

# **Formation and structure of variable production costs of a railway transport arranging company in the international carriage of industrial goods**

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<p>The case company is a joint enterprise of the Finnish Railways (VR) and one of Russia's largest rail operators. It arranges international railway carriages of industrial goods. In recent years, the company has faced a certain decrease in market share. The reason for this was stronger competition from other service providers that entered the Finnish market.</p> <p>This thesis aims at describing the formation and analyzing the structure of the variable production costs of the case company in order to find ways to maintain the company's competitiveness through cost reduction. The second objective is to evaluate the earlier business decision on the relocation of the company's inspection and maintenance depot from Russia to Finland. The results are supposed to show whether it is economically reasonable for the case company to operate according to the new technology implied by the business decision.</p> <p>The research is based on the theory of managerial accounting and other relevant approaches, including cost-benefit analysis. The author used a wide range of secondary data sources and conducted semi-structured interviews.</p> <p>The study results are: (i) classification of the costs of the case company with description of the factors that influence them, (ii) reflections on the cost reduction possibilities, (iii) results of the cost-benefit analysis conducted.</p> <p>The information presented is aimed to be useful for the case company for maintaining its competitiveness and for possible further research on expanding the company's business to the neighbouring Baltic countries.</p>	
<b>Keywords</b> Managerial accounting, classification of costs, factors affecting costs, cost-benefit analysis	

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# 1 Introduction

Competitiveness of a business is dependent on the incurred costs to a great extent that is why knowing them as well as understanding their behaviour is very important. In this thesis, the author examines the production variable costs of an international railway freight transport arranging company. The author analyses the structure of the costs, their behaviour, and factors affecting them. Additionally, the author conducts the cost-benefit analysis (CBA) of the two alternative technologies (projects) of the wagon supply and maintenance in order to evaluate the effectiveness of an earlier business decision on the relocation of the wagon inspection and maintenance site. This thesis is a qualitative research based. As sources of information the author uses primary and secondary data, results of semi-structured interviews with the management of the case company as well as own experience gathered in the field. In the end the author presents the results of CBA.

## 1.1 Background

In order to better explain the background of the thesis topic there should be briefly covered some details about the business in question.

The case company is a joint enterprise of the Finnish Railways (VR) and one of the Russia's largest rail operators and arranges international railway carriages of industrial goods. Historically the company has been oriented on offering the clients a comprehensive service package including as much basic options as possible in order to avoid unnecessary intermediaries and keep the prices at a reasonable level. The Russian rail operator's rolling stock fleet enabled to fully satisfy the major market segments. Nevertheless, in recent years the company faced certain decrease in the market share. The reason for this was a stronger competition from other service providers. The Baltic rolling stock owners as well as tiny Russian rail operators started to offer own rolling stock fleet on the Finnish market. A very important moment is that even though they are restricted in the services they offer, which is more challenging for clients, nevertheless, they have a certain success. This paradox may be explained for the Baltic operators by the fact that the recession in the economy and, consequently, in the domestic transportations forced them to sell the idle wagons at a margin close to zero to the neighbour countries' markets. The Russian competitors also have success because of the lower price they offer. A very small Russian companies or, even individuals owning the railway freight wagons, forced to offer own rolling stock for almost dumping prices because the home market is oversaturated with wagons and the demand there is low.

In order to resist to such aggressive competition the case company should clearly understand the costs it incurs in order to regulate them and to be able to make managerial decisions for further business development.

## 1.2 Research questions

The objective of this research-based thesis is to, first, analyze the variable production costs of the case company as well as the factors affecting them, and, second, to evaluate the effectiveness of an earlier business decision related to these costs. This thesis represents the qualitative research.

For the analysis of the case company's variable production costs and factors affecting them, the author formulated three investigative questions:

1. What are the typical production costs of the case company?
2. How can these costs be described?
3. What are the factors, influencing the variable costs?

Two investigative questions was formulated for evaluation of the effectiveness of an earlier business decision on the relocation of the wagon inspection and maintenance site from Russia to Finland:

1. What was the purpose of the made decision?
2. How has this decision influenced the company's production variable costs?

The overlay matrix shows the connection of the investigative questions with the research methods and the order they applied in the research (table 1).

Table 1. Overlay matrix for research oriented thesis

<b>Preparation of a classification of production variable costs</b>			
<b>Investigative Questions (IQs)</b>	<b>Relevant chapter</b>	<b>Theoretical Framework</b>	<b>Data Analysis</b>
1. What are the typical production costs of the case company?	4	Managerial accounting	Interview Internal secondary data
2. How can these costs be described?	4	Managerial accounting	Internal and external secondary data, Interpretation
3. What are the factors, influencing the variable costs?	4	Business environment specifics, Factors affecting service pricing	Internal and external secondary data, Analyzing case studies

<b>Assessing the influence of a past business decision on the company's production variable costs</b>			
<b>Investigative Questions (IQs)</b>	<b>Relevant chapter</b>	<b>Theoretical Framework</b>	<b>Data Analysis</b>
1. What was the purpose of the made decision?	5	Managerial accounting	Internal and external secondary data, Interpretation
2. How has this decision influenced the company's production variable costs?	5	Cost-benefit analysis	Data assessment based on the interview, interpretation and theoretical models

### **1.3 Demarcation**

The research is focused on the variable production costs of the case company and does not deal with the fixed costs. This is because the main potential for the improvements aimed to increase the competitiveness is inside the variable cost structure. The case company is rather small, so the weight of the fixed costs is not so significant. Additionally, evaluation of the earlier business decision implied the use of cost components related to the variable costs. The research is based on the theory of the managerial accounting.

### **1.4 International aspect**

The company is conducting international business in the field of railway logistics that is why the certain costs are expected to be evaluated taking into account this aspect. The behaviour of some costs is conditional on the legislation and business realities of the foreign countries, therefore this implies the acquaintance with the international environments in question.

### **1.5 Anticipated benefits**

During the research process, the author analyses the variable production costs of the case company, describes the process of their formation and determines the factors affecting them. The goal is to list all the variable costs related to the company's service - cargo transportation - describe them and make a conclusion on their behaviour and the way they can be influenced by the management of the case company. This in turn is aimed at making the company more competitive on the market.

One more benefit that is going to be achieved is providing the management of the case company with the results of cost-benefit analysis that will be conducted in order to evalu-

ate the earlier business decision. The results will help to decide on whether the relocation of the depot was worthwhile and whether the case company should continue to apply new technology.

Additionally, the thesis writing process enables the author to utilize knowledge and skills gained during the study process.

## 1.6 Key concepts

This subchapter describes the key concepts that are used in the thesis.

**Commercial condition of wagon** is its conformity to the carriage of specific freight and the construction characteristics of the wagon. (URL: Valsts valodas centrs)

**Depot** is a special infrastructure facility for storage and maintenance of wagons. (URL: Railway technical web pages)

**Rail operator** is a company that uses the rail network in order to transport goods to their destination by operating its fleet of freight wagons. (URL: Office of Rail and Road)

**Rolling stock** consists of the wheeled vehicles collectively used on a railway, including the locomotives, passenger coaches, freight wagons, guard's vans, etc. In terms of this thesis, the rolling stock is a fleet of freight wagons of different types owned and operated by the AO PGK. (URL: Office of Rail and Road)

**Railway rate** is a price, including approved in the prescribed manner fees charged for cargo transportation and infrastructure services. (URL: DVGUPS)

## **2 Theoretical framework**

The research objectives have determined the structure of the theoretical framework. In the author's opinion, methods of the managerial accounting are the most suitable for accomplishing the objectives in question. Additionally, the theory on service pricing and cost-benefit analysis was used in this research.

There have been analysed the relevant literature and have been chosen the books of the three authors: Colin Drury, Karen W. Braun & Wendy M. Tietz and Edward J. Vanderbeck.

### **2.1 Managerial accounting**

Before discussing the various components of managerial accounting let us remind what the accounting generally is. According to Drury (2012, 4), "Accounting is the process of identifying, measuring and communicating economic information to permit informed judgements and decisions by users of the information."

As it is known, there are two branches of accounting: managerial or management accounting and financial accounting. Financial accounting is concerned with the provision of the information like the income statement, balance sheet, statement of shareholders' equity and statement of cash flows, which stockholders and creditors need to make investment and lending decisions (Braun & Tietz 2013, 4). Thus, financial accounting is oriented on external users. Managerial or management accounting, on the contrary, serves for the needs of internal users. It provides the managers inside the company with the information they need to make business decisions and run the company in the most efficient and effective way (Braun & Tietz 2013, 4).

According to Braun and Tietz (2013, 4), managerial accounting helps the management carry out its three primary responsibilities, that are shown in Figure 1.

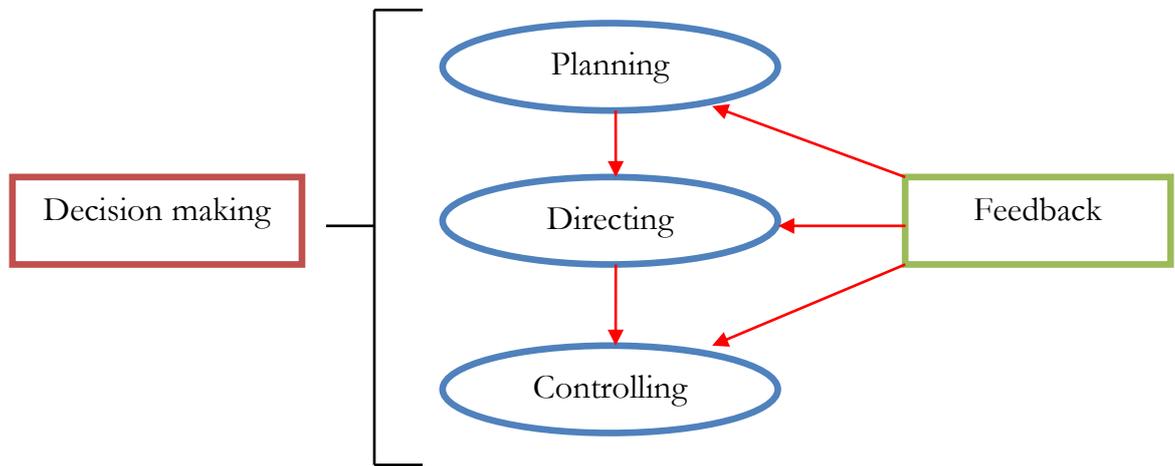


Figure 1. Managers' Three Primary Responsibilities (Braun & Tietz 2013, 4)

Some authors, like for example Vanderbeck (2010, 10), distinguish the third component of the accounting - the cost accounting. Vanderbeck (2010, 10) believes that cost accounting contains the parts of both financial and managerial accounting and serves for providing the product cost data for inventory costing in financial accounting and for reporting in managerial accounting. The concept described by Vanderbeck (2010, 12) is depicted in Figure 2.

