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List of Abbreviations

C-SIS:	Central system Schengen Information System
DSRC:	Dedicated Short Range Communication
EPC:	Electronic Product Code
e-Seal:	Electronic Seal
ETSI:	European Telecommunications Standards Institute 1
EU:	European Union
IBC:	International Border Clearance
IT:	Information Technology
ITBCS:	Intelligent Transportation Border Crossing System
ITS:	Intelligent Transportation Systems
NATAP:	North American Trade Automation Prototype
N-SIS:	National network Schengen Information System
OBE:	On Board Equipment
PC:	Personal Computer
PCA:	Partnership and Cooperation Agreement
RF:	Radio Frequency
RFID:	Radio Frequency Identification
RO:	Read-only
RW:	Read/write
SIRENE:	Supplementary Information Request at the National Entry
SIS:	Schengen Information System
SIS II:	Second-generation Schengen Information System
RSE:	Roadside Equipment

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Jönköping, May 2012

Angelopoulos Panagiotis

Leivo Piia

1 Introduction

In this chapter the general background is given, the problem definition and the purpose of this Master thesis. Thereafter, the research questions are being raised. Finally, the structure of this thesis is being described.

1.1 Background

“The history of transit traffic between Finland and Russia goes back thirty years. Driven by Russia’s economic growth, the volume of traffic will continue to rise, but its nature will change, since shipments of high-value goods are steadily increasing” (Turunen, 2008, p.50).

Finland and Russia have a common history, but no-one could expect that almost 100 years after Finland’s independence, these two countries became important business partners and nowadays Finland is one of the biggest gateways from Europe to the East. From a geographical view, Finland is located on Russia’s border with the Western world. The highest purchasing power in Russia comes from St. Petersburg and Moscow, which are located next to Finland. Most of the companies have found that Finland is the most safe route in the Baltic area for transporting products to Russia. In 2006 the total value of the products imported to Russia through Finland was 30,9 billion euros, which was approximately 30 per cent of Russia’s total imports. The amount of transit traffic to Russia is increasing all the time and the Finnish route is still the most popular one in the Baltic area as it has been the whole twenty-first century (Aukia, 2007; Kuittinen, 2007b).

Finland has strengths, which makes it very important to Europe, when the focus is on transportation to the East. The knowledge of Russia as a trading partner is one of the biggest strengths and it is very important, because in the future Russia will need all the possible routes they can use in order to transport their increasing flows of goods. Finnish border crossing stations are the most over-loaded between the EU countries and Russia, but even if the queues are long, the waiting times are still shorter than other countries border crossing stations. For example, the waiting time at the border stations between Latvia and Russia can be 3-4 days and the average time to cross the border between Finland and Russia is approximately 12 hours (Hämäläinen, 2008; Kuittinen, 2007a; Turunen, 2008).

The excellent availability of warehousing, value adding activities, packaging and good service quality are strengths of the Finnish route as well. Warehousing space is extremely expensive in Moscow and St. Petersburg and as a result, many Russian buyers of electronics store their products in Finland in order to get the products fast to Russia when it is necessary. Security, delivery-time and possibilities for using freight monitoring systems are better on the Finnish side than on competing ones, for example in Estonia, Latvia and Ukraine. In 2008, the number of containers, which were delivered direct to Russia, continued to increase, but the number of unloading containers to warehouses in Finland (on way to Russia) had clearly decreased. The reason for that change was the new warehouses in Moscow and St. Petersburg, which were established by major logistics companies. Thus, high-value electronics were transported to Moscow by direct delivery and stored there. On the other hand, warehousing in Russia is not problem-free, because warehousing costs are high and it can be difficult to hire employees with the right skills. As a result, companies found out later on that it is more expensive to use

warehouses in Russia and they changed their strategies in order to save money (Kuittinen, 2007a; Turunen, 2008).

The flow of goods to Russia is still growing faster than the bottleneck [A bottleneck is the resource that is limiting the performance of a system. Therefore, elimination of a bottleneck, by definition, has the net effect of shifting the bottle neck (Garbus, Miner, DuPlessis, Chang & Malchi, 2003)]. In addition, according to Jagdev et al. (2003, p.414) “a bottleneck can generally be defined as an imbalance between supply and demand” can handle and the infrastructure on Finnish eastern borders has been stretched to the limit.

Finland has nine border crossing stations to Russia (figure 1.1), which are Imatra, Nuijamaa, Vaalimaa, Kuusamo, Rajajooseppi, Vainikkala, Niirala, Salla and Vartius. The E18 road that runs through southern Finland to St. Petersburg is the main road to east. Finnish government has engaged to implement the E18-road project and build that highway all the way from Turku via Helsinki to Vaalimaa. This project is very important for Finland, because the road quality from Hamina to Vaalimaa is poor compared to the amount of traffic to Russia (ELY-keskus, 2011a, b; Hämäläinen, 2009; Kuittinen, 2007a; Kuittinen & Viheraho, 2007).



Figure 1.1 Border crossing stations at the Finnish-Russian border (Kononenko, V. & Laine, J., 2008, p.21)

Finland's main border crossing stations to Russia are Vaalimaa, Nuijamaa and Imatra, because all these three points are located close to the E18-road. However, Vaalimaa is the most used border crossing station in Finland because the main E18-road from Helsinki to St. Petersburg passes through Vaalimaa and Port of Kotka (located only 60km from Vaalimaa) has direct shipping connections from over 80 ports throughout the world. Vaalimaa is located only 187km from Helsinki, 203km from St. Petersburg and 803km from Moscow. The total transportation time from Finland to Moscow and back is approximately six working days, which means that four days pass by to turn-return trip from Finland to Moscow and the remaining two days are spent waiting (Kuittinen, 2007a; Vaalimaa International commercial zone, 2012).

According to the annual Finnish Customs Report of Road Transportation to East (2011), the amount of trucks on border crossing stations in Finland increased 6 per cent (table 1.1). Moreover, the value of all the goods, which were transported via Finland to Russia by trucks were 20,7 billion euros and 60 per cent of these goods were transported via Vaalimaa. The most transported products to Russia are: big machines and equipment, radios, televisions, computer equipment and cars. In comparison with the year 2006, the largest transit transportation commodity groups were the same as in 2011, but the total value of these commodity groups was 11,1 billion euros, whereas in 2011 the total value was 13,3 billion euros. The cause of volume fluctuations is the world economic crisis. Table 1.1 shows these fluctuations between the years 2007 and 2009.

The main problem on the border crossing stations, especially in Vaalimaa, is truck queue, which can be sometimes dozens of kilometres and it causes problems not only for those who are crossing the border, but also to the local society. Some of these problems can be delays, car accidents, environmental pollution and high level of noise. The reason is that the road network and official processes on the Russian side of the border have not developed at the same way as in Finnish side and not at the same rate as traffic volume has grown. Border crossing station in Imatra and Nuijamaa are often almost queue free, while the queue at Vaalimaa crossing point is at least several kilometres. The Finnish government actively seeks to solve problems on the borders, but it is not that simple. A good example is that it has been proposed to build truck parking lot, so that truck queue at busy border crossing station would not cause that much problems on the south-eastern roads in Finnish side. Truck parking lot is not a permanent solution for reducing the queue caused by increasing transportation volume to Russia. Another example for solving the problem is that the Finnish government approved the building of a new road (E18) in order to improve safety, reduce travelling time and increase the road capacity (ELY-keskus, 2011a). There are also many other aspects, which have to be taken under consideration before the problem can be solved (Aukia, 2007; Kuittinen, 2007a; Hämäläinen, 2008).

Table 1.1 The amount of the trucks, which crossed the borders from Finland to Russia (Tulli/Finnish customs, 2011)

	2005	2006	2007	2008	2009	2010	2011
IMATRA	52 900	64 700	101 300	110 200	42 500	56 900	66 800
NUIJAMAA	118 000	118 600	137 500	153 500	68 200	91 900	91 600
VAALIMAA	177 200	238 000	221 700	230 200	175 500	161 100	172 900
NIIRALA	32 900	30 700	24 500	26 400	23 000	23 900	22 800
TOTAL:	381 000	452 000	485 000	520 300	309 200	333 800	354 100

1.2 Delimitations

The authors are going to focus the research from perspective of Vaalimaa border station, instead of focusing on all the nine border stations between Finland and Russia. This is because Vaalimaa border point is the most overloaded crossing point to Russia and most of the companies want to use it, even though other crossing points have no queue.

1.3 Problem definition

Increased transportation volume to Russia via Finland has caused problems on roads in Finland, because queue to the border crossing station of Vaalima can be more than 30 kilometres. All the roads are not in a good condition and truck volume to Russia increases all the time. Border crossing between these two countries can take a long time and at the same time it has side effects for the customs, the logistics companies and the local society.

Kononenko and Laine (2008) have discussed the problems at the Finnish-Russian border crossing stations. They have mentioned that long queue of trucks waiting for their turn at the border for customs control; have become a big problem for Finland. They also believe that problems and queue at Vaalima border crossing point are caused by the complex border control systems on the Russian side. A possible solution, especially for the queue, could be a better cross-border co-operation between Finland and Russia and a possible “visa-freedom”, which has been an on-going project since 2002.

Research, which was made in 2005 (Ministry of transport and communications Finland), presented Finland as the best country for the transit transportation to Russia. For the Finnish logistics sector, rapid economic growth in Russia was excellent news because Finland was well-placed in order to maintain its market share of increasing Russian imports. In the research the authors mentioned that Finland’s competitiveness in Russian foreign trade logistics was based on geographic closeness, competitive infrastructure, speed of transport, safety and value added services and high level of logistics know-how. They brought out strongly these advantages, which outweigh all the problems on the border (ibid).

The authors will study different methods to suggest the best solution for the border-crossing problem in Vaalimaa. The main focus will be on NATAP System (North

American Trade Automation Prototype). This decision was made because NATAP System is clear and has been already implemented on the borders between United States of America, Canada and Mexico. It is important to mention that Canada is the second largest country in the world after Russia and United States of America has the biggest economy (Maps of the world, 2012). The authors will also study some technologies, as RFID, that could be applied in the solution.

1.4 Purpose of study

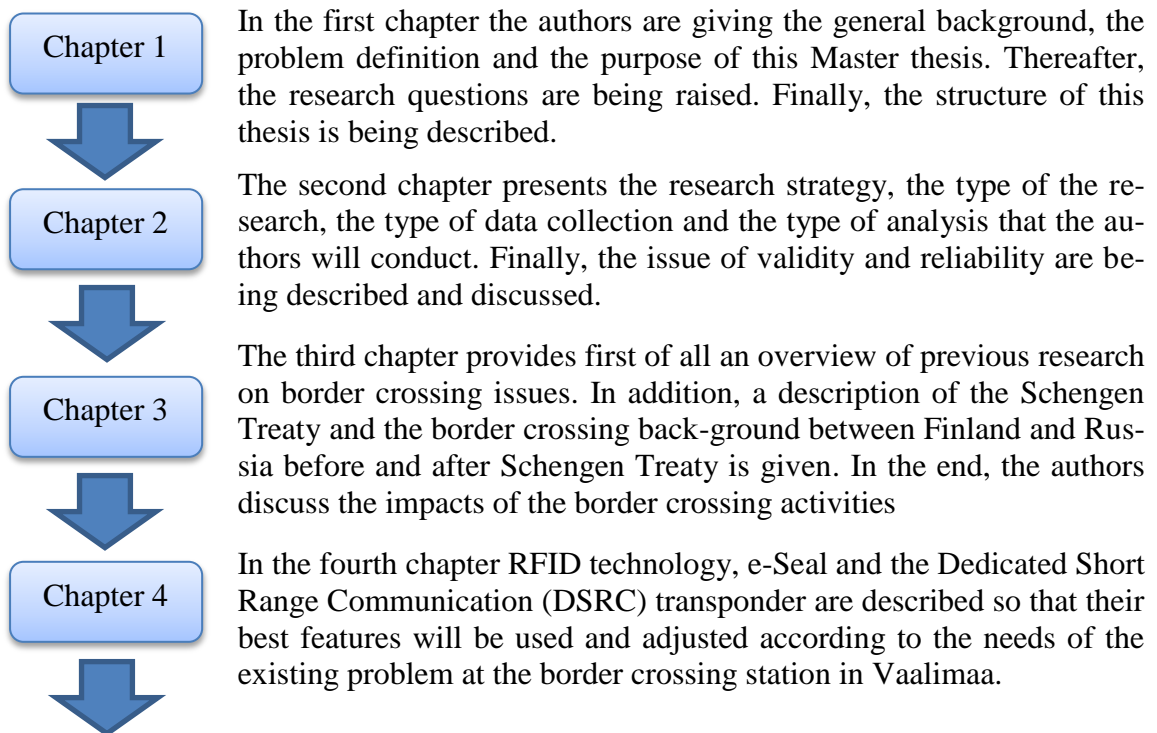
The main purpose of this thesis is to identify the main reasons for the inefficient border crossing process at the border station in Vaalimaa. The authors will analyse the current situation at the border crossing station in Vaalimaa from two different perspectives: Finnish Customs and logistics companies. Finally, the authors will propose a possible solution for improving the whole border crossing process. An appropriate solution for the border crossing problems can help logistics companies, customs, border guards, truck drivers and local society in many ways. A good example is the decrease of transportation time between EU and Russia. In addition, it can assist to build better trust between the two countries.

