

DEVELOPING CO-OPERATION WITH TRANSPORTATION COMPANIES

Case: Uponor Finland Oy

LAHTI UNIVERSITY OF APPLIED
SCIENCES

Degree Programme of International Business

Thesis

Spring 2008

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EINOLA, ANNE-MARI & HOLMBERG, TERHI: Developing co-operation
with transportation
companies
Case: Uponor Finland Oy

Thesis, 81 pages, 5 appendices

Spring 2008

ABSTRACT

This study looks into the performance measurement of Uponor Finland Oy's transportation service providers, the procedure of buying services and features of road transportation. The effect and impact of the selection of service providers (vendors) are viewed from Uponor Finland Oy's angle. Different processes of supply chain management are studied in this study, such as purchasing, outbound logistics and vendor rating. Vendor rating is a process of evaluating vendors by a certain predefined criterion.

This study aims at finding out the availability of information concerning deliveries and developing co-operation between the vendors and Uponor Finland Oy. The vendor rating has been performed as a closure to this study. The theoretical part of this study presents the modes of transportation, focusing on road transportation. The purchasing process is introduced and followed by methods of vendor rating.

The empirical part consists of the evaluation of transportation companies used by Uponor Finland Oy. This study will concentrate on the ten transportation companies selected and the evaluation criterion chosen by the representatives of Uponor Finland Oy. The information was gathered during December 2007 and January 2008. The information was gathered by using personal interviews and a questionnaire. The transportation companies were rated based on the information received from the transportation companies.

The results of this study show that all the chosen transportation companies are performing reasonably well, although some differences were found between the companies. It became clear that the size of the company had relatively small effect on the performance. The lack of unified information is clearly an issue that needs to be given the proper attention to.

Key Words: performance measurement, Uponor Finland Oy, vendor rating, road transportation, buying services

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Opinnäytetyö, 81 sivua, 5 liitettä

Kevät 2008

TIIVISTELMÄ

Tämä opinnäytetyö käsittelee Uponor Suomi Oy:n kuljetustoimintojen palveluntarjoajien palveluntason mittausta, palvelujen ostotoimintoja ja maantiekuljetusten ominaisuuksia. Opinnäytetyössä tarkastellaan palveluntarjoajien valinnan merkitystä ja vaikutuksia Uponor Suomi Oy:n näkökulmasta. Opinnäytetyössä käydään läpi toimitusketjun osa-alueita, kuten ostotoimintoja, lähtevää logistiikkaa ja palvelujentarjoajien vertailua. Palvelujentarjoajien vertailu on prosessi jossa palvelujentarjoajat laitetaan paremmuusjärjestykseen ennalta määrättyjen kriteerien perusteella.

Opinnäytetyön tavoitteena on selvittää tiedon saatavuus kuljetustoiminnoista ja kehittää yhteistyötä palvelujentarjoajien ja Uponor Suomi Oy:n välillä. Palvelujentarjoajien arviointi on suoritettu tämä opinnäytetyön lopussa. Teoriaosa esittelee kuljetusmuodot, keskittyen maantiekuljetuksiin. Ostoprosessin esittelyn jälkeen seuraa palvelujentarjoajien arviointimenetelmiä.

Empiirinen osa koostuu Uponor Suomi Oy:n käyttämien kuljetusliikkeiden arvioinnista. Opinnäytetyö keskittyy kymmeneen Uponor Suomi Oy:n valitsemaan kuljetusliikkeeseen ja näiden kuljetusliikkeiden arvioimisessa käytettäviin kriteereihin. Tietoa kerättiin joulukuun 2007 ja tammikuun 2008 ajalta henkilökohtaisilla haastatteluilla ja kyselylomakkeella. Kuljetusliikkeet arvioitiin kuljetusliikkeiltä saadun tiedon perusteella.

Tulokset osoittavat, että valitut kuljetusliikkeet suoriutuvat kohtalaisen hyvin, vaikka joitain eroja huomattiin kuljetusliikkeiden välillä. Huomattiin että kuljetusliikkeen koolla on suhteellisen pieni vaikutus yrityksen suorituskykyyn. Yhdenmukaisen tiedon puute on selvästi ongelma, jolle täytyy antaa asianmukaista huomiota.

Avainsanat: toiminnan mittaus, Uponor Suomi Oy, toimittajien vertailu, maantiekuljetukset, palveluiden ostaminen

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1 INTRODUCTION

The purpose of this study is to review the current situation of the transportation companies used by Uponor Finland Oy. The name “Uponor” is used in this study instead of the official name Uponor Finland Oy. Uponor Finland Oy belongs under the name of Uponor Oyj. Uponor is one of the leading international plumbing, heating and infrastructure systems solutions manufacturers. Uponor manufactures plastic pipes, components and fittings. The company presentation of Uponor follows in chapter 5.1. One of the authors has been working for Uponor and therefore she became interested in the possibility of writing a thesis for the company. The authors discussed the topic together with the representatives of Uponor. The logistics manager of Uponor assigned the topic to the authors.

The phrase “logistics” is commonly used about the supply chain activities such as transportation, warehousing and finished goods inventory management. For a customer this means the delivery at the right time, at the right amount in a protective and recyclable package. This way, efficient and superior logistics is reflected on the competitiveness of the product. (Copacino 1997, 7.)

Supply chain management means managing the flow of materials and products from the source to the end user. It includes a total flow of materials, from purchasing to delivering. It is a process which is used to control material flows and services involved as well as controlling information flow so that the quality of activities and cost effectiveness are maximized. One of the topics of this thesis is purchasing, a part of the supply chain management, and it is examined in chapter 4. (Sartjärvi 1992, 14-15; Copacino 1997, 7.)

The transport industry is gaining more power and attention than before. Transport has become a real competition tool for companies and is therefore gaining more attention. Now that transportation is seen as a competitive advantage, it is getting the attention it deserves. (Faulks 1999, 146 & 149.)

The study is exploring transportation information such as costs per cubic metre delivered, claims and total expenditure of money. Cubic metre is a unit of volume. It is the volume of a cube with edges one metre in length (Wikipedia 2008). In the following chapters, the objectives of this study, the limitations scale of the study, research methods and the structure of the study are examined.

1.1 Objectives of the study

This study has three main objectives. The first objective is to find out what kind of information the chosen transportation companies are able to provide on a monthly basis? Ten transportation companies were chosen, by Uponor, out of 45 transportation companies used by Uponor. The second objective is to find out ways to improve the co-operation between Uponor and the ten transportation companies. The final objective of this study is to perform a transportation companies rating. The contents of the objectives are gone through as follows.

The first objective can be divided into smaller research problems. When considering information concerning deliveries, accurate and unified information is essential. Are the transportation companies willing to provide information? Are they able to provide the information on a monthly basis? What kind of information are they able to provide? These questions will be answered in the chapter 5.

The second objective can be divided into smaller research problems. Can the information flow be improved? How are the personal contacts maintained? How can the information be made more easily accessible for the transportation companies and Uponor? These questions will be answered in the chapter 5.

The third objective can also be divided into smaller research problems. What qualities in a transportation company are important from Uponor's point of view? How can the performance of the transportation companies be measured? These questions will be answered in the chapters 4 and 5.

There has been a long history of co-operation between some transportation companies and the case company Uponor. During the long history of Uponor, many changes have been made concerning transportation. Some partnerships with the transportation companies have been ended, started and developed. It is important to understand what might happen when one chooses the wrong suppliers. Choosing the wrong supplier may cause very unsatisfied customers.

In order to improve the co-operation between Uponor and the transportation companies used by Uponor, the concepts of vendor rating, road transportation and purchasing are examined. Performance measurement is an important part of this study and is therefore examined as well. Figure 1 shows the situation between Uponor and the transportation companies. In this figure, Uponor is the customer, with a certain need. Vendors are the service providers and the qualities of good service are yet to be defined. In the middle of the figure are the information flow from Uponor to the transportation companies, the actual purchasing process and information from the transportation companies to Uponor.

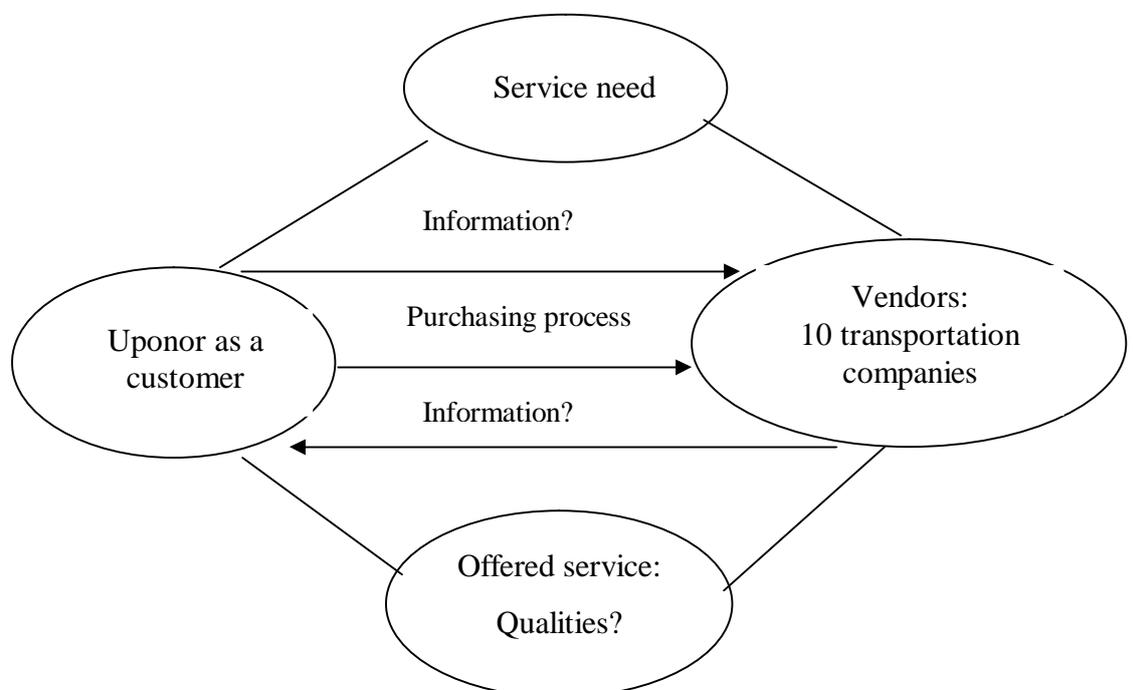


FIGURE 1. Situation between Uponor and vendors. (Modified after Sartjärvi 1992, 9.)

The ever-expanding importance of logistics has put a lot of pressure on the transportation companies as well. This creates a need to examine more closely the actions of the transportation companies. Logistics is considered as a competitive factor in all aspects of business nowadays. For that reason the supply chain is included in this thesis to study the importance of efficient logistics to realize the meaning of high-performance vendors in that chain.

1.2 Limitations

The main limitation in this study is the mode of transportation, which in this case is road transportation. The reason why road transportation was chosen as the mode was because it is the main mode used by Uponor. The main focus is on the domestic road transportation, but because Uponor also uses the transportation services to ship goods to and from Finland, the international aspect is also taken into consideration in this study. One of the limitations is the total expenditure of transportation companies limiting out the ones that Uponor pays only a small sum per year. Therefore this study concentrates on the ones that cost Uponor a lot of money. Due to this, only 10 transportation companies out of 45 are examined.

One of the limitations is the period of time of research, which is between December 2007 and January 2008. The activities of the transportation companies are examined during that period of time and further conclusions are based on the performance during those two months. Although winter time is a somewhat more quiet than summer time, the amount of deliveries is still quite high per vendor to make comparisons and conclusions on performance. Another limitation is that this study concentrates on existing transportation companies, in other words, to companies that Uponor is already using and not to new potential transportation companies. The actual evaluation of the transportation companies has been done by using informal evaluation. The evaluation types are introduced in chapter 4.1.

This study is concentrating on the purchasing and transportation parts of logistics. In this context purchasing is focused on buying services and not on buying

products. In the vendor rating part this study concentrates on the qualification that Uponor is interested in. Also performance measurement is explained to give a better overall picture.

1.3 Research methods and thesis structure

This is a case study where a combination of qualitative and quantitative research methods is used. The theoretical part consists of information from books and publications considering logistics, purchasing process, vendor rating, transportation and performance measurement. (Hirsjärvi, Remes & Sajavaara 2003, 123.) The purpose is to go through factors affecting and concerning transportation. This study uses both quantitative and qualitative methods to get the best results possible. The methods are explained as follows.