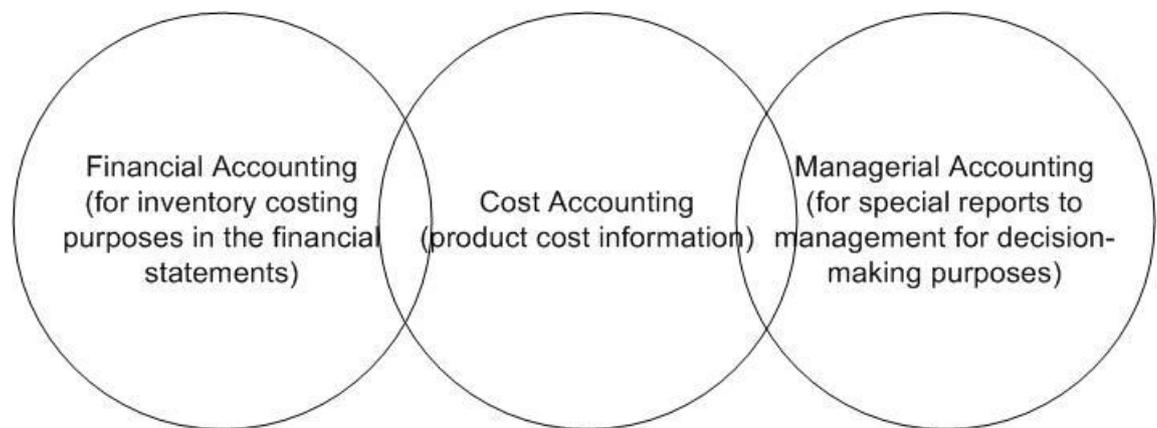


Figure 2. Uses of Product Cost Data in Financial and Management Accounting (Vanderbeck 2010, 12)

Drury (2012, 17) states that a study of the literature shows that the distinction between cost and management accounting is not so clear. He notices that both terms are frequently used synonymously. The author of this thesis shares the viewpoint of Drury and hereinafter uses the term "Managerial accounting" in this research.

## **2.2 Business sectors distinguished by managerial accounting**

As described by Braun & Tietz (2013, 48), there are typically three basic business models companies generate their profits through. One is providing a service, the second is selling merchandise and the third one is manufacturing products.

Service companies sell intangible services like, for example, insurance, health care, banking etc. Generally, such companies do not have inventory, however, some of them may have a little amount of supplies inventory usually used for internal operations. Service firms incur costs to provide services and other associated activities. These activities are, for example: developing new services, advertising, and providing customer service. The most often salaries and benefits make up over 70 % of the costs of the service companies. (Braun & Tietz 2013, 48).

Merchandising companies sell tangible goods that are bought from suppliers. This business model implies that merchandising company resells products with a markup. There are two types of the companies: retailers and wholesalers. Merchandising companies have inventory that generates costs combined of the costs for the goods plus other costs related to the activities needed to get the goods in place and ready to sell. The abovementioned costs include freight-in costs, tariffs and customs duties. Incurring inventory-related costs is only the one part of the business, the other one is operational costs that come from operating stores and websites, advertising, R&D and providing customer service. (Braun & Tietz 2013, 48).

Manufacturing companies, as can be understood from the name, manufacture products. The companies convert raw materials into finished goods by using labour, plant and equipment. Products made by manufacturing companies are sold to retailers or wholesalers. The price is set high enough to cover the costs of manufacturers and to generate a profit. It is distinguished three types of inventory the manufacturer have: raw materials inventory, work in progress inventory, and finished goods inventory. Raw materials inventory is for all raw materials consumed in manufacturing. Work in process inventory is for goods that are still in the manufacturing process and not yet complete. The third type, finished goods inventory, are completed products that have not yet been sold. Units from finished goods inventory are sold to merchandising companies or directly to consumers. (Braun & Tietz 2013, 49).

## **2.3 Products and production systems in the context of rail freight**

In this thesis, the author uses the term "variable production cost". The use of the word "production" is explained in the approach utilized by Troche (2009, 83) in his work related to rail freight. According to Troche (2009, 85), "a production system for rail freight comprises - in a wide sense - all resources necessary to offer a certain rail freight service". In a similar way, the case company uses the different resources in order to offer its services and maintains the spare parts inventory. The spare parts are used for wagon repairs.

## **2.4 Classification of costs and assigning them to cost objects**

Different types of costs are classified in managerial accounting and can be measured by assigning them to cost objects. The author describes this concept in the following chapters.

### **2.4.1 Cost and cost object**

According to Drury (2012, 23), "The term cost is a frequently used word that reflects a monetary measure of the resources sacrificed or forgone to achieve a specific objective, such as acquiring a good or service." Drury points out that the term has multiple meanings. Different types of costs are used in different situations. To clarify the assumptions that underlie a cost measurement there must be added a preceding term, like, for example, variable, fixed or opportunity (cost) and so on.

The next important term used in accounting is a cost object. According to Braun & Tietz (2013, 53), "A cost object is anything for which managers want a separate measurement of cost." For example, the cost object may be the cost of a product, the cost of rendering a service to a customer, the cost of operating some unit or process or anything else for which a manager wants to measure the cost of resources used (Drury 2012, 23).

### **2.4.2 Direct and indirect costs**

According to the common classification, there are two broad categories of costs with respect to the cost object - direct and indirect costs (Drury 2012, 23). Braun & Tietz (2013, 53) give the following definition of a direct cost: "A direct cost is a cost that can be traced to the cost object". A car manufacturer can be taken as an example. If the cost object is a car then the price of the tires needed for assembling the car is a direct cost.

"An indirect cost is a cost that relates to the cost object but cannot be traced to it (Braun & Tietz 2013, 53)." This means that such costs like: the cost of running a manufacturing plant, depreciation, property taxes are considered indirect. On the one hand, the manufacturer cannot make cars without incurring these costs, so, they are related to the cost object. On the other hand, it is impossible to trace a specific amount of these costs to one car. The authors point out that it is a cost object that specifies whether a cost is direct or indirect (Braun & Tietz 2013, 53).

### 2.4.3 Assigning direct and indirect costs

According to Braun & Tietz (2013, 54), the total cost attributable to a cost object can be calculated by assigning all direct and indirect costs to the cost object. By assigning, the authors mean "attaching" costs to the cost object. Assigning of direct costs happens by tracing those costs to cost object. Tracing the costs enables to get a very precise cost figure that gives managers a great confidence in the cost's accuracy. Assigning of indirect costs is executed by allocating those costs between the total number of the cost objects. Speaking of the example of a car manufacturer, this means that total indirect cost is divided up over all cars produced on the plant. The allocation process gives a less precise cost figure than tracing. Figure 3 depicts the cost assigning process. (Braun & Tietz 2013, 54).

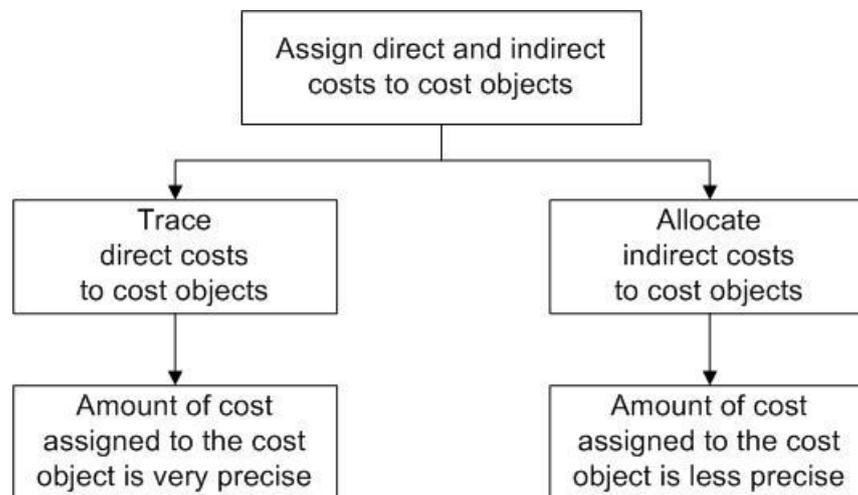


Figure 3. Assigning direct and indirect costs to cost objects (Braun & Tietz 2013, 54)

### 2.4.4 Cost behavior

For calculating costs and making business decisions it is crucial to understand cost behavior, that is, how costs change with different levels of activity or volume. Information about cost behavior helps managers to answer various questions, such as, what will be

the impact on profits if a company increase or decrease selling price by a certain amount or how will costs and revenues change if level of activity is increased? (Drury 2012, 29). Volume or activity may be measured in terms of units of sales or production. For example, it may be: hours worked, patients seen, miles travelled, cars produced etc.

According to Drury (2012, 29), "The terms 'variable', 'fixed', 'semi-variable' and 'semi-fixed' have been traditionally used in the management accounting literature to describe how a cost reacts to changes in activity." The nature of variable costs is such that they change in direct proportion to the volume of activity. This means that if the level of activity is doubled, so do the total variable cost. Thus, Drury concludes that total variable cost changes linearly while, at the same time, unit variable cost stays constant. (Drury 2012, 29). Graphically this concept is illustrated in Figure 4.

