

Saimaa University of Applied Sciences
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Degree Programme in International Business Management

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**DECREASING GLOBAL COSTS OF
TRANSPORTATION BETWEEN INTER-GROUP
LOCATIONS
CASE: OUTOTEC, SPARE PART BUSINESS**

Master's Thesis 2012

ABSTRACT

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The subject of the thesis was to find out ways how the case company Outotec can decrease the global costs of transportation of spare part deliveries between inter-group locations. The main research question was how can Outotec decrease global costs of transportation between inter-group locations? In order to answer the main research question the current situation of the transportation arrangements and costs needed to be studied. Hence the sub research question became: what is the current situation of Outotec's transportation arrangements and costs between Outotec inter-group locations?

The research was carried out by using qualitative research method with the support of pre-gathered quantitative material. The thesis is a part of a larger development project for Outotec's spare part business led by a consultant company. The consultant company gathered the basic information of Outotec's annual sales order lines which was then used as a basis for finding out the main transportation routes between Outotec locations. The information of the main routes was specified in more detail by open email queries to logistics persons working at different Outotec locations. As a result a 12 sheet excel sheet matrix was gathered from the main transportation routes between Outotec locations containing the information of sales order lines, delivery terms and forwarders used, total kilograms delivered by transportation modes, current transportation costs per unit by transportation modes and comparisons of transportation costs per unit by forwarder and transportation mode.

The research showed that the delivery arrangements between Outotec inter-group locations are uncoordinated and there are overlapping functions. Therefore the costs of transportation are higher than they could be. Three main problems increasing the costs of transportation were defined. There are no global contracts with the forwarders, the use of airfreight and express deliveries is too extensive and there is no cooperation in delivery arrangements between Outotec locations. All the locations basically use their own transportation services and delivery terms. In order to improve the situation Outotec should choose global centralized partners for transportation and make long term contracts. The use of airfreight and express deliveries should be decreased by better stock planning and the cooperation in transportation arrangements between Outotec locations should be started by agreeing on common rules and delivery terms and by consolidating deliveries.

Keywords: transportation, transportation costs, modes of transport, delivery terms, outsourcing

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1 INTRODUCTION

Increasing customer demands and company profit expectations have high impact on supply chains these days. In order to carry out and maintain effectiveness of the constantly changing supply chains and logistics, the company's transportation arrangements need to be able to adapt quickly to the changing requirements without causing unnecessary transportation costs. Due to globalization of trade, transportation has become an even more complex function with several aspects for companies to consider when targeting cost control and cost reduction.

The importance of transportation costs has grown because of globalization and complex business networks. By properly managed transport it is possible to decrease transportation costs and increase profit and have better customer service. This thesis is a case study of a single international company's endeavor to control and decrease the global costs of transportation.

1.1 Background

The case company, Outotec, has traditionally concentrated on providing plant and equipment solutions. Since the main focus has been on equipment, after sales services have not been strongly recognized in the company strategy. During recent years, the importance and growth possibilities of after sales services have been paid attention to, and therefore Outotec has begun to develop and enhance its after sales organization and service functions. For the coming years the growth targets for after sales business have been set high, but at the same time the costs should not escalate at the same pace. Therefore the functions require further consideration. In order to reach the set targets a special project for developing after sales services was launched. The project concentrates specifically on the spare parts business. This thesis is a sub project of the spare parts business project.

Earlier there has been no clear understanding of the material flow and re-

sources included in Outotec's spare parts business around the world. No one has had the global knowledge regarding which spare parts have been delivered, where from, whereto, by whom and at what cost. Outotec's service locations, meaning the units selling and delivering the spare parts around the world, have been working independently without common guidelines or cooperation with each other. Part of the spare parts business development project was related to removing the lack of knowledge of the current situation in spare parts business. The aim of the spare parts business project was to analyze the current state of global spare parts business, and based on the analysis make suggestions for future spare parts business road mapping.

A consulting company was hired to run the spare parts business project and thus make an overall global analysis on the current situation and costs of warehouses, purchasing and sales transactions, suppliers, customers, and inbound and outbound transportation. As mentioned earlier, this thesis is a sub project of the spare part business project. The subject of the thesis is to more closely concentrate on a specific area of transportation costs within the development project. The area of concentration is inter-group transportation costs meaning the costs occurred while delivering the spare parts from one Outotec location to another.

1.2 Objectives of the study and research question

The objective of the thesis is **to find out ways how Outotec can reduce the global costs of transportation of spare part deliveries between inter-group locations**. In order to make improvement suggestions, an analysis on current transportation arrangements and costs of spare part deliveries between Outotec inter-group locations needs to be made. The intention of the thesis is to find an answer to the main research question:

- How can Outotec decrease global costs of transportation between Outotec inter-group locations?

In order to be able to answer the main research question, the current state of the transportation arrangements and costs needs to be examined. The sub-question hence is:

- What is the current situation of Outotec's transportation arrangements and costs of transportation between Outotec inter-group locations?

The research needed to be done in order to find out about the current situation. How the actual research was carried out is discussed in chapter 7. The chapter will describe in detail the different steps taken and the methods used.

1.3 Limitations of the thesis

The thesis is limited only to Outotec inter-group transportation between Outotec locations. The outbound deliveries to end customers from Outotec warehouses and the inbound deliveries from suppliers to Outotec warehouses have not been researched though the subjects are a part of the spare parts business project. This research concentrates on transportation lanes between Outotec locations with highest volumes in sales order lines. A few Outotec locations have been left out of more detailed analysis due to the insignificant amount of sales order lines and therefore infrequent transportation needs. The locations left out of the more detailed analysis are discussed in chapter 8.

1.4 Theoretical framework and study structure

The background, objectives and limitations of the thesis are discussed and explained above, and thus concentration will now be turned to the theory supporting the study. The theoretical framework of the study consists of subjects related to supply chain management and logistics, transportation, transportation modes, outsourcing and third-party logistics (3PLs), delivery terms, costs of transportation and ways of decreasing costs of transportation. The study structure starts with theory point of view and proceeds through

research design to the current state analysis and problem identification leading finally to improvement suggestions for the problems detected.

In chapter 2 the main subjects addressed are supply chain management and logistics. The basic concepts and activities of supply chain, supply chain management and logistics are explained in order to understand the wider perspective where transportation takes a position. The difference between supply chain management and logistics is brought up since the terms are commonly mixed up and often result in confusion.

Chapter 3 construes the meaning of the term transportation and the role of transportation as a value adding function. The efficiency principles of transportation are described and the activities of transportation are presented. One of the transportation activities, selecting the mode of transport, is more closely set out due to its high effect on Outotec's transportation costs. Naturally, the modes of transport are also studied insofar as is pertinent to the topic. Outotec outsources its transportation activities and therefore outsourcing has a relatively high importance in the chapter.

Chapter 4 dedicates itself to delivery terms and choosing the suitable delivery term. The most commonly used set of delivery terms, Incoterms 2010, is explained in detail due to the fact that Incoterms itself, and the consequences of choosing a certain term, can be quite challenging to understand. Delivery terms play an important role as a cost factor and a confusion maker at Outotec, and are therefore included in the study.

Chapter 5 aims at describing the relevance of the amount of transportation costs to the company's profits. The transportation activities which create the costs and the different ways of defining the transportation activities are studied. The basic concepts of rates and pricing are presented. Thus the main focus is on the factors which influence transportation costs and pricing.

Chapter 6 concentrates on transportation management and transportation planning as being conducive factors in decreasing the costs of transportation.

Transportation management systems are presented as they can be an effective way of diminishing transportation costs, for example, through better cost-control and accuracy. As cost decreasing factors, the different ways of consolidating the deliveries are explained and the importance of logistics service provider selection and contracts are discussed.

After reviewing the theory chapters related to the subject, in chapter 7 the research design, or in other words the research plan is reviewed. This chapter depicts the different stages of the research step by step, and presents how the research process was carried out. The methods used in the research are also explained.

Chapter 8 reports the current situation of global Outotec inter-group transportation arrangements and costs. The intention is to answer the sub research question about the current situation of Outotec's transportation arrangements and costs of transportation between Outotec inter-group locations.

The logical step after analysis of the current situation of Outotec's transportation arrangements and costs is problem definition. Chapter 9 defines the main problems identified based on the current situation described in chapter 8. The consequences of the detected problems are also discussed.

In chapter 10 the purpose is to give an answer to the main research question how Outotec can decrease global costs of transportation between Outotec inter-group locations. Practical improvement and development suggestions for the problems detected in the previous chapter are presented. The conclusions of the study are presented in chapter 11.

2 SUPPLY CHAIN MANAGEMENT

The times when an individual company competed as a single entity have passed. Nowadays it is almost impossible for a company to survive on its own and keep up with the ever increasing demands and growing profit expectations.

In this context, the companies working together are called supply chains. In global trade in order to keep the critical production processes going, the emphasis is on speed and cost efficiency which can be achieved by having effective transportation functions. The purpose of this chapter is to explain the concepts of supply chain, supply chain management and logistics, and to give the reader a directional framework for understanding that transportation is a part of a wider perspective consisting of supply chain and logistics.

A supply chain is a network of units which are involved in producing and delivering an end product to the final customer. Depending on the industry, the supply chain includes activities such as sourcing raw materials, manufacturing, producing and assembling the products, warehousing, order entry and tracking, distribution and transportation to the end customer. Commonly the primary members concerned are suppliers, producers, wholesalers or distributors, retailers and customers (Sanders 2012, pp. 3-4). Supply chain also needs supporting members, who provide resources, know-how, instruments and reserves for the primary members (Brewer & Button & Hensher 2001, p. 105).

Supply chain management in turn is about designing, coordinating and managing the flow of products, information and funds related to the supply chain (Sanders 2012, p. 3). In addition to the mentioned flows, Bowersox & Closs & Cooper (2002, p. 6), add to the list the flows of service and knowledge. According to Brewer et al. (2001, pp. 99-100) the Global Supply Chain Forum has defined supply chain management as:

“...the integration of key business processes from end user through original suppliers that provides products, services, and information that add value for customers and other stakeholders.”

Supply chain management consists of three main activities; coordination, information sharing and collaboration. Coordination includes the movement of funds and goods or services throughout the whole supply chain in both directions containing also possible return flows. Sharing relevant information among the members of the supply chain is important in order to assure the smooth op-

eration of the supply chain. Taking into consideration the planning, operating and execution of the business decisions towards the common goal for all supply chain members, collaboration is essential. (Sanders 2012, pp. 6-7).

2.1 Logistics vs. supply chain management

Supply chain management is often mixed up with logistics. Despite the common confusion logistics is a separate though a key supporting function to supply chain management (Sanders 2012, p. 15). Bowersox et al. (2002, p. 4) define logistics as the work required to move and position inventory through the whole supply chain. According to Sanders (2012, p. 15) logistics is a part of supply chain management and is responsible for transporting and delivering products to the right place at the right time throughout the whole supply chain. In addition to right time and right place, Ballou (1992) specifies that the goods should be also in the right condition and the whole process should be done in a way that the company concerned would gain the highest possible profit (Brewer et al. 2001, p. 66).

2.2 Logistics activities

Logistics is a complex function consisting of tasks relating to transportation, storage, material handling, packaging, inventory control, order fulfillment and facility location (Sanders 2012, pp. 187-189). Furthermore Lambert & Stock (1992, p. 13) widen the perspective by mentioning logistics activities such as customer service, distribution communication, demand forecasting, procurement, parts and service support, salvage and scrap disposal and return goods handling.