Quantitative research method is usually statistical, dealing with numbers. The processes of gathering information, processing information and analysing information are all separate phases of research. Quantitative research can be demonstrated in the form of tables, figures, statistics and there is no need for verbal explanation. Quantitative research method mainly uses numerical tests, questionnaires and interviews, statistics and analyses as tools for the research. (Uusitalo 1999, 81.) In this study questionnaires were used to gain information from the transportation companies. For the questionnaire used, see appendix 1. The information gathered in the questionnaire was, for example, cubic metres delivered and costs of deliveries per month.

Qualitative research method is usually verbal or illustrative. The processes of gathering, processing and analysing information is usually more tied together than in quantitative research method. This means that they are not separate phases of research. Qualitative research methods usually are observations, informal interviews, different documents and publications. One of the authors of this study has been working at Uponor and has had the possibility to observe Uponor and the transportation companies. The qualitative information material is not as unanimous

as in quantitative research method. The reliability and validity of the research is not so likely than in quantitative. This method makes it easier for the reader to follow the reasoning. (Uusitalo 1999, 81.)

The empirical part is based on interviews with the representatives of the transportation companies and statistical data gathered from the case company's representatives. These interviews were done by phone and by e-mail. Also personal interviews are used, for example the transportation planner of Uponor Finland Oy on March 2008. In this study a questionnaire is used as a basis for obtaining information from the transportation companies. The questionnaire consists of open questions, structured questions and numerical data.

Many publications are used to explain vaguely the whole supply chain and supply chain management. A lot of sources are used to go through the modes of transportation, later concentrating mostly on road transportation. Purchasing as an operation is examined based on many publications on the factors affecting purchasing. Vendor rating and factors including vendor rating are explained based on different sources.

The basic structure of this study includes transportation, purchasing, vendor rating, case Uponor and conclusions. Chapter 2 introduces the modes of transportation and explains the concept of road transportation in more detail. Some vehicles and equipment used in road transportation are also introduced. The basis for freight charges in road transportation are gone through. Some environmental issues from the angle of road transportation are introduced also. The future of transportation is also examined.

Chapter 3 includes the purchasing process in detail – starting from the need and ending to the delivery and follow-up of delivery. Chapter 3 also examines information technology solutions that can be used in supply management and purchasing.

Chapter 4 introduces the concept of vendor rating. This chapter examines how the performance of vendors can be measured. The criteria that are mainly used in vendor rating are also introduced, and the qualities emphasized by Uponor are gone through in the case study, chapter 5.

Chapter 5 gives an introduction to the case study and introduces the case company Uponor. After the company presentation follows the introduction of the transportation companies and the rating of transportation companies. The last part of this chapter is the recommendations. Finally the conclusions are shown in chapter 6.

2 TRANSPORTATION

Transportation means basically moving goods or people from one location to another, for example moving goods from the seller's premises to the buyer's premises. Nowadays the distances between the seller and buyer can be very long, therefore the meaning of transportation has increased. Decisions concerning transportation should always be made keeping in mind the whole logistical system. This part of the study introduces the modes of transportation, concentrating mainly on road transportation. (Gourdin 2001, 84.)

2.1 Four elements of transport systems

There are four basic components of transport that needs to be examined: the way, the terminal, the unit of transport and the unit of propulsion. The way is the route that the unit of transport uses and moves along. The terminal is the place where one transport network ends and another begins. The unit of transport is the vehicle used in the transportation. The unit of propulsion is what makes the vehicle move. (Benson, Bugg & Whitehead 1994, 27.)

The way can be divided into three parts: natural ways, natural ways artificially improved and artificial ways. Natural ways include the air, the open sea, inland lakes and waterways. These are free for anyone to use. Natural ways that are artificially improved are basically anything that has been improved by people, for example, rivers with their banks improved. Artificial ways include roads, although roads have been with us for so long that we do not consider them artificial anymore, railways, and canals. (Benson et al.1994, 27-30.)

Roads are usually public ways, everyone can use them. The government provides infrastructure: roads are usually government-owned and maintained. Roads are large networks that make every place accessible. Due to the good network of roads, routing is easy and if some roads are too busy, taking another road is easy to avoid traffic. (Benson et al. 1994, 32; Sussman 2000, 54.)

Terminals are used to change vehicles, either to a vehicle of the same mode or to a vehicle of different mode. There are three basic functions of terminals: to allow easy change between vehicles operating on that way, to ease consolidation of traffic, and to allow access to vehicles operating on a specialized way. There are all sizes of terminals, depending on the need. In road transport, terminals should be able to provide parking space, garage, and maintenance for the vehicles. To be able to handle the goods, proper variety of mechanical aids should be provided. (Benson et al. 1994, 45-46.)

The five basic transportation modes are using several different units of transport of goods and the equipment used in road transport will be examined more closely in this part. Roads are usually government owned and maintained and used by everyone. Roads can actually impose limitations on the size and speed of the equipment used in the transportation. (Benson et al. 1994, 32.)

There are many different types of vehicles used in road transport, but there are two basic groups: rigid and articulated vehicles. A rigid combines the source of power and the unit of carriage in the same vehicle. Articulated vehicle has a separate motor unit, which can be linked to a trailer or semi-trailer. Rigid vehicles are usually harder to operate than articulated vehicles. There are several important sub-classes: covered van, open trucks, tippers, platform vehicles, tankers, and hopper vehicles. Different vehicles in transportation are introduced in chapter 2.5. (Benson et al. 1994, 122.)

Without the propulsion unit no transportation equipment will be able to move. There are several types of prime movers, for example, electric motors, diesel or oil engines, turbines and jet engines. Electric engines were commonly used for example in electric railways. Also battery-operated vehicles, like forklift trucks are included in this type of prime movers. There are two types of turbines: impulse turbines and reactor turbines or combination of both. Jet engines are primarily used by jet aircraft for long distance travel. Diesel engines are most suitable for heavy road haulage. (Benson et al. 1994, 148-149.)

Operating plans in transportation are to be considered as well. The operating plans means the planning that management in a transportation company for example need to do. Scheduling is one of the major issues in transportation, and simply means the time when the truck leaves and when it needs to come back. Crew assignment means the dividing the tasks between employees: who drives what truck, goes where and what time to pick up which delivery. It is quite essential to manage flow distribution so, that peaks and imbalance are considered and managed. This means that there are enough vehicles and crew to meet all situations. (Sussman 2000, 54.)

Sometimes trade-offs need to be considered. If a customer needs to buy services for a low cost, the level of service can not be so good than it would be at a higher cost. The equipment or the personnel can not be so well suitable for that particular company's needs. Finally, management of a transportation company should do some contingency planning. Contingency planning means the procedure of "what do we do when things go wrong". (Sussman 2000, 54.)

2.2 Modes of transportation

The five basic transportation modes are road, rail, water, air and pipeline. All five modes are different and some are more suitable for certain situations. Choosing the right transportation mode is more complicated than it may seem and it is crucial for an organization to choose the right mode. The factors that affect the chosen mode are usually, price, suitable equipment and length of the transport. These five transportation modes will be examined more closely in this part.

Road transport

Road transport can be extremely flexible in terms of routing. One can change the routes quite quickly if needed. Road transport is mostly used for high value and lower volume cargo. The concept of road transport is explained in more detail in chapter 2.3.

Rail transport

Rail transport is good for transporting large quantities of goods over long distances. Rail transport is mostly used for low-value and high-volume cargo, but it is also used to transport containers. Size, weight and volume do not cause problems, but the tracks are fixed, which limits the possible routes and height is one limitation that needs to be considered. Another problem is the different gauges used in different countries. This means that in such cases the goods must be physically moved from one railroad's equipment to another. Most nations have one railroad and that railroad is usually government owned meaning the railroads are often monopolistic. The railroads do still face competition, but mostly from other modes of transportation. (Gourdin 2001, 85-86.)

Water transport

Water transport takes place in inland waterways and oceans. This transport mode is quite slow, but also cheap. Water transport is good for transporting low value and high volume products. There is a variety of vessels available, which means that basically anything can be transported. (Gourdin 2001, 90.)

Air transport

Because air transport is considered expensive it is mostly used in emergency type transports, when everything else fails. Air transport is fast, but expensive. Air transport is used a lot even though it's cost. Air transport is good for transporting small items, with high value, over long distances. (Faulks 1999, 50; Gourdin 2001, 90.)

Pipelines

Pipelines are mostly used to transport oil and natural gas. This is a very low cost system, because not much labour is needed to be able to operate it. There is little risk of loss or damage to the goods transported. The pipelines can be and used 24

hours per day. Because pipelines are operated 24 hours per day, meaning continuously, there must be a sustained need for the product. The minus side is that the routes are fixed and can only be used one way. (Faulks 1999, 45; Gourdin 2001, 89.)

2.3 Road transportation

One of the major advantages of road transport is door-to-door service. Road transport also operates as a link between other modes. For example, the seller loads the goods to a truck, the truck transports the goods to a train station, the goods are transported by train to another train station and a truck picks up the goods and delivers the goods to the customer. (Gourdin 2001, 87.) Figure 2 illustrates the example given above.

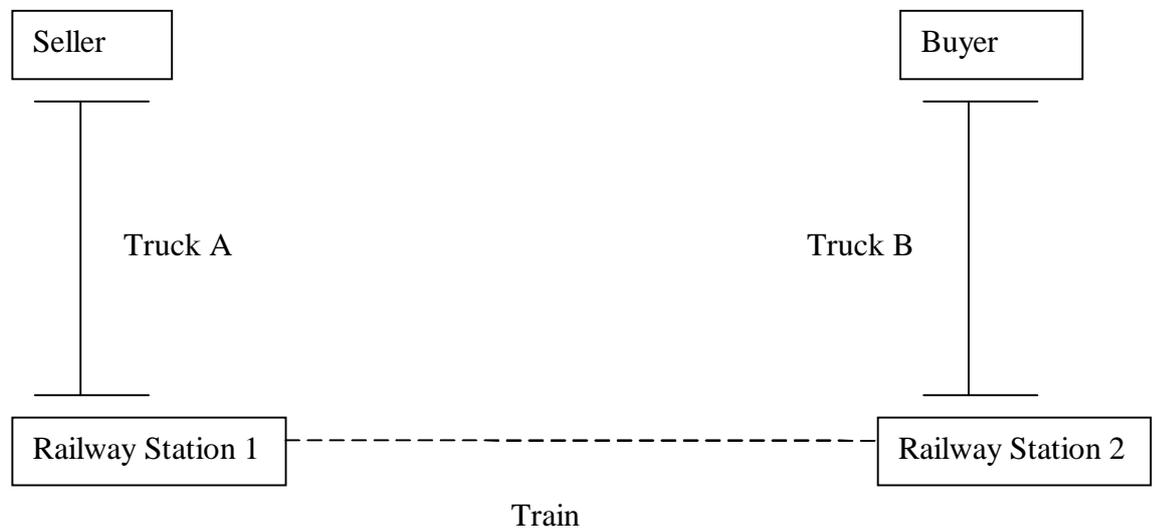


FIGURE 2. Road transportation as a link between other modes.

The most commonly used vehicles in road transportation are trucks, trailers and containers. These are explained in more detail in chapter 2.5.

Roads are usually public ways, meaning that the government takes care of them and everyone is allowed to use them. There are also some problems that need to be taken into consideration, for example, the fact that trucks are not the only one's using those roads. Due to this, some roads can get very crowded, which can cause delays in shipments. (Gourdin 2001, 87.)

The costs in road transportation are not always higher when delivering over longer distances. In road transportation it can sometimes be more profitable to deliver farther away than to customers nearby. This is due to the situation shown in Figure 3. Sometimes the customers can be geographically close to each other, but far away from the company itself. The customers nearby can be scattered and therefore the routing to reach them is difficult. When customers are closer to each other – even though far away from the company – one route can be used to reach them all. So it can be seen that deliveries farther can be more profitable than delivering near. This is illustrated in the Figure 3 below, in the so-called fly-net model.