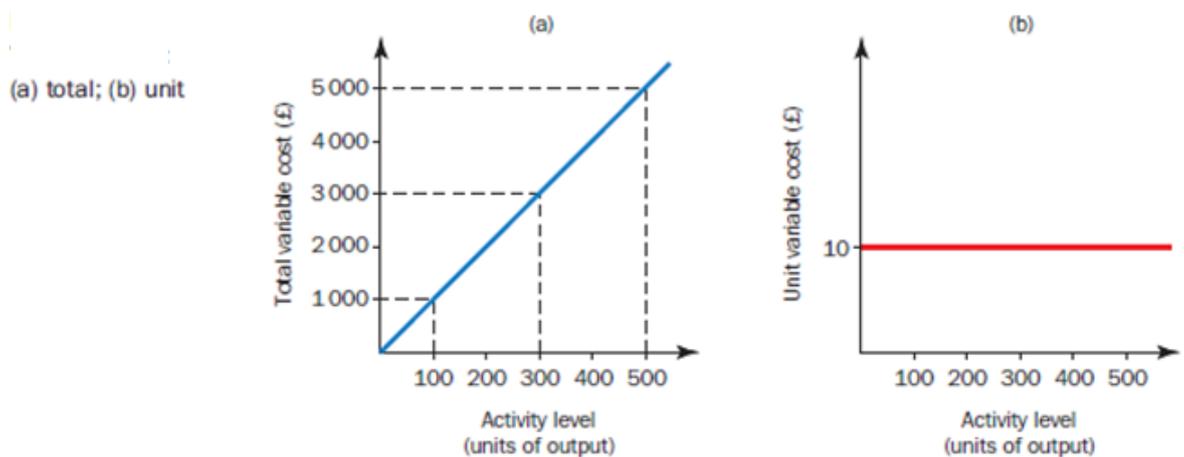


Figure 4. Variable costs (Drury 2012, 29)

Total fixed costs are not dependent on the level of activity and remain constant for a specified time period (Drury 2012, 29). Roughly speaking, costs are considered fixed if they do not change within an accounting period that is typically a one year. However, if we take a look on a unit fixed cost we will see that it changes proportionally with the level of activity. Figure 5 depicts this concept.

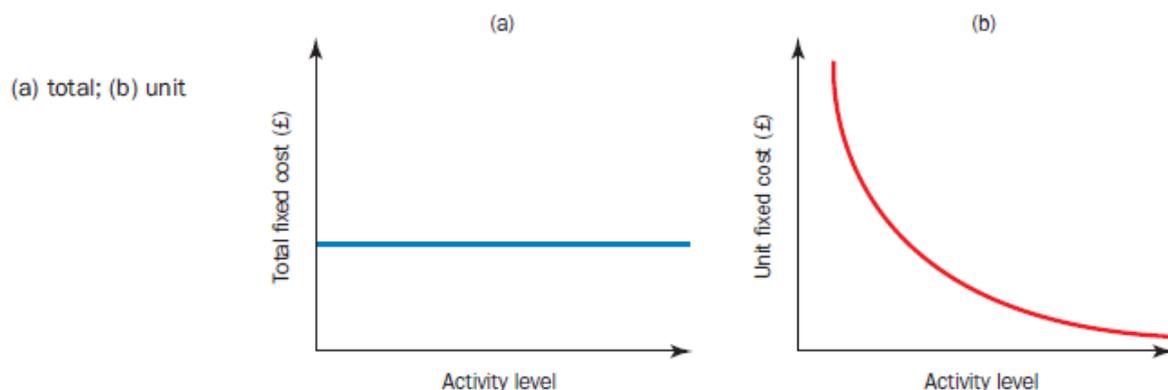


Figure 5. Fixed costs (Drury 2012, 30)

#### 2.4.5 Information for decision-making

For decision-making, it is very important to identify whether costs are relevant or irrelevant to a particular decision. According to Drury (2010, 32), relevant costs are those future costs that will be changed by a present decision. Consequently, irrelevant costs are those costs that will not be influenced by the decision. Drury (2010, 32) points out that in the short-term not all costs are relevant for decision-making.

Another important concept related to decision-making is an opportunity cost. According to Drury (2010, 33), this cost is applicable to scarce resources and measures the opportunity that is lost or sacrificed when one course of action is chosen over an alternative course of action. The opportunity cost is zero if no alternative use of resources exists.

#### 2.5 Factors affecting service pricing

In a "client - service provider" relationship the costs of the client are the selling prices of the service provider. Consequently, when considering the factors that influence the price of a service we consider the factors that have an influence on the costs of the client. Nevertheless, a list of the factors affecting the costs of a company is a little bit longer than the list of factors that influence selling prices due to the existence of the internal factors related to the costs incurred by a company.

Avlonitis & Indounas (2007, 84) in their study analysed data from service companies operating in different service sectors in order to explore the pricing objectives that companies pursue when pricing their services. They used in their research 28 pricing objectives and came to the conclusion that those initial objectives could be grouped in a subset of major underlying dimensions-factors due to the interrelation between many of the objectives in question. They distinguished the eight factors that are listed in Table 2.

Table 2. Factors affecting service pricing

	<b>Stability in the market</b>
Factor 1	Price stability in the market
	Sales stability in the market
	Market development
	Distributor's needs satisfaction
	Determination of fair prices for customers
	<b>Customer-related objectives</b>
Factor 2	Maintenance of the existing customers
	Long-term survival
	Attraction of new customers
	Achievement of social goals
	Customer's needs satisfaction
	<b>Service quality-related objectives</b>
Factor 3	Service quality leadership
	Creation of a prestige image for the company
	Price differentiation
	<b>Financial objectives</b>
Factor 4	ROA
	ROI
	Liquidity achievement and maintenance
	<b>Achievement of satisfactory profits and sales</b>
Factor 5	Achievement of satisfactory profits
	Achievement of satisfactory sales
	Cost coverage
	<b>Market share and capacity-related objectives</b>
Factor 6	Market share increase
	Market share leadership
	Achievement of a satisfactory market share
	Coverage of the existing capacity
	<b>Competition-related objectives</b>
Factor 7	Price similarity with competitors
	Price wars avoidance
	Discouragement of new competitors' entering into the market
	<b>Maximization of profits and sales</b>
Factor 8	Profit maximization

	Sales maximization
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Avlonitis & Indounas (2007, 93) discovered that the service companies seem to follow a hierarchy of pricing objectives strongly orienting on the customers' needs. Customers are considered the fundamental input in delineating the above-mentioned objectives. "Pricing seems to require a "situation-specific" approach according to the unique organizational and environmental characteristics facing a company Avlonitis & Indounas (2007, 93).

## 2.6 Cost-Benefit Analysis

Among the various methods, assisting in decision-making there is one called cost-benefit analysis (CBA). According to Boardman, Greenberg, Vining & Weimer (2014, 2), "CBA is a policy or a project assessment method that quantifies in monetary terms the value of all consequences of a policy or a project to all members of society." The principle of CBA can be depicted with a formula:

$$NSB = B - C,$$

where NSB is net social benefits, B is social benefits and C is social cost.

CBA was initially used by the U.S. Army Corps of Engineers in the 1930s for flood control and harbour deepening projects. Later, in the mid-1960s it was used in the UK by the Ministry of Transport. After that, it had spread around the world and was applied in both developed and developing countries. Although CBA has been used mostly by different government agencies, nowadays the list of users has expanded. (Boardman et al. 2014, 20).

As Boardman et al. (2014, 3) says, CBA assists an analyst in demonstrating the superior efficiency of a particular intervention relative to the alternatives, including the status quo. There are two major types of cost-benefit analysis: ex ante and ex post. Ex ante CBA is conducted while a project or policy is under consideration, before it is started. The purpose of the ex ante analysis is to assist in the decision about the allocation of resources, whether they should be allocated to a specific project or policy or not. Ex post CBA is performed at the end of a project and suits well for learning about actual value of a specific project. (Boardman et al. 2014, 3).

There are also two more types of CBA, that mentioned by Boardman et al. (2014, 3). The first is in medias res, that is performed during the course of the life of a project. The second is one that compares an ex ante with an ex post (or in medias res) CBA of the same project. (Boardman et al. 2014, 3). The types of CBA's are listed in the Table 3.

Table 3. Different classes of CBA

Value	Class of Analysis			
	Ex Ante	In Medias Res	Ex Post	Ex Ante/Ex Post or Ex Ante/In Medias Res Comparison
Resource allocation decision for this project.	Yes - helps to select best project or make "go" versus "no-go" decisions, if accurate.	If low sunk costs, can still shift resources. If high sunk costs, usually recommends continuation.	Too late - the project is over.	Same as <i>in medias res</i> or <i>ex post</i> analysis.
Learning about actual value of specific project	Poor estimate - high uncertainty about the future benefits and costs.	Better - reduced uncertainty.	Excellent - although some errors may remain. May have to wait long for study.	Same as <i>in medias res</i> or <i>ex post</i> analysis.
Contributing to learning about actual value of similar projects	Unlikely to add much.	Good - contribution increases as performed later. Need to adjust for uniqueness.	Very useful - although may be some errors and need to adjust for uniqueness. May have to wait long for project completion.	Same as <i>in medias res</i> or <i>ex post</i> analysis.
Learning about omission, forecasting, measurement and evaluation errors in CBA	No	No	No	Yes, provides information about these errors and about the accuracy of CBA for similar projects.

### **3 Empirical part**

In this chapter, the author describes the research design and methods used in this thesis. As stated by Ghauri & Gronhaug (2010, 54), the research design provides a plan or a framework for data collection and its analysis. Techniques applied to collect data represent the research methods. Based on the research objectives, the author decided to apply the methods of qualitative research.