The main task of storage function is to decide the number and locations of the warehouses and the amount of inventory. Material handling function is about the actual physical handling of the products such as loading and unloading from the transportation vehicles and placement and picking of products in the warehouse. Packaging is related to material handling. The main task is to prevent the product from damage, but the package also needs to be suitable for

handling in the warehouse and for the transportation mode used. Inventory control is needed for keeping the necessary items in stock, taking care of the on time replenishments and periodical cycle counting. Order fulfillment involves completing, shipping and delivering a customer order. Facility location is about deciding the best location for the warehouses since the location has a remarkable influence on transportation costs and inventory levels. (Sanders 2012, pp. 187-189).

Customer service binds together the logistics activities. All the elements of the company's logistics process have an impact on customer satisfaction which is an integral part of customer service. Communication is a crucial link throughout the firm's logistics system and its customers. Successful logistics is highly dependent on effective communication. Forecasting demand provides information how much and which product should be manufactured and where it should be placed for the customer. Procurement means obtaining the materials and services needed in the company's manufacturing and logistics processes. Logistics also has a role in parts and service support processes such as repair and replacements of the parts, not forgetting the return of parts referred as reverse logistics. Salvage and scrap disposal belong to the logistics process by disposing waste material which no longer can be used. (Lambert & Stock 1992, pp. 13-18).

The above paragraphs included all the logistics activities excluding transportation. Transportation has a special role in supply chains and logistics. Without well operating transportation, logistics cannot fully utilize its advantages. A smoothly functioning transportation system reduces the logistics costs, improves the efficiency of logistics and improves the quality of the service. Therefore, transportation is discussed more thoroughly in the next chapters.

3 TRANSPORTATION

As noted above one of the primary logistics tasks is transportation which deals

with moving products and thus enables logistics to provide place utility (Sanders 2012, p. 189). According to Lambert & Stock (1993, p. 9) **place utility** means the value added to a product by making it available for purchase or consumption in the right place. Transportation also provides time utility by ruling the speed and consistence of product movement from one point to another. **Time utility** means the value established by placing the product available at proper time (Lambert & Stock 1993, p. 9, 162). Blanchard (1992, p. 67) defines transportation as the movement of material between the source(s) of supply and the various locations where operational activities are accomplished. Transportation includes activities such as choosing the suitable routing, complying with transportation regulations and selecting the mode of shipment (Lambert & Stock 1993, p. 15).

3.1 Transportation efficiency

According to Bowersox et al. (2002), there are three factors which are essential to transportation performance: **cost, speed and consistency**. A payment for shipment between two geographical locations is called transportation cost. Speed of transportation is the time needed to deliver the products from location A to location B. The basic rule is the quicker the delivery, the more it costs. The cost of service and speed can be balanced by choosing a suitable mode of transport. Consistency of transportation indicates the variations in time occurring within the delivery on the same route and reflects the dependability of transportation. (Bowersox et al. 2002, p. 41).

Bowersox et al. (2002, p. 330) present two essential transport principles which have a high effect on transportation efficiency: **economies of scale and economies of distance**. According to Sanders (2012, p.189) the term, economies of scale, means that the larger the amount shipped at one time, the lower the per unit cost. For example, the unit cost for a full truck load (FTL) instead of less-than-truck load (LTL) is lower. The phenomenon is explained by the allocation of fixed transportation costs such as cost of equipment and administration to increased weight. Economies of scale is often also called **quantity principle**.

(Bowersox et al. 2002).

Economies of distance means that the longer the distance moved at one time, the lower the per unit cost (Sanders 2012, p. 189). This results due to fixed costs spread over more kilometers, and thus lower per kilometer charges. Economies of distance is also known as **tapering principle**. (Bowersox et al. 2002). The challenge is to find an optimal balance between the economies of scale and distance while sustaining the desired customer service level. In order to accomplish the optimal balance a decision to be made is to choose the right mode of transportation. (Sanders 2012, p. 190).

3.2 Modes of Transport

“The mode of transport describes the type of transport used” (Waters 2003, p. 310). According to Jonsson (2008, p. 64), there are four common types of transport: sea, rail, road and air, as well as combinations of these traffic modes, known as combined transport. In addition to these, Karrus (2003, p. 120) identifies one more mode of transport, which is pipeline. Due to the fact that this research concentrates on sea, air and combined transport, the rail, road and pipeline will be a less of a focus.

3.2.1 Air

There are three main types of airfreight operation; regular service, cargo service and charter operations. The regular service means the use of cargo space in passenger airplanes not needed for luggage (Waters 2003, p. 315). Jonsson (2008, p. 67) refers to regular service with a concept of belly freight. In cargo service the operators run cargo planes on regular schedules. In charter operations a whole airplane is rented for a particular delivery. (Waters 2003, p. 315).

The strength of an airfreight delivery is speed, especially in long distance deliveries between the continents. Airfreight is the main mode of transport for urgent

and by weight or size smaller deliveries. Airfreight has relatively small transportation capacity and therefore the unit rates are high (Karrus 2003, p. 118). Unfortunately the airlines do not have strong control over their costs due to high fixed costs and high variable costs. The fixed costs consist of acquisition of planes and variable costs for example from fuel charges and landing fees (Waters 2003, p. 316). Air transport should not normally be chosen for low-value and high-volume goods (Jonsson 2008, p. 67).

3.2.2 Sea

Over 90% of the world trade is shipped by sea and over half of all the world trade is handled by the world's 20 biggest ports. Sea transportation is basically divided into three main types; inland waterways, coastal shipping and ocean transport. Inland waterways means water transport by rivers and canals, whereas coastal shipping is moving materials from one port to another along the coast. Ocean transport refers to sea freight across the major seas. (Waters 2003, p. 314).

Sea transportation can also be divided to two different modes; liner shipping and tramp shipping. Liner shipping means vessels which transit regular routes on fixed schedules. In liner shipping the rate charge is usually informed beforehand and there is no huge fluctuation on the rate. Tramp ships do not have regular routes or fixed timetables. They are chartered according to demand wherever the most payable freights are available. The freight rates vary according to supply and demand and market situation. (Pasanen 2005, pp. 287-289).

Ships are specially adapted for specific types of goods and transport routes. In container ships the transport capacity of the ship is efficiently used since the containers can be stacked on top of each other. The benefit of roll-on-roll-off (RoRo) vessels is easy loading and unloading since all the units loaded are rolling. RoRo ships are mainly used for transport within continents whereas container vessels are primarily used for transport between continents. Tankers and bulk carriers deliver solid, dry goods and liquid bulk loads. (Jonsson 2008, p. 64-65).

The benefit of sea freight is moving big loads at low unit cost. It is also quite an energy economic mode of transport. The major drawbacks are slowness and inflexibility in being limited to appropriate ports. (Waters 2003, p. 314).

3.2.3 Combined transport

Combined transport is any journey which uses a combination of several transport modes, for example sea and road transport. When arranging delivery for the whole route from the supplier's warehouse to the customer's site, a combined transport solution is often necessary when using sea, rail or air transport (Jonsson 2008, p. 67). Brewer et al. (2001, pp. 141-142) appoints a term "multimodal transport" for the same activity.

Efficient interfaces between the transport modes are needed when there are two or more modes of transport used. This requires the use of standardized loading units such as containers, swap bodies or semi-trailers which can be transferred from one transport mode to another without the load being opened or repacked. The system is called intermodal transport (Jonsson 2008, p. 67). According to Brewer et al. (2001, p. 142) there are two relevant parts in intermodal transport: the transferability of the items transported and the provision of door-to-door service.

Perhaps the most famous component of intermodal transport is the containerization. Without using containers, each transfer between transport modes would cause delays and add costs for extra handling. Still, the aim of combined transport is to bring together the benefits of several separate transport modes and avoid the disadvantages of each. Among many benefits, the use of containerization simplifies the transport, makes the handling and delivery faster and easier, reduces the packing costs and loss due to damage and misplacement. (Waters 2003, p. 319).

3.2.3.1 Express deliveries

Express services are time and day definite deliveries where the carrier gives a guarantee to certain agreed upon shortest possible delivery times. The basic transport is usually done by air (sometimes by road) and the service includes associated services such as pick up from origin, relevant export and import formalities, and delivery to destination (Suomen kuljetusopas). Due to the use of many modes of transportation the express services can be regarded as combined transport (Brewer et al. 2001). The rates of express services are high and usually only small packages are delivered by express services (Suomen kuljetusopas).

Brewer et al. (2001, p. 457) has another kind of an approach to the issue in which the express deliveries have been divided into three concepts: courier services, express delivery services and parcel delivery services. In **courier service**, the goods, usually small packages less than 5 kilograms are personally accompanied by the courier during the whole journey from the point of origin to the point of destination. The use of courier service in international deliveries does not play a major role due to the high cost of the delivery. **Express delivery service** is a delivery service which delivers the goods door-to-door from the sender to the receiver within a guaranteed delivery time. A specific delivery time can also be negotiated since the transportation program is flexible. There are no binding weight or measurement restrictions. **Parcel services** are a lot like express delivery services excluding the fact that they have fixed, defined transportation routes and there are some requirements for standard sized goods in order to allow automated transportation (Brewer et al. 2001, p. 457-458). Following Brewer's (2001) definition of express services in this research, when referring to express delivery it is understood as parcel service.

3.2.4 Road

Road transport is the most widely used mode of transportation (Waters 2003, p. 313). It is the most flexible transport mode since it can be used for door-to-door deliveries as well as for pick-ups and distribution services. The restrictions

for road deliveries result mostly from the road network and its restrictions and size and weight limits for vehicles. (Karrus 2003, p. 114).

3.2.5 Rail

Rail transport is mostly used on transporting large quantities of high-volume goods of lower value over long distances. The greatest benefits of the transport mode are high capacity, low unit cost and environmental cleanliness. The biggest disadvantages on the other hand are limited railway network and regulated schedules which cause inflexibility. (Jonsson 2008, p. 65).

3.2.6 Pipeline

The pipelines are utilized on delivering oil, gas and the utilities of water and sewage. They can move large quantities over long distances though being slow and inflexible while transporting only between fixed points. (Waters 2003, p. 316).

3.3 Transportation mode selection criteria

There are many features affecting the selection of transport mode such as the industry of the company, nature of the materials to move, regularity and frequency of the transport, geographical location of the shipper, transportation distance, batch volume and weight and value of the shipment (Suomen kuljetusopas). Bloomberg & Hanna & Lemay (2002, pp. 119-121) mention also access to carriers, price, transit time, security of the goods, government regulations and safety.

As is shown in the Table 1, the differences in transport modes originate from costs, reliability, speed, flexibility and limits on volume and weight.

Table 1 Criteria of different modes of transport.

MODE/CRITERIA	Road	Rail	Sea	Air
Cost	Medium	Low/Medium	Low/Very Low	High
Speed	Moderate	Moderate	Slow	Very High
Flexibility	High	Low	Low	Medium
Limits on volume/weight	Medium	Low	Low	High
Reliability	Good	Good	Limited	Very Good

When choosing the correct mode of transport one should be able to combine good service level, quality and reasonable costs (Suomen kuljetusopas). The difficulty results from trying to take into account all the above mentioned selection factors at the same time (Bloomberg et al. 2002, p. 119). In addition to the transportation mode selection another important choice is to be made; the choice of logistics service provider. The next chapter discusses generally about outsourcing but the logistics provider selection is handled as an efficiency improving factor in its own chapter 6.1.3.