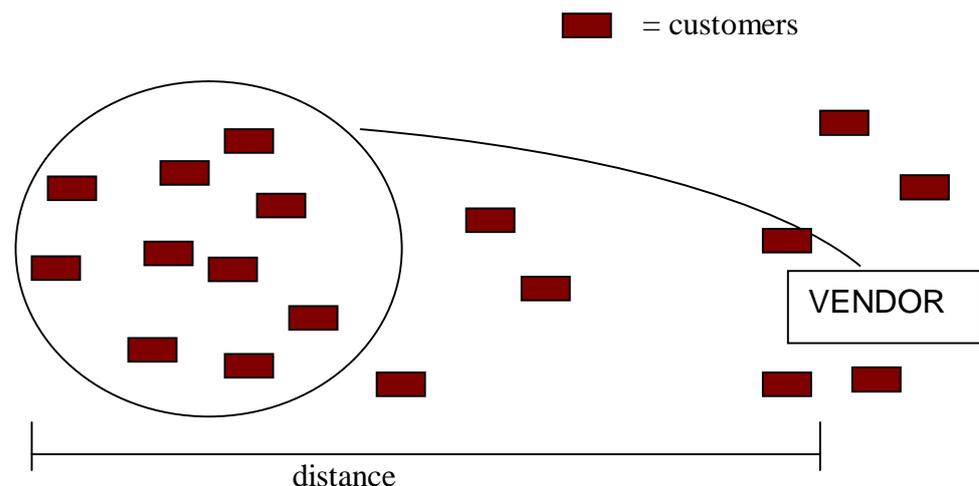


FIGURE 3. Flyswatter model (Sartjärvi 1992, 63).

Delivery costs can otherwise be lowered by longer delivery times, because the need for speed increases the cost. Implementing minimum order levels enables to ship only in lower-cost bulks, because delivering single parcels is very costly. For the delivery on single parcels, the groupage possibility should be considered. (Sartjärvi 1992, 128.)

2.4 Legal forms of transportation

These forms are closely linked to modes of transportation. These four legal forms of transportation are common carriers, contract carriers, exempt carriers, and private carriers. The reason why these four forms of carriers are closely linked to modes of transportation is that these four forms are operated within the five modes of transportation. Not all these forms are used in all modes of transportation.

Figure 4 gives a good idea how these forms are divided on the different modes of transport. (Lambert & Stock 1993, 188.)

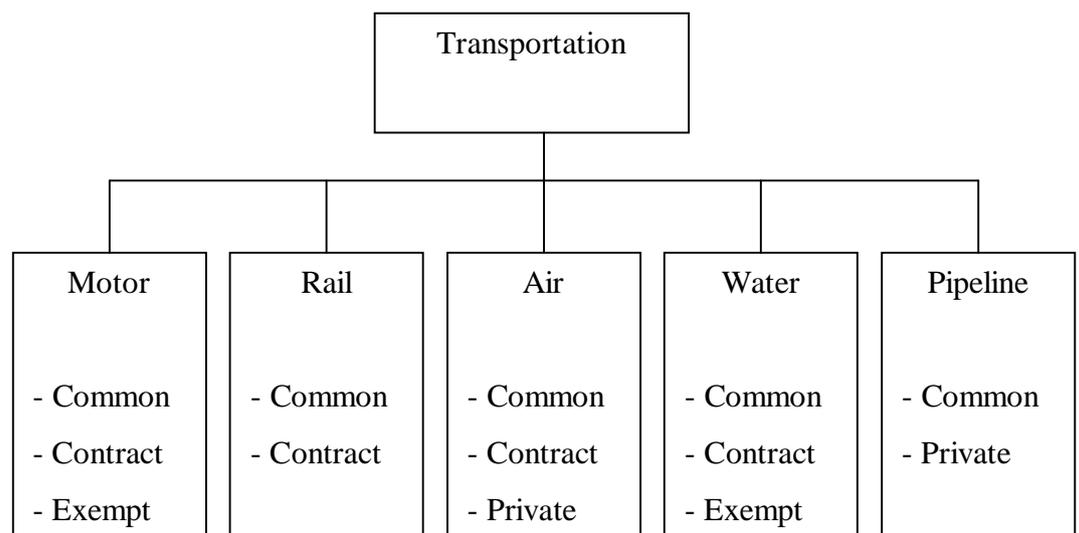


FIGURE 4. Legal Forms of Transportation (Lamber & Stock 1993, 189).

Common carriers refer to services provided to any shipper. These services are offered at published rates between designated points. Common carriers must be granted authority from federal regulatory agency. This authority will determine what kind of commodities can be transported and what market areas the carrier may serve. Common carriers must serve all shippers who ship the commodities under their authority. (Lambert & Stock 1993, 188.)

Contract carriers differ quite a lot from common carriers. Contract carriers do not serve general public. They serve a certain number of shippers under specific contractual setup. These contract carriers serve certain areas and specific types of commodities. The contract between the shipper and the carrier makes sure the shipper will get a specified transportation service at certain cost. Usually hiring a contract carrier is cheaper than hiring a common carrier. (Lambert & Stock 1993, 189.)

Exempt carriers are not limited to serve certain routes, areas or rates. The type of commodity transported and the type of operation determine the exempt status. Using exempt carriers is usually cheaper than using common carriers or contract carriers. Although it is cheaper, it is not suitable for most companies, because not all products can be given the exempt status. (Lambert & Stock 1993, 189.)

Private carriers differ from common carriers, contract carriers and exempt carriers in a way that private carriers are not for hire. Private carriers transport only their own products and operate from their own facilities. Private carriers have more flexibility in transporting their products, because they can decide everything themselves. (Lambert & Stock 1993, 190.)

2.5 Vehicles and equipment

There are three main dimensions in material handling: physical, management and technology dimensions. Physical dimension includes all movement into and out of the company. Management dimension includes planning, supervising and

supporting of the physical dimension. Technology dimension includes all the information systems needed to be able to perform material handling. Material handling equipment can also be divided into three prime forms; manual, semi-automated and automated. Manual systems are operated by persons, who use powered equipment. Semi-automated systems are basically a blend of machinery operated by people. In semi-automated systems the machinery is computer-managed. Automated systems are completely operated by computer-managed machinery. (Lysons 2000, 365-366.)

A truck in road transportation is a large vehicle used for transporting large volumes of goods, materials, or equipment. Trucks can pull trailers or carry containers. These are explained in the following parts. As discussed in chapter 2.1, the government can regulate road transportation. In most countries, a special driver's license is required to drive any type of truck greater than 4,5 tonnes. In Finland any vehicle or a combination that exceeds 3,5 tonnes requires a class C driver's license. More information on trucks can be found in appendix 2 and about driver's license classifications on appendix 3. (Wikipedia 2008; Ajoneuvohallintakeskus. 2008.)

Containers, also known as intermodal containers are the main type of equipment used in intermodal transport. Container is box that can be attached to a truck. The proportion of containers is eight feet (2438 mm) wide by eight feet (2438 mm) high. More information on containers can be found in appendix 2. (Wikipedia 2008.)

Truck trailers are often used for freight that is transported primarily by road and rail. Typically, regular semi-trailers can be used without any customization. A semi-trailer is a trailer without a front axle. A large proportion of its weight is supported by a detachable front axle assembly. A semi-trailer is normally equipped with legs, which can be lowered to support it when it is detached. They vary in design, ranging from open-topped haulers to for example refrigerated ones. Many semi-trailers are part of semi-trailer trucks. More information on trailers can be found in appendix 2. (Wikipedia 2008.)

There are basically five main groups of equipment in materials handling: lift trucks, mobile cranes and lorry loaders, conveyors, holding aids, and ancillary equipment. The material handling equipment used varies according to the products and needs. In this part, a closer look at these materials handling groups is taken. (Benson et al. 1994, 236.)

Lift trucks: There are different types of lift trucks. Some lift trucks use forks to raise the load and some use platforms to raise the load. Lift trucks are most suited for lifting many small things that are unitised. Examples of lift trucks are: pallet truck, narrow-aisle trucks, counterbalanced trucks and heavy-duty side-loaders. Pallet trucks roll under the pallet and raise it from the floor. Narrow-aisle trucks are either reach trucks or turret trucks. Counterbalanced trucks can lift, raise and stack palletised loads. Heavy-duty side-loaders are mostly used for lifting heavy containers. To see more examples of lift trucks and picture of a lift truck see appendix 2. (Benson et al. 1994, 238-240.)

Mobile cranes are basically mechanical lifting equipment that can be used to lift and lower materials and move them horizontally. One of the most known lorry loaders is the HIAB, which is used, for example, to place site material on convenient packs. There is a variety of attachments that can be used with the HIAB. See appendix 2 for a picture of a HIAB. (Benson et al. 1994, 242.)

Conveyors are used in several different activities. The main feature of conveyor is that a product is moved from point A to point B on a continuous belt. A belt conveyor consists of two pulleys that are used to change the direction of an applied force or transmit rotational motion, with a continuous loop of material that rotates about them. See appendix 2 for a picture of a conveyor. (Benson et al. 1994, 244.)

Warehouse shelving space should be cheap, strong and adjustable. There is a large variety of different types of racking and other holding aids. Many of these racking or other holding aids give strong, space-saving equipment to fit the customer's requirements. (Benson et al. 1994, 246.)

2.6 Basis for freight charges

It is important to understand what factors are influencing the transportation costs. What are the main issues affecting the costs? The factors affecting the transportation costs can be divided into two main groups: product-related factors and market-related factors. There are also other kinds of factors affecting the pricing of transportation. These other factors are closely linked to product-related factors and will therefore be examined together with product-related factors. (Lambert, Stock & Ellram 1998, 218.)

Product-related factors can also be divided into smaller groups. These groups are: density, stowability, ease or difficulty of handling and liability. Density means basically the ratio of weight and volume. Some materials have a high weight-to-volume ratio, which means that they are quite heavy considering their size. In terms of weight and space, a vehicle is more constrained by space than weight (Bowersox & Closs 1996, 366).

Stowability refers to the ability to fill the space in a transportation vehicle. In another words, some items are difficult to transport due to their shape, size, and fragility. Ease or difficulty of handling the product depends largely on stowability. Products that are difficult to handle are the most costly to transport. Liability refers to products that are relatively high value compared to their weight. These products that are easily damaged or more likely to be pilferaged are more expensive to transport than other products. (Lambert et al. 1998, 218.)

Sartjärvi also includes pricing into the product-related factors. Pricing is also a part of the supply chain processes and an important factor in purchasing. When pricing products and services, the company should also take into consideration the market situation and other external factors to avoid pricing themselves out of the market. Sometimes the company might provide some totally useless (often free of cost) services that are a total waste of resources. The service should be emphasized on the profitable “good” customers. The realistic needs of customers should also be noticed, because if the company is too flexible and customer satisfaction-focused,

customers can make resources run out quickly by irrelevant demands. (Sartjärvi 1992, 74.)

Market-related factors are the second issue affecting the transportation costs. Decisions should be made based on competition and market situation. There are several different factors that belong under the group of market-related factors. Location of the market is one of them. This location determines the distance the goods must be transported. Another factor is the seasonality of product movements. Another example is the nature and extent of government regulation of transportation carriers. In some cases the government regulates certain modes of transportation more heavily than other modes. (Lambert et al.1998, 219; Sussman 2000, 68.)

Transportation counts for a large part of the logistics costs and therefore it is important to understand what the transportation costs consist of. Different vendors use different transportation prices and different pricing principles. (Lambert et al. 1998, 217.) The most commonly used basis for freight charges are introduced in this part of the study.

Cubic metre is very often used as a basis for freight charges in road transportation. Cubic metre is a unit of volume. It is the volume of a cube with edges one metre in length (Wikipedia 2008). 1 cubic metre equals to 333 kilograms in road transportation. (DHL, Freight instructions, 2006.)

Loading metre is another very often used unit of volume in road transportation. One loading metre equals 2000 kilograms. One loading metre also equals to 1 metre lengthwise and heightwise from a trucks trailer or container. There are differences how the weight of a loading metre is defined. Some companies use the 2000 kilogrammes as the weight of one loading metre and some use 1850 kilograms as the weight for one loading metre. (Hörkkö, Koskinen, Mattson, Ollikainen, Reinikainen & Wedermann 2005, 350; DHL, Industry glossary, 2006; Kovalainen 2007.)

The weight of the loading metre (1 loading metre equals to 2000/1850 kilograms) is used when nothing else can be placed on the top, under or on the sides of the consignment, or when the consignment takes the whole cargo space. The weight of the shipment can be calculated: loading metres times the weight of the loading metre (2000/1850 kilograms). (DHL, Freight instructions, 2006.)