#### **3.1 Research design**

The next step after defining the objectives and investigative questions was to think of some freight carriage including as much services as possible and to divide it into elements for further analysis. The means for this are the author's own working experience and secondary data from the internal sources. Since the used secondary data was produced mainly by the financial department, the most appropriate way to understand it and gather necessary comments was to conduct the interview. In the authors opinion the most suitable type of the interview for this was the semi-structured interview. After gaining the full information from the internal sources and the interview, the author started to describe the costs by applying the relevant theory. On the stage of describing the factors, affecting the costs the author needed to investigate and analyse the information from external sources of secondary data. When the first part was ready and the costs are described, there created a platform for proceeding to the second part. The second part is based on the data from the first part, so the clear understanding of the costs is crucial for the whole research. There used both secondary and primary data for the work on the second part. The last stage of the research process is concluding results and making recommendations for the case company.

#### **3.2 Research methods**

According to Ghauri & Gronhaug (2010, 207), "qualitative research implies intensive interplay between data (observations) and theory". In this research, the author is going to depart from theory, because he already has some understanding about the problem and needs to get a direction to proceed. The most suitable and relevant methods appear to be interviews and interpretation of the received data, both from the interviews and secondary data. The secondary data is going to be received from internal sources that are: 1) company's ERP, 2) company's reports. The sources of the external data are: 1) websites of the owners, 2) websites of the contractors, 3) books and articles, 4) industry statistics, 5) research reports. The primary data is going to be received via two face-to-face semi-structured interviews with the business controller and the managing director. The goal of

the first interview is to enrich the preliminary list of the costs made by the author on the basis of the internal secondary data and to assist in further extraction of the data from the company's internal sources. The interview included seven questions and is presented in the Appendices.

The second interview with the managing director took place on the 8th of September 2015 and was aimed to collect the data on the depot relocation project. The interview helped to clarify the costs related to the relocation and some outcomes related to the intangible benefits. The information is used in the cost-benefit analysis.

## **4 Classification of costs of the case company and factors affecting them**

As it was mentioned above, the case company is a service providing organization selling its final product - cargo transportation. Every transportation comprises bigger or smaller number of the different service elements that are produced with the help of the company's personnel and a number of partners and contractors. The production of each service element implies the use of resources and incurring costs related to this.

### **4.1 The typical process of a transportation**

In order to be able to make a list of all the variable costs involved in a transportation process the author analysed the patterns of the past transportations and conducted an interview with the manager. The author is also actively involved in the process of organizing transportations, which helped to describe it. The technology of the service process is reported further.

After receiving an order from a client a manager of the case company orders the wagon(s) from Russia to Finland from the wagon-owner company AO "Pervaja gruzovaja kompanija", hereinafter referred to as AO "PGK". A manager from AO "PGK" organizes the supply of the ordered number of wagons to Finland. The author does not provide details of the activities performed by AO "PGK" when organizing the supply of the wagons to Finland, since it goes beyond the scope of the current thesis. The crucial moment that still should be mentioned here, is a region of supply. The region of supply is an area of the rail network from which empty wagons are sent to Finland. In case of lack of the empty wagons near the Finnish border, AO "PGK" has to deliver the wagons from distant regions that ultimately affects the tariff the case company has to pay for a wagon delivery.

An order sent to AO "PGK" may contain different types of wagons that in turn influences the supply technology after the wagons come to Finland. According to the agreed technology, all boxcar wagons arrived to the Finnish border station Vainikkala are dispatched to the station Kouvola to the wagon depot for the inspection and, if needed, for some repair. After that, the wagons are delivered to the client for loading. The loading takes place at some logistics terminal that either is a direct client of the case company or is in the role of a subcontractor. In the latter case, the case company incurs the costs of services performed by the subcontractor.

When the wagon is loaded and all the documents are ready, the wagon is dispatched to the destination station. Usually during the delivery to the final destination the case company provides the customer with tracing information and other needed services.

For providing its services the case company uses the wagon depot in Kouvola that is a piece of the leased land with the two railway tracks on it. The total number of wagons that simultaneously can be there is 60 items. The labour involved in the inspection and maintenance is the personnel of a local company (hereinafter referred as company B), situated in Kouvola. The case company, therefore, outsources the above-mentioned services from the company B.

## 4.2 Elements of a transportation

The technology described in the previous chapter enabled to present the transportation process as a group of elements. This is done in order to facilitate the classification and analysis. The outline is depicted in Figure 6.

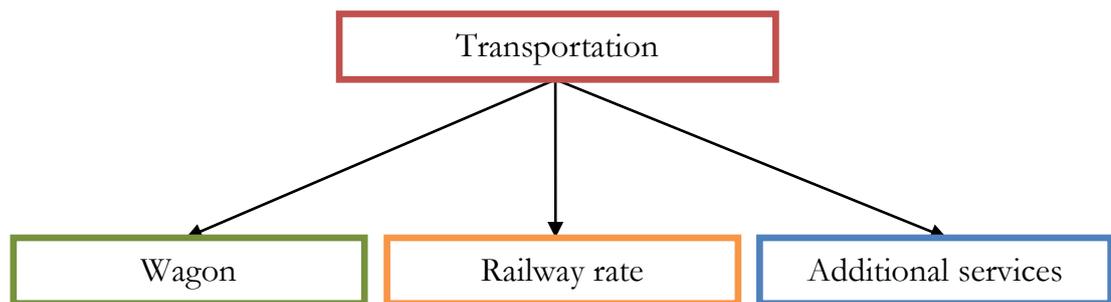


Figure 6. Elements of a transportation.

The further exploration and analysis of the information obtained both from the internal secondary data sources and the interview made it possible to prepare a list of the variable costs related to each element of the transportation service.

## 4.3 Costs of the "Wagon" element.

The "Wagon" element contains four different costs that come from two vendors. The characteristic of the costs is given in Table 3. The author would like to describe the cost named "Cost of a wagon inspection and repair in the depot in Kouvola" in more detail, since it has a compound structure.

It is agreed with the company B that inspections are made for every wagon dispatched to the depot. Additionally, the contractor is obliged to carry out a basic repair if a wagon con-

dition does not meet certain requirements. According to the agreement between the case company and the company B, the company B charges a settled fee for each wagon they handle. This fixed fee per wagon implies only the labour hours devoted to the inspection and repairs. The other fees that contribute to the total cost of the wagon inspection and repair may be characterized as the fees related to the administrative activities in the depot performed by the company B. These fees are administrative fee, waste disposal fee and snow removal fee. Like any administrative fees, they are charged within a certain intervals, like every four or six month. Since they represent indirect costs, they are allocated to the cost object. One more cost inside the "Cost of a wagon inspection and maintenance in the depot in Kouvola" is the tracks rent fee. As it was mentioned above, the depot tracks are on the leased land area. The case company pays the rent charge according to the agreed timetable. Payments are made to the lessor that is the company other than the company B.

All costs related to the "Wagon" element are presented in Table 4.

Table 4. Costs included in the "Wagon" element.

<b>Number</b>	<b>Cost name</b>	<b>Measure (Units)</b>	<b>Cost description (Characteristic of the cost)</b>	
<b>1</b>	<b>Wagon usage fee</b>	<b>Rub/wagon</b>	Comes from the wagon-owner company AO "PGK". Is a direct traceable cost per wagon. The cost is calculated applying the daily wagon usage rate that is generally unchanged during the accounting period.	
<b>2</b>	<b>Cost of a wagon inspection and repair in the depot in Kouvola:</b>		Comprised of several different costs, which are charged by the two vendors. For the facilitation of the accounting process and measurement of the performance is recalculated in terms of the one wagon unit. The components are described below.	
	<b>2a</b>	<b>Direct labour cost</b>	<b>Euro/wagon</b>	Comes from the subcontracted company B. Is a direct traceable cost-component. Agreed to be as a fixed fee per wagon.
	<b>2b</b>	<b>Tracks rent fee</b>	<b>Euro/month</b>	Comes from the lessor. In relation to a

			wagon unit is an indirect cost-component. Represents a fixed cost by the nature.
<b>2c</b>	<b>Administrative fee</b>	<b>Euro/month</b>	Comes from the company B. Is an indirect cost-component that represents a fixed cost by the nature.
<b>2d</b>	<b>Waste disposal fee</b>	<b>Euro/per 6 month</b>	Comes from the company B and represents a variable cost. The more wagons are handled the more waste is disposed. The cost is not traced per wagon, but instead, is allocated to the number of wagons.
<b>2e</b>	<b>Snow removal fee</b>	<b>Euro/per 4 month</b>	Comes from the company B. Is an indirect sporadic cost-component. The value is dependent on the weather conditions.
<b>3</b>	<b>Cost of materials used for inspection and maintenance</b>	<b>Euro/per 3 month</b>	Comes from the company B. This cost is variable, since it changes with the change in the level of activity. According to the agreed technology, the cost is not traced, but instead, is allocated.
<b>4</b>	<b>Possible additional direct labour cost</b>	<b>Euro/hour</b>	Comes from the company B. Is a direct traceable cost per wagon that can arise in case a wagon needs more time for the maintenance because of the worse condition.

#### **4.4 Factors influencing the costs in the "Wagon" element and risks related to them**

Activity of a company is connected with the costs the company incur. These costs come in the form of invoices for services performed and goods purchased. Thus, from the point of view of contractors the costs of the company are the selling prices of the services and goods sold by contractors. Consequently, when speaking about the factors affecting the costs of the company we can speak about the factors influencing the prices of the contractors. However, there should be mentioned that the above-mentioned assumption alone works only in the ideal conditions when the company does not bear any unforeseen extra costs caused, for example, by the poor management of activities. For instance, this may

happen due to the bad qualification of personnel. For this reason, the qualification of workers should be also taken into account as an influencing factor. The next chapters are devoted to the analysis and description of the factors that affect the costs of the "wagon" element.

#### **4.4.1 Wagon usage fee**

Wagon usage fee is charged by the company-owner of the wagons for the whole period of use of the wagon from the beginning of the technical run until its end. The fee is calculated by multiplying the number of days of use by the rate per day. Usually the rate per day is fixed during the year or within the period agreed in the contract between the wagon owner and the lessee. The wagon owner determines the day rate taking into account the following criteria:

- Coverage of the exploitation costs.
- Average value of the rate on the market.
- Target profit.

