the interviewees understand that it is sometimes hard for the authorities to make systems that would ensure more fluent transportation, and they do admit that often the regulation adds quality and safety measures. Maybe the biggest concerns and disappointment are related to decisions like the sulphur regulation directive that might harness the competitiveness of the whole maritime industry. Moreover, traffic infrastructure planning does not often support the fluency of large sized transport in the planning phase, eventually causing lots of problems for the firms that are working with project logistics. Clearly, the problem is that the decision making does not take project deliveries into consideration enough. Although there was some criticism towards the Finnish authorities, the good thing is that: in Finland one gets detailed information of the routes that can be used for massive special transports. Actually, the permission process is faster and more flexible in Finland than it is in Sweden for example.

For project deliveries in the Northern Ostrobothnia, especially the city of Oulu is problematic to get through with special transports. There are lots of obstacles which barrier the routing options. There are clearly differences in the ports that are suitable for handling the project deliveries. As a matter of fact, many times the ports of Kemi and Raahe were mentioned as good places for project deliveries. According to the interviewees, the key point for port choice relies in: location, obstacle-free route, professional handling capability, crane capacity and warehouse capacity.

If compared to other countries of the Barents Region, Finland is much easier from project delivery point of view than the others. Although there are some problematic issues as well, most of the problems are easy to cope with. One of these difficulties relates to decaying road infrastructure. It is actually more a challenge than a barrier, because project deliveries can be done efficiently in the current road conditions. However, it would be better, if the current infrastructure could be developed and repaired more efficiently. The issue seems to be especially in getting the money for such developments also to Northern Finland.
The all-year traffic was seen as a challenge that can cause delays. However, important ice-breaking services are working at good level and the expertise of dealing in hard ice condition is world-class in Finland. The weather conditions can sometimes be so hard that they can barrier the project delivery for a moment, but in big picture the all-year traffic is possible, although transportation is bit harder in winter times.

The distance causes also its own challenge for making project deliveries in Finland. No matter where one travels, the distance is usually quite long between cities, and the infrastructure varies especially, if one has to use the smaller roads. If thinking about the European or Global markets, Finland is located far away. The biggest problem caused by distance relates to time and cost measures. In long distance transportations the freight costs get bigger and the schedules might also be an issue. One has to remember that Finnish companies often compete with international competitors, which means that the logistics efficiency has to be very good to be competitive in the international markets.

5.3.2 Norway

Norway is bit different in project delivery sense, if compared to Finland for instance. First of all, Norway does not belong to EU, which means that the exporting includes more paperwork and bureaucracy than EU transports in general. The fluency problems in cross-border procedures are related to customs clearances and such. Second, Norway is quite difficult in road transport sense, because the roads are curvy and there are lots of tunnels and obstacles, which block the project deliveries. In Norway the handling and transportation costs are very high, if one uses local services. For example, using Norwegian road transportation can end up being very expensive. Furthermore, the weight measures and dimensions play a key role, when doing road transportation in Norway. For instance, the weight restrictions are different in Norway than in Finland. In Norway it is also much harder to transport cargo that has long height, because of the tunnels and such.
“In Norway it is not enough that one is able to transport the product to the port, because there might be no suitable way out of the port to the installation site. The roads are so narrow and curvy that one does not get the permission or no one dares to try to do the transportation. One has to know exactly the port, where the product is being delivered. Especially, if there is a need for road transportation from the port, then it is much more complicated, because one just does not transport products of that size on the road in there. One has to know precisely, if the route exists, that is of course always the case, but especially in there, because the terrain is very challenging.” (Int. 7)

“The roads in Norway are mainly narrow and curvy. Then there are height limits in almost every road, which give their own challenge. For example the width (is problematic). One cannot transport project cargoes that have width of 8-9 meters, unlike here in Finland. It is simply impossible in there, as the roads don’t suit for those type deliveries. And sometimes one has to use ferries, because there are no other options, and the ferries can only take cargo loads of certain size and weight.” (Int. 8)

Third, Norway is one of the leading offshore countries in the world and their quality expectations are very high. These expectations have naturally impact on the transportation as well, which means that everything is being monitored and there is no space for any failures in quality or safety.