Different types of pallets are also used as units of volume. Fin-pallet is a standard-sized pallet used in Finland (Kuusisto & Kukkonen 2007). Eur-pallet is a standard-sized pallet commonly used in Europe. Fin-pallet equals 1000 kilograms and Eur-pallet equals 800 kilograms. Another way of measuring these pallets is that 1 Fin-pallet equals 0,5 loading metre and Eur-pallet equals 0,4 loading metre. The floor measures of Fin-pallet are: 1,2 metres by 1 metre. The measures of Eur-pallet are: 1,2 metres by 0,8 metre. (Transpoint 2008; Kuusisto & Kukkonen 2007.)

Many transportation companies use the best pricing alternative for them, meaning for example that if the actual weight of a cubic metre in a consignment is higher than the normal weight of a cubic metre (1 cubic metre equals 333 kilograms), the transportation company will use the real weight as a basis for freight charges. (DHL, Freight instructions, 2006.)

2.7 Environmental issues

It is clear that transportation has an effect on the environment. Air, land and water are being polluted with poisonous chemicals through different activities, some of which are the result of the provision of transport services (Faulks 1999,157). The results of pollution can be seen in several forms. The increasing population also increases the need for transportation and that causes more pollution. Some of the impacts of pollution are introduced as follows. (Faulks 1999, 146 & 149.)

Fuels are considered a huge pollution source. Fuels mean oil-based petrol and diesel. Petrol is used mainly in cars, light vans and small boats. The main emissions of petrol include carbon monoxide, carbon dioxide, nitrogen oxides and lead

compounds. Emission refers to a release of chemical compounds, which cause pollution. Carbon monoxide is a chemical compound, which is poisonous to all living organisms. Carbon dioxide is also chemical compound, which is the main cause for global warming. Nitrogen oxides refers to a compound of nitrogen and oxygen and is harmful to plants. Lead is a heavy and toxic metal. There is also a version of petrol that has no lead on it. Diesel is used in heavy road transportation, smaller vans, cars and railways. It produces less carbon monoxide and nitrogen oxides than petrol. Diesel is considered a more environmental option than petrol. (Faulks 1999, 164-165.)

2.8 The future of transportation

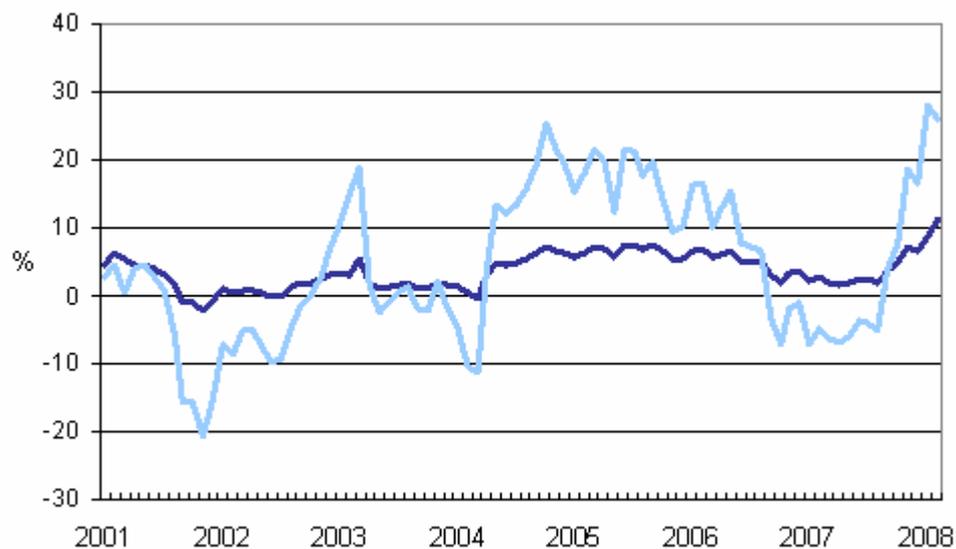
Transportation is overall quite regulated by government with different types of rules and regulations. Considering all the things going on at the moment, for example, the environmental issues and how transportation is causing more stress to it, it might cause the Finnish government among other nations to implement even more rules and regulations to transportation industry. These possible future rules and regulations will cause the transportation companies more costs and therefore the prices of transportation will increase as well. It is always the customer who pays the price for these changes. (Faulks 1999, 146 & 149.)

The whole transportation industry is gaining more power and attention than before. Transportation has become a real competition tool for companies and is therefore gaining more attention. Now that transportation is seen as a competitive advantage, it is getting the attention it deserves. (Faulks 1999, 146 & 149.)

When considering the road transportation, there are some serious issues to be taken into consideration, especially in Finland. During the interview with Antero Laiho, transportation planner of Uponor, it became evident that the future of road transportation in Finland is under a lot of pressure. Even though environmental issues are taking place and the prices are going up in every aspect of transportation, there are still some other factors hiding behind the bigger problems.

The lack of experienced drivers is causing most of the stress in the road transportation industry. Road transportation companies are not able to provide the best possible services at the moment due to lack of experienced drivers. The need of drivers is becoming a serious issue. This may be one of the largest problems in the future for road transportation, not the increasing prices in petrol or vehicles. What could be done about it? There may several solutions, but at least one worth mentioning is the possibility of transforming the image of the road transportation in order to make it more appealing to possible future drivers. The salary-level of the drivers will probably have to be increased as well. (Laiho 12.3.2008.)

The increase in the price of petrol is also increasing the overall expenses of road transportation. More than half of the increase of the total costs during the year 2007 was caused by the increase of the price of petrol. Also the increases in the salaries, interest rates and equipment had a remarkable effect on the total costs. (Kuorma-autoliikenteen kustannukset 2008.)



■ Total index ■ Petrol

FIGURE 5. Cost index of freight traffic in Finland 2008. (Tilastokeskus 2008).

The price of petrol is gradually increasing in the future as seen in Figure 5. This possible increase in the price of petrol should be taken into consideration, although there is not much that the transportation companies or the companies using the services of transportation companies can do about it. (Tilastokeskus 2008.)

3 PURCHASING

Purchasing basically means acquiring goods or services and paying for the goods or services with money or equivalent payment. Purchasing can refer to, for example, the actual acquiring of materials, components, services or equipment. Purchasing refers always to acquiring the products or services legally. (Lambert & Stock 1993, 485; Lyson 2000, 1.)

Communication is the most important part in purchasing. Without communication the purchasing process cannot work. What information needs to be communicated, to whom, when, and in what form? (Sussman 2000, 69.) The process of purchasing

is explained in the following chapter. Purchasing decision can be made either on short-term or long-term basis.

Nowadays instant reactions to customer demands are inevitable for a company and its ability to customize products and services based on the customer needs for a specific customer. The costs should be considered as well. Logistic costs do not usually form a large part of the total price of the product, but mostly they are a large part of the profit, sometimes even bigger than the profit itself. Managers should familiarise themselves with the possibilities of efficient logistics in order to make efficient decisions. Testing is as important as planning when developing something new. (Sartjärvi 1992, 2; 86.)

One factor in purchasing is alertness. This means the company's ability to foresee markets and changes in customer need. These changes can be seasonal and therefore predictable, but upcoming trends are hard to predict. For a manufacturing company in developing their logistics, this could mean preserving some resources from the vendor for the expected rush-time. For example, if it is known that May is the busiest month for company X, can the management give a warning to the vendors of an unusually large service need to help them perform in the peak. In the relationship between company X and a transportation company (vendor), this could mean asking the transportation company to preserve a few extra trucks in May to deliver the company X's shipments. Now the peak does not come as a surprise to the vendors.

There can also be some problems that need to be recognized. These are more or less for the management to solve. Problems vary between the optimal amount of warehouses to the distribution strategies. All kind of information is needed to make the whole supply chain work efficiently: forecasts on demand and markets, information about the products, inventories, raw materials, current situation, amount of finished goods, budget and transportation. There is usually no right answer right away, but the elements of the purchasing need to be familiar to management in order for them to implement them correctly and efficiently. (Sartjärvi 1992, 86.)

3.1 Purchasing process

The purchasing process means the process that a company needs to go through when acquiring something. In this chapter there will be nine steps introduced that will make it easier to understand how the purchasing process works. The purchasing process is explained mostly in the angle of supply, but the process of buying services is similar to this and therefore essential to follow the process as a whole.

3.1.1 Recognition of need

All purchases in an organization begin when a certain need is recognized. The person responsible for the purchasing of a certain product or a service should know how much and when the product or service is needed. In most organizations there is a supply department, at least in larger organizations. The supply department tries to make sure there will be as few as possible of special or unusual orders and even less rush orders. Rush orders are quite expensive and therefore should be avoided. (Leenders, Johnson, Flynn & Fearon 2006, 62.)

3.1.2 Description of the need

Knowing the need of a customer is vital to be able to place the right order of the right product or service. A detailed description of the product or service should be given to be able to purchase the right product or service. If the description is not clear or it is somehow vague, it may lead to extra costs. (Leenders et al. 2006, 62.) All companies are interested in cutting down the costs and by being exact when giving a description of a product or service needed is one way of avoiding excess costs.

3.1.3 Identification of potential sources

If there is no valid contract between a buyer and a supplier over the item needed, there are three choices of action to be chosen from. When buying products or services for the first time from a supplier/provider the process is gone through only once.

1. Request for quotation. Request for quotation is basically a way to make comparisons of the price and therefore the price is the main competition tool in this case.
2. Request for proposal. If the buyer has more complex requirements about the product or service, the buyer can send a request for proposal for potential suppliers. Request for proposal usually includes more detailed information about the needs of the buyer than a request for quotation. This method is also used when the buyer is planning to use negotiations as a means to define the price and terms.
3. Request for bid. The buyer sends a request for bid when planning to use the bidding process without the possibility to negotiate about the price after the bid is received. (Leenders et al. 2006, 66.)

3.1.4 Supplier selection

Supplier selection is a very crucial part of the purchasing process. Where to get the right information concerning suppliers? What is the criterion when choosing a supplier? What methods of evaluation should be used? There are several aspects that should be taken into consideration when choosing a supplier. If a wrong supplier or suppliers are selected, the consequences can be quite serious. Usually choosing the wrong suppliers causes stress to all parties and maybe some unsatisfied customers. (Leenders et al. 2006, 256.)

There are several potential sources, where the information about the potential suppliers can be found. Nowadays one of the most used information source is the

Internet. Online searches are commonly used and also exploring web sites of potential suppliers is a good way to gain more information. This has actually caused organizations to give more attention to the image their web sites give to its viewers. (Leenders et al. 2006, 259.)

Trade journals and trade directories are also a good way to get more information about suppliers. Almost all business fields have their own trade journals. From trade journals the buyers can get some general information about potential suppliers and also check the offerings. Trade directories provide lists of suppliers, addresses, and sometimes financial standings of the suppliers. One other thing that can be found in trade directories is the trade gossip, which helps the buyer to stay up-to-date with changes in the policies of suppliers. (Leenders et al. 2006, 260-261; Lyson 2001, 271.)

Sales representatives, samples and visits to suppliers are also used to get more information. Sales representatives give information for example, about the products and sources of supply. Requesting samples of the products is a nice way to make sure the buyer is familiar with the product. Visiting the supplier helps to gain better relations at all levels of management. Also colleagues are a good source of information. If someone has already done business with the supplier in question and is willing to share the information of how the supplier was able to perform, it is an excellent source of information. Experience should truly be taken into consideration. (Leenders et al. 2006, 261-262; Lyson 2001, 271.)

3.1.5 Preparation and placement of the purchase order (PO)

Placing an order is not very complicated, but there are some things that should be kept in mind. If a buyer places an order on the telephone, it is not enough. The buyer must then send a written order to the supplier. This way the transaction is properly recorded and misunderstandings are avoided. Purchase order form is usually prepared when placing an order. Usually not all people in an organization

are authorized to place orders, but in most cases it is centralized under one department or person. (Leenders et al. 2006, 67.)

Purchase order form should include at least: date of issue, the name and address of the supplier receiving the order, the quantity and description of the items ordered, date of delivery required, shipping directions, price, terms of payment, and conditions concerning the order. The purchase order form varies a lot, meaning there is no one right kind of purchase order form. (Leenders et al. 2006, 67.)