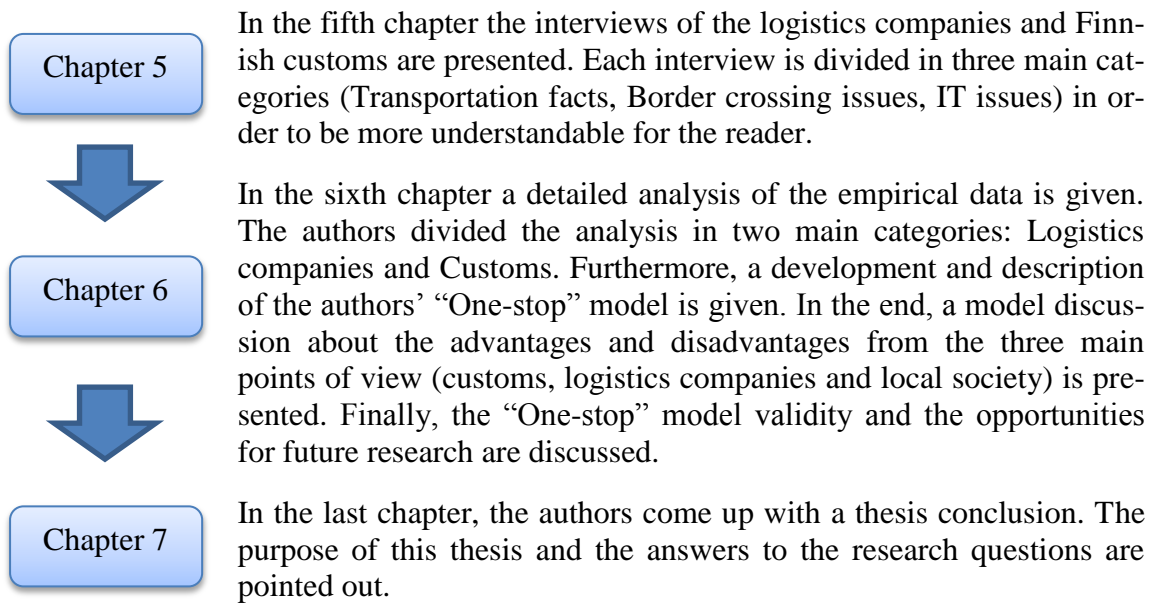
1.5 Research questions

In the face of the described problems the purpose of the present master thesis is to answer the following research questions by using appropriate research methods:

- What are the main reasons of the inefficient border crossing process at the border station in Vaalimaa?
- How can the whole border crossing process be improved?

1.6 Thesis structure





1.7 Conceptual framework of the thesis

The research includes a theoretical and empirical section (figure 1.2). More detailed, the theoretical part includes comprehensive review for the background of the relationship between Finland and Russia from business and transportation points of view, related to similar previous studies and research. The authors have also reviewed different research models, in order to find the best way for answering the research questions in accordance of the empirical data. In addition, IT enablers are presented in order to assist the reader towards a better understanding of their principles and benefits.

The empirical part includes two interviews with logistics companies in Finland: Maersk line and LV Company, and two interviews with Finnish customs and border guards. The interviews are going to be implemented by visiting the companies and customs in Finland. Furthermore, the authors will analyse them in order to collect all the vital data for the identification of the problems at the border crossing process and finally to suggest their own model ("One-stop" model). Moreover, it will be a model discussion based both on the theoretical framework and the empirical data.

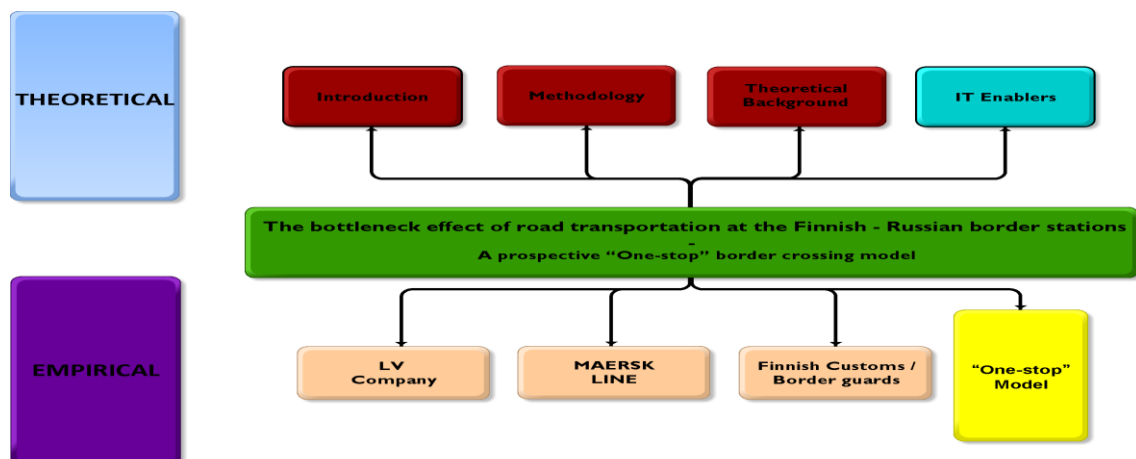


Figure 1.2 Conceptual framework of the thesis (created by the authors)

2 Methodology

This chapter presents the research strategy, the type of the research, the type of data collection and the type of analysis that the authors will conduct. Finally, the issue of validity and reliability are being described and discussed.

2.1 Research strategy

The main purpose of this study is to identify the main reasons for the inefficient border crossing process at the border station in Vaalimaa and to propose possible solution by improving the whole border crossing process.

There are many ways to make research and a wide variety of methods available for designing, carrying out and analysing the result of the research. The choice of the “best” method is not always simply to make and this is why, it is important to start the research process by thinking what the most important is to find out and what the main purpose of the research is. The question “quantitative or qualitative research method” is commonly asked, especially in the beginning of the research, to find out the concept of the research (Blaxter, Hughes & Malcolm, 2001).

In this thesis, the authors will use a qualitative research method in order to get the most dependable information for the reasons of the problems. The aim is to get information about the current situation at the border crossing point in Vaalimaa rather than quantitative information. The qualitative research method allows authors to go deeper inside the topic and this is the reason why this method is the only option for this research.

The authors are going to start the research by making a theoretical frame of the topic by using different data collection methods. The next step is to go deeper inside the topic by interviewing the logistics companies, who are using the route via Finland to Russia, and Finnish customs and border guards, who are working in Vaalimaa. After all the data is collected, the authors are going to propose their own solution for the border crossing problems and conclude the research by measuring its validity and reliability.

2.2 Qualitative research

“Quality is the essential character or nature of something.” (Blumberg, Cooper & Schindler, 2005, p.124). The qualitative tradition can be described as a critique of positivism as recognition of the need for alternative ways to produce knowledge. The aim of the qualitative method is to gain an intimate understanding of people, places, cultures and situations into the reality being studied. Qualitative method seeks answers for the question “how” rather than “how many”, which is the main question in quantitative research method (O’Leary, 2010).

Research methods are techniques, which usually take on a specific meaning according to the methodology in which they are used. Methodology and methods are two different concepts, which are tied close to each other. Methodology usually provides strategies and grounding for the conduct of study, whereas methods are used to collect and analyse data (including for example: interviewing, surveying and observation). Most research methods are used in either qualitative or quantitative methodologies and there are no right or wrong methods, because each research is individual (O’Leary, 2010; Silverman, 2010).

The authors will conduct the research by using qualitative methods, such as textual analysis, interviews and transcripts. Moreover, the authors will collect information by interviewing logistic companies, Finnish customs and border guards on Finnish side.

2.2.1 Case study

Case study is known as empirical inquiry that investigates a contemporary phenomenon within its real-life context and it is usually used to illustrate problems or indicate good practices. According to Gill and Johnson (2010), a case study can involve a detailed investigation of an organization, groups within an organization or individuals therein, with the aim of providing the same type of analysis of the processes (Blumberg, Cooper & Schindler, 2011; Blaxter, Hughes & Tight, 2001).

The authors are going to use a case study of Vaalimaa border crossing station, which is the most overloaded border crossing station on Finnish-Russian border.

2.3 Collection of data

The authors will use two different ways of collecting data, which are direct data collection and indirect data collection. The aim is to make a big picture of the research topic and find the best solution for the problem in the border crossing station in Vaalimaa.

2.3.1 Direct data

Direct data collection usually includes surveys and interviews. The process of collecting data by using a survey can reach a large number of respondents. The data collecting process by asking a range of individuals the same questions related to their characteristics, attributes, for example how they live or their opinions through a questionnaire. Survey as a data-collecting tool has many advantages, for example it represents a large population, allows for comparisons and it also generates qualitative data through the use of open-ended questions. Survey requires researcher to plan and develop own survey-instrument, pilot own approach, make necessary modifications and manage own data (O'Leary, 2010).

Interviewing is a method of data collection that involves the researcher seeking open-ended answers related to a number of questions, topic areas or themes. Two mostly used ways to make an interview are personal interviewing and phone interviewing. Personal interviewing is maybe the most common and clearest way to collect data. The greatest value in personal interviewing lies in the depth of information and detail that can be secured. This method also allows the interviewer to do more things to improve the quality of the information received than with other methods. Interviewers have also more control over the interviewing session, they can also go a bit deeper inside the questions and adjust the language of the interview if they observe any problems. Telephone interviewing is another way to make an interview and it can be an opinion when, for example, the interviewee does not have time for personal interview or if the distance between interviewer and interviewee is long (O'Leary, 2010; Blumberg, Cooper & Schindler, 2011).

The authors are going to make two different question forms, one for the logistics companies and one for the customs and border guards. The authors will set questions to each interviewee, based on theory and previous studies of similar topics. In addition, these questions will be clear and easy to understand in order to avoid misunderstandings.

In general, all the questions will be placed in proper order during the interview conduction. Moreover, the question forms are going to include questions about the products, which are transported to Russia via Finland, and also about the route: what is the origin of the trucks and what is the final destination. The authors are also interested in getting to know how much time it takes, what the process to cross the borders is, if they use any information systems at the borders, and what are the problems that the interviewees' have encountered.

In addition, the authors are going to interview two logistics companies and people who are working on the Finnish-Russian border in Vaalimaa. Interview is the best way to collect data, especially in this research, because there are many different issues, which influence to the problem. Moreover, the authors think that interviewing different people can provide them with widest information upon the issue. Most of the interviews are going to be made personally, but at least one of the interviews is going to be a phone interview, because of customs' busy schedule. Neither the interviewees nor the interviewers are native English speakers. But, the authors will overcome the language barriers because one of the authors is native Finnish speaker and all the interviews will be conducted in Finnish.

The interview questions are given in the appendix I and appendix II.

2.3.2 Indirect data

According to O'Leary (2010), indirect data is situational data that can be found in social situations, documents and databases. It is existing data that researchers simply gather and analyse. Indirect data includes also observation, which is a systematic method of data collection that relies on the researchers' ability to gather data through their senses. Observation is a really important part of data collection, because there are times, when researchers have to "see it by themselves", because there is a big difference between "feeling it" and "having it explained". Data collection through observation takes place in the real world, not in a constructed research world.

Indirect data can also be document analysis or secondary data analysis, which means collection, review and analysis of various forms of written text as a primary source of research data. The data, that the researchers seek, may have already been collected. But all the big amount of hard data, large scale of surveys and organizational records, out there, can all potentially hold the answers to research questions (O'Leary, 2010).

The authors will collect indirect data by using books and journals to find theories, frames and useful tools for the research topic and finally to create a theoretical solution for the problem. Furthermore, there is going to be an analysis of the provided data from the official web pages of the Finnish customs and border guards. The authors are also going to study previous researches about the same topic to understand clearly the reasons for the problem and to find out what kind of conclusions have done other researchers. The aim is to implicate direct and indirect data, to make a big picture of the topic and to understand the meaning of theory by fulfilling it with the results from the interviews.

2.4 Analysing empirical material

“Analysis is an on-going process which may occur throughout your research, with earlier analysis informing later data collection.” (Blaxter, Hughes & Tight, 2006, p.193).

The aim of analysing qualitative data is to create new understandings by exploring and interpreting complex data from sources such as interviews, group discussions, journals, documents and observations, without the aid of quantification. When analysing empirical material, the researchers should create the big picture of the research by thinking of 1) their own expectations, 2) the research questions, aims and objectives, 3) how the researcher can work with the data, so that it helps to achieve the project’s state goals; it is also important to think about theory, and 4) how the data confirms the researchers’ theory and how that theory can help to explain the data. The last point is to think about methods-how the methods employed might affect the results (O’Leary, 2010).

The process of qualitative analysis (figure 2.1), requires the researcher to 1) organize the raw data, 2) enter and code the data, 3) search meaning through thematic analysis, 4) interpret meaning and finally 5) draw conclusions. During the analysing process the researcher should keep in mind the bigger picture of the research, which includes research questions, aims, objectives and theory. (O’Leary, 2010).