5.3.3 Sweden

Unlike the academic literature states, Sweden is not very easy country in project logistics sense. The difficulties are especially related to transporting project cargo on the road. The height limit is often a real issue for project transports and the permission procedures are also harder than in Finland. In Sweden one has to make lots of work for the routing, if compared to Finland. However, the weight restrictions are very similar between Finland and Sweden, which increases the fluency for cross-border project transports. The bad thing in Swedish system is that the permission
process can sometimes be a bit slow. Moreover, in Sweden one cannot move the portals alone, as one has to purchase the service from the local municipality. One has to use the authorities also for monitoring the project delivery. In other words, in Sweden one has to purchase lots of additional service that raise the cost of transportation to very high level.

The handling expenses are quite high in Sweden, if compared to Finland. This means that even though maritime transport could be a good option, the handling expenses that one needs for getting the product to the site, might make this option too expensive. For example, doing a project delivery from Finland to Sweden with truck and ferry transport can be more cost-efficient than the direct maritime transport with a cargo vessel.

“Sweden is really challenging country for special transports. There are railroad bridges and transport obstacles, so the difference to Finland is huge. In Finland one can transport almost everything on the road, in Sweden not. One does not even get the permission for some transports there. There is a rule that the biggest transports have to be taken into the nearest ports...This means that, if one has to transport something to the inner land, one gets easily into situation, where the transportation has to be done through some big lake. (Int. 7)

If thinking about the potential transport mode options for Sweden transports, the alternatives seem to be limited to road transport and maritime transport. When asked about the railroad, it was evident that the interviewed firms do not use that one at all.

5.3.4 Russia

Russia poses lots of challenges in project delivery sense. The interviewed companies were experienced in Russian trade, so they already knew what the possible challenges are and how to cope with those challenges. It seems that earlier experiences help the companies a lot, and the know-how of Russian culture is valuable for fluent transportation. The interviewed companies had experiences of maritime, railroad and road transports to Russia. It seems that of those three transport
modes, the maritime transport is the most problem free. In Russia the river routes offer also a possible alternative for water transportation. It was obvious that in Russia the main challenges relate to road and railroad transport, and the barriers are posed by infrastructure, border-crossing issues and culture differences. For example, the Russian regulation of how to attach cargo load had been a problem for railroad transportations. If the attachment of railroad cargo is not done exactly as the plans state, the cargo will be sent back immediately at the first checkpoint station. On one hand, there are problems that relate to bureaucratic structure that is hard to cope with. On the other hand, if one is able to transport the first time, the next time is always easier. In other words, one has to know what to expect, when exporting to Russia.

If the local knowledge is valuable in Nordic countries, the same knowledge is actually crucial in Russia. Especially Russian speaking assistance is needed in most of the occasions. One cannot do the Russia transportation without planning the delivery very carefully in advance. When the transportation arrives to the border, there is no place for any unawareness. Project business in Russia is somewhat a struggle. The big projects come and go, and for foreign SME’s it is hard to bind resources to projects that can take dozens of years to even get started.

The transportation culture is also a bit different in Russia than it is in other Barents countries. For instance the cargo is not usually unloaded at the same day as the project transportation arrives to its destination. In addition, the transportation route plays a very key role in project deliveries. For example the road conditions tend to vary a lot and seasonal fluctuations cause their own challenge. The same railroad width is of course a very good thing for the fluency of cross-border traffic between Finland and Russia. As a matter of fact, the railroad transport to Russia is often times the more popular solution than the road transport, if the cargo size does not block this alternative. Sometimes there are also issues with the Russian railroad wagons that might be in bad shape and the attachment points might be almost completely lacking.

