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CHOICE OF THE OPTIMAL ROUTE FOR MULTIMODAL CONTAINER
TRANSPORTATION

Bachelor's Thesis 2014

ABSTRACT

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The objective of the work is to find the most suitable route for multimodal container transportation from South Korea to Latvia, according to client`s requirements.

In this work were described different transport features and factors that can influence rout-planning process, presents container transportation market analysis, liner shipping process description, Dispatch and delivery places` geographical location and infrastructure description. After that were suggested several possible delivery routes for particular cargo.

In empirical part, author compare ways of cargo delivery according to particular way. Were defined price, delivery time and safety level for every route. According to results, were chosen the most optimal route for cargo delivery.

To achieve the objective were performed several tasks. First, to get familiar with the factors that may influence the choice of rout. After that to make an analysis of the container shipping market. Also to analyse geographical location of sending/receiving places and transport infrastructure Then to develop delivery routes and to analyse them, to compare analysis results, and, finally, to choose the optimal rout for cargo delivery.

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LIST OF ABBREVIATIONS

TACA- Trans-Atlantic Conference

FECC – Far east container conference.

BAF (Banker Adjustment Factor) – Added cost of fuel (for 1 TEU)

CAF (Currency adjustment factor) – Currency added fee (% of sea freight rate),

USD – United States Dollar.

TEU- The twenty-foot equivalent unit

FEU - forty-foot equivalent unit (often FEU or two TEU).

LPG – liquid petroleum gas

LNG - Liquefied natural gas

ETD – Estimated time of departure

ETA - Estimated time of arrival

NVOCCs – (Non Vessel Operating Common Carriers) Companies, which organize transportation by vessel, which are operated by another company. (Forwarders)

CFS – Container freight station

CIS- Community of Independent States

CBM – m³ .

IMDG - International Maritime Dangerous Goods Code

ADR- International Regulations Concerning the Carriage of Goods by Road

RAD- International Regulations Concerning the Carriage of Dangerous Goods by Rail

UN –United Nations

UNSTAD - United Nations Conference on Trade and Development

VAT (Latv. - PVN)- value-added tax.

1 INTRODUCTION

The topic of this thesis is “The Choice of the Optimal Route for Multimodal Container Transportation Organization”. As is known, logistics and the supply chain system is a developing structure nowadays. Primarily, thanks to the company’s desire to expand the borders and business opportunities, desire to globalize business, to find foreign partners and discover new horizons.

Mostly the products are manufactured in Asian countries-China, Japan and Korea. Many companies are buying items for resale or for own use directly from manufacturer because of low prices and high quality level. Therefore, the main question is “How to deliver a cargo from Asia to other places easily, safely, how to make delivery cheap and fast?”

This thesis objective was to find the optimal route for the container transportation from South Korea to Latvia, according to customer’s requirements.

Business greatly depends on the transport: how quickly the requested item may be shipped, is the delivery of the goods secure and they will not be damaged or lost, and the price.

There is also a need to understand the difference between modes of transport and their comparative advantage, for example, maritime transportation vs. air transportation. Both transportation modes are important; however, for cargo delivery to the point of destination, in most cases, carriers prefer to use the road transport. All these aspects serve to emphasize the need to assess the factors affecting the supply route selection, as it should be profitable, safe and cost effective.

To answer these questions and reach thesis objectives were defined six challenges to be met during the project. These are:

- > Get to know the various factors that may affect the route selection and planning;
- > Perform the container shipping market analysis;

- > sending and delivery places geographical location and transport infrastructure analysis;
- > To develop several possible route options;
- > Compare possible route options;
- > Choose the most suitable route for container transportation.

2 FACTORS AFFECTING THE CHOICE OF TRANSPORTATION MODE

In this part is presented the description of the methods for choosing the most effective transportation route.

The approach has been divided into four main sections: operational factors, cargo characteristics and factors, transportation mode characteristics, costs and service requirements. (3)

The key elements will be described further in this part, while the overall process is illustrated in Figure 1.

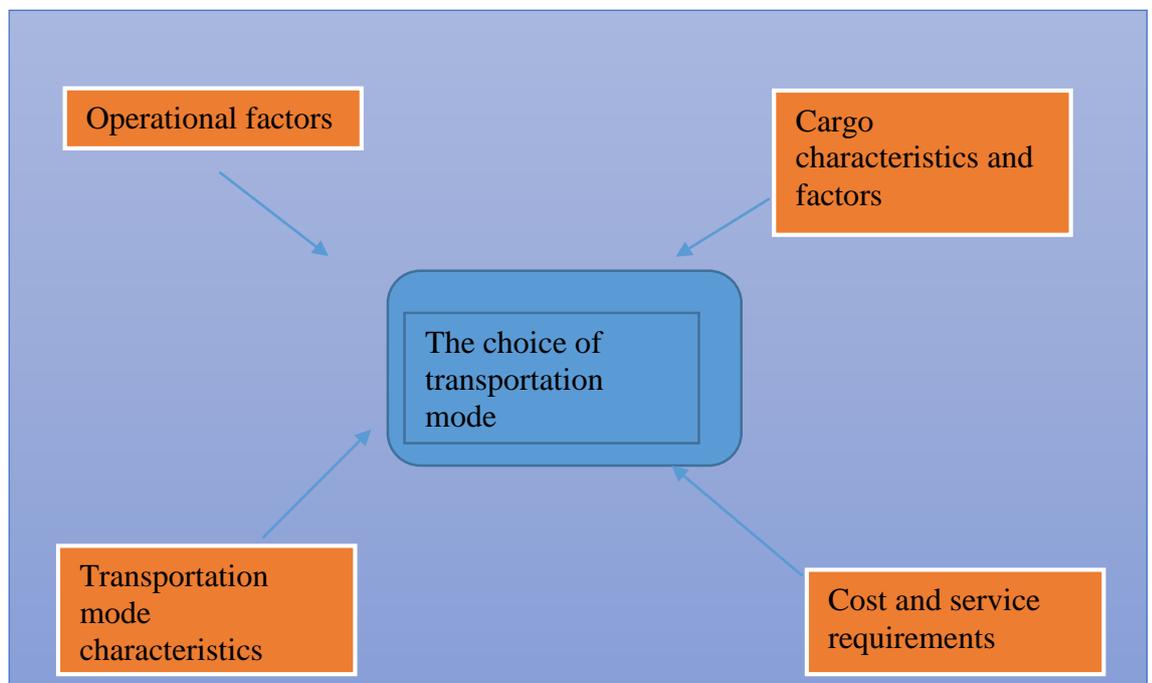


Figure 1 Process of choice of transportation mode (3)

Many of these considerations are quite clear, but the problems can still arise during defining aspects that affect the selection process of the transportation mode and

thus should be taken into account. To make the selection process faster and even more effective there is a need to use special methods. (3)

There is a large number of operational factors that should be taken into account while planning the transportation. They are classified as external factors related to distribution process, customer`s features and requirements, physical characteristics and other parts of logistics and supply chain. It is also important to remember that all transportation modes have different characteristics (time, risks, costs, etc.). It is clear that several transports with their operational requirements are more suitable in a certain case, than the others. (3)

Other important factors, that should be taken into account are relevant factors related to the overall route planning in order to ensure the effectiveness of the service (e.g. the shipment must be delivered very fast, it should be very cheap and there is no matter how long it will take). (3)

However, in most cases the customer is interested in finding the compromise between the price, speed and service quality. In other words, making a compromise is the key mission of planning the route and transportation mode selection process. (3)

2.1 External factors

Factors that are related to the other side of the direct distribution could be added to overall operational factors. They can be extremely important as different countries have different laws and regulations. Those are:

- basic infrastructure of the country (different transportation mode exploitation characteristics: e.g. it is easier to deliver cargo using rail transport, than auto transport; or there is no loading equipment directly in the specified location. In this case additional costs can emerge);
- market barriers (customs duties, import / transit tariffs. These factors may affect the price of the transported goods as well as the optimal route planning)
- export control and licences (the amount of goods, that can be carried during the specified period of time);

- Legislation and taxation policy (general rules may be similar, but there are some aspects that tend to vary (transportation and environmental rules can be different));
- financial institutions and services, as well as economic conditions (exchange rate, inflation and economic stability);
- communication systems (such as different service types or procedures, which can only be performed during the day);
- culture (different cultural aspects, that can affect the way of doing business);
- climate characteristics (extreme temperature changes that can affect the product's condition).

This list can continue, but these conditions are dependent on the country. (3)

2.2 Customer`s characteristics

Customer`s characteristics, requirements and relationships with partners can affect route planning. Both domestic and international customer`s characteristics and requirements can impact the planning process (except transportation by sea). The most important features that should be taken into account are:

- level of service quality (offers, time, price);
- location and accessibility of the delivery place;
- credit rating (payment terms and conditions, company`s reputation, etc.)`
- benefits and conditions of sales;
- cargo dimensions;
- importance of the customer;
- details of goods transportation. (3)

2.3 Cargo characteristics

Cargo characteristics and features is a very important factor since it influences the route planning process and selection of transportation mode. The most important facts are:

- the value of cargo
- weight and volume

- type of goods
- special terms and conditions during transportation (dangerous goods, special conditions of carriage) (3)

2.4 The description of characteristics of different transportation modes

The choice of transportation mode and route planning process that are described in this thesis study includes not only a variety of operational factors, but also transportation mode's specification aspects, that can impact the planning process. In this part the author would like to present different modes of transportation which can be used for cargo delivery.

2.4.1 Carriage of goods by sea

Cargo transportation by sea can be performed in four ways. One of them is conventional freight. This method is used in case of containerized cargo holds (e.g. coal or any other kind of bulk cargo). In this case cargo is imposed on the basis of U.S. dollar exchange rate (per ton.), transportation costs are calculated by multiplying the weight of the cargo freight rate per tonne. (14)

The second way is LCL (Less Than Container Load). The cargo is placed in the container, which is loaded on board. Container can also be loaded not only with one particular customer's cargo. Sometimes one container can be loaded with cargos that belong to several different shippers. In this case transportation costs are calculated by multiplying rate by metrical volume (m^3). (14)

The third way is FLC (Full Loaded Container). A container is loaded with one particular customer's cargo and is placed on board. In this case transportation costs will be calculated according to the type of the container. Every container type has its own fixed transportation rate. (14)

The last way of transportation by sea is RO-RO (Roll On- Roll Off). This method is suitable only when cargo is literally "rolled" on and off board. The costs depend on U.S. dollar's rate the rate in dollars per unit by m^3 . The rate may be different if the cargo is on wheels or not. (14)

Cargo transportation by sea is very favourable and convenient, because the costs are relatively low and thus any type of cargo can be carried and handled for long distances, in addition that is why it is relatively slow. The port operations (loading, unloading, cargo processing, custom clearance) take time as well.

Maritime transportation properties and conditions

Maritime liner shipping companies send containers to the warehouse where the cargo will be sorted and loaded. This procedure is the responsibility of consignor. After the loading process is completed, there is a special seal with a unique number that stevedores put on the container doors. The seal helps to prevent cargo loss and theft.

While container is being loaded on board, the company issues the Bill of Lading, which fulfils three important functions:

- the evidence of receipt of cargo
- the evidence of a contract of carriage
- the documentation of title to cargo. (16)

Other shipping documents fulfil first two functions of B/L, but do not control transit cargo delivery at the delivery destination point, as well as do not favour the buyer to sell the goods to third parties. These documents refer to the state that has the right of acceptance of the cargo at the place of delivery.

Bill of Lading cannot be issued electronically, only in 3 original copies to the shipper, carrier and consignee. Without the original of B/L cargo cannot be received.

When the original B/L is issued, the buyer or the bank must comply with all conditions of payment according to stated requirements. After the payment procedure is completed, the shipper or seller sends another set of shipping documents to the buyer or recipient.

In the set of transportation documents there must be approval note that cargo is delivered and received, this note is issued by the carrier.