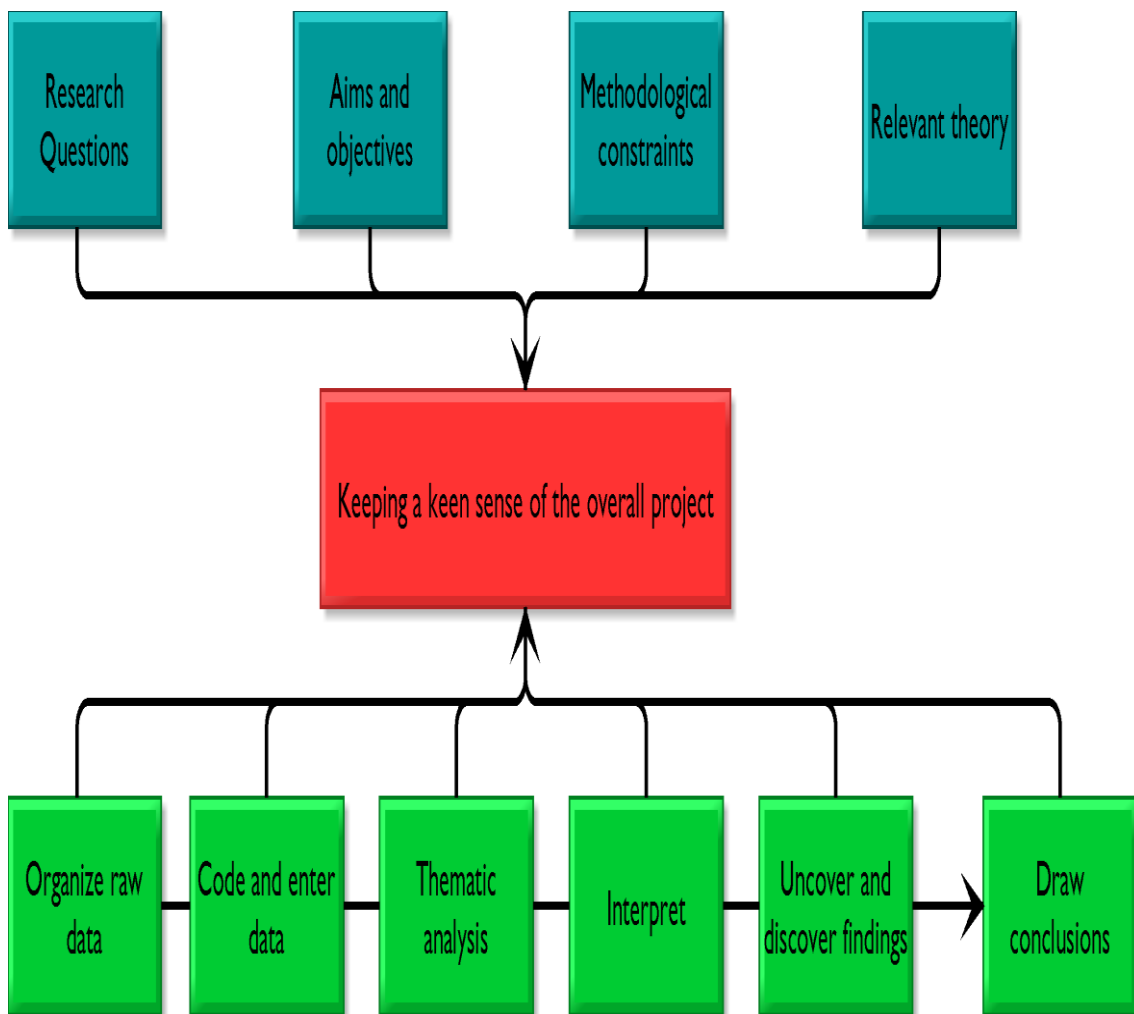


Figure 2.1 The process of qualitative analysis (O’Leary, 2010, p. 257)

The authors are going to follow the process of qualitative analysis, which has been presented in the previous paragraph. Firstly, the authors are going to organize the research project by building theoretical frame for the topic. The next step is to gather more information by making interviews. Then, the authors will analyse the results compared to theoretical framework and finally they will draw a final conclusion by creating their own model.

2.5 Validity and reliability

Validity is another word for truth. It is a characteristic of measurement concerned that a test measures what the researcher actually wishes to measure, which means that differences found with a measurement tool reflect true differences among respondents drawn from a population. Practically, validity means that for example the researchers collect data by using a survey, but some of the interviewees do not understand the questions the way the researcher meant to do. If the researchers process the answers by using their own original thoughts and do not notice that there might be some misunderstandings, the answers are not valid (Silverman, 2010; Blumberg, Cooper & Schindler, 2011; Hirsjärvi, Remes & Sajavaara, 2005).

The main idea of reliability is to understand how well the researcher has carried out the research project. The main question is: has the researcher carried out the research in such a way that, if another researcher looked into the same questions in the same setting, they would come up with the same results? If the results are repeatable then the research is reliable. If the measure is not reliable, it cannot be valid (Blaxter, Hughes & Tight, 2001; Blumberg, Cooper & Schindler, 2011).

Moreover, the interview questions will be able to bring the same results no matter where the research will be repeated. But it is essential to keep in mind that the result can be vary because of external factors, like financial events, natural disasters, wars etc. Finally, the research is also based on previous solutions in similar situations. This is one of the main characteristics of construct validity, which “*refers to previous success with similar constructs, established theories and models, and representative interpretations*” (Klenke, 2008, p.103).

3 Theoretical Background

This chapter provides first of all an overview of previous research on border crossing issues. In addition, a description of the Schengen Treaty and the border crossing background between Finland and Russia before and after Schengen Treaty is given. Then, the authors discuss the impacts of the border crossing activities.

3.1 Border crossing

By definition, the border stations induce restrictions on the trade of goods between two countries. While, for example, the European Union facilitated economic integration makes the flow of goods and collaboration across national borders simple and smooth, the relevance of the cross-border context is still high in many parts of the globe (Lorentz, 2008). Moreover, Weart (1998, p.54) states that “*border crossings always have been a source of delay and frustration for both shippers and carriers*”. In addition, according to Bergan and Bushman (1998, p.1) “*without improvements and expansions to the border crossing process and facilities the increased demand will result in increased delays and will inhibit future increases in trade*”.

3.1.1 North American Trade Automation Prototype (NATAP)

NATAP is a joint initiative between the United States, Canada, and Mexico to standardize data and document processes for trade agencies involved in border clearance. NATAP (figure 3.1) is defining and developing the technology, data systems, and operational requirements for implementing automated border crossings (Bergan & Bushman, 1998).

According to United States General Accounting Office (2000, p.31) “*the prototype assess the potential to harmonize trade processes and develop and share common data using internet-based communications - in other words, a paperless process to clear each nation’s Customs at the border. The prototype also utilized intelligent transportation systems, such as transponder/radio frequency identification devices in trucks, to provide advance information to Customs officials at the border*”.

Trucks participating in this particular border crossing program are equipped with a dedicated short range communication (DSRC) transponder. The main philosophy is that before a truck leaves for a cross border trip, it will be assigned a unique trip/load number that is stored electronically on the transponder. The main goal of this activity is that the number will identify that particular truck and that particular trip in order to access its trip information file (Bergan & Bushman, 1998). In addition, according to Trommer (1996, p.1) “*Exporters or shippers will send electronic documentation to U.S. and Mexican customs authorities and Mexican brokers. Information would also be sent to the Immigration and Naturalization Service to ensure the driver meets immigration requirements*”.

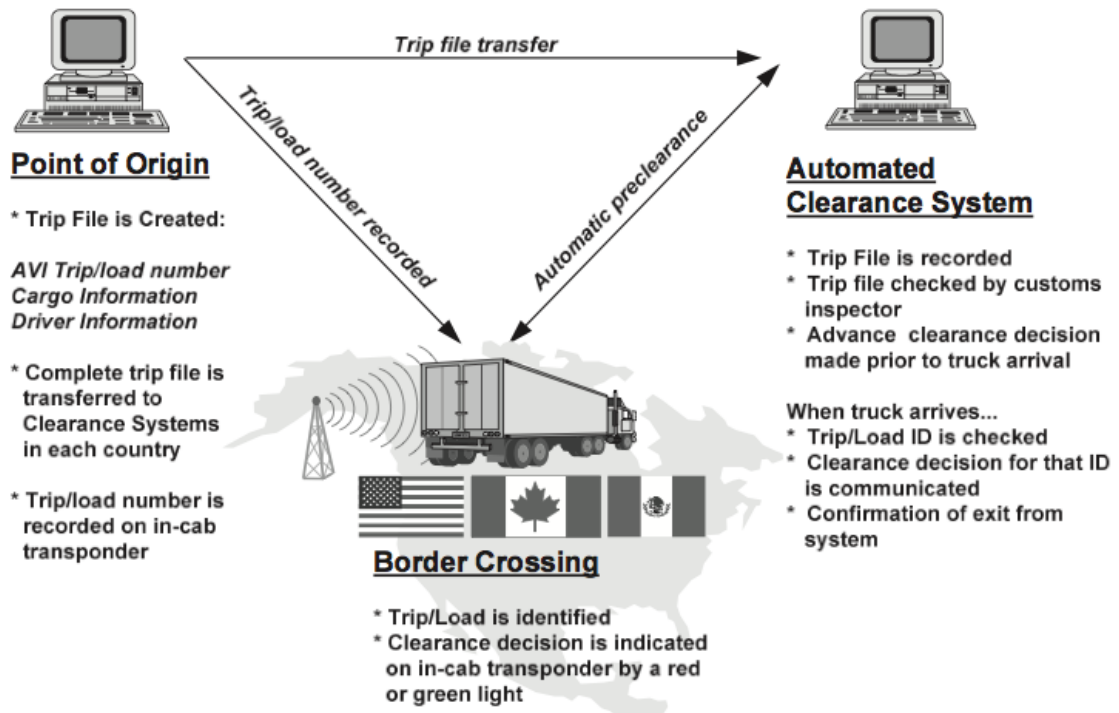


Figure 3.1 Overview of NATAP System Concept (Bergan & Bushman, 1998, p.4)

3.1.2 Intelligent Transportation Border Crossing System (ITBCS)

Tsai (1997, p.2) in his paper, which was prepared for his presentation at the Intelligent Transportation Systems (ITS) Session of the 1997 XIIIth IRF World Meeting in Toronto of Canada, states that “*ITBCS will enable electronic clearance by customs and immigration authorities, and provide transportation agencies with safety data*”. Moreover, “*the automated system needs to enable border inspectors to track and verify status of four types of items: (1) driver/passengers, (2) tractor or bobtail, (3) trailer, (4) load*” (Bochner, Stockton & Burke, 2001, p.9).

Intelligent Transportation Border Crossing System (ITBCS) is based on usage of dedicated short range communication (DSRC) transponder to trucks and vehicles. A unique trip/load number is stored every single time to the DSRC transponder and it is read when the truck arrives at the border station booth. Meanwhile, cargo’s and driver’s information, as well as, the unique trip/load number are already been sent and stored in advance in an electronic form on government system. The decision, that has been made, is connected with unique trip/load number. The main objectives of ITBCS is to improve the system efficiency in total, to support transportation safety and industrial development, to increase tourism, to heighten producer access to international and regional markets, and all transportation users to join higher level of service. One of the main advantages of ITBCS is that commercial vehicles and passenger cars, which are equipped with DSRC transponder, will cross the borders with small or without delays at the border crossing stations. In addition, the use of electronic clearance, which means a paperless business process, saves time and money for both public and private sectors (Tsai, 1997).

3.1.3 International Border Clearance (IBC) program

The program was initially considered as a way to test the feasibility of utilizing Intelligent Transportation Systems (ITS) technologies at border crossings to assist trade and transportation safety, and accelerate the processing of commercial vehicles through ports of entry in United States of America along international borders (Johnson & Thomas, 2001). *“ITS technologies have been successfully implemented in many cases, and while cost/ benefit information is limited, it is generally accepted that ITS technologies can provide significant benefits at a relatively low cost, when implemented appropriately”* (Wilbur Smith Associates, DRI/McGraw-Hill, VZM/Transystems, HNTB Corporation & WHM Transportation, 2001). The vision of IBC program is the seamless, harmonized, and timely clearance of international commerce between and through trading countries resulting in safe and legal commercial operations (Johnson & Thomas, 2001).

The full implementation of the IBC system permits connectivity with state and federal commercial vehicle information systems for safety and credential verification, and access by other organizations or individuals seeking shipment status or traffic information, or collecting tolls (Ibid).

3.1.4 Blaine Border Crossing Project

Washington State Department of Transportation runs this project in order to improve commercial vehicle movements across the international border by implementing a system. The system follows the same principles as the NATAP system, however, some unique features were included and as well as the level of connection to the trucks was upgraded (Bergan & Bushman, 1998).

The project involved two American ports, one in Seattle and one in Tacoma Washington. These two ports are pretty close to the big Canadian city of Vancouver and as a result, there is a big amount of cargo that arrives into Seattle and Tacoma and then is transported by truck across the international border into Canada. An important factor which helped to design this project was that a lot of cargo containers coming into the ports were equipped with identification tags in accordance with an international standard (Ibid).

3.2 Border crossing background between Finland – Russia

The border that separates Finland and the Russian Federation defines the line, where East meets West. The 70-year-long closure of the border, from the Finnish independency until the collapse of the Soviet Union (in 1991), have had various implications, some of which seem to be more persistent than others. The Finnish-Russian border became the first land border between EU and the Russian Federation, when Finland joined the EU in 1995. The collapse of the Soviet Union redefined Finland’s place in the world, because now Finland was free from the fear of Soviet influence and allowed to pursue towards goals that were considered to match better with the Finnish interests. Finland recognized the power of the Russian Federation very early and started to co-operate with it, which caused cross-border business activities, tourism and public sector’s cross-border cooperation (Eudimensions, 2012).

After Finland joined EU in 1995 the relationship between Finland and Russia changed, and the new relationship was built between EU and Russia. The relationship between these two is based on a Partnership and Cooperation Agreement (PCA), which was

signed in 1994 and entered into force in 1997. Today, Russia and Finland are very close partners and their cooperation has increased fast by economic development (ibid).