The handling of the purchase order form varies as well. The most basic way of handling the purchase order form: The original is sent to the supplier and sometimes a duplicate is also sent, so it can be sent back to the buyer as an acceptance to complete the contract. One copy is filed by the purchasing department. One copy may be kept in the supplier file. One copy is sent to the accounting department. One copy is sent to the stores department, so it can plan for the receipt of the materials. One copy may be sent to the receiving department to be filed. Figure 6 illustrates the idea of the purchase order handling. (Leenders et al. 2006, 69)

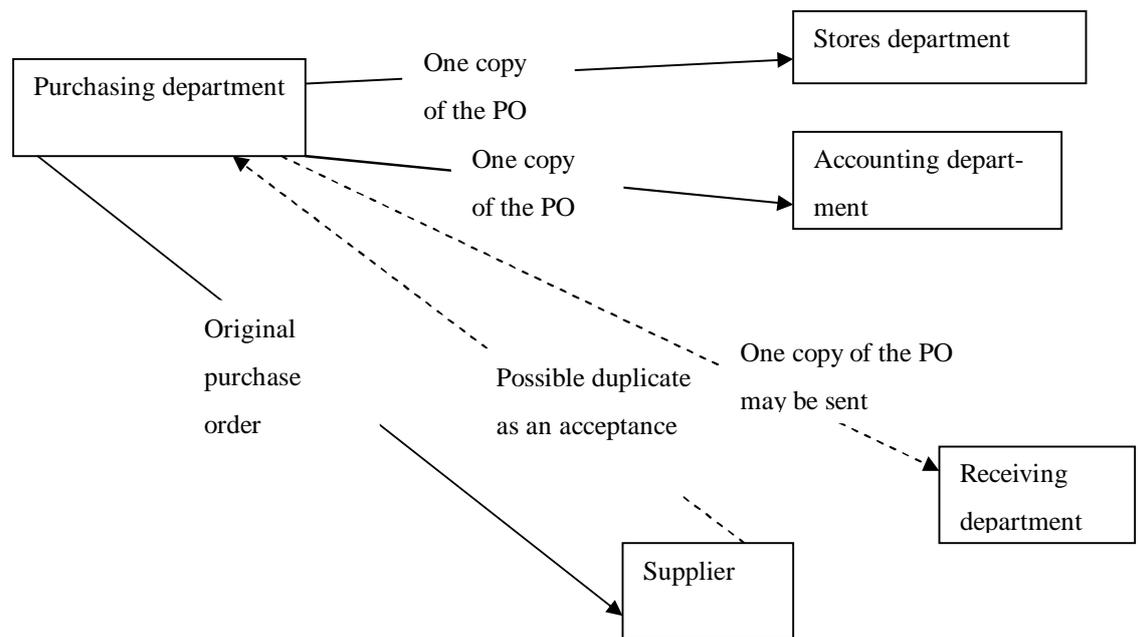


FIGURE 6. Process of the purchase order (PO means purchase order).

In some cases a blanket or open-end orders may be used. The costs can be reduced by using blanket or open-end orders. A blanket order generally covers a variety of items. It is mainly used when there is a need to repetitively purchase diverse supply items from a single vendor. A blanket order is issued for a specific amount of money. When the specific amount of money has been used, a new requisition must be handled to re-establish the blanket order for further purchases. An open-end order permits for addition of items and also permits an extension of time, if needed. (Leenders et al. 2006, 69-70)

3.1.6 Follow-up and expediting

At the time the order is issued, a suitable follow-up date is designated, if the purchaser wishes to follow-up. Follow-up is usually done to assure the supplier's ability to meet the delivery promises. If there should be problems with meeting the delivery promises, the buyer needs to know as soon as possible to be able to make

the necessary actions. Sometimes this requires a visit to the suppliers' facility, but this happens mostly on critical and expensive purchases. The most common way to do follow-up is to do it on the phone. This theory is utilized in chapter 5.

(Leenders et al. 2006, 72.)

Expediting basically means pressuring the supplier to meet the delivery promises, to deliver ahead of schedule, or to speed up the delivery of delayed order.

Expediting is to assist the progress of something. In another words, the purpose of the expediting is to ensure the delivery of purchased goods to a pre-determined and promised delivery schedule. In some cases expediting may involve a threat of order cancellation or withdrawal of possible future business, if the supplier fails to meet the agreement. A good example of expediting could be for example, when a service buyer notifies the carrier of the need to quickly move the shipment through the carrier's system, which makes the carrier try to deliver the shipment as fast as possible. (Baily, Farmer, Jessop & Jones 1994, 110; Leenders 2006, 72; Erridge 1995, 12-13.)

3.1.7 Receipt and inspection of goods

Many organizations have centralised all receiving under one department. Receiving is so closely involved with purchasing that receiving departments are often accountable to the purchasing department. The main objects of receiving are to confirm the order as arrived, make sure the shipment arrived is in good condition, make sure the quantity ordered has been received, forward the shipment to its suitable next destination, make sure that suitable documentation of the receipt is registered and send to appropriate parties. In some cases the shipment has been damaged in transit, or some shortages exist either because some items have been lost in transportation or because it was shipped with too inadequate amount of items. If one of these situations should occur, a full report should be written about it. Taking photos as a proof of the shipment when it has arrived is also sometimes a good idea. (Leenders et al. 2006, 73.)

The liability of carrier varies depending on the contract between the shipper and carrier. These issues are never easy. The terms should always be carefully drafted and followed in the contract. There are two basic types of claims that can be made:

1. Unconcealed loss or damage, which means that when it is clear that loss or damage has occurred this must be noted to the carrier's delivery receipt. Taking some photos of the damaged shipment is always a good idea. This way one has some evidence about the loss or damage. Sometimes the carrier and shipper are not able to solve the issue of loss or damage and the matter will be handled in the court. (Johnson, Wood, Wardlow & Murphy 1999, 237.)

2. Concealed loss or damage means that the merchandise is found short or damaged only after the container is opened. If this should occur, the unpacking should be stopped immediately and photos taken of the merchandise damaged. The carriers' local agent could be asked to inspect the merchandise and make a report. In this kind of loss or damage it is usually quite hard to prove when the actual loss or damage has taken place. If the damage to the shipment is noticed before the consignee accepts the goods, the carrier is liable to pay for the damage. (Johnson et al. 1999, 238.)

The main thing in is to always check the delivery and the package as soon as possible. One can take photos to state more clearly what has happened. When one notices the loss or damage one should immediately report it to the transportation company, who delivered the package.

When buying services the quality is inspected in a different way. When buying products the inspection is done when the goods arrive to the company's premises. In the case of outsourced transportation, the inspection of the goods happens at the opposite end from the angle of the company buying the services. The end-customer inspects the goods according to the process. The company buying the transportation services inspects the quality of the service in correspondence with the information given by the end-customer.

Reclamations are one part of customer service and companies many times need to face all kinds of difficult situations. Reclamations can sometimes be reverse logistics, meaning that the companies have to consider the handling of returned goods as a part of logistics as well. The reaction to reclamations can be a competitive advantage and it can turn the whole thing up-side down. Below are three reclamation situations:

1. customer reclamation -> situation ok -> satisfied customer
2. customer reclamation -> situation not ok -> unsatisfied customer
3. NO customer reclamation -> unsatisfied customer

This means that in situation 1 the company receives reclamation, they do their best and correct it, and the customer is satisfied again. He tells his friends: "They did everything they could and now it's great!" In the second situation the company cannot clear out the reclamation, and the customer is left unsatisfied. He can tell his friends: "Well, they tried." In the third situation nothing happens. The customer perhaps thinks it is not worth to complain. He tells his friends, that he received a load of useless goods and that they should never do business with that company. It's a company's advantage to inform customers of the possibility to easily and pleasantly reclaim in order to make reclamations a smooth and easy part of the ordering possible to avoid situation 3. (Sartjärvi 1992, 55.)

3.1.8 Invoice clearing and payment

An invoice is a business document issued by a seller to a buyer, displaying the products, quantities and agreed prices for products or services which the seller has already sent or performed to the buyer. An invoice indicates that payment is due from the buyer to the seller, according to the payment terms. The invoice clearance procedure varies, but the invoice should always be checked and audited. Either the supply or accounting department handles the invoice. (Leenders et al. 2006, 74.)

If the supply department handles the invoice, the following procedure is characteristic: After being checked and adjusted for any essential corrections, the original is sent to accounting to be kept until supply authorises the payment. Duplicate if the invoice is kept by supply, so it can check it against the invoice. If the duplicate and invoice agree, supply keeps both of them until the goods have been checked and accepted. Then the supply sends its duplicate copy of the invoice and the receiving report to accounting. If the accounting department handles the invoice, the following procedure is typical: invoice is mailed in duplicate by the supplier to the accounting department, where the invoice is marked as received and checked and certified for payment. If the purchase order and invoice differ it will not be certified for payment. If there are any variations on the purchase price terms or other features, the invoice is sent to supply to be approved. The implementation of information technology facilitates the purchasing process and the payment procedure as well, as is explained in chapter 3.2. (Leenders et al. 2006, 75; Baily et al. 1994, 273.)

3.1.9 Maintenance of records and relationships

The final step in supply process is to update the records. Updating records is more than just filing the copies and it is always up to the organization itself to decide how much information about the past and the future they want to keep. The updating of records can be done either manually or by computer. Nowadays most organizations prefer to do the updating of records by computer. (Leenders et al. 2006, 76.)

Supply data collection occurs throughout the process. Turning data into usable knowledge is a continuing challenge (Leenders et al., 2006, 77). Deciding the need of information is another one. What will be done or decided with the help of this information? After answering these questions it will be known, what information is relevant to be gathered and processed.

Relationships are the key to every form of business - the relationship with the main suppliers even more so. The relationships can change over the time, for example, new relationships will be formed and some old ones will be ended, and some relationships will be developed. The main relationships, meaning the ones that are crucial for the business, should be well taken care of. (Leenders et al. 2006, 77.)

The number of suppliers is an important decision to be done in an organization. There are some plusses and minuses in having either a single supplier or having more than one supplier. If an organization decides to use only one supplier, the plusses are: possibly a good and long relationship, due to having time to concentrate on creating good relations with the supplier, less quality variability, lower costs.

The biggest minus in having a single supplier is that it is very risky. What should happen if the only supplier fails to deliver? That is a question worth thinking about. If an organization decides to use more than one supplier, the plusses are: larger capacity, it divides the risk of supply interruption, creates competition among the suppliers, which will hopefully lead to better service. The minuses are that having more than one supplier requires more organising, not knowing the suppliers as well as one would if only had one or a few suppliers. (Leenders et al. 2006, 270-271.)

3.2 Information technology in purchasing

There are a number of reasons why to use information technology in purchasing. The implementation of information technology in logistics, manufacturing and many other things is increasing all the time. Investing in the implementation of information technology-based solutions can be beneficiary for a company for example in the following ways:

- Reducing costs and gaining more efficiency through automating the purchasing process, which basically means that the number of people involved with purchasing process is reduced.

- Fast and easy access to important data helps to notice possible problems quicker and helps make better decisions.
- Faster way of communication between the buyer and the supplier.
- By replacing manual systems with automation, better information exactness can be gained.
- Leaves more time to concentrate on the main suppliers and main purchases.
- Integration of systems with other departments helps with decisions making by compiling more accurate data. (Leenders et al. 2006, 94.)

There are many information technology based systems to choose from. Nowadays there are companies with the main business area of information technology based solutions. These companies produce IT systems developed for the purchasing processes. Some examples of information technology based solutions that can be implemented in purchasing are introduced below. IT based purchasing systems can be used in almost every step of the purchasing process beginning from placement of the order to receiving the goods. (Baily et al. 1994, 273.)

Electronic data interchange (EDI) means the electronic information flow between organizations or the information flow between departments within an organization. EDI enables for example the following information to flow between organizations:

- Trade data includes documents such as purchase order, delivery instructions and invoices.
- Technical data includes for example product specifications.

- Query-response can mean for example to follow the progress of an order.
- Monetary data includes the handling of money, for example the payment via internet.

One of the things to remember when using EDI, is that the information used in EDI needs to be unified in a way that the information technology at the both ends understands the information similarly. (Baily et al. 1994, 272.) Electronic data interchange (EDI) involves the direct, computer-to-computer transmission of inter-company transactions, which means the interaction between companies. EDI is providing companies management new possibilities in controlling delivery performance. Although the technology and standards that EDI can provide have been available to most companies for some time, the implementation of EDI has been slow. Although many people still consider EDI to be involved only with order transactions, the documents that are electronically exchanged often include invoices, shipping advisories, debit or credit memos, and shipping papers. The advantages of EDI of course are greater with a large number of transactions that need to be delivered quickly. (Copacino 1997, 127.)