Marine transportation documents

Clean transportation document – when goods are transported and delivered to the destination point without any damages. If the cargo was damaged during transportation time or there are any changes in its physical condition, documents are called “unclean”, “claused” or “foul”.

In container transportation all the documents usually are „clean” because the cargo is in container and no one opens or checks it during the transportation process.(2)

Marine (ocean) bill of lading (B / L) - a document signed by the liner shipping company representative or NVOCC. The basic and most important information is noticed in this document, there is date and time of issue, B/L number, information about vessel, cargo, seller and buyer, terms of payment. (2)

Negotiable B/L – a transportation agreement which can be sold to third party. Non-negotiable B/L cannot be sold and changed. (16)

Sea waybills (liner waybills) – is a direct/standard marine transportation document, similar to Non-negotiable B/L. (2)

House B/L – marine transportation document that is issued by freight forwarder for shipping line. (2)

Freight regulatory documents

Maritime transportation process can cause some problems or questions pertaining to financial responsibility and material relations. Therefore, during the period of international trade development several rules for regulation of international business process were created. Particularly it is important to notice three documents governing the carriage of goods:

- International Convention for the Unification of Certain Rules of Law Relating to Bills of Lading (Hague Rules) Brussels, 1924. This convention was signed by

more than 80 countries. The main idea was to develop minimum of standards related to carriers' responsibility and obligations. These standards gave an opportunity to divide the responsibility between two parties – cargo owner and carrier. (13)

- Protocol Amending the International Convention for the Unification of Certain Rules of Law Relating to Bills of Lading well known as the Hague - Visby Rules, 1968-1977. The reglament is that the shipper has less bargaining power than the carrier, and protecting the rights of the shipper, the law should impose minimal obligations upon the carrier. (13)
- United Nations Rules for cargo transport by sea, or the "Hamburg Rules" (Hamburg, 1978).

Containerized cargo transportation is governed by the IMO Convention for the safe carriage of containers (International Convention for Safe Containers), adopted 02.12.1972. (13)

2.4.2 Cargo transportation by road

Road transportation mode appeared at the beginning of the 20th century and at once took the leading position among land transport. It is well-known that nowadays roads are rapidly expanding and the length is about 24 million kilometres all over the world. Parts of them are in USA, India, Russia, Japan and China. The world leader of road transportations is USA, as well as several European countries. Approximately 80% of passenger traffic is carried also by road transportation. (15)

Cars and trucks are used not only for goods transportation to long distances, but also in state border areas. This mode is very suitable for cargo delivery to the railway stations, river and port terminals or in “Door-to-Door” transportations. Trucking is growing rapidly due to its high manoeuvrability and high speed. That ensures the delivery straight from sender to receiver. Road transport mobility allows responding quickly to any changes in route, loading/unloading positioning. These changes do not require as much time as e.g. changes in maritime shipping route.

Thanks to the easy flexible schedule and ability to deliver cargo “Door-to-Door”, the sender has no need to organize extra changes of transportation modes or to plan a difficult route.

The main benefit is that the transportation costs can be minimized this way.

Road transport is a very lucrative way to the high-value goods transportations on short distances. Sometimes shipping charges can compete with rail tariffs, as well as efficient and high-quality service.

2.4.3 Cargo transportation by air

Air transport is a mode of transportation, which is very fast but relatively expensive. It plays an important role in the field of international passenger traffic. Other benefits are geographical mobility and service quality. There are about 5,000 big airports worldwide, main are in USA, Russia, Japan, U.K., France, Canada and China.

In comparison to other modes of passenger and freight transportation the air transport has a huge advantage in route length and speed. It took a strong position in the international passenger traffic. Only in last 80 years it's capacity has doubled, because of new high jet aircrafts with high comfort and service level, energy efficiency indicators and transportation costs improvement.

It is very easy to match air freight with any other, because of convenient Airport-to-Airport system and schedule flexibility.

However, problems may arise due to the fact that the commercial recording, loading and reinforcement takes time, and it affects the timely delivery. This mode of transportation is best suitable for large companies or manufacturers because, due to the fact that the goods can be delivered quickly, the aforementioned big companies can reduce costs relating to the warehouse operation. This concept is known as "LEED-time economy."

However, the air transport is very expensive, and this is a disadvantage of this mode.

In the air transport the rate is calculated in two ways. The first is by the actual weight (if English measurement system is used weighting the goods), the second - by the amount (the weight is multiplied by 166, resulting in a weight in kilograms). In both cases, the rate is based on the U.S. dollar and the weight in kilograms. (14)

2.4.4 Cargo transportation by railway

In recent times, railway transport in land cargo deliveries is used quite rarely; however, it still has an important role. Approximately 10% of all transported cargo is carried by rail.

The railway network has been operated since the beginning of 20th Century, its length is approximately 12.5 million kilometres in 140 countries worldwide. Half of it covers the U.S., Russia, Canada, India, China, Australia, Argentina, France, Germany and Brazil. But still there are several areas where there is no railway at all or it is not developed so well.

Rail transport is one of the most effective and convenient land transportation modes, especially for bulk cargo. Not long time ago, the railway administration presented more services to make the transportation even more effective: vehicle platforms, ISO container transportation, new technologies for loading and handling operations, freight forwarding operations, etc.

This transportation mode is relatively inexpensive and it suits perfectly for bulk or oversized cargo transportation to long distances, in case time is not so important. But there is also a disadvantage- loading time can be longer if there is a need to move cargo from rail to truck or other transport. This mode is slow because there are not so many locomotives available at stations or in factories. The documentation preparation, the railway regulations and conditions in different countries can also impact the transit time.

2.5 Transportation risks, overview

Any cargo transportation procedure includes a variety of risks. Emerging risks are affected by various factors such as weather conditions, packing, loading, etc. In this

part the simple table with list of risks that can appear during the transportation was drawn. (Table 1)

Table 1. Possible risks during cargo transportation.

<p>Transportation by sea:</p> <p>Weather conditions</p> <p>Shallow</p> <p>Fire on board</p> <p>Navigation systems error (captain's incompetence)</p> <p>Commercial mistake (Handling, packaging, documentation)</p> <p>Cargo loss or delay</p> <p>Pirate attack</p> <p>Emergency</p>	<p>Transportation by road:</p> <p>Weather conditions</p> <p>Cargo loss or delay</p> <p>Automobile disorders</p> <p>Emergency</p> <p>Commercial mistake</p> <p>Road repair</p> <p>Different speed limits</p>
<p>Transportation by air:</p> <p>Weather conditions</p> <p>Flight delay</p> <p>Cargo loss or retention</p> <p>Emergency</p> <p>Commercial mistake</p> <p>Crew mistake</p> <p>System error</p>	<p>Transportation by railway:</p> <p>Weather conditions</p> <p>Cargo loss or retention</p> <p>Commercial mistake</p> <p>Service staff incompetence (loading / unloading, packing or reinforcement)</p> <p>Technical Problems / emergency</p> <p>Poor railway condition</p>

2.6 Cargo containerisation and its characteristics

Cargo containerisation is cargo transportation in containers (special or universal). Special containers are used for transportation of the cargo that needs special storage conditions: hazardous goods, perishable goods, etc. One of the advantages of the containerized cargo transportation is that cargo is delivered “from door to door” without any risk of damage. The current container system is adapted for any type of the transport. This system helps to expand the supply chain limits, handling

procedures and cost reduction. Containers are easily transferred from one transport mode to another.

Railway containers are shipped by rail and road transport, maritime containers- by water transport. Air containers are transported by air and road transport. There are special requirements for every particular multimodal transportation. For example, railway transportation is cheaper, then road transportation. It also offers more flexible schedule.

Earlier cargo containerisation was considered as an economical problem, but now this aspect is viewed from the logistics side. All transportation modes must be integrated in one standardised system. There should also be a common measurements system and documentation standards. However, for profitable transportation (in accordance with ISO standards), all vehicles and other transport modes have to be equipped with unified parameters. All handling equipment should also fit to every transport mode and all types of containers.

Speaking about maritime containers, for international and inland transportation a re-usable transportation equipment unit is intended for. Container`s frame must be sufficiently strong during the whole period of use to ensure safe transportation period.

Despite the purpose of the container, all of them have similar dimension system. They are standardized by gross weight, dimensions, size and construction of fastening parts (handling equipment`s, railway stock, road trailer platform).

Thanks to these standards, cargo handling, loading/unloading time, delivery time, transportation costs can be reduced. Multimodal container transportation is economically profitable, but not all of the existing ports can serve the needs of big container vessels. Therefore, transportation is organized by “feeder” principle. It means that liner ships with great draft call at first 5-6 large ports with deep waters (that allows to moor the vessel and to make all essential operations), then smaller feeder vessels transport containers to the smaller ports.

Container handling operations costs are not relatively high, but still cover the costs of all additional cargo services. As it was previously mentioned, the container

transportation helps to deliver cargo without any damage. The amount of cargo and flexible timetable also helps to reduce cargo delay. The container transport mode allows operators to reduce the cost of loading and unloading, cargo storage and retention costs, handling costs, cargo storage and retention costs.

2.7 Types of containers

A container is a unit of cargo storage and a carriage which is used for cargo transportation operations. These are made of different materials and have different shapes. Multi- purpose containers are used more often.

2.7.1 20` Standard

The container is completely closed, water and dust-tight with a solid roof, side and end walls. At one end of the wall is a door. It is designed for various cargo transportation and storage. The container's sizes are given in Table 2. (9)

Table 2. 20` container specification.

Description	Parameters
Max. load	28 200 kg
Dimensions	20` * 8` * 8`6``
Capacity	33m ³
Door, width	2 350 mm
Door, height	2 274 mm
Internal length	5 896 mm
Internal width	2 350 mm
Internal height (loading line)	2 393 mm
Weight (Gross)	30 480 kg
Weight (empty)	280 kg

2.7.2 40` Standard

The container is completely closed, water and dust-tight with a solid roof, side and end walls. At one end of the wall there is door. It is designed for various cargo transportation and storage. The container's sizes are presented in Table 3. (9)

Table 3. 40` Container specification.

Description	Parameters
Max. load	28 200 kg
Dimensions	40` * 8` * 8`6``
Capacity	67m ³
Door, width	2 340 mm
Door, height	2 274 mm
Internal length	12 032 mm
Internal width	2 350 mm
Internal height (loading line)	2 393 mm
Weight (Gross)	32 500 kg
Weight (empty)	3 700 kg

There can be found parameters of one more 40` container in Table 4. The main difference from the ordinary 40` is the height. The High Cube Container is higher, so it can be loaded with a bigger cargo volume. (9)

Table 4. 40` HC (High-Cube container with increased capacity) specification

Description	Parameters
Max. load	28 620 kg
Dimensions	40` * 8` * 9`6``
Capacity	76m ³
Door width	2 340 mm
Door height	2 577 mm
Internal length	12 032 mm
Internal width	2 350 mm
Internal height (loading line)	2 697 mm
Weight (Gross)	32 500 kg
Weight (empty)	3 880 kg

Standard containers are often used for different cargo transportations. There are also other container types that are designed for specific cargos. (9)

The “*Open Top*” doesn’t have a roof, the “*Flatrock*” does not have side walls. These container types are used for an oversized cargo, which cannot be loaded through doors. (9)

Refrigerators with the cooling system: isothermal with the refrigeration system (compressor, absorption equipment, etc.). Temperature range from – 35 C° to +30 C°. (9)

“*Solid*” containers have an artificial and a natural ventilation system. They are designed for loads that require special maintenance conditions. For example, to ensure that the harmful vapours or the condensate does not accumulate in the container. Such goods may be regarded paintings, furniture, fertilizers. (9)

„*Hermetical*” (Pressurized) containers are widely used in transportation of products, which need a special temperature or pressure during the whole period of transportation. (9)

2.8 International Commercial Terms (Incoterms 2010) description

Incoterms is an acronym composed of the first three syllables of the words International (International) Commercial (Commercial) conditions (terms). (11)

Incoterms are the standardized set of definitions of international trade, which is used to avoid confusion arising from different interpretations of the rules in different countries. These definitions have been published by the International Chamber of Commerce, gathering of world trade practices. (11)

First time it was published in the 1936th by the label of the International Chamber of Commerce.