The local newspaper in Kotka-Hamina-Vaalimaa area has criticized the border crossing situation, transport volume to Russia, as well as, its impacts for the people who are living in that area. In January 2012 the newspaper reported that the queue to Vaalimaa was over 30 kilometres. The reason for the queue was the lack of proper equipment and the low level of cooperation between the Russian authorities. There was a lot of snow and on Russian side snow removal did not work well, as a result, trucks were stuck on the Finnish side. The roads to Nuijamaa and Imatra were not in a good condition as well and there was the same snow problem in Russia. January is also really busy time for forwarding companies to carry new goods for their customers. In this situation Customs, police and border guards tried to change trucks' route to other border crossing stations, but most of the drivers were not interested to change their route and they wanted to stay and wait in queue instead to drive somewhere else (Mäenpää, 2012).

In February 2012 the same newspaper wrote that transportation volume to Russia has increased very fast and that is why the Finnish government should start building again the big parking area for the trucks in Vaalimaa. The project started many years ago, but they never build it up, because the amount of traffic to Russia decreased a lot in 2008. Thus, in 2009 the government decided to stop the project. Now it is time to continue the project, otherwise queuing trucks will cause lots problems for Kotka-Hamina-Vaalimaa area (Eerola, 2012).

3.3 The Schengen area and cooperation

“The Schengen area and cooperation are founded on the Schengen Agreement of 1985. The Schengen area represents a territory where the free movement of persons is guaranteed. The signatory states to the agreement have abolished all internal borders in lieu of a single external border. Here common rules and procedures are applied with regard to visas for short stays, asylum requests and border controls. Simultaneously, to guarantee security within the Schengen area, cooperation and coordination between police services and judicial authorities have been stepped up.” (Europa, 2012)

3.3.1 The Schengen Information System (SIS)

The Schengen Information System (SIS) operates since 1995 and allows national border control and judicial authorities to maintain and distribute information on individuals and pieces of property of interest. Member States register information to the system through national networks (N-SIS) connected to a central system (C-SIS). Moreover, SIS consists of a supporting network known as SIRENE (Supplementary Information Request at the National Entry), which is the human interface of the SIS (Europa, 2012).

3.3.2 The second-generation Schengen Information System (SIS II)

The second-generation Schengen Information System (SIS II) is the evolution of SIS. Moreover, the SIS II was tested in collaboration with European Union (EU) countries and associated countries participating in the Schengen area before the successful implementation. SIS II contains registrations for people and goods. Border guards, customs officers, visa- and law-enforcement authorities throughout the Schengen area are the only one who are allowed to use SIS II in order to maintain a high level of security all over the Schengen area.

As SIS, SIS II consists of 1) a central system ("Central SIS II"), 2) a national system (the "N.SIS II") in each Member State, which will communicate with the Central SIS II, and 3) a communication infrastructure between the central system and the national systems, in which encrypt supplementary data can be transmitted among the responsible authorities (SIRENE Bureaux).

The SIS II operates 24 hours a day, seven days a week and all year long. If a problem occurs, a backup system is located near Salzburg (Austria).

3.3.3 Relations with third countries: common principles

Not only EU member states participate in Schengen cooperation. Because of the ongoing expansion of the Schengen area, third countries that have trade relationships, and not only that, with EU, have already joined the Schengen Treaty. A real example is Iceland, Norway and Liechtenstein. This participation means that 1) there are no checks at their internal borders, 2) implement the provisions of the Schengen acquis and adopt all Schengen-relevant texts, and 3) cooperate in making decisions about the Schengen-relevant texts (Europa, 2012).

3.4 Border crossing between Finland – Russia before the Schengen Treaty

The size of Finnish trade and other economic activities with the Russian Federation and the Soviet Union has varied considerably in the last centuries. Russian's share of the Grand Duchy of Finland's foreign trade was about 40% in the time when Finland was autonomous region of the Russian Empire, in 1860-1916. Russia was Finland's largest trading partner at that time and the paper industry accounted for half of all Finnish exports to Russia and one third of the Russian paper consumption. Much of Finnish imports from Russia during the autonomous time consisted of consumer goods, raw materials and grain. Trade between the two countries came to a halt in 1917, when Finland became independent and the Bolsheviks closed Russia's foreign trade (Ollus & Simola, 2006).

Finland started to decrease its dependence on grain imports by developing its own agriculture after their independency. In the period between the World Wars, Great Britain was Finland's largest trading partner and the small trade with the Soviet Union collapsed when the Cold War, following the Soviet invasion of Finland, broke out in 1939. However, trade started to increase after the Second World War and Finland became the first market economy which signed a five-year agreement to exchange goods with the Soviet Union in 1951-1955. The clearing system between Finland and the Soviet Union was centralized and the trade was handled through bilateral clearing accounts. Forest products, ships and machinery, equipment and vehicles were the most important exporting goods from Finland to Russia. Ships became to be the largest single item in exports to Russia, after paying off the war reparations in the early 1970s (ibid).

Trade between Finland and Russia started to grow quite soon after the establishment of the new Russia. The largest export category to Russia was consumer goods, wood and paper. The effects of Russia on the Finnish economy, has been significant, because firstly Finnish institutions were formed during the autonomous time under Russian rule. After that Finnish forest industry found international markets as the Soviet Union closed its foreign trade after the revolution. The payment of war reparations helped Finland to

develop into bilateral trade regime that lasted for 40 years and later on the Soviet Union became a significant engine in developing Finnish industry (ibid).

3.5 Border crossing between Finland – Russia after the Schengen Treaty

In December 1996, Finland was acceded to the Schengen Agreement and the Convention and in 25 March 2001, Finland implemented the terms of the agreement (Greek Embassy, 2012). By that time, Finland stopped to have land border controls with Sweden and Norway, which signed and implemented the terms of Schengen Treaty the same dates (Ibid). But Finland continues to have, until now, border crossing controls with Russia, which has not signed the Schengen Treaty and is the last country that Finland has land borders against. Since then, Finland has automatically become the external border of the EU Member States. Because of all the aforementioned changes in trade between Russia and Finland, Russia requested and received compensation by EU for the financial losses (Oxford Analytica Daily Brief Service, 2000).

Vladimir Chizhov, deputy foreign minister in charge of EU relations, acknowledged in 2003 that *“Russia needed to improve border co-operation and step up its fight against illegal immigration and organised crime”* (Jack, 2003, p.1). That is a significant important recognition from the Russian side that there is a problem. At the same time, Russia did not show that it is willing to contribute to a future solution. The verification comes from the closer neighbours of Russia, which face problems along their borders with Russia and Finland being one of them (Ibid.). On the other hand, *“Russia's Partnership and Cooperation agreement with the EU requires member states to allow free (administratively unimpeded) access across their territory to other EU markets”* (Oxford Analytica Daily Brief Service, 2002, p.1).

3.6 Impacts

Impact is the measurement *“of the tangible and intangible effects (consequences) of one thing's or entity's action or influence upon another”* (Business dictionary, 2012).

3.6.1 Environmental Impacts

High traffic volume via Finland to Russia causes different environmental impacts, which have effects especially for the people, who live close to border crossing stations. These problems are for instance exhaust gas, pollution, dirty roads, and restlessness. The biggest environmental impact is different driving styles, which can cause dangerous situations between professional and private drivers. Foreign drivers are considered to be a greater risk than domestic drivers in most countries in the world and most of the foreign drivers are Russian. Leviäkangas (1998) has made a research about foreign drivers and he has found that accident rates for foreign drivers are higher than the rates for domestic drivers. The winter season is especially risky for foreign drivers, but also different traffic cultures of different countries, as well as different social-economic backgrounds can have effects for the safety driving habits. Usually when a foreign driver enters a new country, he or she is not always aware of written and unwritten rules and for example different signing policies may result in risky behaviour among foreign drivers (Leviäkangas, 1998).

3.6.2 Infrastructure Impacts

The quality of road transportation infrastructure causes risk not only for the drivers, but also for the other people around. In the Nordic countries, the quality is higher in comparison with the East European countries, where the infrastructure is bad and needs rehabilitation and improvement. Infrastructure differences between two neighbour countries might be big, because infrastructure dependence on the overall state of the economy (Leviäkangas, 1998).

The condition of the Russian road network is mainly poor, because transportation has been concentrated on the railroads. Most of the Russian roads are gravelled and some others without any surfacing. Roads on maps are not always trafficable for heavy vehicles, which is even worse for the trucks, which are characterized by poor condition and old-fashioned technology as most of the Russian trucks are. Russian truck-owners cannot afford to maintain their vehicles and renew their fleet as often as their Western European colleagues (Mäkelä, 1995; Leviäkangas, 1998).

3.6.3 Economic Impacts

Economy between Finland and Russia has deepened after the demise of the Soviet Union. Finnish investments in Russia have increased rapidly and especially in last years, as Finnish firms have invested in Russia. Finnish export to Russia has increased considerably and Russia has risen to be the most important trading partner for Finland. Traffic through Finland to Russia has also increased rapidly since the fall of the Soviet Union. Transit traffic has effects on the Finnish economy, especially in Southern and Southern-Eastern Finland. An increasing share of the export growth has been attributable to re-export, which was in 2004 at least a quarter of Finnish exports to Russia. There are some reasons why goods head through Finland as re-exports. One of the reasons is that re-export is a side effect of transit traffic, partly an option for Finnish exporters to fill the Russian import demand in products that Finnish industry does not produce (Ollus & Simola, 2006).

Re-export is related to the grey economy and the evident economic effects of grey trade are realized as lost tariff (A tax of imports or exports) and tax income of the Russian Federation. This phenomenon has indirect effects for Finland as well, such as increasing biased competition and introducing unhealthy business practices in Finnish business. The number of Russia-related firms has increased rapidly, especially in Kotka-Hamina region and this business area is strongly dominated by grey schemes. Russian firms mainly dominate the whole transport business to Russia, and that way the use of double invoicing is more a rule than an expectation. Russian Federation is currently earning a third of its budget incomes from customs duties and if Russia lowered its customs duties and other tariffs on imported goods, the grey activities around the trade would decrease (ibid).

3.6.4 Social Impacts

Truck drivers' driving habits and skills as well as driving behaviour have impacts for the people in Finland. Finland and Russia must help together professional drivers to get a better driving education, because in that way the amount of car accidents could decrease. The high transit volume to Russia has also many good social impacts. For example, it increased tax-free shopping, the demand of hotel and restaurant services, as well as, tourism.

Russian influence is most visible in Southern-Eastern Finland, because that is the most important area for Russian travellers and truck drivers, who are waiting their turn to cross the border. Finland should invest more at the service level for Russians. A good reason is that in 2010 Russians spent approximately 680 million euros in Finland and the amount of the travellers is increasing (ELY-keskus, 2011c). Dasher and Haunt (2011, p.148) mentioned in their article that *“at borders between poor and rich countries, huge service price differentials could be exploited to mutual benefit, offering better-paid job opportunities to the poor as well as better shopping opportunities to the rich”*. Even Finland is not a poor country, it still gets lots benefits from Russia and Finland can also offer opportunities to Russian. A good example is that Russians can get a good education or job opportunity on Finnish side (Leviäkangas, 1998; ELY-keskus, 2011c).

3.6.5 Political Impacts

Being neighbours is not only a geographical fact. Russia and Finland are cooperation partners, which share a number of common interests. Their relationship is “a strategic partnership”, which indicates that they are neighbours, interdependent and influential global actors. The EU is Russia’s biggest trading partner and Russia is the third biggest partner for the EU. In 2008, the volume of trade was nearly 280 billion euros and the majority (80%) of the foreign investment to Russia originated in the EU Member States. The relationship between these two countries has developed in the framework of the strategic partnership. Russia is not interested in a membership of the EU, but the cooperation aims to free trade and exemption from visa requirement (Ministry for foreign affairs of Finland, 2009).

On the other hand, Finland seeks to maintain and develop active and efficient relationship with Russia on political issues, economy, inter-authority cooperation and open interaction between civil societies. Russia’s economy is very important to Finland and it will continue to be significant. In 2008 Russia was the most important trading partner to Finland and the volume has increased rapidly in the past years. Russia is Finland’s principle supplier of energy and all natural gas used in Finland is imported from Russia. Border crossing situation is very important for both of the countries and the development of transport connections across the whole border between Finland and Russia is important for business and tourism in particular (ibid).

Every year, about a million trucks cross the border between Finland and Russia and it has increased road transportation risks, especially on the Finnish side. Russia has invested in its own ports, which are expected to reduce transit traffic in future on Finnish roads. Free border crossing system has also been under review, because Finland processes by far more visa applications than any other Schengen country. Thus, Finland aims on more effective and flexible handling applications for visa. In addition, Finland sees it as important that visa procedures are equally efficient on both sides of the border (ibid).

4 IT Enablers

Enablers are “*capabilities, forces, and resources that contribute to the success of an entity, program, or project*” (Business dictionary, 2012). In this chapter RFID technology, e-Seal and the Dedicated Short Range Communication (DSRC) transponder are described so that their best features will be used and adjusted according to the needs of the existing problem at the border crossing station in Vaalimaa.

4.1 Radio Frequency Identification (RFID)

Radio Frequency Identification (RFID) is a wireless communication technology that is used to uniquely identify tagged objects or people (Hunt, Puglia & Puglia, 2007). RFID has been around since the middle 1940s but it is recent the introduction as a mean of providing benefits for a variety of business, commercial and societal applications (Poirier & McCollum, 2006). A predominantly use of RFID is to locate, identify, track, and trace objects, such as products, containers, and vehicles (Wu & Subramaniam, 2011).