The lack of an efficient information system can sometimes be the factor that makes it more difficult for a company to develop its operations. The implementation of information systems can be time-consuming and complicated. On the other hand, these information systems include very versatile information, while companies do not even know how to utilize that source of information. A company's internal communication can work reasonably well through these information systems, but they usually lack the qualities needed to work between two companies. The information systems have been developed in such way that they are able to operate as a communication tool between companies. The problem of two persons communicating is that it rarely is recorded in any way for later use, so the information can change during time. It is also very time-consuming. This way the efficiency and reliability of EDI can be seen as an advantage worth considering. (Sakki 1999, 200).

Edifact electronic data interchange for administration, commerce and transport, and enables the efficient exchange of information between companies. It is a versatile system that can be used in several industries. Intranet can be considered an electronic bulletin board for a company's internal use. Intranet may include different publications and it enables easy-access to information. Extranet consists of the intranets of several companies. This allows the companies to use general information. (Sakki 1999, 202-206.)

4 VENDOR RATING

Vendor rating is a system used by companies that are buying services or products of a vendor. The system is used to record, analyse, rank and report the performance of a vendor in terms of a range of predefined criteria, which may include such things as quality of the product or service, delivery performance and financial status of the firm. Vendor ratings can be quite informal, or they can be information technology-based structured programmes with multiple criteria and

pre-set weightings utilizing information technology enabling direct reporting. The theories are utilized in chapter 5.4. transportation companies rating. (12 Manage 2008.)

Vendor ratings usually represent an overall view of a vendor. The purpose is to rate the vendor's strengths and weaknesses, thereby giving a clearer sense of a vendor's overall situation or giving guidelines to either continue or discontinue the co-operation with this particular vendor.

Customer satisfaction is one of the reasons to do vendor rating, especially when the customers have not been satisfied. Then companies need to take a better look at the actions that their vendors do. Especially in the case of delayed deliveries when transportation companies act as vendors. Also the increasing costs and volumes of deliveries in modern international companies create a need to control the service providers.

4.1 Ways to do Vendor Rating

There are several ways to do vendor rating and there is no one right kind of way of doing it. The criteria chosen in the ratings vary depending on the qualities of the vendor in question. Vendors can be evaluated, ranked, analyzed and reports can be made based on these.

Evaluating

Evaluating already existing vendors is usually easier than evaluating new potential vendors. There is also a tendency to compare new potential vendors to the existing ones. Evaluating new potential vendors is very time consuming and therefore also expensive. There are three ways to evaluate vendors and choosing the best method can be tricky. The criteria should be thought through. The criteria can be for

example, technical and engineering capacity, or quality. Of course several criteria can be chosen. The evaluation of management and finance is very important, because the finance situation of the vendor affects the vendor's performance. (Leenders et al. 2006, 263-264.)

There are three basic evaluation types: informal, semiformal, and formal evaluation. Informal evaluation is assessment of the vendor by users. How the user has experienced working with the vendor? This evaluation type is based largely on personal impressions and is often used in smaller organizations. (Leenders et al. 2006, 266.)

Semiformal evaluation is used in larger organizations, because in those different departments can be in different locations, which can make the conversation between internal users a bit more difficult than in smaller organizations. Due to the fact that the departments can be in different locations, a more formal system of evaluation is needed. Annual discussions between the top management in the purchasing organization and the vendors' organization could be organized. In these annual meetings the topics can be for example, past performance and future expectations. (Leenders et al. 2006, 266.)

The formal evaluation usually tries to track down actual performance over time. The actual performance over time means that quantity, price, quality and delivery are examined. By this the performance of the vendor can be rated. One example could be the evaluation of delivery performance. Table 1 gives a good example of delivery evaluation. (Leenders et al. 2006, 267.)

TABLE 1. Formal vendor delivery rating. (Leenders et al.2006, 267).

Excellent	<p>a. Meets delivery dates without expediting.</p> <p>b. Requested delivery dates are usually accepted.</p>
Good	<p>c. Usually meets shipping dates without substantial follow-up.</p> <p>d. Often is able to accept requested delivery dates.</p>
Fair	<p>e. Shipments sometimes late; substantial amount of follow-up required.</p>
Poor	<p>f. Shipments usually late; delivery promises seldom met; constant expediting required.</p>

Quantification of delivery as a performance area can be quite easily done.

Quantification means removing all subjectivity out of the evaluation process. A rating system, which is based on giving points, is a good way of evaluating delivery performance. Table 2 gives an example of rating system based on points. (Leenders et al. 2006, 267-268.)

TABLE 2. Rating system based on points. (Leenders et al. 2006, 268).

15 points	> 98% on-time
10 points	95-97.9% on-time
5 points	90-94.9% on-time
0 points	< 90% on-time

Analytical Hierarchy Process

One of the ways to do vendor rating can be by Analytical Hierarchy Process (AHP). AHP is an approach to decision making that involves structuring multiple choice criteria into a hierarchy, assessing the relative importance of these criteria, comparing alternatives for each criterion, and determining an overall ranking of the alternatives, as defined by DSS Resources. Organizing and assessing alternatives against a hierarchy of objectives gives means to deal with complex decision making and a more efficient identification of selection criteria and the weighting and analysis of the criteria. The benefit of the analytical hierarchy process is the fact that it captures both subjective and objective evaluation measures. By increasing the number of criteria, the importance of each criterion is thus diminished, which is then compensated by giving a certain weight to each criterion. (Analytical Hierarchy Process 2008.)

Weighing is done by giving a relative weight to each criterion, based on its importance within the hierarchy. The sum of all the criteria must equal 100 percent. Evaluating is done by scoring alternatives and comparing each one to others. The alternatives are compared and the one that best fits the requirements in the ranked as number one. (Analytical Hierarchy Process 2008.)

Vendor rating by Gartner

Usually vendor ratings are used to rate vendors as entities; however, they are also used to rate different aspects of a vendor, such as its strategy, organization, products, technology, marketing, financials or support. The following example tells about the method a company called Gartner uses. Gartner Research is a company living out of vendor rating; its main business area is rating companies. Gartner's perception of a company is very highly valued and appreciated. This way vendor rating can work as a competitive tool as well. (Gartner 2008.)

TABLE 3. Vendor rating by Gartner (Gartner 2008.)

Strong Positive	Solid provider of services and solutions
Positive	Has strengths, but is also opportunistic
Promising	Shows potential, but is not fully evolved
Caution	Faces challenges
Strong negative	Difficulties in multiple areas

As is seen in Table 3 the vendors with a clear focus, solid products and an advantageous market position may be rated "positive" or "strong positive." Vendors that lack these qualities may be rated "caution" or "strong negative." Vendors that have potential, but which are to be very carefully evaluated, are rated "promising." Additionally, vendors that are rated a "strong negative" are put on a vendor alert list, while vendors that are rated a "strong positive" are put on a vendor opportunity list. These vendors, in particular, will be closely monitored." (Gartner 2008.)

Gartner takes vendor ratings quite seriously. Many vendors that were not rated high in the past subsequently corrected their problems and their status was then updated. A vendor's ratings are periodically revised to reflect the change in judgment when a significant internal or external event directly affects the vendor. Gartner continuously tracks markets and technological and organizational changes that may have an impact on a vendor, therefore they recommend companies to pay attention. (Gartner 2008.)

Example of a vendor rating tool

Another example of vendor rating is a ready made vendor rating tool, for example a tool made to the purposes of an Electronic Health Record System. The vendor rating tool used in that case can be seen as appendix 4. It also has weighted criteria and different qualities that are measured.

4.2 The benefits of vendor rating

Vendor rating helps minimize subjectivity in judgement, which means that for example personal impressions are not affecting the rating too much, rating is based on facts. Vendor rating makes it possible to consider all relevant criteria in assessing suppliers. Vendor rating also provides feedback from all areas. Vendor rating facilitates better communication with vendors and this makes it easier to give feedback and ensures that actions can be made based on the feedback. A company can use vendor rating as a tool to require specific action to correct identified performance weaknesses.

Vendor rating can provide overall control of the vendor base. Vendor rating can be used as a regular review, and by setting standards the changes in the vendors' performance can be noticed. By comparing the past performance to the current, a company can forecast the future behaviour of the vendor. This kind of control can help ensuring continuous improvement of the vendor performance. The vendor rating helps building vendor partnerships, because vendor rating increases

interaction between the companies and feedback is given regularly. Obviously vendor rating can only be done once, but it is more effective when vendor rating is done regularly – once a month or once a year, for example. Vendor rating can create a performance-based culture, where the vendor willingly wants to do its best and not just do as their told.

Vendor performance is usually evaluated in the areas of pricing, quality, delivery, and service. Some of the different qualities are gone through in the following chapters. (Inman. 2006)

4.3 The most common qualities in vendor rating

Reliability of delivery refers to the difference between the promised and actual delivery time. The amount of actual delivery times is divided with the number of promised delivery time to get a percentage of the deliveries that were delivered when promised. Also the accuracy of delivery is a part of a reliable delivery. It can be calculated by dividing the amount of faulty deliveries by the total amount of deliveries. (Sakki 1999, 170.)

The average lateness of a delivery could be examined as well. Sometimes the extent of the delay of the delivery can be the most crucial factor in the eyes of the customer. Depending on the case, sometimes the delivery could not even be accepted, if it is delivered late. For example, in the case of delivering perishable goods, the whole delivery could be crucially damaged. (Slack, Chambers, Harland, Harrison & Johnston 1995, 731.)

Quality of service includes quite many separate qualities, such as the commitment and motivation of the personnel, level of customer service and delivery performance. Some qualities are the density of the delivery, flexibility, easiness and simplicity, communications and support. The density of delivery means the frequency of deliveries, meaning how often the deliveries take place. (Sakki 1999, 187.) Delivery can be the most evaluated quality in vendor rating. The accuracy,

duration, lead time and documentation of the delivery can be evaluated. The average time for delivery can be compared to that of other vendors for similar services? The extra effort that a vendor is willing to do in order to meet requirements when an emergency delivery is requested can be highly valued. (12 Manage 2008.)

Commitment can be seen as a part of the quality of service. The commitment to perform well can be seen in the positive level of customer service. Quality of service can be measured by the level of customer satisfaction (Sakki 1999, 187.). All employees must be educated in customer service and they should have a high degree of participation. The quality of service is affected by the motivated and committed employees. (Soin 1999, 9-11.)

According to Sussman, quality of service consists of the price, travel time, service reliability, availability of specialized equipment and probability of loss and damage. (Sussman 2000, 89.)

Complaints should be handled efficiently. The vendor should also provide up-to-date catalogues, price information, and technical information. The vendor should be able to act as a representative of the company buying its services by taking care of customer service. It is very helpful with customer inquiries involving orders, shipping schedules, shipping discrepancies, and invoice errors. The vendor should respond quickly to resolve problems. An excellent vendor provides follow-up on status of problem correction. (12 Manage 2008; Sartjärvi 1992, 50.)

Invoicing. The list or contract prices should not be different on invoices received. The vendor should comply with terms and conditions as stated in the list or contract prices. The invoices should be based on the invoicing principles. Are the vendor invoices accurate? Estimates should not vary significantly from the final invoice. Good vendor invoices are sent on time and easy to read and understand. (12 Manage 2008) Prices should stay reasonably stable over time. The vendor should provide adequate advance notice of price changes. The vendor should also

be aware of the market situations. Possible cost savings are always welcome and the vendors could suggest them.

5 CASE: UPONOR FINLAND OY

The case study is introduced in this part of the thesis. The company presentation is followed by the introduction of the case study by going through the phases of the study. The transportation companies chosen for this study are then introduced. The rating of the transportation companies is followed after the introduction of the case. The final part consists of the recommendations that are based on the results of the case study.

5.1 Company presentation

Uponor Finland Oy is one of the leading international suppliers of plumbing and heating systems for residential and commercial building markets. In this case the name of the company is abbreviated to Uponor. Uponor has subsidiaries in 22 countries, with 17 factories in 9 countries. Uponor Finland Oy employs approximately 4,700 people. The company is listed on the OMX Nordic Exchanges in Helsinki. In 2007, the net sales of Uponor Finland Oy totalled about 1,2 billion euros.