Incoterms helped to standardize trade agreement and to eliminate confusion in trade; they are taken as the world standard. (11)

Incoterms 2013 is the latest publication for now, which is included in the sales-purchase agreement. (11)

These rules are used in case if two international companies sign a sales and purchase agreement and are not familiar with the standards in the conduct of trade in the respective countries. This problem can lead to confusion and legal disputes that can delay the process and cause large money losses.(11)

It is important to know that the force of Incoterms is limited by the scope of rights and obligations of the parties that are also included in the agreement (chapter about material goods providence). Intangible goods are not covered by Incoterms. Usually in practice there can be two types of misunderstandings connected with Incoterms. (11)

First, Incoterms are misunderstood if one thinks that these refer more to the transportation contract, rather than to the sales contract. Second, it is wrong to think that Incoterms cover all obligations that may be included in the contract. As has been mentioned, these conditions apply exclusively to the seller and the buyer according to the sales contract terms.

It is important to consider the actual relationship between various contracts that are needed to perform international sales transactions. Because these are not only the contract of sales, but also of the transportation, insurance and financial contracts. Incoterms relate to only one of them – sales contract. However, the choice of the term is also affected by other requirements.

Here are a few examples. The parties agreed on CIF. The seller, in accordance with the terms of the contract, must provide a waybill or other transport document. In addition, a document that is required under the documentary credit policy will necessarily depend on the used transportation mode. (11)

Secondly, there is also a variety of responsibilities that are to be met by the allocation of risk between the parties. The seller must deliver the goods at the port of delivery, and cover all the costs (risks, freight, loading). Seller's responsibility ended at the moment when the goods are not on board anymore. For example, if cargo will fall into the water during the handling process, the seller will not cover any damage costs, it will be the buyer`s responsibility. In case of accident, the seller covers minimum of costs. (11)

Despite the fact that Incoterms are an important part of the purchase and sales agreement, a number of problems that can occur are often highlighted, such as the sale rights to other parties, non-fulfilment of the contract, and release from liability in particular situations. Incoterms cannot replace the contractual terms, or to solve the problems. (11)

In the last version of Incoterms all the conditions are grouped in four categories to make the understanding easier. Incoterms begin with the term under which the seller offers product availability in his own area ("E" - EX WORKS).

Then comes the second group, where the seller must give the product to the carrier, which is determined by the buyer (the "F" - FAC, FAS or FOB). (11) (6)

The third group is the "C"-group, where the buyer signs a contract of carriage, but does not take the risk of product damage or loss and of additional costs for shipping or handling of goods (CIF, CFR, CPT, CIP). (11) (6)

The last group - "D" - where the seller is liable for all risks and costs, which are necessary for the delivery of goods to the country of destination (DAP, DAT, DDP). (11) (6)

Incoterms 2013, transcript

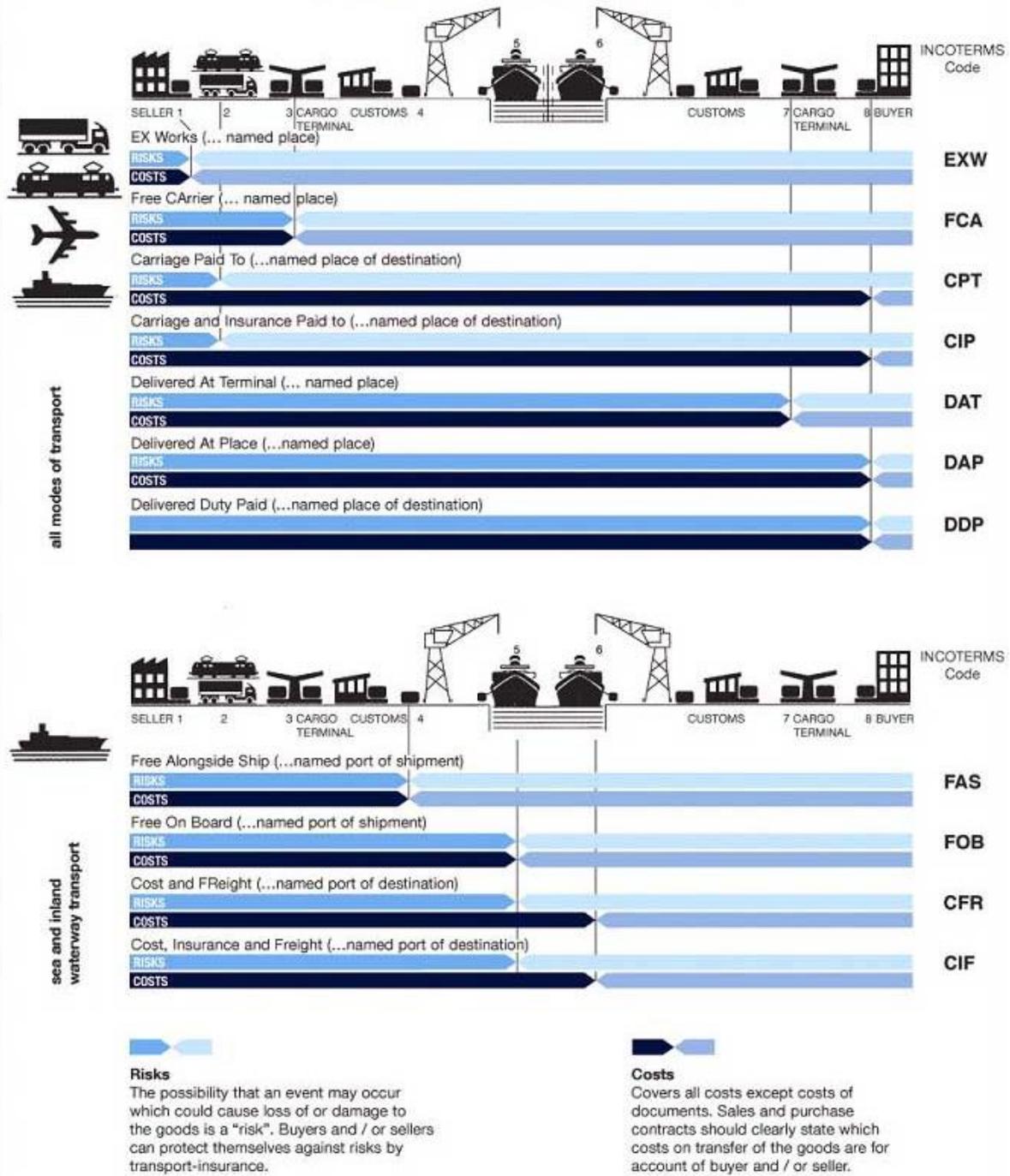
Any mode of transportation:

- EXW - ex-factory (transfer of Origin)
- CPT - Carriage Paid To (place of destination)
- CIP - Carriage and Insurance Paid to (place of destination)
- CFR - Cost and Freight (named port of destination)
- CIF - Cost, Insurance and Freight (named port of destination)
- DAT - delivered to the terminal (the place of destination or port terminal name)
- DAP - delivered to the place (place of destination)
- DDP - delivered by payment of a fee (place of destination)

Transportation by sea and inland waterways:

- FCA - free carrier (transfer of Origin)
- FAS - Free Alongside Ship (named port of shipment)
- FOB - Free on board (named port of shipment)
- CFR - Cost and Freight (named port of destination)
- CIF - Cost, Insurance and Freight (named port of destination)
- DDU, DAF, DEQ, DES no longer exists. (11) (6)

In the Figure 2 the transport links and the responsibilities of the buyer and the seller are presented. Contractual obligations of the parties are grouped together and written in the contract paragraphs. Every paragraph for every party represents their duties according to the particular task. For example, the two sides agreed on the use of the term FOB. FOB - "Free on board" means that the seller is responsible for the delivery of the goods to the port of shipment and has a product to be placed on board. When the goods are on board, the buyer is fully responsible. Under the terms the seller is obliged to prepare the goods for export. FOB term is used only when the goods will be transported by waterways. (23)



Remark: For detailed explanation reference is made to ICC publication INCOTERMS 2010

Figure 2 INCOTERMS 2013 (© Docstoc® 2013)

3 ANALYTICAL PART

In this part, information was collected and summarized from different sources and according to own knowledge gotten from previous studies in Latvian Maritime Academy and practical training in terminal “Vecmilgravis” and freight forwarding company SIA Intellog.

All rates and transit time information were collected from companies, presented in this study, by making calls and sending e-mails.

Solutions for route options were also developed with help of SIA Intellog operations managers and other presented companies` members.

3.1 Liner shipping. Analysis of its working principles.

Liner shipping is a specific form of the transportation service, where the carrier organizes regular transportations from one particular port to another. Usually it is used for a different general cargo delivery according to planned route schedules. Liner shipping company`s service includes berthing operations, different terminal and cargo operations, potential problem solving (e.g. demurrage). Liner service is a regular transportation schedule provided by the carrier, with the fixed cargo rotation in ports. The carrier must provide the service in ports which is related to outgoing and received cargo operations and further transportation (export, import). Despite the fact that ships can call several ports for loading, their ETD and ETA specifically listed in the schedule.

In order to understand the basic principle of liner shipping system it is important to imagine the large port with perfectly working security system and limited access. Today, the shipper does not have to deliver goods directly to the berth, the cargo is transferred to the terminal, from which it is sent further to the berth for loading on board.

When the cargo is finally in the port of delivery, it has to pass checking procedure. If the cargo is locked in a container, port workers just check the documents, the container`s number, the seal`s number, weight, etc. Also, they check if the cargo has been received without damages. If there are any discrepancies, the information

shall be recorded in the “Dock receipt”; in this case the cargo can be received only after the investigation. But that happens only if the cargo is not containerized. Containers are usually recorded as “clean”, without any damages. It is also essential to send the receiving receipt to the liner shipping office in electronic way. After that the office submits shipping documents.

The full package of documents for the particular cargo has to be ready and sent to the carrier one day before the vessel is loaded. If the cargo is not ready for loading and documents are not ready, it stays in the terminal until the next loading.

Usually the liner vessels carry containers, because almost any type of cargo can be containerized. Generally, shippers assemble a full loaded container themselves. If there is not enough cargo for full container load or shipper does not have its own container, the liner company or container consolidators offer their service at the special charter stations (CFS).

Usually the liner vessels are container carriers or Ro/Ro type vessels. There also are several that can carry loss or combine the carriage of bulk or loss with containers.

The biggest part of the liner shipping companies is operating by „hub-and-spoke” system. „Hub” port- a major (mother) port that can operate large ocean vessels. From „mother” vessels the cargo is handled to the smaller „feeder” vessels that deliver the cargo to the ports of destination (spoke-line ports).