According to Hunt et al (2007, p.5) “*there are three basic components to an RFID system:*

1. *A tag (sometimes called a transponder), which is composed of a semi-conductor chip, an antenna, and sometimes a battery.*
2. *An interrogator (sometimes called a reader or a read/write device), which is composed of an antenna, a Radio Frequency electronics module, and a control electronics module.*
3. *A controller (sometimes called a host), which most often takes the form of a PC or a workstation running database and control (often called middleware) software.”*

On the other hand, Garfinkel and Rosenberg (2006) go one step further and introduce one more basic component of an RFID system, which is the antennas and choice of radio characteristics.

4.1.1 RFID Tags

The tag (figures 4.2 & 4.3) is the spine of every RFID system. According to Garfinkel and Rosenberg (2006, p.17) “*each tag consists of an antenna and a small silicon chip that contains a radio receiver, a radio modulator for sending a response back to the reader, control logic, some amount of memory, and a power system*”.



Figure 4.1 RFID tags (Very fields, 2011).



Figure 4.2 RFID tag attached on container (Leghorn seals, 2012).

The tags can be categorized in two groups depending on their power system. One category is *active tags* and the other category is the *passive tags*. The *active tags* have an on-board power source, such as a battery. On the other hand, the *passive tags* do not contain any on-board power source and as a result, they use the power from the sending signal of the interrogator in order to transmit data (Hunt et al., 2007). But Garfinkel and Rosenberg (2006) mention an extra kind of RFID tag, the semi-passive tags. These tags have a battery on-board, the same as active tags, but still use the interrogator's power to transmit data back.

Another variation feature between RFID tags is the type of memory. According to Hunt et al. (2007, p.8) “*they are two kinds of memory: read-only (RO) and read/write (RW)*”. The *read-only tags* are programmed in advance by the manufacturer. The read/write tags can be divided in two subcategories. The first one is the “write-once, read-many” tags and they get programmed by the customer but they cannot be reprogrammed. The second subcategory is the “rewritable” tags, which are reprogrammable (Garfinkel & Rosenberg, 2006).

4.1.2 RFID Interrogators

According to Hunt et al. (2007, p.9) “*RFID interrogators are essentially small computers. They are also composed of roughly three parts: an antenna, an RF electronics module, which is responsible for communicating with the RFID tag, and a controller electronics module, which is responsible for communicating with the controller*”. Moreover, Schuster et al. (2007, p.16) mention that “*the type of information exchanged varies in complexity, ranging from a simple identification code like the Electronic Product Code (EPC), to telemetry involving measurements of environmental parameters such as temperature or humidity within the proximity of the tagged object*”.

The RFID interrogators (figure 4.4) transmit a pulse of radio energy to the tag and receive back the tag's response that consists of tag's serial number and possible some additional information depending on tag and its programming (Garfinkel & Rosenberg,

2006). The reader, combined with an external antenna, reads/writes data from/to a tag via radio frequency and transfers data to a host computer (Ergen, Akinici, East & Kirby, 2007). In comparison with systems that use bar coding, RFID systems do not need manual scanning or a direct line of sight to be scanned (Osman, Ram, Stanfield, Samanlioglu, Davis & Bhadury, 2009). As a result, there is saving of time and elimination of human errors.



Figure 4.3 RFID Interrogators (Cisco, 2012).

4.1.3 RFID Controllers

The main function of RFID controllers is to network numerous interrogators and to centrally process information (Hunt et al., 2007). The software assists screening and feeding of RFID data to backend business applications (Wu & Subramaniam, 2011). As a result, if the RFID tags are the spine of every RFID system, the RFID controllers are the “brain” (Hunt et al., 2007).

The main capabilities of RFID controllers by gathering information from the range space could be:

1. *Inventory keeping and alerting when is needed*
2. *Tagged objects’ movement tracking all through into a system*
3. *Identity verification and grant authorization*
4. *Charge an account*

(Ibid, p.11)

4.2 Electronic Seal (e-Seal)

“An e-seal (figure 4.5) can use RFID (figure 4.6), infrared, or cellular tags, for example” (Anderson, 2005 p.64). Moreover, e-seals can vary in forms, but all of them have two main components: an electronic tag and a reader (Ibid). In addition, “an e-seal would be combined with an intrusion detection device inside the container; the intrusion detection would use a light sensor, an infrared sensor, and an acoustic sensor. If any of these devices sense activity, an alarm will be set off and transmitted to a reader at a port authority, for example or to a central monitoring station.” (Ibid).

A detailed structure of how an e-Seal works, it can be described in the following three stages:

“Stage 1: Without the bolt in place, the e-Seal cannot be read. At this point, it is off.

Stage 2: The physical action of locking the seal activates the RFID tag which now returns a signal when interrogated. Once a signal is received, the container is considered sealed and ready for dispatch and the manifest can be associated with the unique number on the e-Seal. E-Seal's tracking application can be programmed to respond to various business triggers. For example, if a read is not received within a certain timeframe, the software will send an alert so the situation can be inspected and remedied. Confirmation of status can speed up customs processes and accelerate labour intensive 28 activities.

Stage 3: Any attempt to remove the e-Seal destroys the circuit. This may declare the end of the journey or indicate tampering.” (Secura Shield Australia Pty Ltd, 2008).



Figure 4.4 E-Seal Bolt (Tyden brooks, 2012)



Figure 4.5 Radio Secure E-Seal (Hello trade, 2012)

4.3 Dedicated Short Range Communication (DSRC) transponder

According to Ahson and Ilyas (2008, p.397) “the DSRC system basically consists of two components, the Roadside Equipment (RSE) and the On Board Equipment (OBE). The RSE communicates and provides useful information to the OBE” (figure 4.7). Dedicated short-range communications (DSRC) are one-way or two-way short- to medium-range wireless communication channels specifically designed for automotive use (Miller & Shaw, 2001). In Europe in September 2008 the European Telecommunications Standards Institute (ETSI) has allocated 30 MHz of spectrum in the 5.9GHz band for Intelligent Transportation Systems (ITS) (European Telecommunications Standards Institute, 2008). According to the technical features of each transponder, there is the ability to provide visual signal or not, to the driver.



Figure 4.6 Wave recording sensor and DSRC Transponder (Info myto, 2012).

5 Empirical Study

The interviews of the logistics companies and Finnish customs are presented in this chapter. Each interview is divided in three main categories (Transportation facts, Border crossing issues, IT issues) in order to be more understandable for the reader.

5.1 LV Company

The first interview was conducted on 28.2.2012 and the authors interviewed the CEO of the company. LV Company is a small size forwarding company, which is owned by Russians, but it locates on Finnish side, about 60km from Vaalimaa.

Most of the products the company transports are shoes, handbags and office furniture, which are coming from China and going to St. Petersburg and Moscow. The company's order-size is proximately 300 containers per month and they use only trucks for transportation.

5.1.1 Transportation facts

The transportation route that the company uses, go through at least four different countries. Usually the containers go from China via Germany or Netherlands and Finland to Russia, for example from China to Germany the container is shipped by vessel as well as from Germany to Finland. The Port of Kotka is the delivery port, where containers are unloaded from the vessel and are loaded for the trucks. The company wants to use the border crossing station of Vaalima because it is the shortest route to Russia and it is always their customers' wish. The only case when trucks drive for example via Nuijamaa is if the customs say so. The Customs is the only one, who can change the route and border crossing point, if it is necessary.

5.1.2 Border crossing issues

The most important factor that the company takes into consideration is their customers' wish, when they are designing the transportation route. The customers tell which way they want their goods to be transported and if there is a long queue to the border crossing point, the Customs can change the route. That means that they have to use the next border crossing point, which is in Nuijamaa and locates approximately 90km from Port of Kotka. Even that Nuijamaa is the "second option" to use, Vaalimaa still remains the main transportation route because the road is in a good condition and if something happens to the trucks, the company can easily fix it and take it back to the depot.

The company or its drivers cannot change the route when the truck is already on queue, because the customs on Port are the only one, which are allowed to change the route, in case that the queue is more than 25km.

Nowadays, the time which is needed for crossing the borders from Finland to Russia varies from half a day up to three days. It depends, on what day of the week it is. For example, if the driver picks up the container from the Port on Tuesday, the border crossing can be done in half a day or at the most one day. But if the driver picks up the container on Friday, the border crossing takes approximately three days. The busiest times at the border station from Finland to Russia are Monday evenings and Tuesday mornings, and from Russia to Finland are Friday evenings and the whole Saturday. Monday and Friday are the most important days for forwarding companies, because drivers want

to cross the border in the beginning of the week, so they can be back in Finland before the weekend.

The company wants its drivers to cross the border in the beginning of the week, because the drivers have to pay taxes in a tax-office in Russia and if they cross the border, for example, on Friday evening, they have to wait two days before they can make the payment. The reason is that tax-offices are open only weekdays. Moreover, drivers do not get salary during the weekend, but they still have to take care of the truck and the container during weekends. It is important to mention that it is more safe to keep containers in Finland than in Russia, because criminality level is really low in comparison with Russia. As a result, trucks are usually waiting in Finnish side and crossing the border on Sunday evening.

5.1.3 IT issues

Reasons for the delays at the border are, for example, Customs' poor IT-systems, bureaucracy and legislation in Russia. Finnish and Russian Customs have similar IT-systems on the borders, but on Russian side the Customs does not have a good knowledge of using their IT-system and they usually want to collect data by using a paper and pen. On Finnish side the drivers use for example barcode, which includes all the information the customs need, when the driver is picking the container at the port. Finnish Customs can handle TIR Carne documents electronically by using their IT system, which is common everywhere in Europe, but when the driver cross the border the Customs on Russian side have to register manually all the information to their system. IT-system usually is being upgraded every three years in Finland and in Russia. The company uses its own IT-system to make waybills and to keep contact with their customers and is not related with the Customs' system.

5.2 Maersk Line

The second interview was conducted on 28.2.2012. The authors interviewed sales executive from Maersk Line Finland. The company is the global containerized division of the A.P. Moller - Maersk Group and it provides oceans transportation services around the world.

5.2.1 Transportation facts

The interviewee stated that they have huge transportation volume to Russia by vessels and trucks. High-value goods includes into the product category, which is mostly transported to Russia via Finland. Usually, cargoes like food and clothing products are transported via Baltic States (Estonia, Lithuania and Latvia). The high-value category goods are mostly coming from Asian countries or from middle Europe (because of warehousing) and the final destination of these goods is St. Petersburg and Moscow.

The company uses mostly vessels and trucks for transportation to Russia. If the final destination is St. Petersburg, they use vessels, but if the final destination is Moscow, they use trucks. At the winter time it might be too much ice at sea in the port of St. Petersburg and the vessels can't use the port. In that case, the company has to use truck to St. Petersburg, as well.

The most common route that the company uses from Asia to Russia is via Germany or Netherlands and Finland. For example, if the final destination is in St. Petersburg, the

company carry the goods from Asia via Germany (for example, port of Hamburg) straight to port of St. Petersburg. But if the final destination is in Moscow, the goods go from Asia via port of Hamburg to Finland (port of Kotka) and from the Finnish port via Vaalimaa to Moscow by trucks. Another option is to carry straight from Asia to Ukraine, to port of Illichevsk, and from there to Russia by trucks.

The most important factor is that the company takes into consideration price, time and quality when designs the transportation routes. But usually, is their customers' decision which route to use.

5.2.2 Border crossing issues

In 2008, Russia set an act that trucks, which are carrying new cars to Russia via Finland, are not allowed to cross the border in Vaalimaa. Russia has also decided that most of Russian import, which final destination is St. Petersburg should be transported via port of St. Petersburg instead of Finland.

Russia wants to grow its own Ports and that is why they have moved part of the incoming traffic to the ports. Port of Ust-Luga is the newest port in Russia and it is going to be the biggest competitor of port of Kotka-Hamina. Port of Ust-Luga has many advantages, which makes it even more important for the incoming traffic. It situates only 170km from St. Petersburg (Port of Kotka locates about 250km from St. Petersburg) and the port is handling about 350 000 to 400 000 TEU (twenty foot equivalent unit) every year (the capacity of port of Kotka-Hamina is about 500 000 TEU). Port of Ust-Luga is growing really fast and its capacity will be 3 million TEU, when they start to operate in the whole capacity (the whole capacity in Port of Kotka-Hamina is about 1,5 million TEU).

About ten years ago the Siberian railway was the most used way from Asia to Russia. The railway was from Asia to Finland and if the final destination for the products was in Russia, the containers' storage, warehousing and distribution happened in Finland. The reason was the high level of security, lower warehousing costs and good quality. This was the best way to deal with the cargo from Asia to Russia, because it was then and it is still more expensive to keep containers in Russian than in Finland, if you take into consideration that the risk rate is 0 in Finland and much more higher in Russia. Thus, it costs a lots money to have a good security systems in Russia.

Usually all the containers came from Asia to Finland by train and then went from Finland to Russia by trucks. However, some years later Russia set the new act, which meant that the Siberian railway was only allowed to use when the products' final destination is in Moscow. If the final destination is, for example St. Petersburg, the transportation has to carry out by vessels and trucks or in other way.

5.2.3 IT issues

The interviewee thinks that the reasons for the delays at the border in Vaalimaa are poor facilities and IT-system, as well as, the legislation on Russian side. Russia sets acts all the time, which has effects for border crossing between Europe and Russia. For example, Russia has set new weight limits, which are different in EU. This situation causes problems for the companies, when they are planning transportation routes for their products from middle Europe to Russia. These weight limits are sometimes the reason for companies to choose to use vessels instead of trucks. Moreover, the interviewee

thinks that the biggest border crossing problems are in Russian side and if the queue is long there, it blocks the traffic in Finnish side as well. Bureaucracy is also one of the biggest problems in Russia and sometimes trucks can pass the queue on Russian side, if the driver pays extra money under the table at the border crossing point.