A quotation for the transportation, including the wagon usage fee, is given to a customer before the transportation starts. The wagon owner estimates the amount of days of the technical run based on the normative delivery time and the approximate time needed for loading and unloading of the wagon. The estimated number of days is then multiplied by the day rate to calculate the total usage fee that represents a cost for the case company. The interviewed manager informed that the wagon usage fee may reach up to 17 % of the total transportation cost. This suggests that this component has a considerable weight in the whole cost structure of the transportation.

In order to reduce the costs related to the "wagon usage fee" component the case company can try to affect both the value of the usage rate per day and the way the number of days in use is calculated. As it was mentioned earlier, there are three criteria that the wagon owner considers when determining the day usage rate. The case company potentially can influence only one of them – the target profit. By negotiating, the case company can ask the wagon owner to reduce the day usage rate by decreasing the level of its target profit. The second way to cut the costs coming from the "wagon usage fee" component is to decrease the number of days used in calculations. The wagon owner always strive to reduce the risk of possible losses that may arise if the number of days in use is calculated to be too low. For minimizing the risk, the wagon owner usually makes some margin by adding some extra days into the calculation that ultimately increases the value of the wagon usage fee. This secures him, but simultaneously poses a risk to the case

company that a client will not buy the service because the price is too high. To deal with this problem the case company should control the technology of calculating the days in use and interfere in the process when needed.

In order to evaluate the influence of the "Wagon usage fee" on the total cost of a transportation the author uses sensitivity analysis. For the purpose of the analysis from the internal secondary data there have been chosen two transportations: one with a short delivery time to some Russian destination station and the second one with the delivery to Uzbekistan, which implies the significantly longer delivery time. The results of the analysis are showed in Table 5.

Table 5. Cost sensitivity analysis for the short and long distance transportations with the two scenarios

	Actual data	Change in wagon usage fee	
	Euro	minus 3 days	plus 3 days
<b>Transportation to Russia</b>	1800		
Wagon usage fee	$W.u.f. = days * rate = 8 * 14=112$	$W.u.f. = (days - 3) * rate = 5 * 14=70$	$W.u.f. = (days + 3) * rate = 11 * 14=154$
%	$\% = \frac{112}{1800} * 100\% = 6,2\%$	$\% = \frac{70}{1800} * 100\% = 3,9\%$	$\% = \frac{154}{1800} * 100\% = 8,6\%$
<b>Transportation to Uzbekistan</b>	4000		
Wagon usage fee	$W.u.f. = days * rate = 17 * 14=238$	$W.u.f. = (days - 3) * rate = 14 * 14=196$	$W.u.f. = (days + 3) * rate = 20 * 14=280$
%	$\% = \frac{238}{4000} * 100\% = 6\%$	$\% = \frac{196}{4000} * 100\% = 5\%$	$\% = \frac{280}{4000} * 100\% = 7\%$

The results show that the increased quantity of days used in calculations may increment the total cost of a transportation by 1 % for the long distance deliveries and even by 2,4 % for the short distance transportations. Even though the percentage is low, it still has a certain influence in the highly competitive environment. The author points out, that the calculations made are approximate to some extent, nevertheless are based on the real data. This approach is universal and may be applied to some certain transportation that needs to be evaluated.

#### **4.4.2 Cost of a wagon inspection and maintenance in the depot in Kouvola**

As was mentioned earlier, the elements of the inspection and maintenance cost are generated by the two vendors: the subcontracted company B and the lessor of the depot tracks. Tracks rent fee, administrative fee, waste disposal fee and snow removal fee are not charged simultaneously, but instead have different accounting periods. The case company allocates the periodic costs to the number of wagons sold within a month. So, the total semi-variable cost per wagon can be derived. The cost in question is the compound cost, hence, for describing factors that have an impact on it, there would be reasonable to consider the factors influencing each cost component separately.

The first component is the direct labor cost. Direct labor cost is agreed to be unchanged within a certain relevant range and it is 85 euro per wagon. There are several factors that can affect the direct labor cost. First of all, it is a relevant range. The service providing company that inspects and maintains the wagons set the price of its services at the level that covers costs and brings profit within a particular relevant range. If the activity level goes beyond the limits of the agreed relevant range, the company's level of profitability changes. If the number of the wagons arriving to the depot for inspection and maintenance decreases dramatically, the fixed cost per wagon raises and gradually makes the contractor's service unprofitable. To avoid this the service providing company can either cut the fixed costs, for example, by discharging a part of personnel or agree with the case company a hirer price for its services. The second option, consequently, increases the case company's variable cost per wagon.

The other factors that can influence the direct labor cost component can be, for example, changes in legislation implying the indexation or some other increase in salaries. Also the growth of the corporate tax rate or the increase in social contributions. Moreover, the service provider can raise the price due to the changes in the pricing policy related to some new business strategy.

The next cost component inside the cost of a wagon inspection and maintenance is the tracks rent fee. This is a component that comes from a third party provider. This cost component has a major value among all the costs composing the cost of a wagon inspection and maintenance, therefore any changes in it have a strong influence on the overall cost. The main risk connected with this component is that it cannot be influenced much by the case company. In case the lessor decides to raise the fee the case company has no alternatives to keep the value of cost unchanged, except to try to negotiate about it. It is impossible for the case company to change the service provider because the current les-

sor is the only party that can lease the tracks in Kouvola. Neither the case company can relocate the wagon depot to some other station in Finland due to the significant capital investments concerned with it. So, if the lessor raises the rental price the case company has to deal with the increased cost and either can bear it itself or shift it to the clients. The second option is not favorable because it reduces the company's competitiveness.

The third component is the administrative fee. The case company has to pay it each month to the company B. The value of the charge is agreed to be constant during the year. The point of this fee is that it consists of the company B's commission for the services it orders from own contractors that are performed in the interests of the case company. The contractors perform various services for the company B, like, for example, waste disposal, snow removal and supply of materials according to the contracts concluded between them. The company B orders the services and materials both for the own needs as well as for the needs of the case company at the same price. As a result, the case company pays less than it otherwise would have to pay if it had to conclude several agreements directly with each contractor of the company B. Concluding several agreements with each contractor is costly because the only case company's need for the services and materials is lower than when it is joint with the company B. Therefore, here works the economy of scale principle. For this reason, the price of the services and materials solely for the case company would have been higher.

The next component is the waste disposal fee. It is a variable cost related to the maintenance and repair of wagons. The more wagons is handled in the depot the higher this cost is. This cost arises from the need for disposing rubbish found in the wagons and scrap left from materials used for maintenance and repair of the wagons. On the average, the amount of the fee lays within the range of 500-700 euro for the half of a year. Since it is quite few with regard to other costs and, otherwise would need a lot of service provider's paperwork related to assigning this cost, the management has decided not to trace these costs to each wagon handled, but instead to allocate them to the number of wagons maintained and repaired during the half of a year.

The removal of waste is performed by the third party provider that charges the company B. The company B charges the case company exactly the same amount including its provision into the administrative fee.

The last component in the "cost of a wagon inspection and repair in the depot in Kouvola" is the snow removal fee. This cost is indirect in relation to the cost object that is transportation. The value of this cost is mainly dependent on the weather conditions.

#### **4.4.3 Cost of materials used for inspection and maintenance**

Wagon maintenance and repair imply the use of materials and some spare parts. It is agreed that the service providing company B purchases all needed materials itself, while the supply of spare parts is done by the case company. The service provider charges the case company four times a year. The distinctive feature of the case company's wagon supply technology is that condition of the arriving wagons cannot be known beforehand. The condition can be predicted indirectly by looking at the date of the previous depot maintenance of the wagon, however it does not guarantee anything. In severe operating conditions a wagon condition worsens rather quickly. This means that the case company does not have possibility to order only prima condition wagons. Consequently, it is not reasonable to trace the costs per wagon related to the materials used for inspection and maintenance in the depot in Kouvola, because, anyway, the case company has no possibility to influence and manage it. In other words, if we considered carriages arranged last month and compared them to the similar carriages conducted this month, meaning that they are absolutely the same services, we would find that costs of materials incurred in these carriages have different value for each transportation. Due to this reason, the cost of materials used for inspection and maintenance is not traced per wagon, but, instead is allocated to the total number of wagons.

Since the service provider strives to retain the case company as a client, it provides quality services and follows customer-related objectives in its pricing strategy. This means that the service provider is not aiming at receiving the maximum profits charging the case company for the used materials. Consequently, the major factor that may affect the cost of materials used for inspection and maintenance is the market price of the materials.

#### **4.4.4 Possible additional direct labour cost**

Some wagons arrived to the depot in Kouvola may need considerable repair because of the worse condition. The number of such wagons cannot be determined in advance and only can be very roughly predicted. When such a wagon comes to the depot the company B inspects it and agrees with the case company whether it is reasonable to repair it or not. Most commonly, the case company orders the wagon repair if its price is lower than the returning railway rate for the wagon return to some maintenance depot in Russia. However, it is not always reasonable to repair the wagon in Finland. Sometimes the damage of wagon is so specific that it can be fixed only in the specialized maintenance depot in Russia.

If a wagon repair is ordered from the company B, the case company incurs both the cost of a wagon inspection and repair in the depot in Kouvola and the additional direct labour cost. Additional direct labour cost is valued in euro and implies the charge for the labour time used for the wagon repair. The factors that influence the additional direct labour cost are similar to the factors affecting the cost of a wagon inspection and repair in the depot in Kouvola.

#### 4.5 Railway rate

The second element of transportation that generates variable costs is the "Railway rate" element. Railway rates are inherently the sale prices of the production of the railway transport, which is a transportation of cargoes. Each transportation implies that the case company pays the rates both for the loaded and empty run of the wagon. Finnish railway rates are paid directly to the Finnish Railways and Russian and CIS rates are paid to AO "PGK" that acts as an agent for the case company. The principle scheme is depicted in Figure 7.