3.4 Outsourcing and 3PLs

In order to succeed in the competitive business world a company should recognize and concentrate on its core competencies (competencies in which the organization has a competitive advantage). The core competencies should be carried out in-house and consider outsourcing other functions. This chapter discusses outsourcing in general and its drivers and drawbacks. The selection of logistics service provider is discussed later in the chapter 6.1.3.

Outsourcing means contracting out one or more activities called for by an organization to a third-party specialist (Brewer et al. 2001). Sanders (2012) defines outsourcing simply as *hiring third party to perform a set of tasks for a fee*. Traditionally companies have performed a wide range of activities internally but within the last decade the decision to pay for a third-party specialist for performing certain activities has become more common. IT, finance, security,

cleaning and maintenance, human resources and logistics are the activities most commonly outsourced. (Brewer et al. 2001).

The companies which provide logistics and transportation services to other firms are called third-party logistics providers or 3PLs (Sanders 2012, p. 197). Third-party logistics providers are also known with the abbreviation LSP, logistics service providers. According to Rushton & Croucher & Baker (2010, p. 59) the use of logistics service providers has increased notably in the past years especially in Europe and North America. As shown in Chart 1, in a study of Europe's Fortune 500 companies in 2006, taking into consideration the different logistics activities, transportation is the most outsourced field of logistics. Thus the outsourcing of other activities has also recently been growing. (Rushton et al. 2010, pp. 59-60).

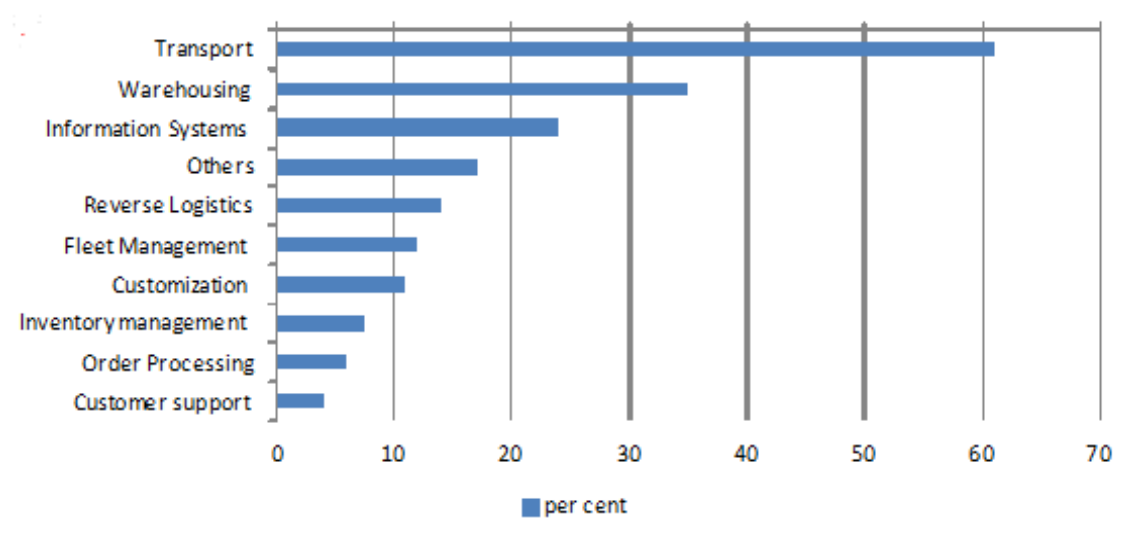


Chart 1 Logistics functions outsourced in Europe 2006 (Eyefortransport 2006).

In the 1970's it was still quite common for the companies to use their own fleets for transportation, both domestic and international. Nowadays it is quite rare, and transportation services are mostly outsourced (Karrus 2003). Though the transportation services have been outsourced for already many years the way of working has been transaction based and single-function specific (Simchi-Levi & Kaminsky & Simchi-Levi 2003). The modern 3PL arrangements pertain to long-term commitments by contracts and often multiple functions are included.

Nowadays the third-party logistics contracts are seen more as a strategic alliance than a supplier – customer layout. (Simchi-Levi et al. 2003).

From the transportation point of view, Dechter (2008) brings up a question of the difference in 3PL provider and freight forwarder. In his opinion freight forwarders move cargo from one point to another whereas 3PLs move, store and process inventory and at the same time may provide traditional freight forwarder services. Thus the services of freight forwarders and 3PLs are overlapping. Dechter (2008) also claims that the freight forwarder is an expert focusing on the cost and transportation while the 3PL often is a generalist providing an overall service and expecting to be compensated for it. The question is if the compensation paid to the generalist 3PL is cost effective compared to the work of a specialist freight forwarder (Dechter 2008). There is no clear answer. Generally 3PL appears to be a quite broad concept and difficult to define exactly. In the context of this study, third-party logistics refers to transportation companies and freight forwarders.

3.4.1 Drivers and drawbacks of outsourcing

In order to decide what should be outsourced and to what extent, **the drivers and drawbacks of outsourcing** should be considered. Logistic service providers can bring many advantages but also disadvantages to their clients. Rushton (et al. 2010, p. 533) divides the major drivers into **organizational, financial, service and physical** categories. These factors are discussed more thoroughly in next paragraphs.

Organizational factors include several points. The main advantage factor according to Rushton (et al. 2010) and Simchi-Levi (et al. 2003) is that while the resources of the companies are limited by using 3PL, the company can concentrate on its **core competencies**. Thus Simchi-Levi (et al. 2003) points out that if the outsourcing of other functions fails, it can also endanger the core competencies. The second advantage is **access to wider knowledge** (Rushton et al. 2010, p. 534). For example, technology advances constantly

and companies themselves may not be able to follow all the changed requirements (Simchi-Levi et al. 2003). The potential disadvantages come from **lack of the suitable experience** of client company's products and markets, **cultural incompatibility** between the logistics service provider and client, and **loss of control** over the delivery operation. The loss of control over the delivery operation can be essential if the logistics is experienced as a key component in competitive advantage. Furthermore possible disadvantages are **loss of distribution and logistics expertise** within the client's company and the risk of losing the **confidentiality of information** by logistics service provider. (Rushton et al. 2010, pp. 534-535).

Financial drivers are also diverse. Using a logistics service provider brings **capital cost advantages** for the client. The company does not have to invest for example in vehicles, and they can use the assets for more important investments in core business (Rushton et al. 2010, p. 535). According to Simchi-Levi (et al. 2003) the use of 3PLs turns **fixed costs into variable costs** making the company more attractive from an accounting point of view. If the logistics service provider offers its services to other companies also, the **economies of scale** discussed in chapter 3.1 can bring cost advantages. It can also have an impact on **daily operating costs** since the labor and the equipment of the logistics service provider can be more efficiently used. In addition, the **cost follow-up** is more clear and transparent since the costs originate from payments made to the third-party. The disadvantage in financial factors is the possible **changeover costs** resulting from moving the in-house operations to be outsourced. (Rushton et al. 2010, p. 535).

In general the **service** level should get better when moving from in-house operations to outsourcing; thus the subject is often under dispute (Rushton et al. 2010, p. 536). Simchi-Levi (et al. 2003) states that service improves since reacting to changing business conditions is more **flexible in resource and workforce** when using third-party logistics. Logistics service providers can also offer **value added services** such as tracking and tracing. It is also possible that accomplishing service improvements is more effective by a third-party than in-

house, especially if the requirements have been stated in the contract with **performance-related incentives**. (Rushton et al. 2010, p. 536).

Among others, the **physical factors** consist of **complexity of the global markets, relocation needs and vehicle and delivery characteristics**. In an international context logistics is a quite complex function. For example, the choice of mode of transportation, long delivery distances and varying customs procedures are perhaps more easily done by experienced logistics service providers. The markets are also changing frequently so the need for relocation of the logistics facilities may come in question when the demand or supply locations change. Vehicle and delivery characteristics can be so special that all the logistics service providers are not able to offer them and leading to the use of a specific logistics provider. (Rushton et al. 2010, p. 537).

The major drivers and drawbacks have now been discussed. Unfortunately, there is not one single way to define the crucial factors of choice for reasoning the outsourcing. The factors used are strongly related to the industry of the company, the size of the company, the type of market, and the features of the products among many others. Each company should individually consider the factors influencing their decision. Still, in general the most substantial factors are reducing costs and improving customer satisfaction. Though it seems quite easy and convenient for the client company to use a third-party logistics provider it must be remembered that the logistics provider needs to be monitored and to a certain extent managed and controlled by the client company. The client company thus has to be involved in the outsourced activities. (Rushton et al. 2010).

4 INCOTERMS

In order to do business the parties involved should be able to “speak the same language” amongst other things in terms of delivery related issues. Though the language used in practice would be the same, the meaning of the words can

differ depending on many factors such as culture or industry of the business. In order to agree clearly on delivery issues the common internationally recognized delivery terms have been composed. The delivery term is an important and essential part of the sales contract. It defines the delivery related responsibilities, cost division and risk transfer between the parties involved. Delivery term specifies who is responsible for the expenses involved in a shipment and who is responsible for paying possible damage of goods at a given point. To this end, delivery term has a direct impact on company's business and costs and therefore the terms are included in this study.

The most commonly used delivery terms in international trade are Incoterms rules, which were created already in 1936. Incoterms is a globally accepted contractual standard, which is regularly updated by International Chamber of Commerce, ICC. The newest version is Incoterms 2010 which specifically takes into account the constant expansion of customs-free zones, the increased utilization of electronic communication and documents and the concern on security issues of deliveries. In addition to international trade the rules are increasingly also used in domestic trade. (Incoterms 2010).

Generally speaking the Incoterms consist of three-letter trade terms used in the selling of goods (Incoterms 2010). Each name and abbreviation of the terms has been designed so that they describe the essential content of the term (Kauhanen & Talvela 2007). The terms primarily depict the tasks, costs and risks between the seller and the buyer in the context of the delivery of goods (Incoterms 2010). Rätty (2011) states that the rules also define the delivery and receipt of the goods, but does not describe the relation between seller/buyer and third parties or the ownership of the goods. The delivery term is a part of the sales contract agreed upon by seller and buyer and it indicates what seller and buyer have agreed upon regarding the delivery of the goods. The delivery term should comply with the trade practice appointed between the seller and the buyer. (Rätty 2011).

4.1 Classification of the rules

In Incoterms 2010 the number of rules was diminished from 13 to 11 and the explanations and definitions of the rules were made more simple and clear. The 11 rules of Incoterms 2010 have been divided into two main groups. Ex works (EXW), Free Carrier (FCA), Carriage Paid To (CPT), Carriage and Insurance Paid To (CIP), Delivered at Terminal (DAT), Delivered at Place (DAP) and Delivered Duty Paid (DDP) are the seven rules which suit any mode or modes of transport. The other group consists of four rules, which are suitable only for sea and inland waterway transport; Free Alongside Ship (FAS), Free On Board (FOB), Cost and Freight (CFR) and Cost Insurance and Freight (CIF). In Appendix 1 all the Incoterms 2010 rules and their responsibilities have been illustrated. (Räty 2011).

4.1.1 The rules for any mode or modes of transport

“Ex works” means that the seller delivers when it places the goods at the disposal of the buyer at the seller's premises or at another named place (i.e., works, factory, warehouse, etc.). The seller does not need to load the goods on any collecting vehicle, nor does it need to clear the goods for export, where such clearance is applicable. (Incoterms 2010, p. 131).