5.3 Finnish Customs/Border Guard

The third interview was conducted on 28.2.2012 and the authors were interviewing a person, who works for Finnish Customs in Kotka. In the beginning of the interview the interviewee told to the authors that he has general knowledge about the topic, but the best knowledge have the people who are working at the border in Vaalimaa.

Finnish customs is a part of the European Union's customs system and it is central state agency supervised by the Minister of finance. Finnish customs cooperates with the trade community and with domestic and foreign authorities. Finnish customs has approximately 2 370 employees in the organization (Tulli/Finnish customs).

5.3.1 Transportation facts

The interviewee referred to the authors that most of the goods, which are transported via Finland, are high-value goods, for example computers, televisions and phones. The products are coming mostly from Asian countries and the final destination is St. Petersburg or Moscow. The reason why Finland is very important transit country is because the route by a truck via Finland is the safest and at the same time the faster way to Russia. Moreover, the interviewee believes that it is faster to go to Russia via Finland by trucks than to go direct to Russia via port of St. Petersburg, because the truck can drive straight to the final customer.

5.3.2 Border crossing issues

The whole procedure at the border takes usually one to two hours in Finnish side, but on Russian side it takes much more, because of the Russian legislation and the new acts that they are setting all the time. Finnish customs takes care only of the traffic and they do not have to do any clearances or deal with taxes, because customs in Russian side takes care of it. That is another reason for the queues. Russia also set its own acts for the border crossing, but they do not ever turn over the acts that they have set in the past. That causes problems not only to Finland, but also to other European countries. Russia has also set its own weight limits for the trucks and if the weight is more than the limit, the company whose truck is crossing the border, have to pay for over-weight. These weight limits causes problems at the border, because the limits are different in Russia and in EU.

5.3.3 IT issues

IT-systems in Russia and Finland are quite similar, but not straight connected to each other. EU has its own IT-system, which is the same in every EU country. Finnish and Russian IT-systems work together, but because of their differences, many problems are caused at the border. Russia wants more specific information, for example, for the incoming traffic, but IT-system on Finnish side cannot provide this information. But this information is necessary for the Russian side and that is why customs in Russia has to full-fill more information in to their system, when the truck is crossing the border. These delays affects also all the other drivers at the border.

The customer is the one, who decides border crossing point for the truck. On the other hand, Customs are the only one, who can change the route, if they it is necessary. A good example is when the queue to Vaalimaa is more than 25 km, they can force all the trucks to drive to Russia via Nuijamaa. However, most of the companies want to transport their goods via Vaalimaa, even the queue is many kilometers, because the road is in a good condition and E18 road (from Turku to Vaalimaa) is the main road to Russia. In addition, the distance from Kotka to Vaalimaa is only 60km, whereas the distance from Kotka to Nuijamaa is 90 km. Finally, the route planning has been affected by the increase of diesel price worldwide.

5.4 Finnish Customs/Border Guard in Vaalimaa

The fourth interview was conducted on 5.4.2012 at Vaalimaa's border crossing station, where the authors were interviewing the executive officer of Vaalimaa border station.

5.4.1 Transportation facts

The interviewee referred that most of the trucks are coming from Germany, Netherlands via Finnish ports of Kotka and Hamina, Helsinki and Turku. The final destinations for the containers are St. Petersburg and Moscow in Russia. Vaalimaa is the busiest and most used border-crossing point in Finland, because it is the fastest and safest way to Russia. Moreover, the road condition in order to reach border crossing station of Vaalimaa is better compared to the other stations. The road is also better in Russian side from Vaalimaa to St. Petersburg compared to the other roads in Russia.

5.4.2 Border crossing issues

Forwarding companies and their customers decide the route they want to use, but they have to state to Finnish customs which border crossing point they have chosen, before the truck picks up the container at the port. Sometimes, if the queue is long at the border crossing station, the customs at the port can change the route and send the truck to another border crossing point. Customs is the only one, which can change the route and border crossing station, because drivers have to follow TIR Carnet [it is a customs transit document used to prove the existence of the international guarantee for duties and taxes for the goods transported under the TIR system (IRU, 2012)]. Thus, it is only customs which can change the information on TIR carnet.

The most common reason for changing the route and border crossing station is when the queue at the border is over 25km. If the queue is long, the customs at the port changes the route, for example to Nuijamaa. They might change the route for all the trucks, which are picking up containers at the same day. But still, there is a possibility for the driver to change the route back to Vaalimaa, even if the customs has changed the route to Nuijamaa. If the driver insists to drive to Vaalimaa, he has to ask for permission from the customs. Usually in these cases, the driver has to wait one to two days to gain the permission and cross the border. In some other cases, drivers are allowed to overpass the queue, if they have a special permission for doing that. Usually, are allowed to overpass the queue trucks, which are carrying groceries or goods for diplomats.

Border crossing between Finland and Russia in Vaalimaa border crossing station takes approximately 5 minutes in Finnish side, but about 20 minutes in Russian side. There are also pre-border activities, which take more time and the whole procedure can take from 30 minutes up to one hour. It depends on how fast the driver can deliver all the pa-

pers to the customs office. In case that there is a queue, the border crossing procedure can last even longer than an hour. The estimated queuing time in Vaalimaa is measured by using kilometres, which means that if the queue is one kilometre, the waiting time is one hour. During that one hour, Customs can service approximately 30 to 35 trucks.

The interviewee believes that the main problem for the delays at the borders is in Russian side. The process takes long time in Russia and trucks are not allowed to wait between Finnish and Russian borders (the distance is 2km). Thus, if the process goes slow in Russia, all the trucks have to wait in Finnish side. The queue and a big amount of the trucks are causing problems that the local society has to deal with every day. The biggest problems for the surrounding area are the exhausted gas, pollution, dirty roads, restlessness and road safety. Finnish government has tried to solve the problem by fixing the width of the main road close to Vaalimaa area. They have also built more toilets for the drivers, but still seems to be not enough. Finland has invested a lot of money for the road E18 project, which is the biggest road project in Finland right now. The road is going to be a big highway all the way from Turku to Vaalimaa, which will make driving safer for private drivers and at the same time more comfortable for the truck drivers. The interviewee hopes that the new road will solve some of the problems, which affect the local society around Vaalimaa area.

There is never straight advantage because of the queue, but of course it is good that the volume to Russia is high. It has caused lots good things for Kotka-Hamina-Vaalimaa area. It has created more jobs for the ports, forwarding companies and also for different restaurants and gas stations. Another good thing is that most of the trucks, which are carrying cars, are not using Vaalimaa as a border crossing point anymore. An act, that Russia set a decade ago, forbidden car-carrying trucks to use the border station of Torfjanovka (This is the border station on the other side of Vaalimaa). But even nowadays, where the car-carrying trucks are allowed to cross the border from Vaalimaa, they still do not want to use that border crossing point because they got used to use the other border crossing points.

5.4.3 IT issues

Customs has one IT-system, which is the same all over Finland and it has connected to the EU system as well. Thus, it is a kind of one big system inside EU. IT-systems between Finland/EU and Russia are not same, but they are quite similar. In addition, the systems are being updated constantly. The Finnish IT-system includes different functions, which helps Customs for example to make a risk analysis faster, when the truck arrives at the gate. The border crossing procedure can be described as follows. When the truck arrives at the gate, an automatic camera takes a picture of the truck's number plate in order to identify which truck is going to cross the borders. The system also weights the truck, so Customs can get the information of outgoing cargo and make sure that the weight is inside the weight limits. When the driver has done this "first step", he has to drive the truck to the parking area and bring all the documents (licenses, insurance and TIR carnet) to Customs' office, which locates close to the gate. Customs usually make the decision by using previous information of the driver or the transportation company. If they have had problems before, for example, they smuggle cigarettes, alcohol or drugs, the Customs might want to check the cargo. Moreover, the driver has to show his passport to the border guard. There is a new automatic passport checking system in Vaalima, which makes passport control process easier and faster. At the automatic passport checking area, there are five passport control points and one border guardian, who

takes care that everything goes well. If there is any problem with a passport, he will check it manually. More detailed, the driver has to show his passport to the machine and at the same time an automatic camera takes a picture of the driver and compares it with the picture on the passport. If there is something wrong with driver's passport, the system gives a signal to the border guardian and he will lead the driver to another room in order to check the passport again.

Automatic passport checking has helped Customs to handle the high volume of passengers and truck drivers, who are on their way to Russia. All new passports with an electronic chip can be read by the electronic passport reader. But the "old passports" have to be checked manually, because Schengen requires doing so.

The main thing that Customs wants in Finnish side of the border, when trucks are driving to Russia is to keep traffic on and without problems. Border guards take mostly care of passports and Customs takes care of trucks for a closer checking, if they see that it is necessary. Customs has four dogs and their trainers (which are Customs staff) and they are walking around the border area and check trucks randomly. Drivers have to take care that their containers are not open and that seals are intact.

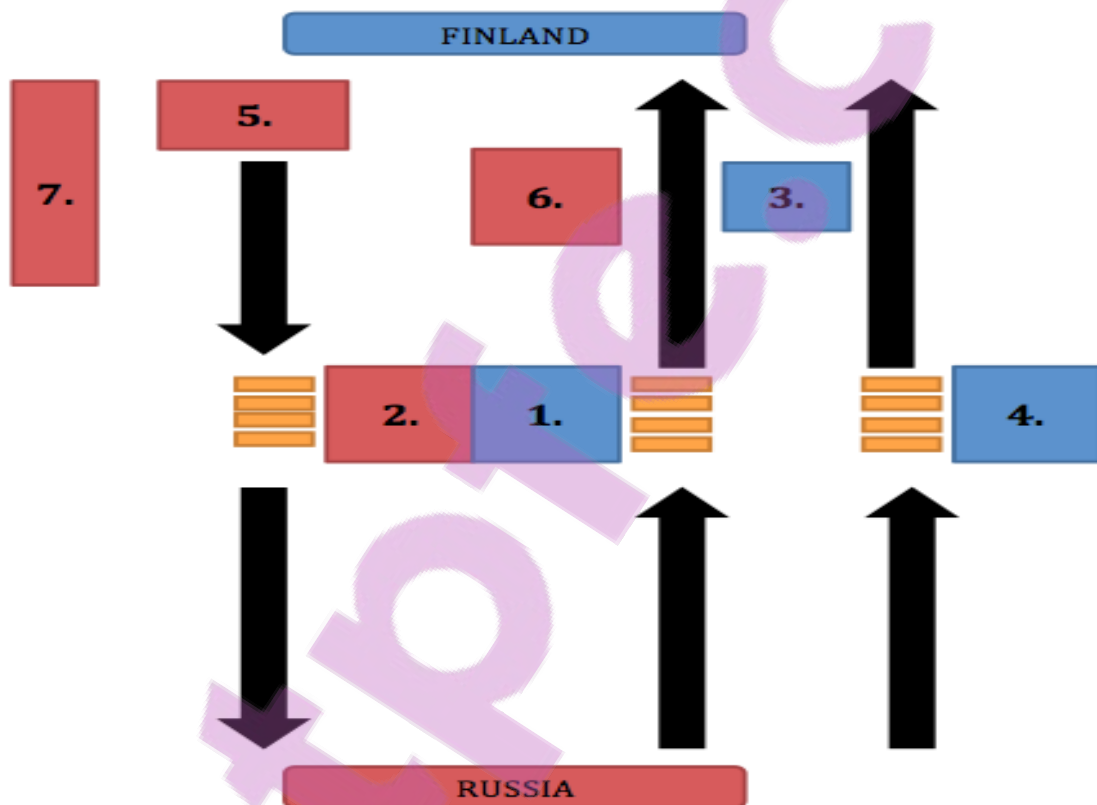
The biggest problems that Customs deal with are the high volume of traffic to Russia and cigarette smuggling, which has increased very fast. The volume to Russia is high and Customs has not enough employees to work and handle the whole volume. In the past, Customs had problems with drug trafficking, but not that much anymore. Moreover, the interviewee believes that right now most of the drugs are not going to Russia through Finland, as it was many years before.

The interviewee thinks that Customs can solve these problems, if they could have more employees and better IT systems to speed up the border process. They have only one building where they handle private drivers and truck drivers at the same time. But in the future, they are going to have two different Customs buildings, one for the private drivers and one for the truck drivers. In that way, they can make documentation checking easier. Another thing is that Customs has many different systems (for example, camera systems, documentation systems and identifying systems), which are working quite well together. But the interviewee opinion is to have an integrated system, which will also include all the acts. Thus, Customs could speed up the process and they might not need that many employees to handle the process.

The interviewee sees an opportunity in RFID tags, e-Seals and DSRC transponder system. He believes that the system would be very useful and it could help Customs to handle the traffic to Russia. In addition, he thinks that the system could be the answer for the employee problem as well. On the other hand, the system has also disadvantages. In case that Customs in Finland will use a system like that, they should use the same system in Russian side too. Right now Finnish Customs are not allowed to share all the information with Russia. For example, Customs are not allowed to tell the value of the outgoing cargo and it is not going to change, because EU has set the rule. It also might be against the law to keep drivers under the control all the time.

Border crossing process (figure 5.1):

1. The truck drives to the gate, where customs' IT system takes a picture of the truck's number plate to identify the truck and the driver. That is the place, where the system also check the truck's weight.
2. The driver takes all the papers to the customs building, where all the documents and passport are checked -> customs make a decision if they want to check the truck.
3. If everything is acceptable, the driver can take all the papers and cross the border, but if customs wants to check the truck/container, they can take the truck to the scanning hall, where they can scan the whole truck/container and see what is inside and how much.