3.2 Liner shipping in Freeport of Riga.

Port of Riga is one of the commercial ports of Baltic Sea, which is located in Latvian Republic. The port is located on both costs of the river Daugava, its length is about 15 kilometres. The water territory of the port is 4 386 ha, the land territory – 1 962 ha, the maximum draft is 14, 7 m. (24)

The handling capacity of the port’s terminals is million tons per year, which was the highest in Baltic States in year 2012- 36 million tons. The biggest percent overall cargo turnover is the transit cargo from CIS (Commonwealth of Independent States). (24)

There are 33 stevedore companies and 28 shipping agents operating in the Freeport. The main cargo types that are operated in the port are containers, different metals, wood, coal, fertilizers, and chemical and petroleum products. The percentage of the cargo handled in year 2013 is presented in figure 1 and 2. (24)

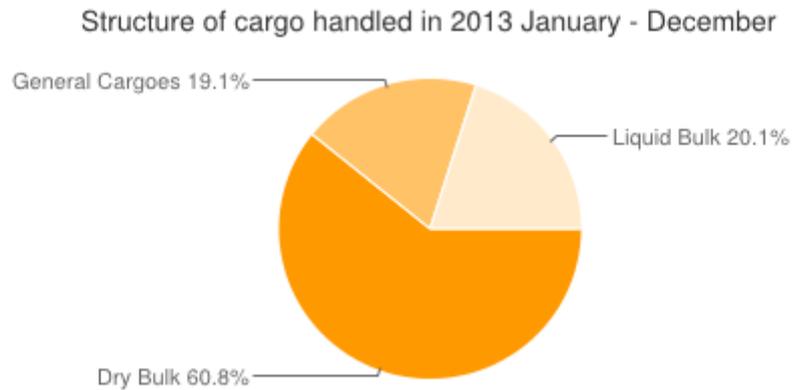


Figure 1 Structure of cargo handling, year 2013 (© 2013 Freeport of Riga)

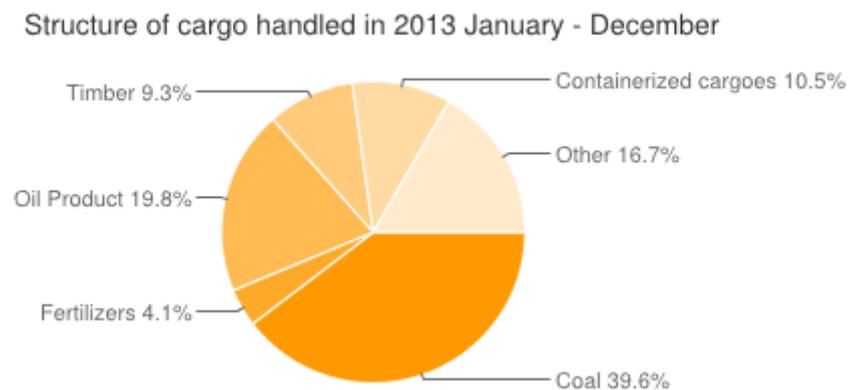


Figure 2 More detailed structure of cargo handling, year 2013 (© 2013 Freeport of Riga)

In the figure 2 it is clear that the containerized cargo does not have the highest percentage of overall turnover, however, it takes the third place.

There are different liner shipping companies that are operating containers in the port of Riga, these are BCT (Baltic Container Terminal), Frigo Baltic, RCT (Riga Container Terminal) and RUT (Riga Universal Terminal). There are different liner shipping companies as well, most of them are the largest in the world's container market:

- Maersk

- MSC
- CMA-CGM
- Hapag-Lloyd
- Safe Shipping
- MOL
- OOCL
- K line
- Evergreen line
- Zim
- Hamburg Sued
- CSAV group

All of above mentioned companies are delivering containers to the Freeport of Riga. They also offer commercial processing and storage services. The Table 5 below shows the world rating of the container operating companies by the cargo volume. (25)

Table 5. World's container carrier rating by the volume of cargo (alphaliner.com)

Rnk	Operator	Total		Owned		Chartered			Orderbook	
		TEU	Ships	TEU	Ships	TEU	Ships	% Chart	TEU	Ships
1	APM-Maersk	2 630 861	578	1 424 345	245	1 206 516	333	45.9%	292 320	16
2	Mediterranean Shg Co	2 382 755	488	1 043 301	191	1 339 454	297	56.2%	457 029	40
3	CMA CGM Group	1 502 474	429	527 782	84	974 692	345	64.9%	195 490	19
4	Evergreen Line	813 015	200	450 147	101	362 868	99	44.6%	260 383	25
5	COSCO Container L.	790 939	172	426 293	108	364 646	64	46.1%	66 930	5
6	Hapag-Lloyd	737 794	154	390 899	66	346 895	88	47.0%	39 507	3
7	Hanjin Shipping	646 752	120	311 546	46	335 206	74	51.8%	81 800	10
8	APL	643 750	124	312 600	44	331 150	80	51.4%	83 200	8
9	CSCL	585 027	137	419 049	78	165 978	59	28.4%	172 000	13
10	MOL	545 100	111	214 722	35	330 378	76	60.6%	76 600	7
11	OOCL	472 523	91	312 065	46	160 458	45	34.0%	61 968	6
12	NYK Line	458 716	102	300 513	54	158 203	48	34.5%		
13	Hamburg Süd Group	440 808	102	271 065	51	169 743	51	38.5%	146 762	18
14	PIL (Pacific Int. Line)	379 914	179	238 713	113	141 201	66	37.2%	57 656	14
15	Yang Ming Marine Transport Corp.	373 459	88	213 354	45	160 105	43	42.9%	245 200	22
16	K Line	357 254	69	127 352	21	229 902	48	64.4%	69 350	5
17	Hyundai M.M.	335 493	58	100 646	17	234 847	41	70.0%	65 500	5
18	Zim	335 237	87	133 394	25	201 843	62	60.2%	35 200	4
19	UASC	283 136	52	198 164	26	84 972	26	30.0%	178 000	12
20	CSAV Group	260 019	53	63 418	13	196 601	40	75.6%	82 300	9

According to the data provided in the table 5 it is easy to see that Maersk Line nowadays is the leader in the world's container operations. The company currently employs 25 000 staff worldwide, owns 600 vessels and is capable of carrying 3.8 million TEU. (25)

3.3 International container transportation, market analysis.

The World Ocean takes about $\frac{3}{4}$ of the world's territory, so the maritime transport is a very important branch, especially in the container traffic. Approximately 50-60% of maritime transportations are the container traffic. But if to take only general cargo transportation, containers take about 90%. (15)

Container transport sector is currently one of the fast-growing in the world's market. Its expansion and demand growth is affected by different factors, such as the fleet market development and globalization of economic activities. Also, the deficit of cargo volume and the fact that trends are changing especially tends to container sphere development. (15)

3.3.1 Current Trends

As has been mentioned earlier, maritime transport costs are relatively low, the use of containers makes it universal, because any cargo can be transported in containers. Liner shipping services offer the most convenient and the best solutions for both ship owners and cargo shippers, as it allows to load vessels in both directions and helps to avoid "empty" routes. Of course, it is strongly influenced by the freight costs. The fact that the cargo nomenclature is very wide; it attracts more customers (including those who are accustomed to using other modes of transport, organization of transport). (15)

3.3.2 Competitiveness

World container shipping market is very competitive. There are approximately 24 different competing carriers, whose goal is to get the maximum profit from container shipping, because the sea transport is only a part of the entire multi-modal transportation system. (15)

The container must be delivered by land from the sender to the point of loading and then- from the port of delivery to the recipient. Such services is offered by the variety of shipping companies, and not necessarily that the shipping companies are the leaders in this particular field, as most shipping companies usually divert the containers to other specialists who deal with other modes of transport. These,

mostly large multinational companies, operate as cargo forwarders. They have a wide range of clients and a good experience in land transportation organization. Many of them are very successful in competing with major ocean container carriers, offering a full range of services for containerized cargo delivery. (15)

Nowadays, there are 5 966 vessels, which are operating in liner shipping and transporting approximately 17 662 459 TEU`s and 225 288 694 TDW, including 4 987 ships that transport 17 195 053 TEUs. (25)

In the given figure 8 are presented 10 companies, which are carrying containers all over the world, the TEU traffic volume and percentage. The light blue colour shows the part of fleet that is currently running. It is clear that the biggest part of the market belongs to MAERSK, MEDITERRANEAN Shg Co (MSC) is on the second place, and CMA CGM Group on the third. These statistics are published on 10/13/2013. (25)

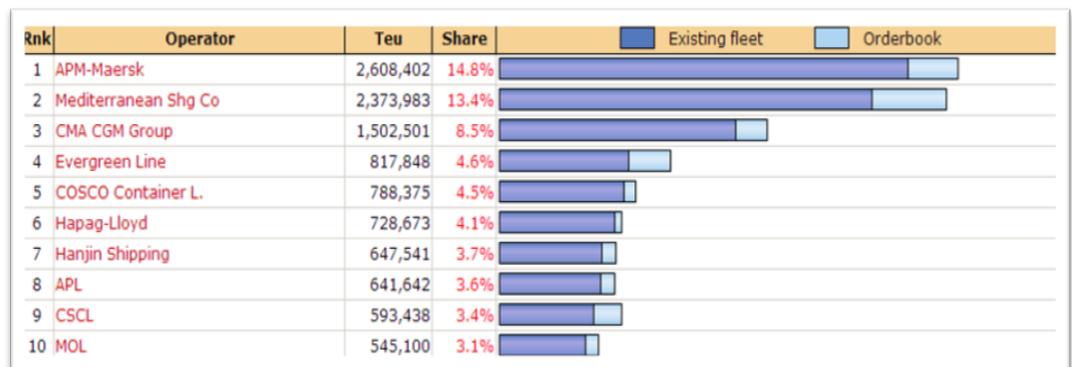


Figure 8 World rating (<http://www.alphaliner.com/top100/index.php>)

3.4 Pricing strategy for the world's container transport

Key factors that affect the price of transportation are the distance and direction, export and import, other different factors and costs, port fees, the type of container, is container owned by the carrier or by owner of the cargo. It is very important to consider the seasonal and weather conditions as well, as, for example; during the winter the price will be higher, because of the need for additional service to improve conditions for easier navigation. World exchange fluctuations, fuel price volatility and world's amount of cargo are also strongly influencing freight costs.

This segment of the market is oligopolistic. But sometimes, when it comes to regular customers who have a large amount of cargo, the company offers a service

fee lower than it is shown. As a result, other carriers are lowering their rates to remain competitive. Usually it appears when companies start offering a variety of services "packages" with different prices to different customers based on the amount of shipped cargo. The offered price is different from the basic fixed prices by approximately 20%. (15)

Sea shipping fees formation looks like this: freight costs + CAF + BAF + other additional costs. Abbreviations may be different, but the point remains the same. When the client requests transportation rates, the supplier must determine all the components separately, or if the client cannot count everything independently, the freight forwarder has to offer ALL IN (all-inclusive) rate.

Often, liner-shipping companies introduce a special rate, which is linked to a pirate attack cases. It's called Pirate Surcharge (PS) and is approximately 100 USD/ 20 TEU and 230 USD/ 40 TEU. PS takes into account if cargo is transported to or from South Africa and East Africa, Dar es Salaam, Tang, Zanzibar, Mombasa and Nacal ports. The money, earned from PS charges, is sent to the foundation, which is organized to fight against piracy. (18)

3.5 The description and analysis of transported goods

The case and cargo description were given by company Intellog Ltd.. The company Intellog Ltd. , which is located in Riga and is operating as a freight forwarding company, offered to pave a route for cargo transportation from South Korea to the port of Riga and after that to the customs warehouse. The company provided a part of transportation documents (B / L, commercial invoice, packing list), which can be found in Annexes I to III.

The cargo is special massage beds, designed by Nuga Medical Co., Ltd. (S-Korea). This company is a world leader in wellness products. Nuga Best products are very popular and are being successfully sold in Latvia. The company`s stores are located in several Latvian cities - Daugavpils, Jelgava, Jurmala, Liepaja and Riga.

3.5.1 Cargo description and analysis

The transported cargo is “Personal low frequency combined stimulator by warm heat NUGA BEST NM-5000”, 155 kits plus additional parts. The price of one kit is 972.50 US dollars. One kit includes main bed, bed frame and sub bed. The cargo is located in South Korea, Busan city. In the table 5 below are given all dimensions of presented goods. (Appendices I to III)

Table 6. Dimensions

Name of position	Number of packages, box	Size of one position, cm	NETO, kg	GROSS, kg
MAIN BOX	155	125*63*19	11811	4960
FFRAME BOX	155	134*66*23	4650	5890
SUB BOX	155	93*63*18	1581	1860
A/S PARTS	2	55*47*32	42	45
	2	55*47*32	30	33
TOTAL:	169		11 883,00	12 788.00

The total volume that is specified in Bill of Lading is 64 0000 CBM without pallets.