Uponor's business operation can be divided into three parts: heating and cooling, plumbing, and infrastructure. Uponor Nordic manages Uponor infrastructure and housing solutions businesses in Finland, Sweden, Norway and Denmark. In 2006 its net sales totalled 378 million euros. Uponor has seven production units and employs 1,300 people in the Nordic countries. The organizational structure of Uponor is shown in the Figure 7. Uponor's business area has been divided into four regions: Uponor Central Europe, Uponor Nordic, Uponor Europe - West, East, South, and Uponor North America. Uponor Nordic has been divided into four parts: Sweden, Finland, Danmark and Norway.

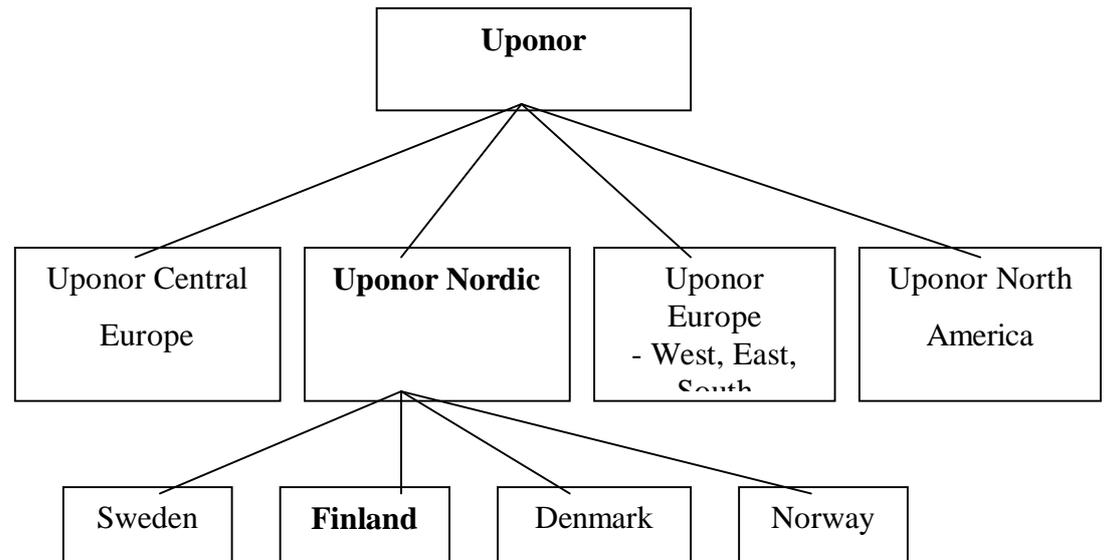


FIGURE 7. Organizational chart of Uponor Finland Oy.

This study is concentrating on the Uponor Finland Oy, which operates under the title of Uponor Nordic. The purchasing, which in this case means buying services of transportation companies is centralised within the Uponor organization.

Centralization means that one person or department is authorized to place orders and in this case there are a few transportation planners within Uponor Finland, with only a few always within a production plant.

The history of Uponor dates back to 1918, when a carpentry workshop was founded in Lahti by Aukusti Asko-Avonius. The affiliated company, Upo Oy, was established in 1938 and furniture production was expanded to include household appliances during the following years. In 1965 the Group opened a plant in Nastola and entered the plastic pipe industry. The internationalisation of the Group's operations began in 1982, when a new subsidiary, Oy Uponor Ab, was established. Through acquisitions, Oy Uponor Ab expanded fast into the Nordic countries. As a result of several acquisitions, Uponor extended its operations throughout Western Europe. (Uponor 2005).

Uponor entered a new field of industry, hot water pipe systems, by purchasing two of the largest companies in the field, Wirsbo of Sweden and Hewing of Germany, and with these acquisitions Uponor's business operations spread into North America. After the acquisition of Aldyl gas pipe operations in the early 1990s, Uponor's business activities had reached South America. In the 1990s, the Uponor plastic pipe operations became the core area of the Group's business operations. By the early 2000s, all the non-core divisions were divested, and operations focused on the core plastic pipe business. The parent company's name was changed to Uponor Corporation in a year 2000. (Uponor 2005.)

One of the Uponor's business operations is heating and cooling. Uponor's underfloor heating has established a strong position globally in all kinds of premises, from single-family houses to multi-storey commercial buildings. Uponor's underfloor heating system is a market leader in several European countries, like Germany, Switzerland and the Nordic countries. The underfloor heating system can be installed either under the floor or in the walls and roof. Uponor's cooling solutions can be used in homes and in commercial premises and offers an alternative to indoor climate control. The cooling system is based on the water circulating on the pipe system. (Uponor 2007.)

Plumbing is one of the Uponor's business operations. Basically Uponor offers thorough range of plumbing systems for all kinds of buildings. The systems come with pipes, fittings, components and tools for installation. The plastic materials used in the products can be recycled after use. (Uponor 2007.)

Infrastructure is also one of the Uponor's business operations. Uponor is a supplier of infrastructure solutions for water, gas and sewer pipe systems. Uponor's pipe systems, chambers and tanks are used to build and maintain public or private water and waste-water infrastructures. Uponor also offers solutions for ventilation, non-urban wastewater treatment, and renovation. (Uponor 2007.)

5.2 Case introduction

This part of the study is based on the needs of Uponor Finland Oy. Uponor is a customer to these transportation companies, because these companies provide their services to Uponor. The process of buying transportation services it is a bit simpler than the purchasing process, because there are not as many steps. No tenders or quotations are needed when dealing with the existing vendors. In this case the process is different due to the fact that purchasing department does not buy the services. Logistics department buys the transportation services from the vendors. The logistics manager of Uponor makes the decisions concerning the transportation companies that are used and makes the contracts. It is the transportation planner's responsibility to make the daily decisions on which transportation companies to use and to which purposes.

The first objective is to find out what kind of information the transportation companies are able to provide on a monthly basis. This includes the transportation companies' willingness to provide the information and their ability to provide information on a monthly basis. Uponor is interested in getting more overall information about the transportation companies that they are using. It is essential to find out what kind of information the transportation companies are able to give on a monthly base.

The second objective is to find out ways to improve and develop co-operation between the transportation companies and Uponor. This includes improvement of information flow, maintenance of personal contacts and easy access to information.

Third objective is to perform a transportation companies rating. This includes the transportation companies effect on Uponor, the qualities Uponor is looking for in a transportation company and how the performance of transportation companies be measured.

Uponor would like to receive information for example about the volumes delivered, the cost of deliveries and the amount of claims. Uponor would also like to know about the invoicing and reporting systems, and the invoicing principles that the vendors are using. Invoicing principles refers to the grounds of billing the customer; this can be for example hours spent or kilometres driven. The reason why Uponor wants to receive information, for example cubic metres delivered and the cost of delivery is to make comparisons on the transportation companies.

The research methods used in this part are qualitative, in this case meaning interviews in different forms, and quantitative, in this case meaning the numerical data. (Uusitalo 1999, 81.) The interviews were conducted on the phone, by email or by personal meetings. These interviews were used to gather information about the availability and quality of information. The numerical data was received from the representatives of the transportation companies and included information, such as cubic metres and euros. The names of the vendor representatives interviewed are not mentioned in this study, but are referred as vendor 1, vendor 2 and so on.

This empirical part of the study can be divided into three main parts. The first part of this case study includes the process of selecting the transportation companies that will be examined. The drafting of the base for the interviews is done at this point. The second part of the case study consists of gathering the information needed by interviews with the vendors. The third part consists of processing the information that is gathered. The timetable of this part of the study is given in table 4 below. To get a better understanding, these three parts are explained in a little more detail in this chapter.

TABLE 4. Timetable of the case study.

Part 1	30 th November 2007 – 31 st January 2008	- Choosing the transportation companies for the interviews together with Uponor - Drafting the base for the interviews
Part 2	1 st February 2008 – 29 th February 2008	- Conducting the interviews with the ten transportation companies
Part 3	1 st March 2008 – 31 st March 2008	- Processing the information

During November 2007 and January 2008 quite a few meetings with Uponors' representatives were held. These meetings were to determine the number of transportation companies. Ten transportation companies were selected from 45. The chosen companies are the most often used companies and the ones that Uponor pays the most. When the transportation companies were determined, the next step was taken. The next step was drafting the base for the interviews. In order to draft the base for interviews Uponors' representatives stated what they are interested in getting from these interviews. A questionnaire was made to use as a basis for the interviews. See appendix 1 for the questionnaire.

During February 2008 the interviews were conducted. The main two ways of doing the interviews were either as a phone interview or by sending the questionnaire by email to the representatives of the chosen transportation companies. The phone interviews were mainly conducted on two separate steps. First step included the first call to the representative. During this first call the representatives were

informed of the matter and what kind of information was needed. The second step included a second call to the representatives. During the second call the actual information needed was gathered. Using this two step system, the representatives had enough time to prepare the information needed.

During March 2008 the information gathered in part two was processed. At first all the information received in the interviews conducted on the phone were written down. Then all the information was unified to enable comparisons.

5.3 Transportation companies introduction

The following chapter introduces the transportation companies. The overall information about the companies is given. The companies' ability to provide information to Uponor is shown.

Vendor 1 is an international transportation company operating in over 200 countries and employs over 280 000 persons. They have over 1,5 billion consignments in a year. They have about 76 000 vehicles in use. According to Vendor 1's representative they are able to give regular information through their reporting system. They have a comprehensive variety of information about volumes and invoices. They have an easy-access to the information needed. Finland has been divided into 12 different regions and they charge different rates to every region. Their invoicing unit is mainly cubic metre. Representative of Vendor 1 is already sending monthly reports to the logistics manager of Uponor. (Interviewee A 2008.)

Vendor 2 is a private transportation company and employs only a few persons. Uponor is their main customer. Due to the fact that Vendor 2 is a smaller company it is more difficult for them to maintain the information about deliveries. The lack of resources may be the reason why Vendor 2 is having difficulties to produce reports. They charge based on kilometres driven and hours used in the delivery.

Vendor 2 is able to give the volumes of a day in question, but not the volumes of the day before or the day after. (Interviewee B 2008.)

Vendor 3 is a private transportation company, which has a long history of co-operation with Uponor. Because Vendor 3 has a long history of operating within transportation, they have experienced personnel and efficient planning. Their equipment is up-to-date and they are well aware of the deliveries at hand. They mainly charge according to cubic metres and distance in kilometres. Vendor 3 can report on invoicing information, but they do not keep records on other information. (Interviewee C 2008.)

Vendor 4 is a small private family-owned transportation company. Uponor is their main customer with a long history of co-operation. There is only one truck and one driver. The competitive advantage of this company is the fact that they have a HIAB and they are very committed to Uponor. They charge according to cubic metres and the 12 different regions in Finland. They are very well aware of the deliveries. Vendor 4 would like to attach the monthly report to the invoice. (Interviewee D 2008.)

Vendor 5 is a private transportation company and employs only a few people. Uponor is their main customer. They charge according to kilometres driven and hours spent on the delivery. They are able to give information about the cubic metres delivered and kilometres driven. Vendor 5 suggested that the trucks should be fully loaded, which would be more cost efficient for Uponor. (Interviewee E 2008.)

Vendor 6 is a big domestic transportation company that has a very good logistics chains. They employ about 2000 persons and have 29 terminals nationwide. They can deliver very large quantities due to the fact that they are a very large company. They have very specific information about deliveries and records of state of the delivery. They are currently planning to get an ERP. ERP (enterprise resource planning) is an information system that integrates company's information into one database. It is quite easy to use as a tool to get statistics. They charge according to

weight of the delivery in kilograms and the distance in kilometres. They convert cubic metres to kilograms using the formula of 1m³ equals 333kg. Vendor 6 suggested developing an EDI system that could work as a communication tool between Uponor and them. (Interviewee F 2008.)

Vendor 7 is a nationwide logistics company and has about 1000 small forwarding units. Uponor uses the services of this particular company to ship single parcels and urgent deliveries. They operate in 8 countries and employs about 4 400 persons in the logistics field. They have a very comprehensive reporting system that provides information about the amounts, weights and costs of deliveries. They charge according to units sent and the weight. In parcel deliveries the weight is calculated either using the actual weight or the weight volume. That means that if the actual size of the delivery is substantially larger than the weight implies.

Vendor 8 is a transportation company, which operates internationally in over 200 countries. In Finland it employs about 450 persons. Overall it employs about 74 000 persons and has about 26 700 vehicles in use. They use weight as invoicing principle. Vendor 8 calculates the weight the following formula: in ordinary deliveries 1 cubic metre equals 200 kilograms and in express deliveries 1 cubic metre equals 250 kilograms. This means that if the express delivery is less than a cubic metre the calculate weight is less that 250 kilograms if it does not weight more than that amount. Commonly used invoicing principles are explained in chapter 3.4.