1. Passport and customs control for incoming traffic
2. Passport and customs control for out going traffic
3. Customs' checking hall
4. Checking point for incoming traffic (only for private drivers)
5. Trucks' first checking point (weight checking and truck's identification)
6. Waiting area for passengers
7. Waiting are for trucks

Figure 5.1 Border crossing point (created by the authors in accordance with Rajaliikenne, 2012)

6 Analysis

In this chapter is given a detailed analysis of the empirical data. The authors divided the analysis in two main categories: Logistics companies (see table 6.1) and Finnish Customs (see table 6.2). Furthermore, a development and description of the authors' "One-stop" model is given. In the end, a model discussion about the advantages and disadvantages from the three main points of view (customs, logistics companies and local society) is presented. Finally, the "One-stop" model validity and the opportunities for future research are discussed. At this point, it has to be mentioned that in practice as well as in theory there is no single, agreed way of how to solve the existing problem at the border crossing station in Vaalimaa.

6.1 Logistics Companies

The time, which is needed for crossing the border from Finland to Russia, varies from half a day up to three days. Nowadays, the volume to the border crossing point in Vaalimaa is not as high as it was in 2008, but the volume has started to increase again after the world economic crisis. Monday and Tuesday are the busiest days on the border from Finland to Russia, because most of the companies want their drivers to cross the border in the beginning of the week in order to be back in Finland before Saturday. Companies do not want to keep their trucks in Russian side over the weekend, because it is more safety to be in Finland, where criminality level is much lower than in Russia.

The logistics companies believe that reasons for the delays on the border are for example customs' poor IT-systems, bureaucracy and legislation in Russia. Both countries have quite similar IT-systems, but still they do not work well together. Customs in Russia do not operate in maximum their IT-system and they still make some tasks of the border crossing procedure by using a paper and pen. Moreover, both companies think that Russia is too powerful because Russia is the one, who makes its own decisions of how Russia and Finland should handle their transportation volume. In other words, Russia sets its own acts and rules all the time without any previous mutual discussion or warning with Finland. This fact causes a non-smooth and discontinued flow in the border crossing process. Not very long ago Russia set one new act, which limits the total gross weight for the incoming trucks and that limit is different in Finland. More detailed, trucks with gross weight over 40 000Kg are not allowed to cross the border, even the limit in Finland is 60 000Kg. Thus, this situation causes big problems for logistics companies when they are planning their routes via Europe to Russia. The fact, that companies cannot forecast when Russia will set a new act, leads some of them to use vessels instead of trucks in order to avoid possible problems at the border.

Russia following that new trend has started to build its own ports in the hope that most of the traffic, which goes now via Finland, could go directly to Russia by vessels. Logistics companies and their customers are however the ones, who still make the decision in which way they want to transport their goods to Russia and most of the companies have found that Finland is the best and most safe route in the Baltic area.

Table 6.1 Main points of Logistics companies' interviews

	<i>Transportation facts</i>	<i>Border crossing issues</i>	<i>IT issues</i>
LV Company	<ul style="list-style-type: none"> • From China via Germany/ Netherland to Russia • From China via Finland to Russia • The Port of Kotka is the delivery port 	<ul style="list-style-type: none"> • The most used border crossing point is in Vaalimaa • The customs is the only one who can change the route • Truck drivers are not allowed to change the route • Border crossing from Finland to Russia takes from half a day up to three days • Monday evening and Tuesday morning are the most busiest times at the border 	<ul style="list-style-type: none"> • Customs' IT-system is quite poor • Finnish and Russian customs have similar IT-systems • The customs does not have a good knowledge of IT on Russian side • Finland has a common IT-system with other EU-countries • IT-systems is upgraded every three years in Finland and Russia
Maersk Line	<ul style="list-style-type: none"> • From Asia/middle Europe via Finland to Russia • From Asia via Germany/ Netherland to Russia • From Asia via Ukraine to Russia • From Finland to St. Petersburg by vessel • From Finland to Moscow by trucks 	<ul style="list-style-type: none"> • Customers usually decide which route to use • Russia sets acts all the time, which has effects for border crossing between Europe and Russia 	<ul style="list-style-type: none"> • Reasons for the delays are poor facilities and IT-system, legislation and bureaucracy on Russian side

6.2 Finnish Customs

The volume to Russia is increasing and it has caused problems for Finnish Customs and local society. The main duty of Finnish customs (on way to Russia) is to make sure that the traffic flow to Russia goes smoothly, because they are not responsible for outgoing trucks clearances and taxes. The whole procedure at the border point in Vaalimaa takes usually one to two hours in Finnish side, but much more on Russian side. Customs can handle approximately 30-35 (about 1km) trucks in an hour and if the queue is 25km the last truck on the queue has to wait about 25 hours.

Customs believes that the main problems on the border are Russian poor IT-system - which does not cooperate well with the European IT-system-, Russian legislation - new acts are being set all the time -, and the lack of employees at the Finnish borders. As a result, the long queues cause problems to local society, such as, environmental pollution from the trucks; exhausted gas, dirty roads, restlessness and road safety. Customs think that they could solve the problems, if they had more employees and common IT-system with Russia. A closer cooperation with Russia could help these two countries to speed up the border crossing process on both sides of the border.

Table 6.2 Main points of Customs' interviews

	<i>Transportation facts</i>	<i>Border crossing issues</i>	<i>IT issues</i>
CUSTOMS	<ul style="list-style-type: none"> • From Asia to St. Petersburg and Moscow • The route via Finland is the fastest way to Russia • It is faster to go to Russia via Finland by trucks than to go direct to Russia via port of St. Petersburg 	<ul style="list-style-type: none"> • The whole procedure at the border takes usually one to two hours in Finland • The procedure takes more time in Russia, because of the legislation and the new acts that they set all the time 	<ul style="list-style-type: none"> • IT-systems are quite similar in Russia and Finland • EU countries have common IT-system • EU's and Russian's IT-systems work together, but because of their different, many problems are caused at the border
CUSTOMS (Vaalimaa)	<ul style="list-style-type: none"> • From Germany/ Netherland via Finnish ports to St. Petersburg and Moscow 	<ul style="list-style-type: none"> • Forwarding companies and their customers decide the route they want to use • Customs is the only one who can change the route • Border crossing between Finland and Russia takes about 5min (on Fin. side) and 20min (on Rus. side) • Customs can service approximately 30 to 35 trucks/hour 	<ul style="list-style-type: none"> • EU countries have one common IT-system • IT-systems between EU and Russia are not same, but quite similar • Customs has automatic passport checking system

6.3 Points of concurrence

In this part, the authors will answer the first research question which is the identification of the main reasons of the inefficient border crossing process at the border station in Vaalimaa. Based on the interviews, Finnish customs and logistics companies have the same opinion about the current situation at the border crossing point in Vaalimaa. All the interviewees mentioned that poor IT-systems, bureaucracy and legislation in Russia are the main problems. The results show that Russia is very strong and independent actor in transportation field and it can unilaterally change routes and border crossing procedures quite easy.

The logistics companies mention that bureaucracy is also one of the biggest problems in Russia. In addition, they believe that bureaucracy is a consequence of poor knowledge that Russian customs have on how to use their IT-system. Thus, they usually want to collect data by using a paper and pen. On the other hand, the truck drivers sometimes want to avoid the queue by paying extra money under the table at the Russian employees who are in charge at border station.

Legislation issues cause problems between EU and Russia, because Russia sets new acts and as a result, causes problems for the incoming traffic. Another example is that Russians changed trucks' weight limit and it made it problematic for logistics companies to make route decisions. The companies cannot forecast when the weight limits will change and if the limit changes during the transportation (ex., from Asia to Russia), the company has to pay for the extra kilos. The authors think that Russia and EU should have a common legislation policy for transportation in order to manage all the possible changes together. Moreover, Russia sets new acts, but they do not ever cancel previous ones. In addition, sometimes Finnish customs do not know which acts are in use or not. It would be easier for logistics companies in EU, if Russia could inform one or two months in advance about upcoming changes. In that case, companies could change their transportation route if the container is heavier than the new weight limit.

Criminality level is much higher in Russia than in Finland and that is why most of the companies want to transport their goods via Finland instead via other Baltic countries. The logistics companies' interviewees verify that statement, because they do not want to keep their containers in Russia during the weekend for safety reasons. They want to keep them in Finland because during the weekends the Russian tax offices are closed. If trucks cannot cross the border before weekend they will mostly stay in Finnish side, which causes bottleneck effect on the border. The authors think that the trucks should have the ability to cross the border to Russia seamlessly even during the weekends. In that way, the drivers can deliver containers straight to the final customers no matter what day of the week is. Moreover, the elimination of that obstacle will reduce the weekend congestions at the borders.

All the interviewees believe that one of the main problems at the border crossing process is the poor IT-system, which does not work well, especially on Russian side. All the interviewees were from Finland and that is why it is hard to say if the problem is on European side or on Russian side. The fact is that Finnish people think that the problem is on Russian side. On the other hand, Russians might think that the problem is on Finnish side. But the authors believe that the main problem is poor cooperation and communication between EU and Russia. Schengen treaty members have a common IT-system (SIS II), which it is quite similar with Russian IT-system. But the problem is that these

countries are not allowed to share all the information with Russia and that is why it takes so much time to cross the borders, especially when Russian customs cannot get the information they need from the IT-system. The authors think that EU and Russia should develop a common IT-system in order to have a better cooperation by sharing all the necessary information faster. Moreover, both countries' customs could get trained together and develop a better knowledge of how to operate the IT-system in the most efficient way.

6.4 Components and characteristics of previous cases

The idea for the model that the authors will suggest is based on the combination of NATAP (North American Trade Automation prototype), ITBCS (Intelligent transportation border crossing system), IBC (International border clearance program), and Blaine Border Crossing Project which are used successfully in similar occasions. They have been already presented in the theoretical chapter of this thesis and their main and most interesting components and characteristics are grouped in Table 6.3.

Table 6.3 Components and characteristics of previous cases

<p style="text-align: center;">NATAP (North American Trade Automation prototype)</p>	<ul style="list-style-type: none"> • Automated border crossing • Internet based communication -> develop and share common data • Intelligent transportation system -> transponder/ radio frequency identification devices trucks -> provide advance information to customs officials at the border • A dedicated short range communication transponder (DSRC) -> trucks will be assigned a unique trip/load number that is stored electronically on the transporter • Trip file is recorded • Trip file checked by customs inspector • Advance clearance decision made prior to truck arrival • When truck arrives at the border Trip/load ID is identified and checked • Clearance decision for that ID is communicated • Confirmation or not of exit from system • Complete trip file is transferred to Clearance Systems in each country
<p style="text-align: center;">ITBCS (Intelligent transportation border crossing system)</p>	<ul style="list-style-type: none"> • The system is based on usage of dedicated short range communication transponder (DSRL) to trucks and vehicles • A unique trip/load number is stored to the DSRL transponder and it is read when trucks arrive at the border • Main advantages: commercial vehicles and passenger cars, which are equipped with DSRL will cross the border with small or without any delays

Table 6.3 (Continued)

<p>IBC (International border clearance program)</p>	<ul style="list-style-type: none"> • Intelligent transportation system • Provide significant benefits at low cost • The seamless, harmonized and timely clearance of international commerce between and through trading countries resulting in safe and legal commercial operations • Connectivity with state and federal commercial vehicle information systems for safety and credential verification
<p>Blaine Border Crossing Project</p>	<ul style="list-style-type: none"> • The system follows the same principles as the NATAP system • Cargo containers are equipped with identification tags

6.5 “One-stop” Model

At this part, the authors will answer to the second research question, which focus on how the whole border crossing process can be improved. Thus, the authors will present their own model and they will describe its requirements and operation process (figure 6.1) which will be identical for both sides and for both ways.

6.5.1 The technical components

The “One-stop” Model requires some important technical components in order to operate efficiently and provide high levels of security. These technical components are:

- Container RFID tag
- e-Seal based on RFID technology
- DSRC in the truck cabin
- RFID Interrogators
- e-Clearance system

It is important to mention that the technical requirements of these components are beyond of the authors’ research field in this Master Thesis.

6.5.2 “One-stop” Model description

The model can be divided in three main stages:

1. Pre-Border Activities
2. Border activities
3. After-Border Activities

6.5.2.1 Pre-Border Activities

At the time of container’s departure the necessary information will be filed electronically with the e-Clearance system. Exporters or shippers will login to e-Clearance system and they will send the electronic documentation. The system automatically will generate at the same time an export folder for the customs of the country of origin of the container and an import folder for the country of destination. These declarations must be in the form of customs declarations for cargo and in the form of immigration declarations for the carrier, vehicle and driver. In addition, the declarations must include:

- The unique number of the truck's DSRC in order to allow the system to associate the declaration with the appropriate truck.
- The unique number of container's RFID tag
- The unique number of the e-Seal

While the truck is in transit to the border station, the customs will have valuable time for a proper risk analysis and finally come up with the decision of inspecting the truck and its load or not.

6.5.2.2 Border Activities

As the truck approaches the border station, there will be a special lane. When the truck arrives at the gate, it will be weighted and at the same time a DSRC reader will read the DSRC of the truck to obtain the unique number. This unique number will be used to reference the e-Clearance system to determine what decision was made in advance by the customs inspector.

If the decision is positive and the weight of the truck correct, which means no further inspection will be need, then, a RFID Interrogator will read the RFID tag of the container in order to verify that the unique number of the container's RFID tag is the same with that one in the declaration.