For transportation of given amount of the cargo could be used two 20` containers or one 40` container. The maximal volume that can be carried by 20` container is 34 CBM, 40` - 67.7.CBM. The author suggests to use one 40` container, because it is cheaper than two 2x20`. The cargo is loaded without pallets.

3.5.2 Loading space

Knowing the information about the dimensions of the cargo and the container. The percentage of the space used when the container is fully loaded could be calculated.

$$V_{krava} = 64 \text{ m}^3$$

$$V_{kont} = 67,7 \text{ m}^3$$

$$K_{kr} = \frac{V_{kont}}{V_{krava}} = \frac{67}{64} = 1.05 \quad (1)$$

K_{kr} – loading factor

V_{krava} – the volume of the cargo, m^3

V_{kont} – the volume of loading space of the container, m^3

The volume of the cargo loaded fills the container by 100%.

In 40 containers the cargo can be transported by different modes of transport. There is no need to take the cargo out of the container during the transportation.

Weight of the cargo with the container is:

$$M_{kont} + M_{krava} = 12788 + 3700 = 16488 \text{ kg.} \quad (2)$$

M_{kont} - container, kg

M_{krava} – the cargo with the package, kg

3.6 The analysis of Busan transport infrastructure and geographical location.

The national transport infrastructure (railway, roads, and air and sea ways) is highly developed in South Korea. (28)

The total length of railways is 6240 km. The railway is one of the main modes of transport in Korea. Kjonbu line connects the capital of S-Korea with the second largest city Busan. The underground system connects six biggest cities of the country – Seoul, Busan, Tegu, Incheon, Gwangju and Daejeon. (28)

Roads in this country are divided in two parts: national and high-speed. Total road length is 97,252 km; 74,641 km of them are paved. High-speed roads all are toll roads. But it is good that their location is about the same as national roads, which are still free of charge. [28]

S-Korea has one of the world`s largest ferry fleets. Korean ferries go to Japan, China and Russia. The main ports of S-Korea are Jinhae, Incheon, Gyeongsang, Busan, Mokpo, Pohang, Donghae, Ulsan, Yeosu, and Sokcho. The Merchant Navy has 650 ships, which is 7,992,664 registered gross tons, seventy-nine of them are carrying containers. (28)

Busan (부산 광역시 / Busan) is the city in S-Korea (Figure 8), which is located at the south-east coast of the country, the second biggest city. The port of Busan is the biggest port in S-Korea, also the 6-th biggest port of the world . (28)

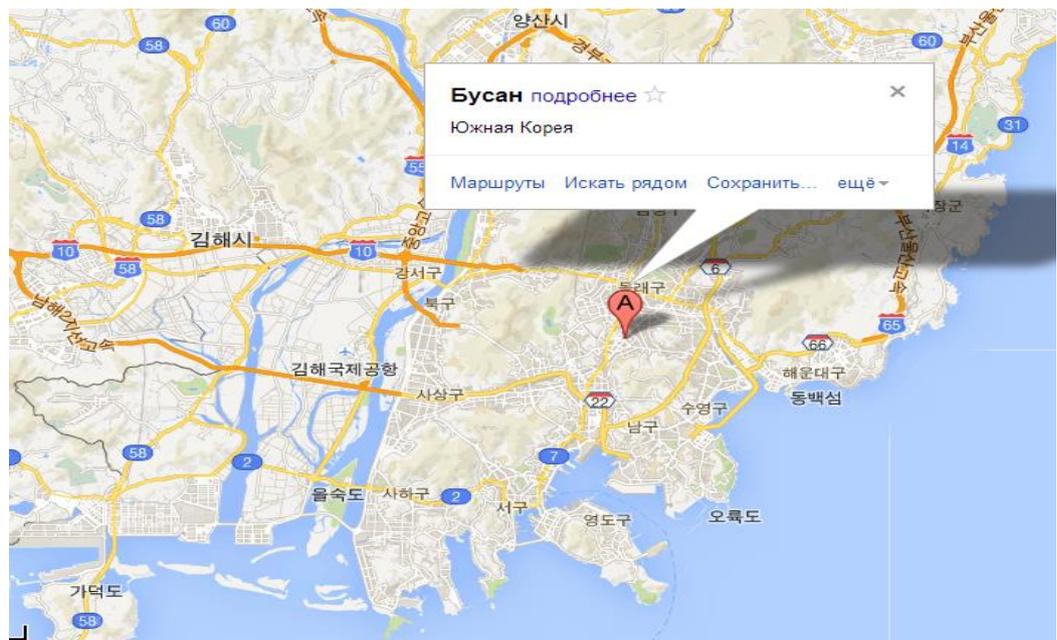


Figure 8 Busan, S-Korea. (google maps)

The port is located in the south-eastern part of S-Korean peninsula and serves as the gateway between Pacific Ocean and Asian continent. The Busan Port handles approximately 40% of the total export cargo, 80% of containers (the third largest container in the world). The port consists of North Port, South Port, Gamcheon and Dadaepo Ports. (28)

The Gimhae International Airport is located not far from the Busan Port (figure 9 „A”)

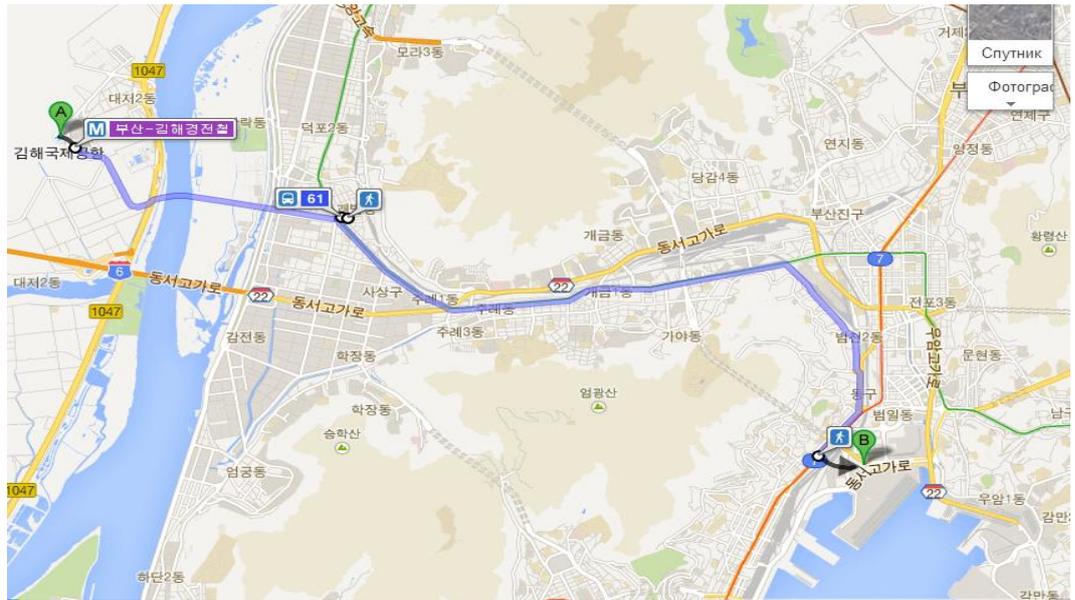


Figure 9 Port Busan – „B”; The Gimhae International Airport – „A”. (Google maps)

It is very easy to get both to the port and to the airport by car, bus or underground. The way from the airport to the port takes about 10 minutes.

3.7 The analysis of Riga transport infrastructure and geographic location.

The cargo must be delivered to the port of Riga, Latvia (see figure 10). Latvia is located at the coast of the Baltic Sea. There are 3 big ports: Liepaja, Riga and

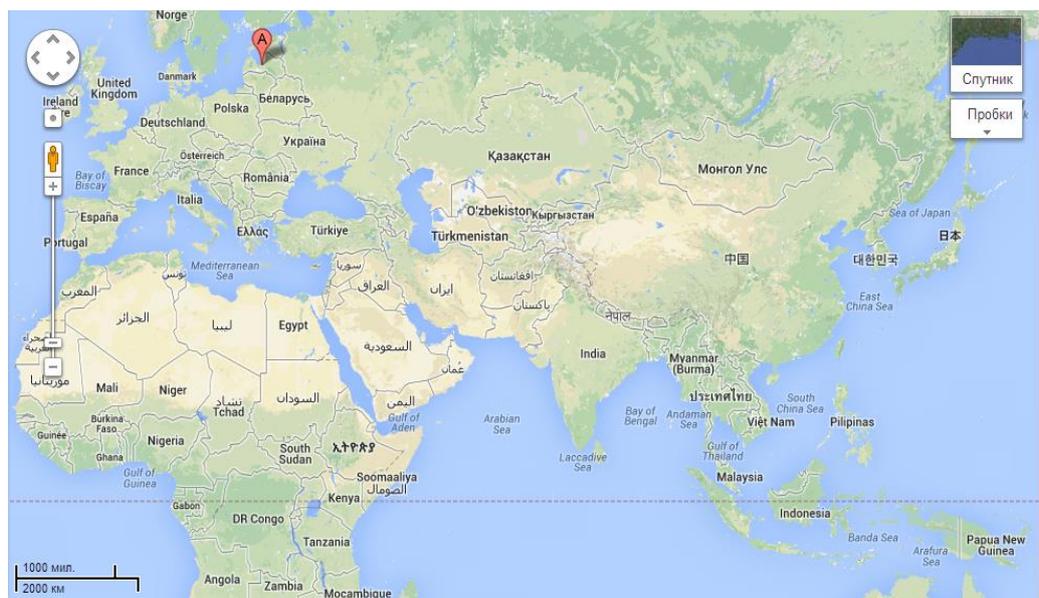


Figure 10 The location of place of delivery. Riga, Latvia. (Google maps)

Ventspils. There are also very developed roads and railways across the country, which give an opportunity to go abroad to the neighbouring countries and others.

The biggest part of the total turnover, which is operated by Latvian ports, is transit cargos.

The international airport is located not far from the centre of the city, approximately 15 kilometres. It operates different kinds of international flights and also has several warehouses.

The railway network is connected to the port terminals and warehouses, to make easier handling and transportation procedures.

3.8 The analysis of cargo delivery options

The cargo is located in S-Korea; port Busan, which has a free exit to the Pacific Ocean. Knowing the transport infrastructure in this area, the author offers several options for transportation routes:

- transportation by sea (Maersk);
- transportation by sea (MSC);
- transportation by sea and railway;
- transportation by railway;
- transportation by railway + road;
- transportation by air + railway

These examples of possible routes were chosen randomly, but according to infrastructure opportunities of both sending and delivery places.

3.8.1 Transportation by sea

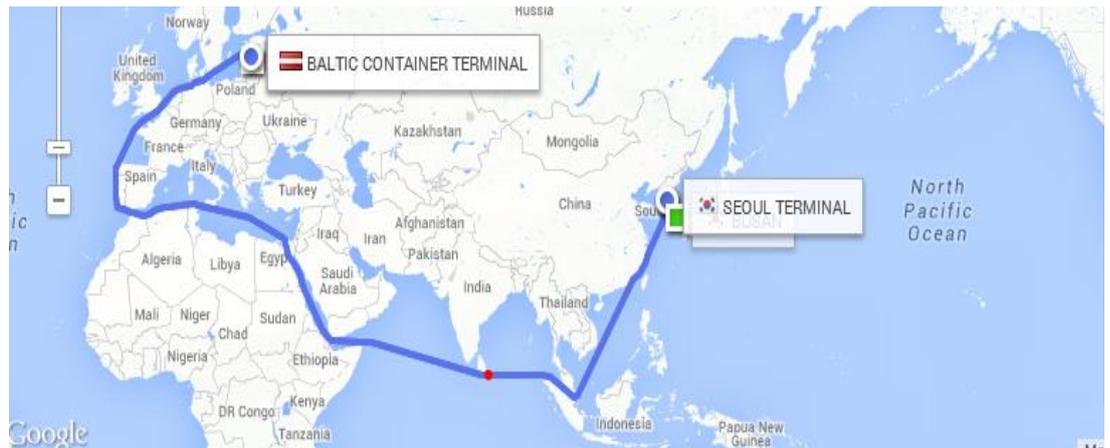


Figure 11 Sea route. (2005-2014 © SeaRates LP)

In the figure 11 the route, which is going through Indian Ocean, is marked with a blue line. In this case the cargo can be delivered by two companies: AP Moller (Maersk Group) and MSC.