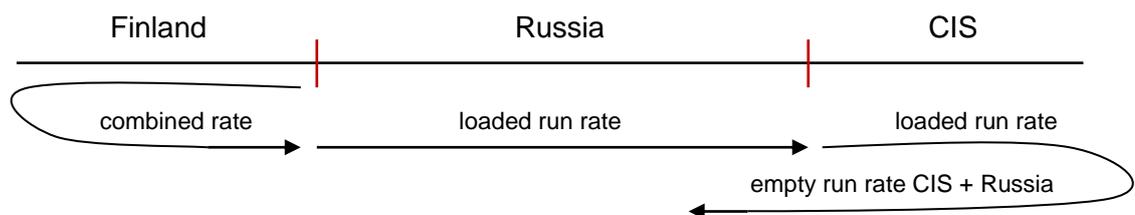


Figure 7. Railway rates included in the cargo transportation

##### 4.5.1 Charging principles in Finland

Even though the Finnish legislation allows the existence of multiple freight rail carriers, until this year there have always been the only one major carrier - Valtion Rautatiet, hereinafter referred to as VR. The case company has a service contract with VR and pays rates charged by it in exchange of the transportation services.

The railway rate that is offered by VR consists of the infrastructure charge paid to the Finnish Transport Agency plus the traffic control, traction services, and shunting charges collected by VR itself. VR has the right to set on its own the price of all the components except the infrastructure charge that is determined by the Transport Agency.

The infrastructure charge comprises the basic infrastructure charge, track tax and the investment tax levied for the railway line section Kerava–Lahti. The basic infrastructure charge is levied for railway traffic operations based on the Finnish Transport Agency's

immediate infrastructure management expenses. The track tax covers the environmental costs caused by train traffic and the fixed infrastructure expenditures of the infrastructure management. The investment tax for the line section Kerava–Lahti is levied over a period of 15 years to cover the investment costs for the railway line from the inauguration in autumn 2006 to August 2021 (Finnish Railway Network Statement 2016, 58-59). Figure 8 illustrates the structure of the infrastructure charge.

<b>Basic charge</b>	Freight traffic 0,1350 cent/ gross tonne-kilometre Passenger traffic 0,1308 cent/ gross tonne-kilometre
<b>Infrastructure tax</b>	Freight traffic - electric 0.05 cent/ gross tonne-kilometre - diesel 0.1 cent/ gross tonne-kilometre Passenger traffic 0.01 cent/ gross tonne-kilometre
<b>Investment tax (for line section Kerava-Lahti)</b>	Freight traffic 0.5 cent/ gross tonne-kilometre Passenger traffic 0.5 cent/ gross tonne-kilometre

Figure 8. Infrastructure charge

Freight charges set by VR are calculated based on several aspects:

- the type of wagon used for transportation
- the type of the goods to be transported
- the gross weight or volume of the goods
- the distance carried, per wagon
- the goods item included in the consignment (VR-Transpoint).

The chargeable distance between the forwarding and the destination station is determined according to railway kilometers. In the international traffic, the tariff includes both the charge for the loaded and the empty run and is paid at a time. Legislation prohibits the use of non-resident wagons for transportations inside Finland, therefore it is implied that a wagon arrives to and departs from Finland by the same route (VR-Transpoint).

#### 4.5.2 Charging principles in Russia and CIS

Like in any industry, freight rates and other associated profits received by the railway administrations and carriers are expected to cover their expenses, ensure their development, financial sustainability and competitiveness in the long run. The basis of the railway rates is the price of carriage that consists of three parts:

$$Price = C_1 + C_2 + C_3$$

$C_1$  - cost of fuel, electricity, materials and depreciation

$C_2$  - salaries and social security contributions

### $C_3$ - surplus value

When determining the value of rates the railways together with the government conduct a specific pricing policy. By this, one should understand the general principles according to which the railway acts when determining the price for its services. The pricing policy is one of the important factors that aimed to lead the railways to its objectives. There can be distinguished the following objectives that are intended to make the railway transport more competitive and increase its financial sustainability in the long run:

- Maximization of the volume of transportations.
- Stimulating the pace of renovation of the assets.
- Maximization of the profits from the main activity.  
(Tereshina, Galaburda, Trihunkov 2006, 339-341).

When organizing a transportation there are two alternatives. If a client wants to deliver goods to Russia then the case company pays, besides Finnish rate, the Russian railway rate only. If a client wants to deliver goods to some CIS country (Commonwealth of Independent States) then the case company pays the transit freight rate through Russia and, probably some CIS country, plus the import freight rate of the destination country. Additionally to the above-mentioned freight rates paid for the load run, the case company pays the rate for the empty run to the agreed destination after the wagon is unloaded. The next destination can be as in some CIS country and in Russia as well.

Charges for the international transportations are determined based on the Unified Transit Tariff and International Railway Transit Tariff and valued in the Swiss francs. Payments are charged on the basis of the bilateral or multilateral agreements between member countries. According to the agreements, there have been determined railway rates that can be regulated by increasing or decreasing coefficients by each party of the agreement. There are certain rules related to this that specify the periodicity and the notification procedure. Profit distribution between the railways that participate in the transportation is carried out in the following way:

- Profits obtained from executing the initial operations and additional charges gained remain in the country of departure.
- Profits obtained from executing the final operations and additional charges gained remain in the country of destination.
- Profits obtained from the transit delivery are distributed proportionally between the participating railway administrations taking into account the actual coefficients applied by these administrations.

International freight rates are differentiated by the type of the wagons used, the level of cargo capacity utilization, the distance of transportation, the type of shipment and the type of size overage. (Tereshina, Galaburda, Trihunkov 2006, 354).

Figure 5 outlines the comparison of cost per kilometer of transportation of a cargo unit by rail and road on the territory of Russia. As can be seen the railway transportation and, correspondingly, the case company's service becomes more reasonable and attractive for the distance of transportation roughly more than 1100 kilometers.

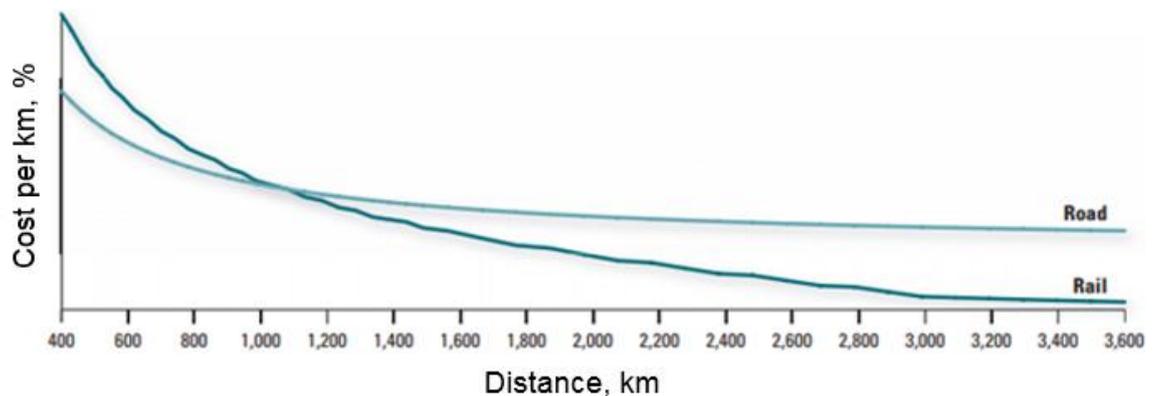


Figure 9. Comparison of cost per kilometer of transportation of a cargo unit by rail and road (ATKearney)

#### 4.6 Factors influencing the cost of the "Railway rate" element and risks related to them

For the case company railway rate is the major cost connected with the arrangement of transportation. This cost is a direct variable cost because it changes proportionately with changes in activity. The more carriages organized and wagons used the higher this cost is. The nature of the cost is such that the case company cannot affect it.

At the same time, the positive moment is that competitors have to pay the same charges because the rate is equal for each market player. The case company, nevertheless, has the possibility to enter into competition. To do this the company should optimize the delivery route or arrange the shorter empty run of the wagon after unloading. The shorter empty run enables to lessen the railway rate and the wagon usage fee.

One more factor affecting costs the case company incurs is the exchange rate difference. AO PGK first calculates the railway rates in rubles, converts them into euro, and then sells to the case company. There are two issues related to this pattern. First is that when converting rubles into euro AO PGK may apply quite unfavorable exchange rate to reduce the own risks, which in turn makes the selling price of a service too high. The second issue

stems both from changes in the exchange rate and from the length of the period of validity of given quotes. If the period of the validity of a quote is too long and the ruble constantly depreciates then clients suppose the quote to be recalculated and become cheaper. If this does not happen, the clients switch to competitors offering more flexible quotes. So, the case company should monitor the volatility of the exchange rate and react to the changes more quickly.

#### **4.7 Additional services**

Due to the agreed business strategy, the case company offers the certain range of services that does not include terminal operations. Some clients, however, need those services. For this reason, the case company purchases some services from companies that specialize in terminal logistics. Additional services is another element in the process of organizing a freight carriage.

"Additional services" element implies the following services organized by the case company:

- cargo handling
- storage
- road transport services
- project shipments
- forwarding services.

The all above-mentioned services except the forwarding services the case company buys from contractors. The price of these services is thus included to the selling price of the freight transportation offered by the case company.

The choice of the contractor, that is in most cases a freight terminal, is made on the basis of several criteria. One of the most important is price, however the own weight have also the others, for example: specialization, experience, geographical location and existence of relationships with competitors. Most often, the case company needs to request for quotes from several contractors in order to get the most beneficial price. In this case, a sales manager of the case company has to carefully estimate possible risks. For example, there is a risk that the contractor having its own network of service providers that enables to organize the transportation, will independently contact the customer of the case company and try to offer a competitive price.