“One cannot transport heaviest cargo loads (to Russia on the road after the winter), because the roads are in such bad shape. The road transports to Russia cannot be as heavy as in Finland, because they don’t get through. The infrastructure is weaker and permission
When asked about the current connections to Russia, the responses show that the connection is not the major issue, as the most difficult problems are clearly posed by other barriers. Although the transports to Russia are a bit different than those in Nordic countries, the barriers are not impossible to be overcome. The project delivery process is in general very similar in Russia, but in Russia one might face unexpected circumstances.

“We had a project in Russia, which lasted 4 months. It was very challenging and in very challenging place, the connections were really poor. The transportation was first made by railroad and then by road all the way across Siberia. The places there were really difficult and they used some kind of a sleighs or sledges to transport the cranes... by hauling the cranes...on the Russian steppes.” (Int. 8)

5.4 Revised project delivery process model

The empirical findings suggest that the earlier constructed Project delivery process model (figure 5) was fairly accurate. The different project delivery process phases are: manufacturing, project cargo, transport mode choice, loading/stowing, transportation and final destination. The empirical analysis provided detailed information of these phases and confirmed their validity in real project deliveries. Moreover it became clear that the earlier assumed special focus (logistics efficiency, schedule, collaboration, planning, costs and special arrangements) is essential part during the whole project delivery process.

However, there are some minor issues that have to be acknowledged, when the model is compared to the real life project delivery process. First of all, one cannot draw a simplified model that would encompass all the potential factors aligned in every project delivery, as each project delivery is unique. Second, based on the interviews, the variation of potential factors is somewhat large, although each project delivery seems to have similar type of major elements. Third, the model seeks to
combine project deliveries in the Barents Region that is a huge geographical area, which means that there are lots of country related factors, as the circumstances can differ a lot from one country to another. Fourth, one of the challenges is also related to transport modes, because the project delivery differs a lot depending on what kind of mode one uses. Fifth, although the project delivery model is theoretical in nature, it actually underlines all of the major aspects embedded in each project delivery process. All in all, the project deliveries seem to be challenging, but companies seem to do quite well with them, especially the experience is a key thing for encountering the biggest problems. When the interviewees were asked, if the factors pictured in the model were correct, the response dictated that the factors are correct. But because each case is different, some of the factors might not be relevant for every case and context. It was interesting to acknowledge that although the model was drawn based on theoretical sources the accuracy of potential factors was good.

The barriers that were identified earlier (see. table 1) were very accurate. However, if one considers the results of empirical analysis, the most important barriers are: infrastructure, regulation, border crossing issues, distance and challenges with all year traffic. Whereas lacking collaboration and customer demands seem to remain a relatively minor issue from the barrier perspective, but they are evident aspect of logistics and business in general. Environmental regulation was not seen as a pinpoint barrier for project logistics, because its effects are not directly affecting in each project deliveries, therefore the barrier of environmental regulation could be considered as part of the regulation, rather than a separate barrier hindering the process. All barriers harness the fluency of project deliveries inside the Barents Region, but the impact of each barrier varies a lot depending on in which country the actual transportation is taking place. There is also variance inside the single country level.

Based on the empirical analysis, the opportunities are hard to put into one definitive order. Table 2. suggested that maritime transport is the best option for project deliveries in the Barents Region. Based on the interviews, the maritime transportation is the best option, if the distance is long and the cargo load is big. However, unlike it was assumed earlier, the road transportation is actually equally, if not more widely used option also in the category of longer distance project
deliveries. Especially the low cost and flexibility benefits seem to be the main reason for using road transportation. Also the railroad transportation seems to be fairly useful in deliveries that are destined to Russia, but the biggest components are rarely transported with train, when compared to maritime- and road transportation modes. On one hand, the most accurate presumption was that air transportation indeed does not play any key role for project deliveries. On the other hand, air transportation cannot be totally forgotten, because projects are always dependent on the human aspect. This means that the company personnel have to be able to travel fluently; in order to a) do the business transactions and b) be able to follow and monitor the transportation. This human aspect seems to be often forgotten, when considering the usefulness of air transportation for a project delivery.