MSC-Mediterranean Shipping Company is the world's second largest company, which is operating the container traffic. The company is represented in more than 200 countries worldwide. A total workforce is around 40 000 people. The company owns approximately 200 ships, which are calling 250 ports and transport more than 7 million containers per year. (22)

Maersk Group, as previously was mentioned, is the world's biggest container carrier. This company is also operating in other spheres: energy, logistics, wholesale and manufacturing. (21)

The cargo is loaded on board (CMA CGM MEDEA, see Annex 1). The liner shipping company issues B/L according to the received documents. The vessel is to Europe first (Germany, Bremenhafen). In this port, the container is transferred to another feeder vessel, which will deliver it to Latvia. The container will be received in BCT (Baltic Container Terminal). The maximal draft in port of Riga is 14,7 meters, CMA CGM MEDEA has 14,5. It would be very difficult to call the port and to navigate there. The draft of the berth in BCT is 12,5. That is why it would be easier to transport the container with a feeder vessel. (24)

When the container is delivered to the port, the liner shipping company is offering several days of container storage/exploitation free of charge and the period for the container delivery to the receiver by land.

Maersk offers 5 days for storage and 3 days for delivery. MSC offers 14 days for storage and 2 days for delivery.

It is suggested to receive the container the next day after its arrival. Both company`s offers are acceptable in this case.

The presented companies also offer freight rates, which are presented in the table 6 below. The information was presented by companies` representatives, according to latest information about the transportation costs.

Table 6.Freight rates Maersk vs. MSC.

Name of company	Transit time	Freight costs	Rate
Maersk	28-32 d	2400 USD	ALL INCLUDED
MSC	30-36 d	2255 USD	ALL INCLUDED

It is very important to take into account the offered price, transit time and transportation safety. The freight cost, presented by MSC, is more profitable than the other one. However, the reliability level of Maersk company is higher than MSC`s.

The presented route option is one of the most popular ways to transport the cargo from Asia to Europe.

Route: Busan – Brementhafen – Riga.

3.8.2 Transportation by sea and railway

Using two transportation modes the cargo delivery helps to transport the container not only by the liner shipping but also by the railway transport.

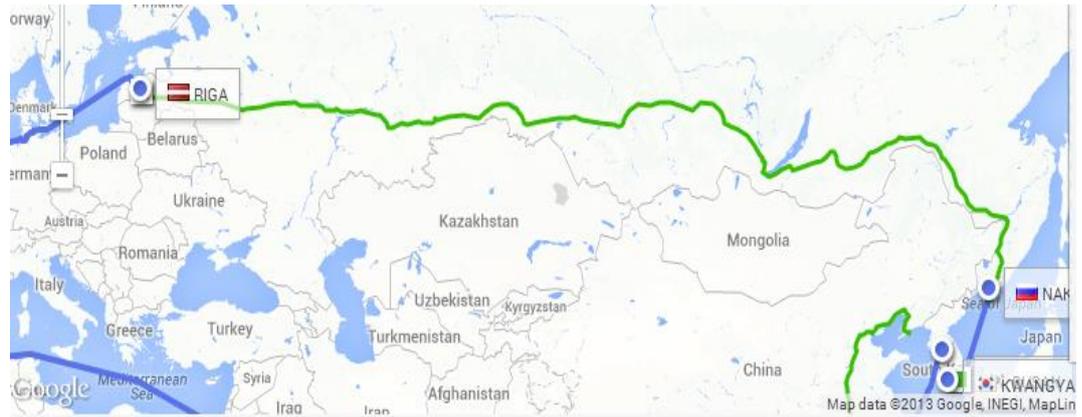


Figure 12 The combined route by sea and railway. (2005-2014 © SeaRates LP)

In the figure 12 there is illustrated the way, how the cargo will be delivered in case of multimodal transportation. First, it will be transferred from Busan to Russia (Port Nahodka, blue line). CF&S Company will organize these operations. The main office of the company is located in Tallinn. They also have several representatives in Riga, St. Petersburg and Moscow. (10)

To deliver the cargo by the railway the author suggests the following route (through Trans-Siberian magisterial): Nahodka-Khabarovsk-Chita-Irkutsk-Novosibirsk-Omsk-Chelyabinsk-Yekaterinburg-Kazan-Moscow-Riga. The cargo is loaded on a platform. Station Nahodka offers different services, such as handling (up to 30t), warehousing, custom clearance and commercial operations. From Nahodka the container goes to Moscow, where it will change the route and will go straight to Riga (Station Riga-Krasta). Station Riga-Krasta is offering the same service as Nahodka.

3.8.3 Transportation by railway

S-Korea has very good and developed railway infrastructure that is why the cargo can be also delivered only by railway. This service can be operated by OAO “TransContainer”. This company is operating different kinds of multimodal container transportations from Asia to Europe. (26)

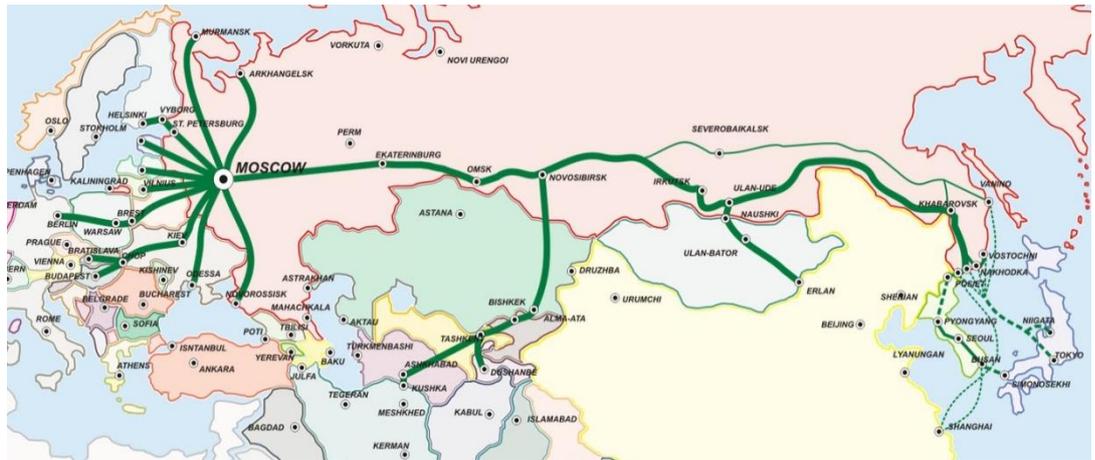


Figure 13 The Siberian magistral. (© Orange Slovensko, a.s., 2008-2011)

In the figure 13, the route from Busan to Riga is shown: Busan – Seoul – Pjongjang – Poset – Nahodka – Khabarovsk – Ulan-Ude – Irkutsk – Novosibirsk – Omsk – Yekaterinburg – Moscow – Riga.

The railway transportation process – is the technological and organizational set of activities, which is processed by the sender, railway operators and consignee. The entire organisational process is developing even nowadays. It's functions and operations control is centralised, according to the law of transport systems. The railway transportation control system consists of three levels –railways, railway stations and the railway department. The use of containers during their transportation makes it possible to carry almost any load - liquid, bulk, oversized, perishable, and different types of hazardous cargo. Containers are loaded at the departure point and unloaded only at the place of delivery. Rail carriers offer low transportation tariffs and the schedule accuracy. The delivery by rail is two times faster than the transportation by sea. The sea shipment takes about 28 days, but the rail service can take just about 10 days. One more advantage is the reduction of cargo handling activities and reduction of political risk (the biggest part of the route is in Russian territory, where there is a stable democratic politics).

Approximately 50 % of the transit cargo is transported through the Trans-Siberian Magistral. Its technical capacity allows carrying up to 100 million tonnes per year, including 200 thousand containers (international transit). Container shipments could reach about 1 000 000 units per year.

The quality of the service meets the highest international requirements, during the operations there are used the most innovative and modern technologies, to increase the operational affectivity. The transportation process is under control all the time, the customer can check where the cargo is any time he needs. All the documentation and information about the cargo location is carried electronically. Containers, which are transported with one locomotive, are recorded in one transportation document.

The customs inspection and the checking stations are equipped with the modern facilities. The cargo is monitored during the entire transportation process. Nowadays there approximately 30 different transportation routes are used. The most popular are:

- Nahodka – Vostochnaya – Marcevo (“Hyundai Motor Co.” Auto parts delivery from Busan to Taganrog);
- Nahodka – Moscow;
- Nahodka Brest;
- Zaboikalsk / Nahodka – Kaliningrad / Klaipeda;
- Beijing – Moscow;
- Brest – Ulan Bator;
- Huh Hoto – Duisburg;
- Baltic States – Kazakhstan / Central Asia;
- Nahodka – Almaty / Uzbekistan.

In the figure 14 all, the above mentioned routes are marked. As it was already mentioned, the cargo will start the journey in Busan and the destination point is Riga. The company OAO “TransContainer” suggested the route (Busan-Seoul-Pjongjang-Poset-Nahodka-Habarovsk-Ulan-Ude-Irkutsk-Novosibirsk-Omska-Jekaterinbur-Moscow-Riga) and the price of the delivery (Table 7). The information was given by company representative according to the latest information about freight costs.

Table 7. Freight rate, TransContainer.

Company	Transit time	Price	rate
TransContainer	20-30 d	3900 USD	ALL INCLUDED

The transit time is approximately the same as for the sea delivery and the freight price is also satisfying. The main problem is the risk (cargo delay), which can be the cause of the condition of railways. The recommended speed in several areas is 30 km/h; the customs clearance can take time at the Korean and Russian borders as well.

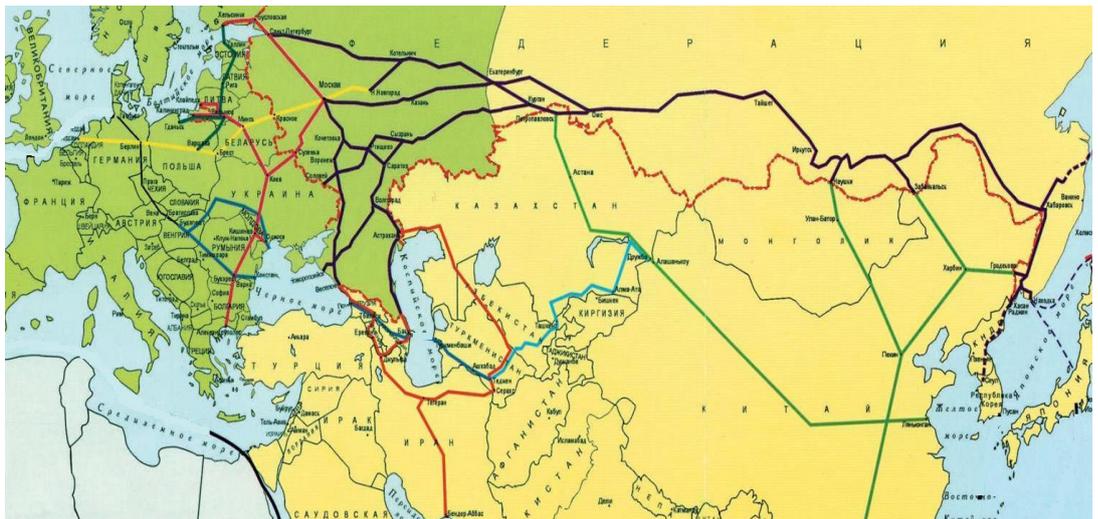


Figure 14 Siberian magistral (© 2014 MyShared Inc.)