“Ex Works” rule is recommended to use only for pricing purposes and domestic trade. Problematic areas are transfer of risks and taxation issues. The responsibilities are not smoothly divided. The risk transfers from seller to buyer when the seller has placed the goods at the disposal of the buyer. The seller has no obligation to load the goods (Incoterms 2010; Räty 2011). In spite of all this, in practice the seller often loads the goods since work performed on the seller's premises by the buyer is usually neither desirable nor permitted. The buyer must remember that the responsibility of the loading and possible damages to the goods, property and personnel is on buyer though the loading is carried out by the seller. (Kauhanen & Talvela 2007).

In taxation point of view the seller might have problems to prove that the sales can be done without value added tax since the taxation authorities require proof that the goods have been transferred out of Finland to another European Union

country or outside the European Community. The buyer is responsible for all the transport and customs documentation so the seller may have problems receiving the needed documentation. (Incoterms 2010; Rätty 2011).

“Free Carrier” means that the seller delivers the goods to the carrier or another person nominated by the buyer at the seller’s premises or another named place. The parties are well advised to specify as clearly as possible the point within the named place of delivery, as the risk passes to the buyer at that point. (Incoterms 2010, p. 139)

“Free Carrier” is the most usable and clear rule when the buyer picks up the delivery from the seller’s premises. The address of the premises should be clearly defined in order to avoid any misinterpretation. The loading of the goods and the export formalities, when applicable, are the responsibility of the seller. If the delivery point is agreed to be for example at the terminal of the buyer’s forwarder, the allocation of costs may cause conflicts. Though the rules are internationally accepted there are still some interpretation differences in different countries. FCA term is easy and apparently inexpensive for the seller but using the term can be seen as bad customer service since the buyer bears most of the risks. (Incoterms 2010; Rätty 2011).

“Carriage Paid to” and “Carriage and Insurance Paid to” means that the seller delivers the goods to the carrier or another person nominated by the seller at an agreed place (if any such place is agreed between the parties) and that the seller must contract for and pay the costs of carriage necessary to bring the goods to the named place of destination. (Incoterms 2010, pp. 149, 157)

The difference between CPT and CIP terms is that in CIP term the seller also contracts for insurance to cover the buyer’s risk of loss of or damage to the goods during the transportation. An important fact to remember, which often causes discord between the parties, is that in both terms the risk passes and costs are transferred at different places. The parties should define as precisely as possible the place of delivery where the risk transfers and the place of destination to which the seller covers the costs. If nothing else has been agreed, the risk transfers when the seller hands the goods over to the first carrier. The buyers in many countries commonly incorrectly think that the risk transfers only at the place of destination, which is not true. (Incoterms 2010; Rätty 2011).

Some exporters justify their willingness to arrange delivery with C-terms by wanting to ensure that the delivery is safely done in the way the nature of goods requires. It is beneficial to use a logistics provider of which ways of working are known in advance and seen well fit (Kauhanen & Talvela 2007). CPT and CIP terms are safe but laborious for the seller. The negative point for the buyers is that they carry the risks but cannot affect much to the choice of the carrier. (Incoterms 2010; Rätty 2011).

“Delivered at Terminal” means that the seller delivers when the goods, once unloaded from the arriving means of transport, are placed at the disposal of the buyer at a named terminal at the named port or place of destination. “Terminal” includes any place, whether covered or not, such as a quay, warehouse, container yard or road, rail or cargo terminal. The seller bears all risks involved in bringing the goods to and unloading them at the terminal at the named port or place of destination. (Incoterms 2010, p.169).

When using DAT term, the place of delivery needs to be precisely defined since the concept of terminal is quite flexible and ambiguous. The terminal can be situated close to the buyer after the main transportation but also close to the seller before the main transportation. In order to avoid disputes, the responsibility of possible warehousing costs for late pick up of the goods from the terminal should be defined in the contract. (Rätty 2011).

“Delivered at Place” means that the seller delivers when the goods are placed at the disposal of the buyer on the arriving means of transport ready for unloading at the named place of destination. The seller bears all risks involved in bringing the goods to the named place. (Incoterms 2010, p. 177).

The buyer is responsible for the costs of unloading the goods unless they belong to the seller based on the contract of carriage. While using DAP term, the seller should be aware of the conditions of the buyer’s country (Rätty 2011). According to Kauhanen & Talvela (2007) the use of DAP term is effortless for the buyer and considered as good customer service since the buyer does not have to use its own resources to make the delivery arrangements. The negative point is that the seller bears all the risks and the costs are apparently high (Rätty 2011).

“Delivered Duty Paid” means that the seller delivers the goods when the goods are placed at the disposal of the buyer, cleared for import on the arriving means of transport ready for unloading at the named place of destination. The seller bears all the costs and risks involved in bringing the goods to the place of destination and has an obligation to clear the goods not only for export but also for import, to pay any duty for both export and import and to carry out all customs formalities. (Incoterms 2010, p. 185).

In DDP term the seller has the maximum responsibilities. The seller should find out beforehand if he/she is able to obtain import clearance and if the VAT or other import taxes of the destination country can be paid by the seller. In some countries it is not possible for the seller to bear all the responsibility so the knowledge on the conditions of the destination country is essential. (Incoterms 2010; Rätty 2011). The DDP term is typically used when shipping warranty deliveries for defective products or missing items. In these cases the seller usually is responsible for all the costs of delivery and is not entitled to invoice the costs from the buyer. (Kauhanen & Talvela 2007).

4.1.2 The rules for sea and inland waterway transport

“Free Alongside Ship” means that the seller delivers when the goods are placed alongside the vessel (e.g., on a quay or a barge) nominated by the buyer at the named port of shipment. The risk of loss of or damage to the goods passes when the goods are alongside the ship, and the buyer bears all costs from that moment onwards. (Incoterms 2010, p. 195)

The seller is responsible for the costs and risks so far as the goods are delivered alongside the ship. Yet if the buyer requests, or it is a common trade practice, or if the buyer does not instruct the seller in time, the seller can agree on carriage on usual terms at the risk and expense of the buyer (Rätty 2011). In container sea transport, FAS term is not usually applicable since the containers are handed over to the carrier at a terminal; hence in such cases FCA term should be used (Incoterms 2010, p.195).

“Free on Board” means that the seller delivers the goods on board the vessel nominated by the buyer at the named port of shipment or procures the goods already so delivered. The risk of loss of or damage to the goods passes when

the goods are on board the vessel, and the buyer bears all costs from that moment onwards. (Incoterms 2010, p. 203).

The above described situations in FAS term concerning the contract of carriage and container sea transportation are also valid for FOB term. Despite the international rules there are many local country-specific versions of FOB term, so the sales contract should be done in detail in order to avoid disagreements (Räty 2011). The common practice of the ports can also have impact on the cost distribution. Depending on the port there might be several transfers and lifts of the shipments and all cause additional costs for the seller. (Kauhanen & Talvela 2007).

“Cost and Freight” and “Cost Insurance and Freight” means that the seller delivers the goods on board the vessel or procures the goods already so delivered. The risk of loss of or damage to the goods passes when the goods are on board the vessel. The seller must contract for and pay the costs and freight necessary to bring the goods to the named port of destination. (Incoterms 2010, p. 211).

The difference between CFR and CIF term is that in CIF term, the seller is responsible for contracting for insurance cover against the buyer's risk of loss or damage to the goods during transportation. In both terms the risks and costs are transferred at different places. The sales contract should define both the place of cost transfer, which is the destination port and the place of risk transfer, which is the port of shipment. Neither of these rules is fully applicable if the goods are handed over to the carrier before they are loaded on board the vessel. Container sea transport is a good example of such case where the goods are given to the carrier already in the terminal. In these cases, instead of CFR, the term CPT and instead of CIF, the term CIP should be used. (Incoterms 2010).

4.2 Choosing of Incoterm

The answer to the question of who chooses the Incoterm is ambiguous. The customer is often asking to quote with certain Incoterms. The seller can either accept the term requested or offer another in their opinion more suitable term.

Nevertheless negotiating with the buyer is recommended in order to ensure that both parties understand their obligations and thus avoid later problems (Sitpro Ltd 2007). Kauhanen & Talvela (2007) allege that though the whole variety of Incoterms is widely used from EXW to DDP-term, the companies usually choose only a few best suited terms to regular use between the parties concerned. In Appendix 2 Rätty (2011) has defined a matrix in order to help in choosing the correct Incoterm.

There are many factors which should be taken into consideration while choosing suitable Incoterms; the regulations of the country of the buyer, standard practices, the method of transport used, availability of information and customer service (Sitpro Ltd 2007). Kauhanen & Talvela (2007) consider also the cost factors, supply chain reliability and fluency factors and the impact of the size of the company and its resources.

Certain countries have **regulations** controlling the use of Incoterms in importing the goods. The reason for such action is usually to protect and support the insurance and logistics providers of the countries and ensure that the benefits of the business actions are directed to the importing country. In some countries there are no official regulations but there might be commercially standard practice which is followed. For example within European Union it is customary to use terms in which the seller is responsible for arranging the transportation. Possible **company policies** can also affect the choice of the term. (Sitpro Ltd 2007).

The **legislation** obeyed differs in different terms. The rule of thumb is that unless nothing has been agreed in the commercial contract, in F- and C-group terms, the followed rules come from the legislation of the seller's country. When using the D-group terms the legislation of the buyer's country is valid. (Rätty 2011).

As discussed earlier the **method of transport** used gives certain restrictions in choosing the Incoterm since the terms are divided into terms which can be

used in any transport method and to terms which can be used only in sea transport. Also the **availability of information** is essential while choosing the Incoterm. Both parties should be aware of their obligations and be able to follow them. For example knowledge on buyer's country and its logistic availabilities is important since the buyer's location might be so remote and not easily accessible that the seller is unable to arrange the delivery. Issues concerning duties and taxes are also often so complicated that the seller may not be able to fulfill its obligations in the buyer's country. (Sitpro Ltd 2007).

The **level of customer service** should also be taken into consideration. It is not always the wisest way to choose the term which is most beneficial to the seller. Sometimes in the name of customer service it is justifiable to consciously agree on a term which is not so personally beneficial. The Incoterms also have an effect on **financial issues** of the company. When using certain terms, the revenues can be booked to accounting earlier, depending on the fact when the goods have been delivered according to Incoterms. (Sitpro Ltd 2007).

According to Kauhanen & Talvela (2007) **the costs** are usually the basic starting point for choosing the Incoterms. Instead of the seller's or buyer's will to minimize their own costs the overall view nowadays is more concentrated on the mutual benefit and comprehensive management of the supply chain. In practice in most cases the seller is able to arrange the delivery more economically than the buyer. (Kauhanen & Talvela 2007).

Many companies consider providing added value to the customers when they can take care of the delivery reliably and fluently with reasonable costs. **Providing added value** may become an important factor in choosing the Incoterm especially when the products are valuable or the supply chain is lengthy or eclectic. (Kauhanen & Talvela 2007).

The research of Kauhanen & Talvela (2007) showed also that the **size of the company** has an impact on the Incoterms it chooses to use. The bigger the company is, the more it uses D-terms thus taking care of the delivery arrange-

ments and being liable for costs. Small companies have less resources and perhaps less knowledge on arranging export deliveries. (Kauhanen & Talvela 2007).