Depending on the type of cargo and destination, the delivery process can vary from easy short distance transportation to complex deliveries that involve cross-border logistics. Therefore one has to understand that the prevailing circumstances might have huge impact on the project delivery factors. For example, road circumstances in Finland might be totally different from those in Russia. The key thing for using the model is therefore: First, to understand the possible barriers; Second, to know what the best opportunities for the delivery are; and Third, to clarify what kind of different phases does the project delivery process include. The revised project delivery model (see figure 6.) combines both empirical evidence and theoretical aspects of project deliveries in the Barents Region.
Figure 6. Revised project delivery process model
6 CONCLUSIONS

This chapter includes the conclusions of the research. The research findings and their relevance for both managerial implications and theoretical contribution are provided. Furthermore, the validity, reliability and generalization of research results are presented. Finally the limitations of this research and possible future research thoughts are discussed.

6.1 Findings

The aim of this research was to describe the project delivery process and to provide understanding of possible barriers and opportunities featured in this delivery process.

The main research question was:

- How is the project delivery process in the Barents Region?

To answer this question, the research provided a model for project delivery process in the Barents Region (figure 6). First the project delivery is featured by different elements: manufacturing, project cargo, transport mode choice, loading/stowing, transportation and final destination. During all of these elements, there has to be special focus on logistics efficiency, schedule, collaboration, planning, costs and special arrangements. The elements of the figure 6. are bit overlapping, and the structure of the figure is not linear, as the project deliveries differ from one another. For example transport mode choice and opportunities boxes are very similar in nature. However, the opportunities box includes all the features that are embedded in different transport modes, whereas the transport mode choice itself pictures only the 4 possible alternatives. There are also differences depending on what type transport modes are used. According to the empirical analysis, all the relevant phases are pictured in the figure 6, but the actual project delivery process is hard to picture in detailed way in such simplified figure. Therefore, the model seeks to describe the project delivery process in general way. The project delivery process has also specific features in the Barents Region and these features are mainly underlined by
the barriers and opportunities. The revised model was drawn by combining the theoretical discussion with the empirical analysis.

The first sub research question was:

- What kinds of transport logistics barriers there are for project deliveries in the Barents Region?

First a list of potential barriers was provided in table 1. The empirical analysis conducted in chapter 5. suggests that the transport logistics barriers in the Barents Region are: infrastructure, regulation, border crossing issues, distance and challenges with all year traffic.

The second sub research question was:

- What kinds of transport logistics opportunities there are for project deliveries in the Barents Region?

To define what kinds of opportunities there are, the research presented an evaluation of different transport modes and discussed their usefulness for project deliveries. The empirical analysis suggests that maritime- and road transportations offer the best opportunities for project deliveries, followed by railroad transportation, that are used especially in deliveries to Russia. The air transportation is clearly the last option for project deliveries. Although air transportation is not used for project deliveries, it is needed for passenger traffic in the projects. Northern Finland features a good level of ports and road connections for possible project deliveries. The railroad connection to Russia works sufficiently at the moment. However, the lack of air transport connections to other Barents Region countries is an issue. All in all, the current connections are good for project deliveries in most important transport modes, but there could a better level of infrastructure.

Each project delivery is unique process that includes a combination of different phases and actors. These project deliveries are often complex in nature, thereby governing special caution and planning to ensure fluent transportation. As each
delivery includes different type of challenges, one has to acknowledge the different variables that are affecting in project deliveries in the Barents Region. Of course there are also some similarities between the cases, but each case presents its own challenges. With the help of these empirical findings, one should be able to identify the possible barriers and best opportunities that are included in project deliveries in the Barents Region.

6.2 Theoretical contribution

This research included the academic literature review of transport and project logistics. Because there are not that many academic researches of project deliveries, this research provides a great deal of new findings for the academic field. For example Andersson et al. (2011) and Fagerholt et al. (2013) concentrated on viewing project logistics with routing and scheduling measures, whereas this research describes the whole project delivery process with broader perspective. Still, it was interesting to note that the earlier findings of Branch (2009), Andersson et al. (2011) and Fagerholt et al. (2013) were similar with the findings of this research. But unlike the earlier research of project deliveries, this research combined the cross-border logistics in the Barents Region with the project logistics context.