3.8.4 Transportation by railway and road

The cargo delivery from Busan to Moscow by the railway will be organized by OAO “TransContainer”. Intellog Ltd. will organize the further transportation from Moscow to Riga. This company is operating as a freight forwarder and has many orders for transportation from Port of Riga to Russia and back.

In this case, the author takes into account the price of road transportation, price of handling and the railway transportation costs. These figures are given in Table 8. The information about freight costs was presented by companies` representatives.

Table 8. Transportation costs, TransContainer and SIA Intellog.

Company	Transit time	Freight costs	rate
TransContainer	15-20 days	3541 USD	ALL INCLUDED
Intellog	2- 3 days	2340 USD	ALL INCLUDED

Intellog is a young company, which is operating in the market for only one year. However, it has proved itself as a reliable partner. The proposed transit time and the price are satisfying.

3.8.5 Transportation by air and road

In this case, the cargo should be delivered to the International Airport of Busan. At the airport, the cargo will be loaded in on board and transferred to Moscow. From Moscow, it will be delivered to Riga.

Aeroflot Company can provide the air transportation service; SIA Intellog can transport the container from Moscow to Riga. Transportation costs for this delivery option are presented in table 9. The given information about transportation costs was presented by companies` representatives.

Table 9. Transportation costs, Aeroflot and Intellog

Company	Transit time	Freight costs
Aeroflot	2-3 d	51152 USD
Intellog	2-3 d	2340 USD

The air transport is the safest mode of transport, as well as company Aeroflot is a reliable company. The transportation transit time is approximately 6 days, which is the fastest one. The transportation price is 53492 USD, it is very expensive and does not provide the best for customer`s requirements satisfaction.

4 PRACTICAL PART

In this part the method of possible route evaluation and the choice of the most optimal route for given cargo and distance will be presented.

4.1 The comparison of possible routes, choice of the most optimal

In this part six route options will be compared (Table 10) and choose the most suitable one.

It was decided to summarize costs for every part of transportation and also the transit time duration. Results are presented in Table 10.

Table 10. Companies` Offers

Transportation options	Carriers	Transportation costs	Transit time
Transportation by sea 1	Maersk	2400 USD	28-32 d
Transportation by sea 2	MSC	2255 USD	30-36 d
Transportation by sea + railway	CF&S	3790 USD	22-26 d
Transportation by railway	TransContainer	3900 USD	22-30 d
Transportation by air + railway	Aeroflot + SIA Intellog	53492 USD	2-3 d
Transportation by railway + road	TransContainer + SIA Intellog	5881 USD	17-23 d

All information gathered during the analysis was used for comparison.

First carrier or forwarder should compare possible transportation options according to several requirements, which will satisfy the customer. These requirements are:

- speed of delivery ("Door to Door");
- price;
- safety during transportation (cargo loss or damage risk, risk of additional costs).

It is suggested to evaluate characteristics of each delivery with 1-5 points according to five-point grading scale. The best result is 5, the worst – 1. It is also compulsory to evaluate the importance of customer`s requirements. Taking into account the customer's requirements, the importance of the selection criteria can be assessed as a percentage. In this particular case, price is the most important criteria that is why it gets 50% evaluation. Other two characteristics get 25% each (Table 11).

Table 11. Route selection criteria`s evaluation, %.

Criteria	Evaluation, %
Price	50%
Transit time	25%
Safety	25%

Same information is visualised in the diagram below.

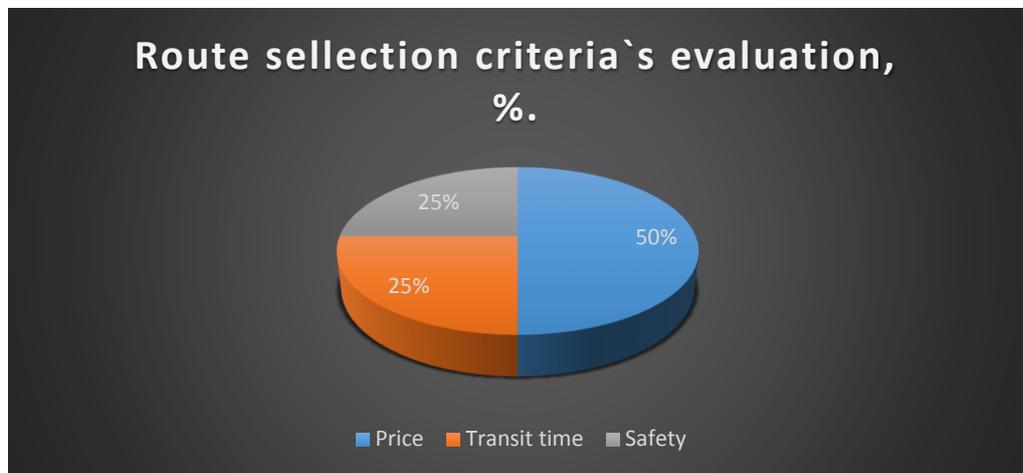


Figure 3 Route Selection criteria`s evaluation, %.

All information about the prices, risk assessment and transit time length for every suggested delivery option was also possessed. This information will serve to draw up the rating table.

First, the author proposes to assess each type of transport prices offered according to five-point grading scale.

The author assumes that the evaluation is carried out according to the following principle:

- 2000 - 3000 = 5
- 3001 - 4000 USD = 4
- 4001 - 5000 USD = 3
- 5001 - 6000 USD = 2
- 6000 - ... USD = 1

Table 12. Evaluation by price

Delivery option	Price , USD	Evaluation
Sea, Maersk	2400	5
Sea MSC	2255	5
Sea + railway	3790	4
Railway	3900	4
Railway + road	5881	2
Air + road	53492	1

The same information is illustrated in histogram 1 below.



Histogram 1 Evaluation by price.

Histogram 1 and table 12 clearly show that the leading position belongs to both sea services. These delivery options both have the lowest price and the highest evaluation. However, MSC offered price is even lower than that of Maersk. The delivery made using either the railway transport or the combined transport "Sea + railway" is on the second place. Third place is taken by a combined transportation "Railway + road" and the lowest evaluation is given to "Air + road".

It is further proposed to evaluate the transit time using the same system. In order to assess the length of the journey the author calculated the average number of days (see Table 14).

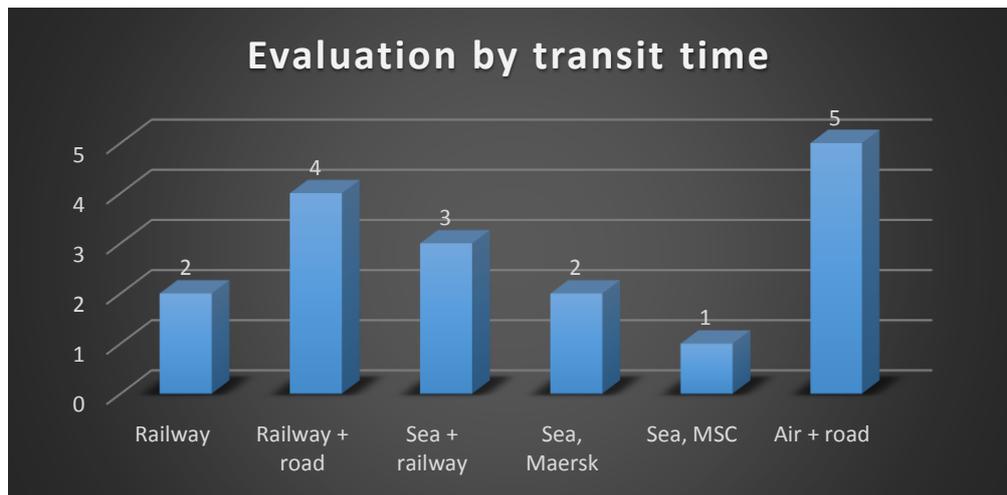
It is assumed that the evaluation is carried out according to the following principle:

- 1-15 days = 5
- 11-20 days = 4
- 21-25 days = 3
- 26-30 days = 2
- 31-35 days = 1

The evaluation results can be seen in Table 13 and the histogram 2.

Table 13. Evaluation by transit time

Delivery option	Min days	Max days	Average	Evaluation
Railway	22	30	26	2
Railway + road	17	23	20	4
Sea + railway	22	26	24	3
Sea, Maersk	28	32	30	2
Sea, MSC	30	36	33	1
Air + road	2	3	2,5	5



Histogram 2 Evaluation by transport time.

It is evident that the option “Air and road” is the fastest one, it takes only 2-3 days. The second fastest way of delivery is “Road + railway”, third – “Sea + railway”. The most long-time options are deliveries by sea.

The third factor according to which the assessment is made is the safety of transportation. It is suggested to look upon several risk evaluations and to calculate the average grade in the end for every delivery option (table 14, histogram 3). For options, which have two modes of transport, rates are calculated by summing the two modes of assessments and calculating the average.

Table 14. Rating by transportation safety level

	Company	Transportation mode	Punctuality	Cargo safety	Average
Railway	5	4	3	2	3,5
Railway + road	4	3,5	3	2	3,1
Sea + railway	5	4	4	5	4,5
Sea, Maersk	5	4	5	5	4,8
Sea, MSC	4	4	5	5	4,5
Air + road	4	4	4	5	4,3

Each carrier was graded according to his/her reputation. In terms of vehicles, it is widely known that the most reliable transport mode is the air transport, the second is the sea and railway transport and the road transport takes the very last place.

The lowest grades were given to the “Railway” option and to the “Railway+road”. The transportation of the cargo through North Korea could be difficult because of the unstable political situation in this country. The cargo can be lost, stolen, damaged or detained without any explanation. Histogram 3 graphically shows the results of the evaluation.



Histogram 3 Evaluation by safety level.

The last step in the optimal delivery route selection process is summation of data and comparison of the results.

Table 15. The end results of the evaluation

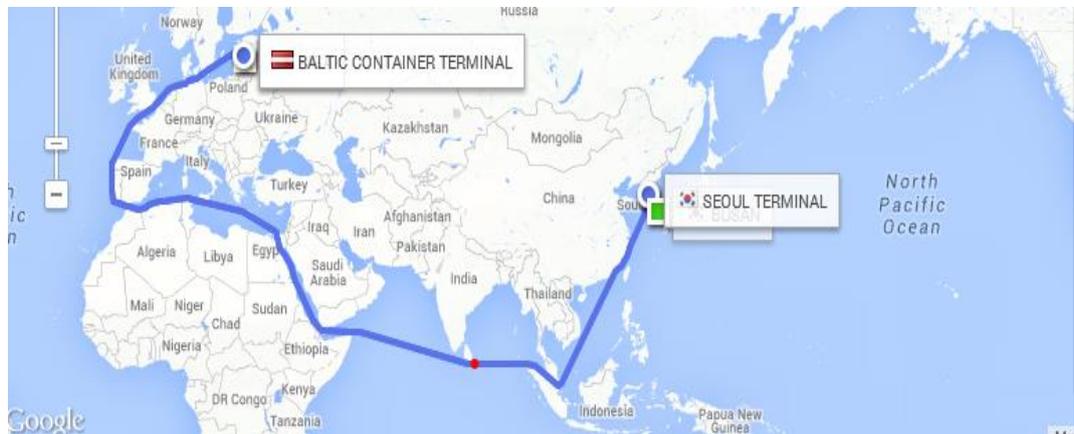
	Price	Transit time	Safety	Total	Average
Railway	4	2	3,5	9,5	3,2
Railway + road	2	4	3,1	9,1	3,03
Sea + Railway	4	3	4,5	11,5	3,8
Sea, Maersk	5	2	4,8	11,8	3,9
Sea, MSC	5	1	4,5	10,5	3,5
Air + road	1	5	4,3	10,3	3,4

There are final results presented in table 15. First, overall results for every option were summarised (column “Total”), then the average grade for each was calculated (column “Average”). The best result, which shows the most suitable route option, is marked with yellow colour. The results are shown graphically in histogram 4.