If the number is the same, the RFID Interrogator will continue and it will read the unique number and the statues of e-Seal. If there is a match again, the system will generate an affirmative decision with the condition that the driver will pass the passport control. This means that as the system reads all the tags and checks the unique numbers in accordance with the declaration, the driver has to identify himself by using the automatically passport ID system. In other words, *"the driver put his passport to the machine and at the same time an automatic camera takes picture of the person and compares it to the picture on the passport"* (Finnish Customs Chief in Vaalima, personal communication, 2012-04-05).

If the result is affirmative and at the same time the name of the driver matches with that on the declaration, the final result will be transmitted back to the DSRC in the cabin of the truck and it appears as a green light on the transponder. If the truck is given clearance in the form of a green light it can proceed through the customs area and exit the country of origin without stopping for any supplementary inspection.

In any other case, the DSRC in the cabin of the truck appears a red light. If the truck receives a red light it must stop and report to a customs inspector for additional inspection.

6.5.2.3 After-Border Activities

The truck will go through the same procedure to enter the destination country. The unique number of the DSRC of the truck will be used to access the results of the advance check and the result will be transmitted to the in cab transponder. In addition, the DSRC reader will be used to confirm that the truck has left its country of origin and has entered the destination country. At this point, the system will record that the trip is completed.

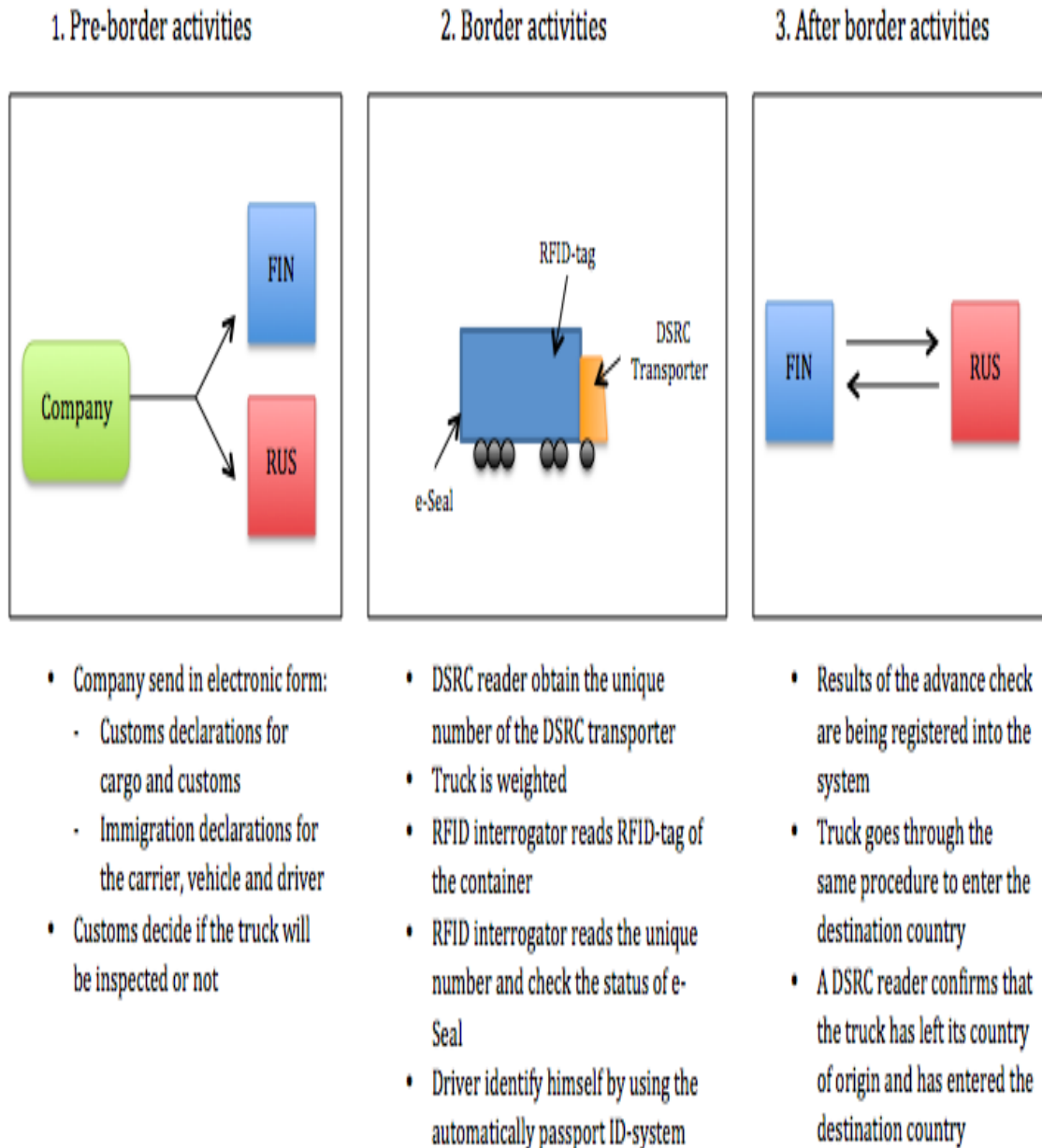


Figure 6.1 “One-stop” model (created by the authors)

6.6 Model discussion

The “One-stop” Model, as every model, has strong and weak points. At this part, the authors will try to describe all the advantages and disadvantages of their suggested model from the three main points of view: customs, logistics companies and local society.

6.6.1 Advantages from custom’s and border guards’ point of view

One of the main advantages is that the whole border crossing process will be speeded-up and the congestions will be reduced or even better, they will be eliminated. Moreover, a more automated process leads all the parties to less physical contact. Thus, there can be a reduction of the level of bureaucracy and corruption, at least at the border crossing stations. Additionally, the installation and operation of such a system can in-

crease the level of safety and security. Consequently, the system can be used as a tool in order to prevent smuggling of any kind or other illegal activities that take place before, during and after crossing the borders. Another advantage is that the number of staff in order to operate the border station properly and in secure is not be high related with the amount of transported volume. In other words, the number personnel can be the same no matter the shift and the workload.

6.6.2 Disadvantages from custom's and border guards' point of view

The most important disadvantage is the cost for creating and installing such an advanced system. Moreover, the personnel must be trained in order to operate the system efficiently and without safety gaps. In addition, in both countries the customs, border guards etc. must have mutual cooperation and trust. In any other case, the suggested border crossing system becomes useless. One last disadvantage is the limitation of sharing vital information between Finland and any other third country because Finland is a member of Schengen Treaty.

6.6.3 Advantages from logistics companies' point of view

The user of RFID tags gains the capability for seamless and continuous two-way communication as an object moves through a supply chain (Schuster, Allen & Brock, 2007). In addition, the use of e-Seals at containers increases the level of safety and security. For ex-ample, in case that someone tempts the seal, vital information, such as time and location, can be retrieved in order to specify the exact conditions of the incident.

Moreover, the lack of congestions can provide many benefits to the logistics companies. First of all, the total time of the trip will be reduced because their trucks will cross the borders faster than the "old-fashion" way. In operation level, that means more trips can be done. As a result, the logistics companies will utilize the level of use of their trucks, which means that they will become more efficient and more competitive. Secondly, the logistics companies will reduce their expenses for food and accommodation for their truck drivers which used to pay because of the congestions at the border stations. Thirdly, the truck drivers will be relieved from the paper work, as all the paper work will be done electronically in advance. This relief has psychological effects on the drivers, such as less stress during the trip, which they already have due to the numerous things that they are responsible for. Moreover, due to this relief, the truck driver will not have to leave the truck and the cargo unattended for long time.

6.6.4 Disadvantages from logistics companies' point of view

The cost is once again the main disadvantage for the logistics companies. The cost of RFID tags, DSRC and e-Seals is not high. It varies between 50 and 100 euros for both of them and it depends on their technical features, quality, durability etc. But if you multiply that cost with the number of trucks and containers that each company uses, then the amount of money that has to be invested, is significantly big. Besides, the logistics companies have to buy and maintain all the necessary equipment, such as RFID interrogators, controllers, and antennas. Moreover, they have to train their staff in order to operate the equipment properly and seamless. But staff training except for being expensive, it is time-consuming. A possible side effect might be an internal change on structure and management in some departments of the companies.

6.6.5 Advantages from local society's point of view

One of the main advantages is the reduction of local environmental pollution. The truck will not wait at the queue with their engines in operation in order to avoid side effects, such as to be frozen, especially during the winter months. Another advantage is that the level of road safety will increase because the trucks will not be parked any longer on the right side of road. Moreover, the local drivers will save time during their everyday transportations as they will be traffic free.

6.6.6 Disadvantages from local society's point of view

The main disadvantage will probably be the fact that many people, who have or work in companies which depend on truck drivers' demand, will lose their jobs. The lack of queue means that the truck drivers will not have to stop and wait anymore and as a result, they will not spent the same amount of money any more to the local enterprises.

6.7 "One-stop" model validity

A validity test could not be conducted because of the theoretical approach of the suggested model. On the other hand, as mentioned before, the creation of the "One-stop" model is based on the combination of NATAP (North American Trade Automation prototype), ITBCS (Intelligent transportation border crossing system), IBC (International border clearance program), and Blaine Border Crossing Project which are used in similar occasions.

6.8 Future research

The authors would like to mention that for any future research regarding this topic, the researchers first of all should consider to have also interviews on Russian side in order to have a holistic view of the problem's reasons. These interviews should focus not only on Finnish Customs and logistics companies, but also, on truck drivers and Russian authorities. In additions, it would be interesting to investigate if there are other possible transportation routes with similar qualifications and how this can affect the transportation volume via Finland. Furthermore, the "One-stop" model could be improved and probably adjusted for other transportation modes. Last but not least would be research for examining the willingness of private and public sector to invest in similar transnational solutions.

7 Conclusion

In the last chapter, the authors come up with a thesis conclusion. The purpose of this thesis and the answers to the research questions are pointed out.

The purpose of the study was to identify the main problems of border crossing process at border station in Vaalimaa. In the beginning of this research the authors investigate and describe the main problems for the bottleneck effect of road transportation at the border crossing point in Vaalimaa. The fact that the traffic volume via Finland to Russia has increased fast, has caused different kind of problems especially at the border crossing process.

This research was made from Finnish point of view and the authors have examined the border crossing issues from three different perspectives: logistics companies, Finnish customs and local society. According to the interviews, the research shows that the current problem at the border crossing point in Vaalimaa is truck queue, which can be sometimes dozens of kilometres and it causes problems not only to the Finnish customs, but also to the logistic companies and the local society. According to the interviews, the authors have presented that the main reasons for the inefficient border crossing process are bureaucracy, legislation issues, criminality level and poor IT-systems. In order to solve the problem and manage all the possible changes, the authors think that Russia and EU should have close cooperation in any level. A good example could be the development of a common IT-system in order to share all the necessary information faster. Moreover, both countries customs could get trained together and develop a better knowledge of how to operate the IT-system in the most efficient way.

The authors after analysing the current situation in Vaalimaa, created the “One-stop” model as an improvement of the whole border crossing process. The model based on four previous cases (NATAP, ITBCS, IBC, and Blain border crossing project) which have already been used in similar occasions. A validity test could not be conducted because of the theoretical approach of the suggested model and future research should be done in order to overcome the delimitations.

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Appendices

Appendix I: Interview questions for logistics companies

1. What kind of goods or products do you transport?
2. Where are they coming from?
3. What is the final destination?
4. Could you tell us the order-size (truck loads, containers etc.)?
5. Which means of transport (trucks, vessels, airplanes or railway) do you use?
6. Could you inform us about the transportation routes that you use?
7. Could you tell us the most important factors that you took into consideration when you designed the transportation route?
8. Do you adjust your transportation routes when the queue is long at Vaalima's border station?
9. If yes, which are the alternatives routes that you prefer to use and what are the reasons?
10. If no, what are the reasons that attract you to stay at the queue and not to change your route?
11. Do you know how much time does it need to cross the borders?
12. Are you satisfied from the time that you spend in order to cross the borders and why?
13. If no, what would a reasonable time for you?
14. In your opinion, what are the reasons for the delays at borders?
15. Do you use any Information Systems and what?

Appendix II: Interview questions for Finnish Customs

1. Where are the trucks coming from?
2. What is the final destination? (possible more destinations)
3. Who makes the decision for the trucks in which border station have to go?
4. What are qualifications for changing the transportation route, who does that, and where?
5. Why do you believe the truck drivers stay at the queue and do they have any other options?
6. Do you know how much time does it need to cross the borders?
7. In your opinion, what are the reasons for the delays at borders?
8. Can you mention some of the biggest problems that the local society faces every day because of the queues?
9. Do you think that there are also advantages because of the queues and what are they?
10. Do you use any Information Systems (IS) and what?
11. How often do you change the Information Systems?
12. Can you describe us how the IS works?
13. Do they have the same IS at the Russian side?
14. Can you describe us the whole procedure at the border station? (What papers are needed, who carries them, how you make the decision to inspect a load, what means do you use for the inspection, how long does it take? etc.)
15. What are the most important things that you pay attention during the custom controls?
16. In your opinion, what are the most important problems that you deal with?
17. In your opinion, what are your suggestions in order to speed up the process?
18. In your opinion, why do they prefer Vaalimaa border station at the most and not the other borders stations?
19. Are you using an automatically passport ID system?
20. What do you think about RFID tags, e-Seal (RFID), and DSRC transponder?

Appendix III: Interview information

COMPANY	POSITION	TYPE OF INTERVIEW
LV Company	CEO	Personal interview
Maersk Line Finland	Sales Executive	Personal interview
Customs	Customs chief in Kotka	Telephone interview
Customs, Vaalimaa	Customs chief in Vaalimaa	Personal interview