This research contributes especially in the transport logistics of Barents Region and provides a model for understanding the different phases of project delivery and reveals the underlying barriers and opportunities in project logistics context. By focusing on the project deliveries in the Barents Region, this research gives unique information of cross-border project deliveries, thus differing from earlier research. Moreover, by combining the country related findings with the earlier academic findings, this research has provided new information of the potential problem sources also in the cross-border logistics between the Nordic countries, in addition to well-known barriers in Russia. The earlier research has typically focused on viewing some specific country and industry level like the research of Olsen et al. (2005). As mentioned earlier, the academic literature of project logistics is almost completely lacking, which means that this research has provided new theories for future research as well. The importance of Barents Region trade is estimated to grow in the coming years, and therefore it is also important to understand the country related features that
are present, when transporting cargo in this area (Siuruainen 2010; Liikennevirasto 2013; Valtioneuvoston kanslia 2013). The research provided a detailed model for understanding the project delivery process and with the help of the model the different phases of project delivery process could be better understood from the theoretical point of view.

6.3 Managerial implications

The research findings are especially useful for businesses that are engaged in transporting project deliveries in the Barents Region. The importance of different phases for the success of project deliveries could be examined with the help of the model that was provided in figure 6. To further cope with the potential problems, this research provided barriers that are hindering the project deliveries. When the managers are planning the project deliveries, the key thing is to understand, how to plan the project deliveries in way that barriers could be overcome to ensure the fluency of transportation. First of all, the project delivery builds upon good and detailed planning, where the potential barriers are noted. Many times the hardest work is done already at the planning phase, as all the possible solutions from transport mode choices to route options are compared. Manufacturing plays also very key role in project delivery success. There should be special emphasis on transportation already at the workshop, in order to add the fluency of the delivery. To ensure that everything goes as planned, there has to be a project manager, who coordinates the project delivery process in loading/stowing, transportation and the final destination phases. However, in every project delivery there are still things that cause unexpected problems. To further tackle the potential problems, the research included a list of best opportunities for the project deliveries from the Northern Finland perspective. This research suggests that the best transport modes for project deliveries in the Barents Region are road- and maritime transport.

This research provides valuable knowledge for the different actors that are involved in project deliveries. Because these cross-border project deliveries tend to be very complex in nature, it is important that each actor has profound understanding of the logistics focus that is needed, starting already from the manufacturing, for ensuring that the cargo is being delivered safely for the final customer. The key thing is to
understand that project delivery is a multilevel process that requires detailed planning and implementation, in order to be able to deliver products, safely, efficiently and in cost-efficient manner.

6.4 Validity, reliability and generalization

The results of the research are evaluated by analyzing the validity and reliability measures. In the qualitative researches, these two measures are used to clarify, that the outcomes of the research are trustworthy by highlighting the role of objectivity. (Koskinen et al. 2005: 253-254, Hirsjärvi & Hurme 2010: 185.) Validity and reliability were originally created for quantitative research and their usefulness for evaluating qualitative research has been criticized. Therefore, the key thing in qualitative research is to try to describe the conducted research in detailed manner. Reliability measures focus on the repeatability of research outcomes. In other words, the reliability is high, if the research is capable of giving less random results. The researcher can increase the reliability by carefully describing, how the research was conducted. Validity is used to evaluate, how well the used research method was able to measure the things it was supposed to measure. For instance, it can be problematic in validity sense, if the interviewee understood the interview question differently than the researcher. (Hirsjärvi, Remes & Sajavaara 2006: 216-217.)

In order to increase the trustworthiness of this research, the used research methods were described and different phases were explained profoundly. The interview details: company, location, title and duration, were given to clarify the interview setting. Furthermore, the case examples were described in detailed manner, so that the reader could understand the different phases of these real project delivery processes. The quotes from interviewees give authentic commentaries of research phenomenon, which increases the trustworthiness of this research. (Hirsjärvi et al. 2006: 216-218.)