Histogram 4 Final Results.

According to the results it is clearly seen that the maritime transportation with Maersk Line Company got the highest evaluation – 3,9 points.



Picture 15 The optimal route for cargo transportation from S-Korea to Latvia. (2005-2014 © SeaRates LP)

The route is marked with the blue line in the picture above. The length of the route is 21700, 2 kilometres. The liner shipping company provides the container to the carrier. When the cargo is loaded into a container, it is delivered to the port and loaded on board according to FOB requirements. During this time, customs brokers prepare the export declaration, shipping company issues the B/L, where is all the information about the vessel, consignee, consignor, cargo, etc.

There is no doubt that this method of comparative evaluation is not the only one, because either the cargo owner or the carrier can create their own method, which might be more suitable for each of them. The factors or other information can also be changed.

CONCLUSIONS

All the factors that were presented in thesis are very important in route planning. Even the very small aspect or characteristic can affect the process.

After analysing container shipping market, the author concluded, that the market is oligopolistic. The three main players in the market, which include higher traffic levels, are Maersk Line, MSC and CMA CGM.

After analysing the cargo that could be delivered, geographic location and transportation infrastructure facilities of places of sending and delivery, it was stated, that these points have all the opportunities for delivery organization.

To deliver the container from Busan (South Korea) to Riga (Latvia), six possible multi-modal routes were offered: maritime shipping with Maersk Line, maritime shipping with MSC, railway, road + railway, sea transport + railway, air transport + road transport.

After analysing and comparing the proposed routes, the it was concluded that the most optimal route is a maritime carriage by Maersk Line.

PROPOSALS

To choose the optimal route for a multimodal container delivery, carriers or shippers should develop a methodology that allows to compare the possible delivery options. Every company chooses their way for comparison, which is more comfortable in their situation.

It is very important to select and evaluate key factors by which other routes will be analysed, because they also depend on methodological principle. In this thesis work, the author offered the price (as the most important factor), length of the transportation and transport safety as the key factors. These may vary differently, for example, only the price and duration, or only the price, or just duration. The mode of transport, the cargo characteristics and its location can be presented as a contributing factor.

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APPENDICES:

Maersk Line Bill of Lading

NUGA BEST Commercial Invoice

NUGA BEST Packing List

APPENDIX I

		BILL OF LADING FOR OCEAN TRANSPORT OR MULTIMODAL TRANSPORT	SCAC MAEU
			B/L No. 559594742
Shipper NUGA MEDICAL CO., LTD. SAN 2-1, GAGOK-RI, JIJEONG -MYEON, WONJU-SI, GANGWON- DO, KOREA TEL:82-33-730-0001 FAX:82-33-748-7557		Booking No. 865132857	
		Export references	Svc Contract 639506
		Onward inland routing (Not part of Carriage as defined in clause 1. For account and risk of Merchant)	
Consignee (negotiable only if consigned "to order", "to order of" a named Person or "to order of bearer") TO ORDER WELLNESS SYSTEM WORLD LLP		Notify Party (see clause 22) SIA INTELLOG NOMETNU IELA LV 5414 Daugavpils Latvia 135A	
Vessel (see clause 1 + 19) CMA CGM MEDEA	Voyage No. 934W	Place of Receipt. Applicable only when document used as Multimodal Transport B/L. (see clause 1)	
Port of Loading BUSAN, KOREA	Port of Discharge Riga, Latvia	Place of Delivery. Applicable only when document used as Multimodal Transport B/L. (see clause 1)	

PARTICULARS FURNISHED BY SHIPPER

Kind of Packages; Description of goods; Marks and Numbers; Container No./Seal No.	Weight	Measurement
1 Container Said to Contain 469 BOXES	12788.000 KGS	64.0000 CBM
1 PERSONAL LOW FREQUENCY COMBINED STIMULATOR BY WARM HEAT NUGA BEST NM-5000 MAIN BOX(MAIN BED) 155 BOXES FRAME BOX(FRAME) 155 BOXES SUB BOX(SUB BED) 155 BOXES 2 A/S PARTS 4 BOXES		
*HS CODE: 102101300021823 - 102101300021830 - 9018.90-9090		
N/M		
MRKU2833273 ML-KR2251745 40 DRY 9'6 469 BOXES 12788.000 KGS 64.0000 CBM SHIPPER'S LOAD, STOW, WEIGHT AND COUNT		
FREIGHT COLLECT		
CY/CY		
Outward Forwarders reference WON HYECHONG		
Above particulars as declared by Shipper, but without responsibility of or representation by Carrier (see clause 14)		

Freight & Charges	Rate	Unit	Currency	Prepaid	Collect
Carrier's Receipt (see clause 1 and 14). Total number of containers or packages received by Carrier. 1 container	Place of Issue of B/L Seoul	SHIPPED, as far as ascertained by reasonable means of checking, in apparent good order and condition unless otherwise stated herein, the total number or quantity of Containers or other packages or units indicated in the box entitled "Carrier's Receipt" for carriage from the Port of Loading (or the Place of Receipt, if mentioned above) to the Port of Discharge (or the Place of Delivery, if mentioned above), such carriage being always subject to the terms, rights, defences, provisions, conditions, exceptions, limitations, and liberties hereof (INCLUDING ALL THOSE TERMS AND CONDITIONS ON THE REVERSE HEREOF NUMBERED 1-26 AND THOSE TERMS AND CONDITIONS CONTAINED IN THE CARRIER'S APPLICABLE TARIFF) and the Merchant's attention is drawn in particular to the Carrier's liberties in respect of on deck stowage (see clause 18) and the carrying vessel (see clause 19). Where the bill of lading is non-negotiable the Carrier may give delivery of the Goods to the named consignee upon reasonable proof of identity and without requiring surrender of an original bill of lading. Where the bill of lading is negotiable, the Merchant is obliged to surrender one original, duly endorsed, in exchange for the Goods. The Carrier accepts a duty of reasonable care to check that any such document which the Merchant surrenders as a bill of lading is genuine and original. If the Carrier complies with this duty, it will be entitled to deliver the Goods against what it reasonably believes to be a genuine and original bill of lading, such delivery discharging the Carrier's delivery obligations. In accepting this bill of lading, any local customs or privileges to the contrary notwithstanding, the Merchant agrees to be bound by all Terms and Conditions stated herein whether written, printed, stamped or incorporated on the face or reverse side hereof, as fully as if they were all signed by the Merchant. IN WITNESS WHEREOF the number of original bills of Lading stated on this side have been signed and wherever one original Bill of Lading has been surrendered any others shall be void.			
Number & Sequence of Original B(s)/L THREE/3	Date of Issue of B/L 2013-03-15				
Declared Value (see clause 7.3)	Shipped on Board Date (Local Time) 2013-03-15				
<p style="text-align: right;">Stated for the Carrier A.P. Moller - Maersk A/S trading as Maersk Line</p> <p style="text-align: center;"></p> <p style="text-align: center;">MAERSK KOREA LTD. As Agent(s) for the Carrier</p>					

APPENDIX II

COMMERCIAL INVOICE

1. Shipper/Exporter NUGA MEDICAL CO., LTD. SAN 2-1, GAGOK-RI, JIJEONG-MYEON, WONJU-SI, GANGWON-DO, KOREA TEL:82-33-730-0001 FAX:82-33-748-7557		8. NO. & Date of Invoice 20130308-1 of Mar. 8, 2013			
2. Consignee TO ORDER WELLNESS SYSTEM WORLD LLP		9. Buyer(if other than consignee) Same as Consignee			
3. Notify Party 1)SIA INTELLOG REG: 41503061811 RANKAS 11, RIGA, LV-1005, LATVIA		10. Remarks INCOTERMS-2000: FOB BUSAN KOREA CONTRACT #7 OF 05. 01. 2009 CONTAINER NO. : MRKU2833273 / KR2251745			
4. Port of Loading BUSAN, KOREA	5. Final Destination Riga, Latvija				
6. Carrier 934W	7. Sailing on or about 15 mar, 13				
11. Shipping marks	12. Description of goods and / or Services	13. Q'ty/Unit	14. Unit-Price (USD)	15. Amount (USD)	
NO Marks	1 Personal low frequency combined stimulator by warm heat NUGA BEST NM-5000	155 Set	972,50	150 737,50	
Country of origin Korea	Total	155 Set		150 737,50	

NUGA MEDICAL CO., LTD


 Representative Director

16. Signed by

APPENDIX III

PACKING LIST

1. Shipper/Exporter NUGA MEDICAL CO., LTD. SAN 2-1, GAGOK-RI, JIJEONG-MYEON, WONJU-SI, GANGWON-DO, KOREA TEL:82-33-730-0001 FAX:82-33-748-7557		8. NO. & Date of Invoice 20130308 of Mar. 8, 2013		
2. Consignee TO ORDER WELLNESS SYSTEM WORLD LLP		9. Buyer(if other than consignee) Same as Consignee		
3. Notify Party 1)SIA INTELLOG REG: 41503061811 RANKAS 11, RIGA, LV-1005, LATVIA		10. Remarks INCOTERMS-2000: FOB BUSAN KOREA CONTAINER NO. : MRKU2833273 / KR2251745		
4. Port of Loading BUSAN, KOREA	5. Final Destination Riga, Latvija			
6. Carrier 934W	7. Sailing on or about 15 map, 13			
11. Shipping marks	12. Description of goods and / or Services	13. Q'ty/Unit	14. Netto Weight	15. Gross Weight
NO Marks	1 Personal low frequency combined stimulator by warm heat NUGA BEST NM-5000 Main box(Main BED)	155 set	11 811,0 Kg	12 710,0 Kg
	Frame box(Frame)	155 boxes	4 650,0 Kg (125cm*63cm*19cm)	4 960,0 Kg
	Sub box(Sub BED)	155 boxes	5 580,0 Kg (134cm*66cm*23cm)	5 890,0 Kg
	2 A/S PARTS Tourmanium for 5-Ball Projector 5P Temperature Sensor Cable 5 Ball Projector Cable 5 Ball Projector Top 5 Ball Projector Bottom Remote Control Ass'y Remote Control Cable 1 Main Plate Assy Control Plate (with Display) Heater PCB Inlet Plate Assy Heater Cable 2-1 Inlet (Switch) with Fuse (220V/5A) Jack Plate Assy Coil Cable Internal Temperature Sensor Cable Tourmanium for Massage (Internal)	155 boxes	1 581,0 Kg (93cm*63cm*18cm)	1 860,0 Kg

APPENDIX III

Tourmanium for Cervical Vertebra (Internal)			
Lamp			
Lamp PCB			
Low Frequency Pad(LF Pad)			
L/S Cable 1 upper			
L/S Cable 2 under			
Main PCB			
Motor			
Outside Cover			
Five-Ball Projector Cover			
Packing Tape(Blue)	2 boxes	42,0 Kg	45,0 Kg
Fuse 3A		(55cm*47cm*32cm)	
5 Ball Projector Assy			
Inside Cover			
Tension Wire			
Sub Heater Plate			
Main Mat Cover			
Sub Mat Cover			
Remote Control Base			
Bolt Set			
Handle Cover			
Hole Cover			
Spring Hook(Larg)	2 boxes	30,0 Kg	33,0 Kg
Spring Hook(Small)		(55cm*47cm*32cm)	
Total	469 boxes	11 883,0 Kg	12 788,0 Kg

Country of origin Korea

NUGA MEDICAL CO., LTD



 Representative Director

16. Signed by