The most common reasons for something to go wrong are that something was not agreed upon or the practice and the theory of the delivery term do not match. Belief instead of knowledge, local legislation and misuse of the terms are also general reasons for problems. (Räty 2011).

5 COSTS OF TRANSPORTATION

The main activities of transportation creating costs are loading, moving, reloading and unloading of goods (Jonsson 2008). Zeng & Rossetti (2003) define the cost categories a bit differently to freight charge of the delivery, consolidation fee for combining small shipments to form larger shipments, transfer fee incurred from the transfer between different modes of transportation, and pick-up and delivery meaning the transportation charges between shipper's warehouse and forwarder's terminal. These are only two ways of categorizing transportation cost. Both of them leave out for example documentation costs. Depending on the author the transportation, cost categorizing varies considerably. While comparing and studying the costs of transportation one should always remember that the term transportation cost is ambiguous and thus the comparison can sometimes be difficult.

In this discussion sea or air transportation costs, basically the costs from origin air/seaport to destination air/seaport are covered. Due to the limited information available about the loading at the origin and unloading at destination, domestic transportation costs and insurance costs at both ends have been left out. The costs included are defined more specifically in chapter 7. When discussing the costs of express delivery services in the research, due to the nature of the service they include all the costs from origin excluding loading, delivery to the destination unloaded, and customs cleared but duty and taxes unpaid.

Finland State of Logistics reports that in 2009 the total logistics costs in Finland were on average 11.9% of the turnover of the company. These costs include transportation costs, warehousing costs, costs of tied-up capital in warehouses, administrative costs, transportation packing costs and other logistic costs. Unfortunately the report does not define what the other logistics costs consist of. In 2009 the share of transportation costs of the Finnish company's sales was 4.4%. Roughly estimated from the global point of view, one third of the total logistics costs are transportation costs (Finland State of Logistics 2010). Unfortunately the contents of transportation costs have not been unbundled in the report. According to Rantasila (2010) there is no settled common way of calculation of logistics and transportation costs in the accountancy of companies nor in the accountancy of national economy (Finland State of Logistics 2010).

Gilmore (2002) highlights that the transportation costs stand for a significant component of overall supply chain cost and corporate spendings for many companies (Zeng & Rossetti 2003). Gurav (2004) in turn points out that transportation is getting to be a more strategic business function since a larger percentage of the cost of goods sold originates from transportation costs (Mason & Lalwani & Boughton 2007). Though the share of transportation costs is relatively high, transportation cannot be seen only as a cost element, but an essential factor for the company's customer service, profitability and competitiveness (Finland State of Logistics 2010).

5.1 Transportation rates and pricing

Transport rate or tariff is the price of moving a product between locations (Waters 2003). Lambert & Stock (1992) divide the rates into line-haul rates and accessorial charges. Line-haul rate is the cost charged for the movement between two points whereas accessorial charges are all the other costs transportation providers charge for handling or servicing a delivery. (Lambert & Stock 1992, p. 191).

The pricing is done based on cost-of-service pricing, full-cost pricing or value-of-service pricing. In cost-of-service pricing (COSP) the rate is set only based on the actual expense of providing the service. This pricing method is used only in exceptional cases since in the long run it is not profitable for the carrier as the rate does not cover total but only marginal costs. Full-cost-pricing covers both the variable costs and a relevant share of fixed costs. In value-of-service pricing the charged rate maximizes revenues despite the costs. The pricing method charges what the markets will bear and is based on the competitive situation and market demand for transportation service. (Bloomberg et al. 2002, pp.122-123).

5.2 Factors influencing transportation costs and pricing

According to Lambert & Stock (1992) the factors influencing transportation costs and pricing can be grouped into two main categories: **product-related factors and market-related factors**. In addition they also mention service characteristics. Product-related factors are divided into density, stowability, ease or difficulty of handling and liability. Market-related factors consist of the degree of intermode competition, locations of the markets, nature and extent of government regulation of transportation, balance or imbalance of freight traffic in a territory, seasonality of product movements and whether the goods are transported domestically or internationally (Lambert & Stock 1992 pp.164-165). Bowersox et al. (2002, p. 356) adds to the list also distance and volume, which were already discussed more closely in chapter 3.1.

Density means the weight-to-volume ratio of the product. Items, which are heavy compared to their size have high weight-to-volume ratio, whereas items which are lightweight compared to their size have low weight-to-volume ratio. High-density products are usually less expensive to deliver than the low-density products. (Lambert & Stock 1992, p. 164).

Stowability refers to the degree the products can fill the available space in a

transportation vehicle. Stowability depends on the physical characteristics of the product such as shape or size (Lambert & Stock 1992, pp. 164-165). Excessive weight or length or odd package sizes and shapes usually cause higher costs since they do not fit well to the transportation vehicle and some of the cubic capacity is wasted (Bowersox et al. 2002, p. 357). For example the stowability or cube utilization of petroleum is good since it fully fills the transportation container while the stowability of automobiles into a transportation unit is low (Lambert & Stock 1992, pp. 164-165).

Handling of the product is related to the stowability of the product. The items which are not easily handled create more costs. Products, uniform by their physical features and able to be handled with automated systems are less cost spending. The packaging of the product has a strong impact on the ease of handling of the products. (Lambert & Stock 1992, p. 165).

Liability is important especially if the goods are easily damaged or attractive for theft or pilferage. In the case of delivering products assuming for more liability from the carrier, the freight rate will be higher (Lambert & Stock 1992, p. 165). Shippers are able to decrease the risk of damage and eventually transportation costs by improving the packaging of the product (Bowersox et al. 2002, p. 358).

The **competition** between intermode carriers has an impact on transportation costs. The more there is competition and service providers in the markets, the less the cost of transportation. The cost also depends on the distance which the goods need to be transported. (Lambert & Stock 1992).

Earlier **economic regulation** had strong impact on mode or carrier selection, freight rates, service level and routing and scheduling (Lambert & Stock 1992, p. 184), but the economic changes followed by deregulation of transportation have been beneficial for transportation industry (Rushton et al. 2010). Some regional economic regulation exceptions still exist for example in the United States and Canada.

The regulation emphasis has nowadays turned more to **safety regulations**. The regulations were notably tightened after the attacks to World Trade Center in New York and the Pentagon in Washington, DC on 11 September 2001 (Rushton et al. 2010). The effects were felt around the world and as a result international security measures were introduced. Depending on the mode of transportation, shippers are obligated to pay different kinds of security fees.

Another important cost factor is **environmental regulation**. Though direct environmental fees for shippers are rarely presented, not including the exception of sea freight, the cost impacts of environmental regulation are paid indirectly. For example in Europe there are certain times and days of the week when the road freight movements are banned (Rushton et al. 2010). The driver still has to be paid for the waiting hours and eventually this appears to the shipper as increased freight rates.

Imbalance of the freight traffic within a certain area has an effect on costs (Lambert & Stock 1992). The optimal situation would be to have demand for two-way deliveries, but in practice this is seldom the case. The costs in these cases end up to the front-haul movement since the vehicle returns to its origin empty. In case of imbalanced transportation lanes, the lane with less demand has often more favorable rates (Bowersox et al. 2002). The rule of imbalance applies for both domestic and international deliveries. Generally speaking international deliveries are more expensive than the domestic deliveries. (Lambert & Stock 1992).

The impact of transportation on **customer service** is significant. Service characteristics such as dependability, time-in-transit, market coverage, flexibility, traceability and loss and damage performance are part of the customer service. Different **modes of transportation** have different service capabilities (Lambert & Stock 1992, p. 165). The choosing of suitable transportation mode was discussed in chapter 3.3. Another important customer service related factor, which also has impact on costs, is the **logistics service**

provider selection which will be considered in chapter 6.1.3.

6 DECREASING COSTS OF TRANSPORTATION

6.1 Transportation management and planning

Many international companies still run their transportation operations mainly manually based on ad hoc shipping with no planning and forecasting. Operational planning activities can be enhanced, but before it can happen the company needs to know their current state (Heath 2005). Heath has defined five levels of organizations which are in different stages of planning operations activities.

Level one companies are often small by size and have few customers or they can also be large companies with minor transportation needs. These companies usually handle shipments ad hoc one order at a time. The rates and schedules are agreed upon each time separately. No planning or forecasting is done. This working method is very labor-intensive and increases costs. The delivery times are not predictable and as a result customer service weakens. (Heath 2005).

Level two companies have many customers and destinations. Transportation planning is done using experience in foreseeable environment, and transportation management is manual and paper-based. Planning is minimal, mostly ad hoc based. The companies are not able to optimize transportation decisions or deal with operational problems efficiently. The total freight spending and per unit cost is higher than average and the customer service is inadequate. (Heath 2005).

Level three companies somewhat analyze and plan their transportation operations. They have defined general rules which help them to pre-plan their shipments. The information systems are on entry-level. The main problem is that

the transportation business environment changes so quickly that the rules do not conform to the variable circumstances. Level four companies have visibility to all the deliveries to be shipped within the next 48 hours. They use advanced transportation planning systems, which consolidate the orders to more cost effective lots. (Heath 2005).

Level five companies have transportation management systems which deliver fully optimized transportation operations by analyzing shipments in real-time. They can quickly adapt to customers' needs, fully consolidate the deliveries, coordinate the schedules automatically and thus minimize the transportation costs. Level five companies have understood the importance of transportation to the success of the company. (Heath 2005).

The level of planning and forecasting in Outotec locations vary considerably. Probably most of the locations fall to level two or three, but very likely there are also locations which are still on level one. On the other hand there are also locations recognized with features from level four. In order to have the inter-group transportation working smoothly, all the Outotec locations should aim to the same level. In order to reach the same level for example, unified and integrated working methods and rules should be created. With better planning, superimposed working tasks could be avoided and the work load at the shipping and receiving end could be partly diminished. The improvement suggestions are discussed more thoroughly in chapter 10.

Effective transportation management and planning are ways of controlling and decreasing costs of transportation. Transportation management usually involves three parties; shipper, carrier and consignee. In order to manage the process a certain amount of information sharing is essential (Bowersox et al. 2002, p. 239). The current trend of transportation management is a more collaborative approach vertically with supply chain partners and horizontally with logistics service providers. The competitive power of collaboration benefits all parties involved; the effectiveness and efficiency of transport is enhanced and the costs are reduced. Unfortunately, transportation is still often seen as a purchased commodity and the approach is transactional rather than

collaborative (Mason et al. 2007). By now transport is still a separate function and has not been properly integrated to the supply chain (Rodrigues & Stantchev & Potter & Naim & Whiteing 2008).

Transportation management consists of contract negotiations, efficiency improvement, evaluation of customer service and supervision (Bloomberg et al. 2002, pp. 127-128). In addition Lambert & Stock (1992) mention keeping track of transportation rates, selecting the best modes of transportation, choosing specific carriers or freight forwarders, routing and tracing, consolidating orders, documenting and arranging paying of carriers, auditing freight bills, preparing loss and damage claim evidence and filing for claims.

As stated above, one of the transportation management tasks is efficiency improvement. There are several ways of improving the efficiency of transport and thus reducing the costs of transportation. Using transportation management systems, consolidation of orders or shipments and selecting a good logistics service provider are important factors in cost reduction. The following chapters present these three factors in more detail.