The way the case company can try to reduce the costs related to this element is to buy the whole package of services from the same contractor instead of combining them that

sometimes is done. Another way that may work with the bigger client whose freights are handled through the several terminals is to attract all client's goods to the one terminal and get a discount for the bigger volume. Of course, the case company's selling price should not be reduced to the same extent.

## 5 Ex post Cost-Benefit Analysis of an earlier business decision

Some time ago, the case company faced the problem of an increased competition on the market and consequent decline in the sales level. The management of the case company had to take some steps to stabilize the situation. There have been two alternatives. The first one was to decrease the company's margin and the second - to cut production costs. Declining the margin level was extremely unfavorable, so there was the only option to decrease the production costs of the case company. The management of the company analysed the technological process of the wagon supply and came to the result that it could be improved in order to achieve the goal. In order to cut the costs there should be changed the technology of the wagon supply and consequently the place of inspection and maintenance. In practice, this meant that the wagon maintenance depot had to be relocated from Russia to Finland. The case company have found the service providers in Finland and have investigated their capabilities and prices they charged. For making the decision there have been made the calculations and comparison of the costs related to the maintenance and wagon delivery according to the old and new technology. Additionally, the management projected some intangible benefits that were supposed to appear after the change in the technology. Even so, the main basis for making the decision was the calculation of the tangible costs.

In order to evaluate the effectiveness of the new accepted technology and ascertain that the costs have been reduced, the author decided to apply an ex post cost-benefit analysis (CBA). Besides evaluation of costs, this approach also takes into account the intangible benefits caused by a project, thus making the evaluation of the made decision more comprehensive.

Boardman et al. described nine steps for conducting CBA. They are shown in Table 6.

Table 6. Steps for conducting CBA

1	Specify the set of alternative projects.
2	Decide whose benefits and costs count (standing).
3	Identify the impact categories, catalogue them, and select measurement indicators.
4	Predict the impacts quantitatively over the life of the project.
5	Monetize (attach dollar values to) all impacts.
6	Discount benefits and costs to obtain present values.
7	Compute the net present value of each alternative.
8	Perform sensitivity analysis.

9	Make a recommendation.
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In the author's opinion, CBA of the assessed decision - the depot relocation project - nevertheless, needed fewer stages for the two reasons. Since the performed analysis was the ex post, it did not imply discounting for obtaining present values. And, the second reason was that there was no need for performing sensitivity analysis. Performing sensitivity analysis was unnecessary in the current case because both the predicted impacts and the appropriate monetary valuation of each unit of the impact could be determined rather explicitly.

The author has adapted the guidelines by decreasing the number of steps. The results are shown in Table 7.

Table 7. The steps in ex post CBA for the case company

1	Specify the set of alternative projects.
2	Identify the impact categories, catalogue them, and select measurement indicators.
3	Monetize all impacts.
4	Compute the net value of each alternative.
5	Make a recommendation.

The first step in the analysis was to set the alternatives. The author chose as the first alternative the old supply technology having the depot at the station Tosno in Russia. This was the displaced project, that is called the *counterfactual* according to the terminology, described by Boardman et al (2014, 7). In the current case, the counterfactual meant the same as the status quo. The second alternative was the new technology having the depot at station Kouvola in Finland.

The second step was to identify the impact categories, catalogue them, and select measurement indicators. As stated by Boardman et al. (2014, 8), we have to know that there is the existence of a causal relationship between some physical outcome of a project and the related party in order to treat something as an impact. So, the author analyzed both technologies starting from the moment when an empty wagon departed from an unloading station to the moment when an inspected and gone through the maintenance wagon was ready for dispatching to a client. There have been generated the following list of the cost impact categories:

1. Railway rate from station of unloading to the maintenance depot.
2. Cost of inspection and maintenance.
3. Railway rate from the depot to the wagon distribution site.

According to the new technology, the depot is in the same place as the wagon distribution site that is in Kouvola. As the result, there is no cost related to the railway rate from the depot to the wagon distribution site in the "New technology" column. Description of the cost impact categories is given in Table 8.

Table 8. Description of the cost impact categories

<b>Cost impact category</b>	<b>Description</b>	
	<b>Old technology</b>	<b>New technology</b>
Railway rate from station of unloading to the maintenance depot	Railway rate from station of unloading to the station Tosno	Railway rate from station of unloading to the station Kouvola
Cost of inspection and maintenance	Includes labor cost, cost of materials and administrative and other costs in Tosno	Includes labor cost, cost of materials and administrative and other costs in Kouvola
Railway rate from the depot to the wagon distribution site	Railway rate from the station Tosno to the station Kouvola	This cost is avoided in the new technology

The next step was to generate the list of benefit impact categories. Valuable practical experience gathered after introducing the new technology helped to take into account the most significant benefits. The first benefit named "Ability to sell service" is attributable to both technologies, because the existence of the depot, wherever it is, is the part of the supply technology. The complete list of the benefits including the benefits appeared after the new technology has been introduced is given below.

1. Ability to sell transportation services.
2. Price premium benefit.
3. Avoidance of reclamations from customers.
4. Avoidance of serious wagon damages caused by their bad commercial condition.

The author explains the nature of the benefits appeared after the launch of the new technology further. Price premium benefit means that the case company has the possibility to add a markup of 2% to the transportation price. The relocation of the depot enabled to better satisfy the customer's demand for wagons needed for carriages and at the same time made it possible to reduce the other costs related to the inspection and maintenance. Hence, the case company got the possibility to slightly increase its gross profit compared to that in the old technology.

The new supply technology enabled to avoid expensive returns of wagons rejected by customers due to their bad condition. Performance of the depot in Kouvola is managed and controlled better than it was in Tosno, so the quality of the wagons' repairs has increased. Additionally, there is a very small risk that a customer will receive a wagon with damaged equipment and consequently reject it. This is because according to the new technology, wagons are repaired in Kouvola right before the delivery to a client. In the old technology, wagons need to go about 250 km being repaired before they arrive to the customer. During this transportation a wagon equipment might be damaged, neither it was possible to repair it in Finland before the delivery to the client. According to the statistics, each 20<sup>th</sup> wagon would have been returned back to Russia for the repair if there would not be the depot in Kouvola.

"Avoidance of serious wagon damages caused by their bad commercial condition" means that the case company gained the possibility to avoid the cost that would appeared if a wagon damaged to the unusable condition. This cost is 20000 euro per wagon.

After the list of cost and benefit impact categories was ready, the author catalogued them in Table 8. The next step was to select measurement indicators. As Boardman et al. (2014, 9) remarks, "the choice of measurement indicator depends on data availability and ease of monetization." Taking this into account the author has determined the measurement indicators, listed in the Table 9.

Table 9. Benefit and cost impact categories with measurement indicators

<b>Benefit impact category</b>	<b>Measurement indicator</b>
Ability to sell service	Average sales revenue gained from one transportation using one wagon
Price premium benefit	Extra revenue from one transportation using one wagon
Avoidance of reclamations from customers	Amount of money saved due to the lack of need to return a bad condition wagon back to Russia in terms of one transportation using one wagon
Avoidance of serious wagon damages caused by their bad loading condition	Amount of money saved due to the lack of need to pay the wagon owner a compensation for the damaged wagon in terms of one transportation using one wagon
<b>Cost impact category</b>	<b>Measurement indicator</b>
The measurement indicator for all the cost impact categories is the euro value spent to supply one wagon	

The next step was monetizing of the impacts. They are monetized in terms of one wagon, using the statistical data gathered internally. The formulas provided below.

$$\text{Ability to sell service} = 4000 \text{ euro}$$

$$\text{Price premium} = 4000 * 2\% = 80 \text{ euro}$$

$$\begin{aligned} \text{Avoidance of reclamations from customers} &= \\ &= \frac{\text{railway rate} + \text{days in use} \times \text{day usage rate}}{20 \text{ days}} = \frac{700 + 3 \times 14}{20} = 37,10 \text{ euro} \end{aligned}$$

$$\begin{aligned} \text{Avoidance of serious wagon damages caused by their bad loading condition} &= \\ &= \frac{\text{compensation for one wagon}}{\text{number of wagons in a year}} = \frac{20000}{1307} = 15,30 \text{ euro} \end{aligned}$$

The net value computation of each alternative is performed in Table 10.

Table 10. Computation of the net value of the alternatives

	Inspection and maintenance in Russia	Inspection and maintenance in Finland
	euro	euro
<b>Benefits of the project</b>		
Ability to sell service	4000,00	4000,00
Price premium benefit		80,00
Avoidance of reclamations from customers		37,10
Avoidance of serious wagon damages caused by their bad loading condition		15,30
<b>Total Benefits</b>	<b>4000,00</b>	<b>4132,40</b>
<b>Costs of the project</b>		
Railway rate from station of unloading to the mainte- nance depot		
cost of transfer	25,00	100,00
cost of using a wagon	140,00	70,00
Cost of inspection and maintenance		
labor cost	35,00	85,00
cost of materials	4,00	5,00
administrative and other costs	5,00	3,00
Railway rate from the depot to the wagon distribution site		
cost of transfer	100,00	0,00
cost of using a wagon	42,00	0,00
<b>Total costs</b>	<b>351,00</b>	<b>263,00</b>
<b>Net Benefits</b>	<b>3649,00</b>	<b>3869,40</b>
<b>Difference</b>	<b>220,40 euro</b>	

As can be seen from the table, the new technology is better and helps to save 220,40 euro per carriage. This is owing to the fact that the new technology brought the benefits that were absent in the old technology and the total costs of the new technology are lower than those in the old technology. Such significant improvement allows making an unambiguous conclusion that the new option is economically viable. Estimating the annual effect of the new project (alternative), in the author's opinion, the case company will clearly become more competitive, so should definitely continue to apply the new technology.

## 6 Conclusions

In this chapter, the author summarizes the main outcomes of the research and provides recommendations. Additionally, the author discusses other topics like the reliability and validity issues and learning outcomes that were gathered during the thesis writing process.