One way to evaluate the research is to examine the generalization aspect. The qualitative research has been criticized, because the amount of research objects is so small that it is hard or even impossible to make feasible generalizations. For example, the case studies include often very unique settings. Thus also the results of
this qualitative research are hard to generalize, but the gathered data is rich and it gives information of project deliveries in detailed fashion. (Koskinen et al. 2005: 263-267.)

6.5 Limitations

This research examined the project deliveries in the Barents Region. The focus of research was therefore limited into one specific transport logistics scope. The evaluation of project delivery process included a special emphasis on picturing a general model of the process, rather than giving a pinpoint formula for every possible case. Thereby understanding the uniqueness of each project delivery plays a key role, when analyzing the usefulness of the results displayed. As the focus was set to Barents Region, the research emphasized mainly the deliveries in Finland, Norway, Russia and Sweden. However, also Denmark was brought into case examples, even though it does not belong to the Barents Region. Although Denmark was involved in transportation examples, this research does not analyze the specific features of Danish transport logistics as the focus in cases 1 and 2 is mainly in port of Raahe. The reason for highlighting the role of Finland is twofold. First of all, this research is conducted by examining the Finnish transport logistics companies, which inevitably sets the focus on Finnish logistics branch. Second, this research presents project deliveries that are connected to cross-border project deliveries that are either transported to or from Finland.

Given the fact that this research was conducted by using qualitative method, the goal was to get rich data of the research phenomenon. To ensure this goal to happen the interviewees had to be selected carefully. The interviews were focused on logistics companies that have experiences of project deliveries. All of the interviews were conducted in Finland, which means that the results consist solely of the perspectives of Finnish companies. Most of the interviewed companies are SME’s, which means that their problems might be different from those faced by the bigger companies. There were also lots of steel product –based companies among the interviewed companies, so the results might differ a bit, if the research had been conducted by including other industry levels as well. Furthermore, the researcher’s subjective
perception of the research phenomenon has inevitably some influence for the research outcomes.

One of the greatest problems for using qualitative research methods is the researcher preconception of related to findings of the research. In other words, even though the interview material states something else, the researcher might not be ready to abandon the original idea of how the results must be. This means that subjective prejudice dictates the research focus, thereby harnessing the trustworthiness of the research findings. (Metsämuuronen 2008: 47-48.)

The first case is a description project delivery that was taking place after this master’s thesis was published. Therefore there might be some level of inaccurate information concerning the phases that had not been yet completed, when this research was conducted. Especially the interviews concerning this case were done over a half year before the estimated transportation day, so it is obvious that some changes might have occurred. However, the case 1. concentrates on the project delivery by detailing different project phases, thus giving important input for this research.

When analyzing the barriers and opportunities on country level, one has to understand that the significance of different factors varies a lot depending on the nature of cargo, the transport modes and the transport routes. The difficulties faced in some cases might not be an issue, when viewing that similar issue in big picture.

The model of project delivery process in the Barents Region was built to provide better understanding of the different phases and factors that are included in such project deliveries. Because the model was born by combining knowledge from various logistics related sources, it might not picture the project delivery process as accurately as possible. But because project logistics is researched very rarely by academics, this research offers new tools for the academic field as well.
6.6 Future research

When evaluating the results of this research, it is clear that more research concerning the project deliveries is needed. As the role of cross-border logistics between Barents countries might rise in the future, there will be a need for academic research that would encompass the issues faced, when transporting goods in this area. As this research highlighted the role or transportation in project deliveries, there could be a change of research focus on the service aspect. Moreover, because the transport modes differ from one another a lot, it would be useful to do a research that would emphasize on one transport mode in more detailed fashion. The research focus could be pinpointed into some specific cross-border logistics issue between two countries, and even more; to research transportation of some particular product category. All in all, there is a clear need for further research concerning both project deliveries and logistics in the Barents Region. By doing this type of research, the awareness of logistics in the Barents Region could be increased and the capability of solving logistics related issues would be a better one.
REFERENCES