6.1.1. Transportation management systems

The transportation management system (TMS) is a transportation software application which properly used can improve transportation operations in terms of accuracy, time, compliance, cost control and customer service, and thus diminish transportation costs (Higham 2009). According to Papineau & Goodwill (2008) the return on investment from a transportation management system comes from management and monitoring of freight charges, internal process and administration improvements and improved customer service.

The main functions of the transportation management system are shipment planning and scheduling, order consolidation, route optimization, carrier selection, carrier rate management, freight payment, transportation mode selection, transport document preparation, shipment tracking, integrated claims

management and performance measurement (Bowersox et al. 2002). The transportation management system can vary from basic structures gathering and maintaining the data of carriers and rates, to more complex structures for example providing decision support for shipment consolidation and carrier selection and support shipment status visibility (Papineau & Goodwill 2008).

6.1.2 Consolidation

The most traditional pattern of transportation is a direct delivery, one order at a time, from the supplier to the customer. The advantages of this pattern are relatively high delivery flexibility, high on-time delivery and easy re-planning. On the other hand very strong disadvantage of direct delivery of frequent small shipments is the high transportation cost caused by the inefficient use of capacity. One way of enhancing the capacity utilization is to combine many small orders or shipments into fewer or larger consignments (Jonsson 2008, pp. 320-321) Broadly said the larger the shipment is and the longer the distance it is transported, the lower the cost per unit is (Bowersox et al. 2002, p.165). In this context the bundling of goods is called consolidation (Brewer et al. 2001).

There are several ways of executing the consolidation such as fixed delivery days, breakpoint distribution and hub-and-spoke systems, milk runs and consolidated distribution. In order to avoid many small shipments to the same destination, fixed delivery dates can be used either by shipper or by transportation provider. Different orders for the same customer will be gathered together and shipped on a fixed date. The disadvantage is that the delivery will take a few extra days. Breakpoint distribution happens when many flows of items are coordinated between terminals where large consignments are split for further transportation (Jonsson 2008, p. 321). Hub-and-spoke consists of links that all coincide to a main hub, where the bundling of flows happens (Brewer et al. 2001 p. 243). Filling a vehicle by making several loading stops along the transportation loop in a certain area for further transportation to a terminal for reloading or directly to a customer is called a milk run. In consolidated distribution, small lots of packages from several different shippers are transported together

in the same vehicle. The consolidation happens in consolidation terminals at both ends. (Jonsson 2008).

In order to benefit more from the consolidation without having fixed structures, the shipper can use logistics service provider (LSP) company. Logistics service providers have many customers so the transportation routes are always optimized based on the transportation requirements. This option is attractive especially when there are large distances between the shippers and the customers and the volumes transported are small. (Jonsson 2008).

6.1.3 Logistics service provider selection

As discussed in chapter 3.4, a large portion of transportation activities are nowadays outsourced to a third-party logistics or in other words to logistics service providers. The use of logistics service providers brings many benefits for the companies providing that the selection of the logistics service provider has been done carefully and with thought. Rushton (et al. 2010, p. 59) thus states that one of the most significant decisions of outsourcing is choosing the right logistics service provider among the many possibilities. The selection of a logistics service provider to a large extent adapts, to the selection criteria of mode of transportation, which was discussed in chapter 3.3. The logistics service providers are chosen on the basis of price, accessibility, responsiveness, reliability and claims record. (Bloomberg et al. 2002, p. 121). Bowersox (et al. 2002, p. 370) adds to the list transit time, capability and security.

Many of the logistics service providers offer the basic, core service. In these cases when the core service provided is equal, the terminating factor for logistics service provider selection very likely is the **price** (Bloomberg et al. 2002, p. 121). Nevertheless, these days the competition in the transportation business is tough and the expense level for logistics service providers is quite high. Due to competition, the profit margins have been set so low that there are not necessarily huge differences in price. The logistics service providers need to stand out with some other selection criteria. The other criteria are discussed in the fol-

lowing paragraphs.

According to Bloomberg (et al. 2002, p. 124) **accessibility** means the logistics service provider's capability to provide the transportation capacity for the shipper when and where it is needed. **Capability** refers to the logistics service provider's capacity to offer specialized equipment such as temperature controlled vehicles. In general, capabilities include for example online shipment tracking and consolidation. (Bowersox et al. 2002, p.371).

Customer needs are quite often changing. There are logistics service providers providing only the service agreed to under detailed contracts, and therefore their responsiveness might not be very high. **Responsiveness** means how prepared the logistics service provider is to respond to the changing customer demands. (Bloomberg et al. 2002, p. 125).

Logistics service providers who offer faster and more reliable **transit times** have a strong competitive advantage. If the goods are not delivered on time it may cause problems. At worst, the sales will be lost and production interrupted (Bowersox et al. 2002, p. 371). Bloomberg (et al 2002, p. 125) states that the logistics service providers who deliver on time are worth more. Through **reliability** they add more value for the customer than those who deliver late.

Security means the logistics service providers ability to defend the cargo from theft, loss or damage (Bowersox et al. 2002, p. 371). There are logistics service providers who cause more damage to the cargo than others. In these cases the low-priced logistics service provider is not the low-cost carrier. When selecting the logistics service provider, its **claims record** should be investigated. (Bloomberg et al. 2002, p. 125).

Rushton (et al. 2010, p. 539) presents a survey made by PE Consulting Triennial of the most significant and crucial factors influencing the choice of a logistics service provider. Unexpectedly, the **cost** was not the most crucial factor, though in practice it usually is the main deciding factor when assuring the head

management to vote for outsourcing. As seen in Chart 2, the first place in the survey was awarded to **service** and the cost was not even the second, but was in third place. The distinctive fact was that the **quality of the people** was ranked second in the survey. The quality of the people means the quality of the personnel running the daily operations in the logistics service provider company in the context of operational management, flexibility, problem solving and the ability to get along with their client. (Rushton et al. 2010, pp. 539-540).

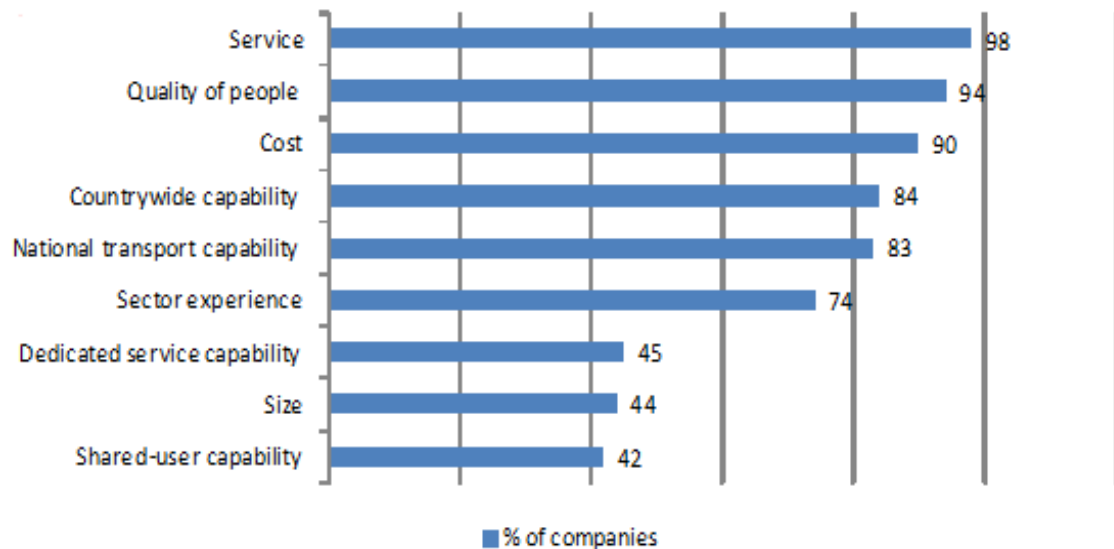


Chart 2 Critical factors in deciding which 3PL to use (PE Consulting Triennial Survey).

The selection of a logistics service provider is not easy and therefore many companies nowadays prefer the concept of a core carrier, which means contracting with a limited amount of logistics service providers instead of wide variety of LSPs (Bloomberg et al. 2002, p. 121). Bowersox (et al. 2002, p. 369) defines core carrier strategy as building a functioning business relationship with a small number of logistics service providers. Concentrating only on a few providers benefits both parties since the operational and administrative processes can be standardized (Bowersox et al. 2002, p. 369). Long lasting settled contracts with logistics service providers can bring know-how benefits as getting used to a company's ways of working and rhythm can take from months to even a year. Centralization of transportation contracts usually also generates cost advantages (Karrus 2003, p. 129). Generally, transportation contracts help

to control the rates, capacity and service levels and to manage risks.

7 RESEARCH DESIGN

This chapter gives background information about the case company and describes the different stages of the research process which were needed to generate the study. The purpose of the study was to find out the recent state of the inter-group transportation between Outotec locations, and based on the findings to make suggestions for decreasing the costs of inter-group transportation. The research was carried out by using a qualitative research method with the help of pre-gathered defined quantitative material gathered by the consultant company responsible for the spare parts business development project.

The case company, Outotec, is a global provider of process solutions, technologies and services for the minerals and metal industries, energy industry, industrial water treatment and chemical industry. The company utilizes its extensive experience and advanced process know-how by providing plants, equipment and services based mainly on proprietary technologies. Outotec works in close partnership with its customers and provides proven environmentally sound and energy saving solutions. (Outotec company brochure 2012).

Outotec operates globally with a presence on every continent and offices in 24 countries. The headquarters is in Espoo, Finland. Outotec had total of 3883 employees in 2011. The sales in 2011 added up to EUR 1385.6 million and the operating profit was EUR 121.5 million. A few years ago Outotec's businesses were reorganized into four business areas: Non-Ferrous solutions, Ferrous solutions, Energy, Light Metal and Environmental solutions and Services solutions. Services solutions offer after-sales services such as technical services, upgrades and modernization services for the old equipment, operation and maintenance services, and component services including spare part sales. Services solutions focuses on providing life-cycle services to Outotec customers,

and growing and developing the global after-sales business. The development project for the spare part business was started. This study is a part of that project, and concentrates on the costs and arrangements of spare parts inter-group transportation between Outotec locations.

As there was no existing global knowledge on transportation arrangements and costs of Outotec locations, the information needed to be gathered. The consultant company responsible for the spare parts business project gathered basic information about Outotec locations such as warehousing data and costs, personnel amounts and their tasks and costs, detailed line by line annual sales order lines and purchase order lines, shipments, logistics costs and inbound and outbound transportation. Detailed Excel sheets were emailed to Outotec locations to be filled out by the persons responsible for the spare parts operations. An example of one of the sheets, the sales order line Excel sheet, is included as Appendix 3. Since the amount of information required was extensive, receiving the replies took quite some time. In addition the quality of the replies varied greatly due to the variability in Outotec locations' ERP systems and their use. Nevertheless the information on sales order lines received provided a sufficient basis to find out the main transportation routes between Outotec locations. The exact shipment information such as weights and delivery terms in the received Excel sheets were not adequate.

Since the thesis concentrates on inter-group transportation between Outotec locations the basic material gathered by the consultant company was used as a foundation to the research. The starting point for the research was the sales order lines between the Outotec locations. The sales order lines to end customers were filtered out of the main data and the information about the sales order lines between Outotec locations were gathered to an Excel sheet matrix. This way the main transportation routes between Outotec locations could be defined. Table 2 in chapter 8 is an example of the Excel sheet matrix without showing the exact sales order line amounts. The reliability of the findings was quite well confirmed by comparing the sales order lines to corresponding purchase order lines of the Outotec locations. Only a few contradictions were found and they were on less active routes.