### 6.1 Key findings

There have been given a detailed analysis of the production variable costs of the case company. For this purpose, the author divided a freight carriage into three elements. On this basis, each element has been examined and subdivided into cost-components. After this, the cost-components were classified and factors affecting them was described. There have been provided reasoning on the ways of reducing the costs of the case company. The results of classification are depicted below.

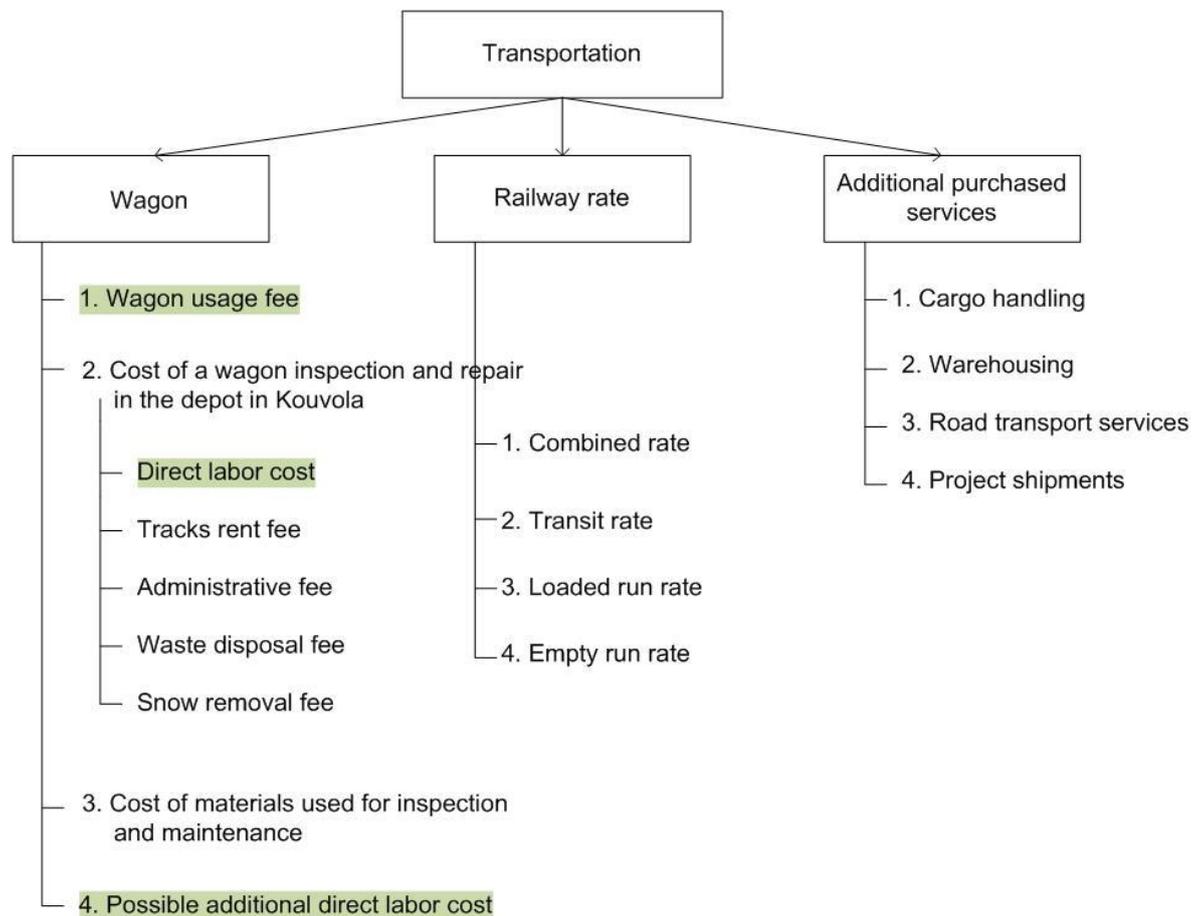


Figure 10. Cost structure of a freight transportation

Cost-components of the "Wagon" element represent both direct and indirect costs. Consequently, some of them traced to the cost object and others are allocated. Traceable

cost-components are highlighted in green in Figure 10. The major cost-component in this group is the “wagon usage fee”. It can reach up to 17 percent of the total cost of a transportation.

The other cost-components have a lower weight in the total cost structure. For instance, the direct labor cost is just about 2% and the tracks rent fee is about 1%. In general, the costs related to the “Wagon”-element were significantly reduced by the relocation of the depot from Russia to Finland. It seems that there is no big potential in cost reduction in this element any more. The second largest cost in this element is “Tracks rent fee”. The way to decrease this cost might be tracks rental in other regions of Finland, however it is not reasonable due to the several reasons:

- Kouvola is the major railway junction in terms of the freight traffic related to Russia, so moving out from it is unreasonable
- The lack of suitable tracks and infrastructure in other regions of Finland that would be economically reasonable.

Potentially, the costs would be decreased by changing the service provider who is in charge for inspection and maintenance, however in practice there is no alternative provider offering sufficient level of quality for the lower price.

The "Railway rate"-element itself is the major cost in a freight transportation and can reach up to 80 percent. The cost-components of the "Railway rate"-element are the different types of railway rates the case company has to pay when organizes a freight carriage. In Finland the case company pays the combined railway rate to the monopolist VR and almost has no possibilities to reduce this cost-component. Railway routes are standard without any alternatives, so the only way to lessen the above-mentioned cost-component is to plan the delivery route so, that a part of the delivery distance is operated by road transport. This, of course, makes sense in case the total cost paid to haulier and VR is lower than it would be if the whole transportation were operated via railway.

When the carriage is organized to some CIS country, the case company pays the transit railway rates via Russia and other transit countries. These rates are determined by Russian railways (RZD) and the Railway administrations of the transit countries and are the same for each market player. In the destination country, the case company's cost consists of the two cost-components: the load run rate and the empty run rate. The value of the load run rate is tied to the location of the destination station and cannot be changed, because the delivery route is standard. Hence, the value of the empty run rate can be influenced by the case company. To achieve this goal the case company should find the next shipper, who will take the wagon for loading, geographically as much closer to the unload-

ing station as possible. The less the distance to the next client the less the amount of the railway rate paid by the case company.

The analysis of the "Additional services"-element has showed, that the total cost of this element can be influenced by the choice of the service provider. Whenever the new delivery scheme needs to be organized, the case company should choose the most qualified and experienced service provider. The price of a service is very important as well. The poor performance can lead to some extra unpredicted costs that can appear right after the transportation starts. It has been investigated that the case company has a possibility to buy services, related to the same transportation from different service providers. For some carriages, it is a reasonable option.

The results of CBA showed that the relocation of the depot was the right decision that helped to significantly decrease the cost of a transportation. Besides the tangible benefits - the cost reduction - the relocation enabled to develop the quality of services, to increase the responsiveness to the demand and to reduce the number of reclamations referred to the commercial condition of the wagons. The listed benefits for sure have improved the image of the case company and made it more competitive on the market.

## **6.2 Recommendations**

The case company should continue to optimize the delivery routes within Finland and, when necessary, to increase the use of the road transport for the delivery of goods from manufacturer or other consigner to the large logistics centre. By doing this it is possible to achieve cost reduction of the transportation because the railway rate from the large logistics centre to the boarder may be significantly lower than the railway rate from some smaller station near the manufacturer (consigner) to the boarder. This is because for VR the operating costs for the smaller distant station may be greater than those for the station inside the larger logistics centre.

Also, the case company may consider expansion in the neighbouring Baltic countries and organizing transportation to and from these countries as well as transit carriages through them. For this, the case company need to carefully consider own capabilities, both internal and external resources and on this basis to make a final decision. In the author's opinion, at first site, the case company has a chance to successfully expand its business to Estonia or Latvia due to some similarities in the business environment, gained experience and the possibility to operate there the railway fleet of one of the shareholders. This may be the topic for the further research.

### **6.3 Reliability and validity**

The reliability of this thesis was maintained by using the academic books and articles written by well-known professionals in the relevant field. In addition, the major part of the secondary data was obtained directly from the case company. The author also used reliable sources of the information when collected the data from the internet. Many theories and approaches were evaluated before the most relevant have been chosen.

The approach used for cost classification seems to be rather universal, thus can be used for other companies as well. The cost-benefit analysis applied for evaluating business decision is one of the possible options and may not be suitable for other businesses. Special needs and conditions should always be taken in account. The author is confident that the results of this thesis are reliable and valid, therefore should be used by the case company.

### **6.4 Learning outcomes**

The work on this thesis required from the author applying a wide range of knowledge and skills acquired during studying. This thesis was done for the real company that is why a lot of time have been devoted for careful searching and handling the information. The author acquired the skill of searching the specific information and evaluating its relevance. While writing this thesis the author has strengthened his knowledge in managerial accounting and learned many approaches and methods applied in it. Application of the theory and its correlation with the practice helped to develop analytical skills and critical thinking. The author's working experience was the benefit in choosing and applying the proper theory and helped in doing the research. The indispensable part of the research was conducting the interviews. The author has got to know different types of the interviews and gained an experience in conducting the semi-structured interviews. The author has broaden his horizons and acquired knowledge in managerial accounting related to the business field he works in. In the authors opinion the made research definitely brings value to the case company.

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## Appendices

### Appendix 1.

#### Questions for the first interview

1. What are the costs related to the Wagon element?
2. What is the value of the wagon day usage rate and how is it calculated?
3. Which of the incurred costs relate to the depot in Kouvola?
4. Who are the contractors of the case company in terms of the additional services?
5. What kind of contracts do the case company have with its contractors?
6. How often do service providers invoice the case company?
7. Are there any alternative service providers in Kouvola who could do inspections and maintenance of the wagons?

#### Questions for the second interview:

1. Is there a calculation or comparison of costs for the alternative implied the depot in Kouvola?
2. What method to estimate the outcome of the depot relocation was used in the company earlier?
3. What is the value of the railway rate for each stage of the wagon delivery from Russia to Finland?
4. What was the labour and materials costs in the depot in Tosno?
5. What issues were connected with the relocation of the depot?