After the main routes were discovered, the information was deepened by combining the sales order line information to available information on shipments, delivery terms, shipment weights and forwarder's and delivery modes used. In many cases the information was not available in the basic data, so more detailed email queries to the logistics persons of Outotec locations in question were sent. With few exceptions, the information requested was quite well received and the overall picture of the enormous variety of delivery terms and forwarders used between Outotec locations became more clear. The variety of delivery terms and forwarders is presented in more detail in chapter 8.

The next step was to calculate the freight costs of the time for the main transportation routes. Unfortunately there were no statistics available for the actual costs on each transportation lane so the cost calculations had to be done on the basis of each lane's forwarder's freight rate charts valid at that time. The freight rate charts used in Outotec locations were received from the Outotec locations' logistics persons. Based on the freight rate charts the calculations were done for sea, air and express delivery modes, since they had been identified as the main delivery modes between the Outotec locations.

In sea delivery mode the costs included in the calculations were documentation costs including the bill of lading and export customs declaration fee, environmental fee, security surcharge, terminal handling charge, port fee, bunker adjustment factor (BAF), currency adjustment factor (CAF) and basic rate charge per w/m. In delivery term air, the costs included documentation fees including air waybill and customs declaration fee, terminal fees, security surcharge, war risk surcharge, fuel surcharge and basic freight rate charge per kilogram. In both transportation modes, the loading at the origin warehouse, unloading at destination air/seaport and possible terminal charges at destination ports, domestic transportation costs and insurance costs at both ends and import customs clearance were left out in order to have comparable figures. Due to the door-to-door nature of the delivery, the express delivery mode costs include all the costs from origin excluding loading, delivery to the

destination unloaded, customs cleared but duty and taxes unpaid.

After the costs in each main lane by the currently used forwarder's rates were calculated, the following step was to calculate the rates for the same main lanes but based on the rates of competing forwarders used in other Outotec locations. The costs calculated were then compared with the currently used forwarder costs of main transportation lanes. The Excel sheet matrix gathered included 12 sheets; sales order lines between each main transportation lane, delivery terms used in each main transportation lane, forwarders used in each main transportation lane, total kilograms delivered between Outotec locations in main transportation routes, total kilograms delivered divided by transportation modes sea, air and express services in main transportation routes, transportation costs in main routes in Euros per kilogram by transportation modes sea, air and express service, and comparisons of transportation costs in Euros per kilogram by forwarder and by transportation modes. The next chapter discusses the current situation of Outotec inter-group deliveries and defines the results of the research from the transportation costs and delivery arrangements point of view.

8 CURRENT SITUATION OF GLOBAL OUTOTEC INTER-GROUP TRANSPORTATION ARRANGEMENTS AND COSTS

8.1 General situation

There were 24 main delivery routes defined. Table 2 below is the Excel sheet matrix mentioned in chapter 7 where the main routes by sales order lines are defined. The case company prefers to keep the information of sales line amounts to themselves, so the main routes are illustrated without the numbers of sales order lines. The grey boxes show the main delivery routes. The countries mentioned in the left side of the table are the sending i.e outbound locations and the countries mentioned above the table are the receiving i.e inbound locations.

Table 2 Excel sheet matrix of the main delivery routes between Outotec locations.

Receiving location / Sending location	Brazil	Canada	Chile	China	USA FL	Peru	Russia	Australia NSW	Australia WA	South Africa	USA MD
Canada											
Finland, Vantaa											
Netherlands											
Finland, Lappeenranta											
Sweden											

These 24 main routes between Outotec Service locations deliver approximately a total of 900 tons of items. Approximately 40% of the tons are delivered by sea freight and 60% by air and express services. **The amount of air freighted goods is quite big compared to sea freight.** Calculated by weight of shipments, in 90% of the inter-group deliveries the sending i.e outbound location is in Finland. This is the reason why the latter part of the study will concentrate on cost performance and optimizing the costs of Finnish locations.

The main but more frequent lines from Sweden to Chile, from the Netherlands to China, Australia (NSW), South Africa and the United States (MD), and from Canada to China were studied but the main concentration was in the most active routes where the outbound location was Finland. Also the deliveries from Finland to Russia were given less notice due to the fact that the nature of the deliveries to Russia are remarkably distinct from the other Outotec location deliveries. The subject is so extensive and challenging that it would probably require a research study of its own, and the current delivery arrangements from Finland to Russia are for the time being sufficiently cost effective.

The study distinctively showed that **there are many different forwarders and transportation companies used.** Some of the routes are handled on an ad hoc basis without any long term contracts. Only in a few locations the shipping is so regulated that they mostly use the same freight forwarder and have yearly

contracts with them. The transportation company used depended often also on the mode of transportation. There were nine different freight forwarders used regularly. In addition there were also randomly used forwarders. The variety of forwarders is illustrated in Table 3. In the table, the forwarders have been renamed with letters in order to keep the exact information within the case company.

Table 3 Forwarders used in the main routes.

Receiving location / Sending location	Brazil	Canada	Chile	China	USA FL	Peru	Russia	Australia NSW	Australia WA	South Africa	USA MD
Canada				Company A/B							
Finland, Vantaa	Company C	Company D	Company E	Company B/F	Company D	Company E	Company G	Company B		Company B/F	
Netherlands				Company B/H				Company B/H		Company B/H	Company B/H/I
Finland, Lappeenranta	Company D/H/I		Company H/I	Company D/H/I		Company D/H/I	Company G	Company D/H/I	Company D/H/I	Company D/H/I	Company D/H/I
Sweden			Company E								

The use of different forwarders is volatile and **the use of delivery terms is not regulated**. The most commonly used delivery terms are FCA (Free Carrier), CIP (Carriage and Insurance paid to) and DAP (Delivered at Place). These delivery terms are suitable for all transportation modes. In sea and airfreight deliveries the most used terms are FCA warehouse and CIP destination air/seaport. In express services the delivery term is either FCA warehouse (though due to the nature of the transportation mode in practice it is more likely EXW) or DAP destination. There are a few country specific exceptions in using delivery terms, such as Brazil. Brazil uses delivery term CPT since the regulations of the country require that the insurance must be taken from Brazil. The variety of delivery terms used in the main delivery routes between Outotec locations is illustrated in Table 4.

Table 4 Delivery terms used in the main routes.

Receiving location / Sending location	Brazil	Canada	Chile	China	USA FL	Peru	Russia	Australia NSW	Australia WA	South Africa	USA MD
Canada				CIP Shanghai							
Finland, Vantaa	FCA Vantaa	CIP Burlington	FCA Vantaa	CIP/DAP Shanghai	FCA Vantaa	FCA Vantaa	FCA Vantaa	CIP Sydney		FCA Vantaa/ CIP Johannesburg	
Netherlands				CIP Shanghai				CIP Sydney		CIP Johannesburg	CIP Baltimore
Finland, Lappeenranta	CPT Belo Horizonte		CIP Santiago	CIP/DAP Shanghai		CIP/DAP Lima	FCA Lappeenranta	CIP/DAP Sydney	CIP/DAP Perth	CIP Johannesburg/DAP Centurion	CIP Baltimore / DAP Jessup
Sweden			FCA Kil								

8.2 The current situation in Finland locations

As mentioned earlier **the Finland locations ship 90% of the inter-group deliveries calculated by the weight of shipments.** There are two locations in Finland: Espoo and Lappeenranta. Lappeenranta covers 95% of the inter-group deliveries calculated by weight of the shipments. Espoo shipments weigh a lot less than Lappeenranta deliveries covering only 5% of the shipments calculated by weight. If we compare these locations by total sales order lines delivered to other Outotec locations, Lappeenranta takes care of approximately 70% of the sales order lines while Espoo's percentage is 30.

The division by delivery modes in Lappeenranta is 44.6% delivered by sea, 55.2% by air, and 0.2% by express delivery. Taking into consideration the high costs of express delivery use, Lappeenranta's is on reasonable level, but the amount of airfreight is too high compared to the sea freight. Many shipments from Lappeenranta are also oversized and heavy and therefore would be more

profitable to deliver by sea freight instead of airfreight. The same delivery mode division in Espoo reveals that 14% is delivered by sea transport, 78% by air transport and 8% by express deliveries. The use of express deliveries is relatively high. The low sea transport percentage in Espoo can be explained by the light weight and smaller size of the items.

From the main routes, Espoo ships goods to Outotec in Brazil, Canada, Chile, China, United States (FL), Peru, Russia, Australia (NSW) and South Africa. The main routes of Espoo to other Outotec locations are illustrated in Figure 1.



Figure 1 The main delivery routes of Espoo to other Outotec locations.

The main routes Lappeenranta delivers to are Outotec in Brazil, Chile, China, Peru, Russia, Australia (NSW), Australia (WA), South Africa and United States (MD). The main routes of Lappeenranta to other Outotec locations are illustrated in Figure 2.



Figure 2 The main delivery routes from Lappeenranta to other Outotec locations.

Both locations ship spare parts weekly to the seven same Outotec locations abroad; Peru, Chile, Brazil, South Africa, Australia (NSW), China and Russia. (Figure 3). **At the moment, the Lappeenranta site and Espoo site do not cooperate while shipping goods.** There are also quite a lot mutual direct customers but they are not discussed in this research.



Figure 3 Mutual shipping destinations of Espoo and Lappeenranta.

As noticed in the general situation of Outotec locations, also **Lappeenranta and Espoo have different freight forwarders while delivering to the same**

Outotec location. In addition the use of a certain forwarder depends on the mode of transportation. Lappeenranta has yearly contracts but different forwarders in each mode of transportation. Espoo does not have long-term contracts but chooses the forwarders according to mode of transportation and destination.

The Espoo and Lappeenranta locations also use different delivery terms to the same locations. Most of the deliveries from Lappeenranta site to other Outotec locations are based on delivery term CIP air or seaport or DAP destination. The Espoo site uses delivery term FCA warehouse and to some destinations CIP or DAP terms. While using the FCA term, the choice of the forwarder is not in Espoo location's hands. In these cases where the transportation is bought from the inbound country **with FCA delivery term the calculations clearly showed that the transportation cost is much higher than using CIP or DAP term** and arranging the transportation from the outbound location, Finland.

Taking into consideration the above mentioned factors it can quite strongly be argued, based on the research, that the current situation of inter-group transportation arrangements between Outotec locations are uncoordinated and there are overlapping functions. Since the locations are working as independent units and without any coordinated common rules, the lack of cooperation has the effect of increasing transportation costs. The costs of inter-group transportation between Outotec locations could be less than they currently are. The next chapter focuses on the problems identified and their consequences more specifically.

9 PROBLEM DEFINITION

There were three main problems detected which have a high impact on increasing transportation costs.

- There is no group level global partnering or contracts with the forwarders or transportation companies
- The use of airfreight and express deliveries is too extensive
- There is no cooperation in shipping between Outotec locations, especially between the main outbound locations of Espoo and Lappeenranta

Each Outotec location has their own forwarder or transportation companies which they use. There are even locations that decide on the use of a forwarder on an ad hoc basis. Ad hoc means that the forwarder is chosen each time separately based on the mode and logistics service provider selection criteria presented in chapters 3.3 and 6.1.3. In these cases the forwarders offer services only for a single shipment. The ad hoc system is inefficient since the selection-offering process is considerably time consuming. It causes extra work and delays on each delivery. The cost of transportation is also most often higher without centralized long-term contracts based on bigger volumes within a certain time frame.

Over half of the deliveries sent from Lappeenranta are shipped by airfreight. As discussed in chapter 3.2.1 the strength of airfreight is speed but since the transportation capacity is relatively low, the unit costs are very high. The huge volume of airfreight increases the transportation costs remarkably. The difference between unit cost in airfreight and sea freight depending on the destination varies between 78-93% with sea freight being more affordable. **Espoo on the other hand ships or is requested to ship (FCA delivery term shipments) a relatively high amount of shipments by express deliveries.** As presented in chapter 3.2.3.1 the express deliveries are used for small urgent shipments since the unit cost is extremely high. Based on the freight rate calculations on average when delivering 10 kilogram packages and under, with long-term freight contracts, the cost of express delivery compared to regular airfreight can be more affordable depending of course also on the destination. The shipments currently delivered from Espoo by express deliveries can weigh even up to 70 kilograms per shipment. The high weights of express delivery

shipments have also a high impact on transportation costs.

There is no cooperation between the Outotec locations in delivery arrangements. The lack of cooperation creates extra costs, overlapping functions and extended delivery times. All the locations basically use their own transportation services and delivery terms. Espoo and Lappeenranta ship deliveries weekly to same Outotec locations abroad with different delivery terms. The variety of delivery terms used causes confusion in the receiving Outotec locations. While shipping with delivery term FCA, the delivery idle time of ready shipment in the outbound warehouse can be from days up to weeks, or even months. The packages waiting for pick up also take up warehouse space. In addition, as the delivery terms and services used are different, decreasing the costs of transportation by consolidation of Espoo and Lappeenranta deliveries is not possible at the moment. Many small shipments sent separately increase the costs of delivery.

10 IMPROVEMENT SUGGESTIONS

One way to assist on achieving the growth targets set for Outotec after sales business is to decrease the Outotec inter-group transportation costs between Outotec locations. Therefore the problems identified in chapter 9 should be solved. Group level logistics service provider contracts should be made, the volumes of airfreight and express service deliveries should be diminished and cooperation between the Outotec locations should be started.

Making of group level logistics service contracts help to control the rates, capacity and service levels and to manage risks. Unfortunately the logistics service provider selection process is slow and it can take a quite a lot of time to get the contract done since in addition to the Outotec inter-group deliveries, all the transportation lanes from suppliers to Outotec warehouse, from Outotec warehouse to Outotec warehouse, from Outotec warehouse to end customers, and direct deliveries from suppliers to end customers should be included. The

number of different transportation lanes is huge. If the process is done carefully and also considers the logistics service provider selection criteria, it will easily take a half a year or even more per transportation mode. In fact, during the reporting of this thesis, one group level contract for express deliveries has been made. The savings in express delivery transportation costs coming from the centralized contract has been calculated to be up to 25%.

Before all the centralized contracts are done, in order to decrease the transportation costs in the meantime the current freight forwarders of both Lappeenranta and Espoo locations could be requested to provide **new freight rate quotations based on the total volumes of Lappeenranta and Espoo deliveries** to other Outotec locations. When the volumes go up the rates should come down. The current logistics service providers would be appropriate choices since Lappeenranta and Espoo locations already have experience about the cost level, service, quality of people, accessibility, capability and responsiveness of the companies just to mention a few of the logistics service provider selection criteria in chapter 6.1.3. A few other well chosen forwarders could be included to freight cost inquiries as well in order to compare the freight rate levels sufficiently. The transportation lane amount between Outotec locations is limited, so the effort taken would be only a fraction of that needed for the group level contracts, but still could bring about some cost advantages before all the group level contracts have been done.

As noticed in chapter 9, the volumes of airfreight and express deliveries used at Outotec are too high since these transportation modes are the ones with the highest cost impact. As presented earlier, the percentage shipped from Espoo by express delivery is relatively high and easily elevates the costs of transportation. **Espoo should ship only small shipments of 10 kilograms or less by express delivery and the rest of the air shipments by regular airfreight.** Many of the Espoo express delivery shipments are delivered on FCA warehouse basis so the choice of delivery mode is up to the receiving Outotec locations. The reason for using express delivery is quite often an urgent need for the item in order to keep the customer pleased. In most cases the rush

could be avoided with **better stock planning based on more affordable transportation modes**. In the Espoo case, even the change from express deliveries to regular airfreight would lead to savings. Depending on the destination, the express delivery price per kilogram is 63-86% higher than the regular airfreight price to destination airport. One must of course bear in mind that the calculation of the rates is not directly comparable between express delivery and regular airfreight since the express delivery cost is based on door-to-door delivery while regular airfreight cost is origin airport to destination airport as discussed in chapter 7.

Over half of deliveries from Lappeeranta to other Outotec locations are made by air freight. Since **Lappeeranta items** weigh more and are larger by size than Espoo items they **should be more often delivered by sea** in order to decrease the costs of transportation. Depending on the destination, the price per kilogram in sea freight is 78-93% lower than in air freight. Changing the delivery mode from air freight to sea freight is only possible by **more efficient stock planning** and stock management of other Outotec locations **based on sea deliveries**. This would also mean increasing the stock to higher levels than they are at the moment in order to save in transportation costs without losing end-customer service levels.

The lack of cooperation has an impact on transportation costs. The transportation costs of the Espoo location would decrease if the **shipments to mutual destinations of Espoo and Lappeeranta would be consolidated** to larger lots i.e shipped together. For example, in airfreight shipments the higher the amount of kilograms is, the smaller the rate per kilogram. Espoo would benefit from shipping its deliveries together with Lappeeranta's heavier shipments since the freight rate per unit would be lower. Also the documentation costs would come down since only one air waybill and one customs declaration would be needed. Unfortunately at the moment the joint documentation is not yet possible since Lappeeranta and Espoo locations are two different legal entities. Nevertheless the shipments could already be shipped together even though the savings would not be so high since the documentation would be

separate and the documentation costs would be paid by both locations. At the moment, without a joint documentation possibility, the savings received from consolidation would be only tens of thousands per year, but it may become significant as the spare part business grows.

Consolidation of the shipments would also benefit the receiving Outotec location since it would diminish the import customs clearance costs after joint documentation is possible, and before that it would diminish the delivery costs to the end location. The consolidation of the deliveries could happen in the hub of the freight forwarder in Finland or in Espoo locations' warehouse in Vantaa, since it is closer to main ports of Finland than Lappeenranta warehouse. Consolidating in the sending location is more profitable, since if the items would only be consolidated at the destination port, it would leave out the benefit coming from shipping larger lots at a time. The drawback on consolidation which should be considered is that it increases the delivery times by a few days since the consolidation should be done on the concept of fixed delivery dates as discussed earlier in chapter 6.1.2.

In order to decrease the transportation costs by consolidating the shipments, a **common delivery term for both companies should be chosen**. The advantages and drawbacks of the currently used terms need to be compared. While using CIP or DAP, the transportation is taken care of by Finland locations and the shipments usually leave the same day they are packed, or at the latest the day after. If FCA is used the delivery will be done by the customer's forwarder, in this case Outotec locations abroad. In these cases the pick up from the warehouse quite often takes at least a few days time, sometimes even weeks or months. These packages waiting for pick up take up warehouse space and the delivery idle time increases.

If the shipping would be done with CIP or DAP terms, the transportation costs would be lower since Finland locations have already more favorable freight rate charts than other Outotec locations due to bigger volumes. Though not directly related to transportation costs while the delivery arrangements would be done from Finland based on CIP or DAP delivery term, the overlapping of work roles

and also partly overlapping tasks would be avoided in both the outbound and the inbound locations. The personnel's capabilities would be better centralized and the development of capabilities would be easier. In the long run, this could have positive impact on transportation planning and thus to transportation costs. Based on the grounds presented above, the improvement suggestion would be to use delivery term CIP destination port in air and sea shipments and DAP destination in express deliveries.

11 CONCLUSIONS

The growth targets for Outotec after sales business for the coming years have been set high. The increasing sales of spare parts should not increase the costs at the same pace. The focus is to increase the sales but at the same time cut the costs as much as possible without lowering the customer service levels. One potential target for cost savings is transportation costs since they have a direct effect on the company's profits. The aim of this thesis was to find out how Outotec can decrease global costs of transportation between Outotec inter-group locations. The global costs of transportation have not been studied at Outotec before, thus in order to reply to the sub research question, the current situation of Outotec's inter-group transportation arrangements and costs of transportation between Outotec inter-group locations needed investigation.

The theory part of the thesis started with describing the transportation function as part of the bigger scheme of supply chain and logistics. The theory concentrates on transportation from a cost creating point of view but discusses the role of transportation as a value adding function. The choice of transportation mode, outsourcing of transportation actions, and the selection of delivery terms are presented due to their high impact on costs. Factors influencing the costs and pricing are also taken into consideration. The cost-decreasing factors focus on the importance of transportation management and planning. Thus, more focus is given to transportation management systems, consolidation of shipments, and selection of the logistics service provider.

The empirical part was performed by using a qualitative research method with the support of pre-gathered defined quantitative material. The consultant company recruited for the spare part business project gathered the global basic information. As the basic material was not sufficient for this research subject, it was refined and investigated further by email queries. The replies received varied by quality and quantity. The starting point of the research was the yearly sales order line amounts between Outotec locations. The material was found to be reliable since the sales order lines matched to the corresponding purchase order lines with a few exceptions. Validating the current amount of transportation costs was difficult. There are no exact comparable statistics from the yearly transportation costs of different Outotec locations by transportation mode, so the calculations needed to be done with the knowledge of the volumes and shipment sizes and freight rate charts valid at that time. Therefore, there are no precise figures of the possible savings but the percentages and figures are directional.

The finding of the study was that the current situation of Outotec's inter-group transportation arrangements is uncoordinated and thus causes unnecessary costs of transportation between Outotec inter-group locations. The main findings were that the costs could be decreased by making global contracts with logistics service providers or at least combining the volumes of Lappeenranta and Espoo under same LSP while arranging the global contracts. The other important points in decreasing the costs was using less airfreight and express deliveries, and starting cooperation between Outotec locations by defining common rules and delivery terms used and then consolidating shipments of Lappeenranta and Espoo. The findings are practical, and within a certain time frame plausible to carry out though they require quite a lot of effort and willingness to cooperate from all Outotec locations. In fact, making global contracts have already been started and the first global contract for express deliveries became effective in May 2012.

In sea and air deliveries the costs of transportation in inter-group deliveries between Outotec locations were only partly studied in order to have comparable

results. The loading and domestic transport freight costs from outbound locations to sea or airport, the terminal handling fees at sea or airport destination, the import customs clearance, insurance costs, and the domestic delivery from sea or airport destination to inbound location were left out. Some of the transportation lanes were not studied in detail since the results showed that the most meaningful volumes from the cost point of view came from Finland. The effectiveness of inbound locations' import procedures and costs were not studied either, but it could be an interesting study subject for the future.

Hopefully in the future as a result of better stock planning of Outotec locations, sea freight could be used instead of air freight and air freight instead of express deliveries. If it should happen, an interesting further research subject would be how wide the percentage of deliveries have been transferred to another transportation mode and how much it has affected the transportation costs. Another interesting research subject would be the transportation management programs. While going through the material for the theory part of the study the use of a transportation management system came up continuously in both literature and articles as a cost decreasing factor.

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