Vendor 9 is an international joint venture transportation company, which operates in nearby European countries. It employs 15 persons in Finland.

Vendor 10 is a Swedish transportation company, which operates internationally. Mainly operates between Sweden and Finland. They are in contact with Uponor on a daily basis and appreciate co-operation. They use loading metres as an invoicing principle. They have a reporting system that can provide various reports.

TABLE 5. Vendors ability to give information.

Company	Able to report on a monthly basis	Information on
Vendor 1	x	volumes, claims, invoicing exports and imports,
Vendor 2	-	-
Vendor 3	x	volumes, claims and invoicing
Vendor 4	x	volumes, claims and invoicing
Vendor 5	x	volumes, claims and invoicing
Vendor 6	x	volumes, claims and invoicing
Vendor 7	x	volumes, claims and invoicing
Vendor 8	x	volumes, claims and invoicing
Vendor 9	x	volumes, claims, invoicing, exports and imports
Vendor 10	x	volumes, claims, invoicing, exports and imports

Table 5 shows each vendor's ability to provide information on a monthly basis to Uponor. As seen from the table the majority of the transportation companies are able to provide the information needed.

5.4 Transportation companies rating

In chapter 4 the concept of vendor rating is introduced. Vendors can be rated in many different ways, because all companies have different priorities. Some companies could for example emphasize speed of delivery when others consider the cost. The weighted criteria given by Uponor were used on the rating of the

transportation companies. These criteria are divided into three groups according to the priority. The most important qualities belong to group A, the rest in groups B and C. All of these qualities are very important, but some of them are more emphasized from the point of view of Uponsor.

TABLE 6. Weighted qualities.

Group	The % of total weight value	Number of qualities	Weight per quality (total value/the number of qualities)
A	45	3	15
B	35	5	7
C	20	5	4

As shown in Table 6, the following qualities belong to group A: capacity, the amount of late deliveries and the amount of claims. These qualities have the weight value of 45 percent of the total. Each quality equals one third of the 45 percent.

The following qualities belong to group B: quality of service, flexibility, co-operation, speed and versatility. These qualities have the total weight value of 35 percent, which means that each one of the qualities have the weight value of 7 percent.

The following qualities belong to group C: invoicing, contacts, development, financial stability and ability to report. These qualities have the total weight value of 20 percent. Each quality equals 4 percent.

The qualities used particularly in this case study, differ from the ones usually used. These qualities have been selected and weighted in co-operation with Uponor. These qualities are the ones considered important to Uponor and are more or less opinion-based, but similar to the definitions based on theory, and they are explained as follows.

Capacity can be calculated in many different ways. Uponor is interested in comparing the ratio between delivered cubic metres and the total costs. This means that the volumes delivered are divided by the costs. The capacity can be a competitive advantage.

Late deliveries refer in this case to delays caused by the transportation company and not to delays caused by productional reasons. Also in this case the rating has been done according to severeness of the delay. This means that not only the amount of delayed deliveries is concerned, but also the extent of the delivery – meaning how long the delay is.

Claims refers to misdelivered shipments when for example the goods get broken during the transport, get lost during the transportation, delivered to a wrong customer or delivered with insufficient documentation.

Quality of service is defined by the experience of personnel, the up-to-date information of the deliveries and standard of equipment of the vendors. The experienced personnel are committed to Uponor and are aware of the current situation of the deliveries. Also the ability to allocate equipment and personnel to Uponor's need is essential. This means that the vendor is willing to prioritise in favour of Uponor.

Flexibility is defined in this case on the rapid response to possible changes and urgent deliveries. Flexibility also means the vendor's ability to adjust to seasonal changes and market changes to meet the need of high peaks.

Speed refers to the duration of delivery. This means that the goods are delivered to the customer's premises as quick as possible. This can be taken for granted, but should be considered as an important factor. The goal is to deliver the goods straight to the customer, but sometimes it could take longer if the goods are taken through terminals.

Co-operation is defined through the interaction between the vendor and Uponsor. The purpose is to plan the future together to be able to perform better. Also the current situation should be discussed to know if the co-operation will be continued. It is important for Uponsor to know the possible problems the vendor might have in order to suggest solutions and meet half-way.

Versatility means that the vendor has suitable equipment to meet the delivery of different product types. This can be a competitive factor in two ways: some vendors can offer a large variety of vehicles with different usages. Some vendors might have invested in one kind of vehicle that is customized according to Uponsor's needs.

Development can be seen as the vendors' ability to invest in the future. This could be for example the vendor's prospective plan to invest in personnel and equipment allocated only to Uponsor.

Invoicing means the exactness of invoices and the principles of invoicing. This means that if the invoicing principles for example state that every kilometre driven costs 1 euro, then the invoicing should be in accordance with that.

The ability to report refers to the easiness and quickness of creating a report on a monthly basis. This report should include information such as cubic metres delivered, number of claims and the costs. Some vendors may have a reporting system, which makes it easier for them to deliver the report, where as some vendors might have to do it manually.

Contacts mean the geographical coverage of deliveries. Although it is states in chapter 2.1 that roads enable access to every place where there is a road, in real life this is not always the case. Some vendors prefer the routes that they are familiar with. It is up to their flexibility if they are willing to change the routes if needed.

Financial stability refers to the history and the development of the company. If for example the company has existed for a long time, but there has been no development in equipment or personnel, it can be assumed they are not likely to develop in the future either.

The results of the rating can be seen in the appendix 5: the performance percentage and rating. The table illustrates the actual performance of the vendors. Each quality mentioned above has been rated from 1 to 10 by vendor. This means each vendor has a different point from certain quality. From this table the overall comparisons can be made concerning all 10 vendors. In appendix 5, the ratings of all vendors can be seen in the same table. The table below shows the pointing system used in the appendix 5.

TABLE 7. Pointing system.

1-4 points	Satisfactory
5-8 points	Good
9-10 points	Excellent

This rating is based on the results from the interviews. The results were interpreted by the authors in order to rate the transportation companies. The qualities and weightings are set by Uponsor. The rating of the vendors is gone through one by one in the following part.

TABLE 8. Vendor 1's performance

Group	Quality	Weighting %	Vendor 1
A	Capacity	15	6
A	Late deliveries	15	3
A	Claims	15	2
B	Quality of service	7	7
B	Flexibility	7	7
B	Speed	7	4
B	Co-operation	7	8
B	Versatility	7	3
C	Development	4	4
C	Invoicing	4	9
C	Ability to report	4	9
C	Contacts	4	10
C	Financial stability	4	6
	TOTAL	100 %	52%

Vendor 1's performance can be seen in Table 8. Vendor 1 got 52 percent as a result of the performance rating, which means that the performance is on average level. Due to the fact that Vendor 1 is transporting internationally the cost is higher and the risks of delays and claims increases.

TABLE 9. Vendor 2's performance from 1 to 10.

Group	Quality	Weighting %	Vendor 2
A	Capacity	15	3
A	Late deliveries	15	8
A	Claims	15	8
B	Quality of service	7	5
B	Flexibility	7	1
B	Speed	7	5
B	Co-operation	7	5
B	Versatility	7	7
C	Development	4	9
C	Invoicing	4	1
C	Ability to report	4	1
C	Contacts	4	3
C	Financial stability	4	2
	TOTAL	100 %	51%

Vendor 2's performance can be seen in Table 9. This vendor also has the performance percentage of average level. Because Vendor 2 is a small company it is not able to produce reports so easily and therefore the overall knowledge is not so good.

TABLE 10. Vendor 3's performance from 1 to 10.

Group	Quality	Weighting %	Vendor 3
A	Capacity	15	4
A	Late deliveries	15	9
A	Claims	15	9
B	Quality of service	7	10
B	Flexibility	7	5
B	Speed	7	9
B	Co-operation	7	10
B	Versatility	7	8
C	Development	4	10
C	Invoicing	4	3
C	Ability to report	4	2
C	Contacts	4	6
C	Financial stability	4	8
	TOTAL	100 %	74%

Vendor 3's performance can be seen in Table 10. Vendor 3 has received 74 percent of the rating. This means that Vendor 3 is performing very well comparing to others. Although Vendor 3 employs only a few people, all the personnel are very well trained and experienced. Their equipment is also well maintained. Due to the fact that this is a relatively small company, it is more difficult for them to provide reports. Reporting is not impossible for them but requires a lot of manual work.

TABLE 11. Vendor 4's performance from 1 to 10.

Group	Quality	Weighting %	Vendor 4
A	Capacity	15	9
A	Late deliveries	15	10
A	Claims	15	10
B	Quality of service	7	8
B	Flexibility	7	2
B	Speed	7	10
B	Co-operation	7	9
B	Versatility	7	9
C	Development	4	8
C	Invoicing	4	5
C	Ability to report	4	3
C	Contacts	4	1
C	Financial stability	4	1
	TOTAL	100 %	77,3%

Vendor 4's performance can be seen in Table 11. Vendor 4 has received the best rating by 77,3 percent. Vendor 4 is strongly committed to Uponor, as can be seen from the results. Every delivery is very well taken care of. Price is one of the competitive advantages of this vendor.

TABLE 12. Vendor 5's performance from 1 to 10.

Group	Quality	Weighting %	Vendor 5
A	Capacity	15	10
A	Late deliveries	15	4
A	Claims	15	4
B	Quality of service	7	1
B	Flexibility	7	3
B	Speed	7	8
B	Co-operation	7	3
B	Versatility	7	6
C	Development	4	7
C	Invoicing	4	2
C	Ability to report	4	4
C	Contacts	4	2
C	Financial stability	4	3
	TOTAL	100 %	48,9%

Vendor 5's performance can be seen in Table 12. Vendor 5 is performing below the average level. The personnel is not as committed as Vendor 4's. Their pricing is very competitive because they are able to deliver large volumes with a small price. This is why they got a ten from the capacity.

TABLE 13. Vendor 6's performance from 1 to 10.

Group	Quality	Weighting %	Vendor 6
A	Capacity	15	8
A	Late deliveries	15	1
A	Claims	15	1
B	Quality of service	7	2
B	Flexibility	7	8
B	Speed	7	1
B	Co-operation	7	6
B	Versatility	7	10
C	Development	4	6
C	Invoicing	4	8
C	Ability to report	4	8
C	Contacts	4	5
C	Financial stability	4	5
	TOTAL	100 %	46,7%

Vendor 6's performance can be seen in Table 13. Vendor 6 has received 46,7 percent and is therefore performing below average. This might be because Vendor 6 is a large company and the personnel's turnover diminishes the commitment. Although the price level is not so poor, the actual pricing is much more competitive. This is because they provide groupage deliveries, which are priced per unit. Groupage deliveries mean a situation when a truck load of single deliveries are combined and shipped through terminals or distributed directly.

TABLE 14. Vendor 7's performance from 1 to 10.

Group	Quality	Weighting %	Vendor 7
A	Capacity	15	2
A	Late deliveries	15	7
A	Claims	15	7
B	Quality of service	7	9
B	Flexibility	7	9
B	Speed	7	7
B	Co-operation	7	1
B	Versatility	7	1
C	Development	4	1
C	Invoicing	4	10
C	Ability to report	4	7
C	Contacts	4	4
C	Financial stability	4	10
	TOTAL	100 %	55,7%

Vendor 7's performance can be seen in Table 14. Vendor 7 has received 55,7 percent from the rating. Vendor 7 is very accurate in invoicing and deliveries and is able to report. Because all the shipments are priced as single units the cost is very high.

TABLE 15. Vendor 8's performance from 1 to 10.

Group	Quality	Weighting %	Vendor 8
A	Capacity	15	1
A	Late deliveries	15	2
A	Claims	15	3
B	Quality of service	7	3
B	Flexibility	7	4
B	Speed	7	6
B	Co-operation	7	2
B	Versatility	7	2
C	Development	4	5
C	Invoicing	4	7
C	Ability to report	4	10
C	Contacts	4	7
C	Financial stability	4	4
	TOTAL	100 %	34,1%

Vendor 8's performance can be seen in Table 15. The vendor has received only 34,1 percent and is therefore well below average. This is due to the fact that Vendor 8 delivers internationally, which causes the high price because in the table 15 capacity means the ratio between the volumes sent and the costs of delivery, the higher price lowers the capacity. Also the risks of loss and delays increase due to long distances.

TABLE 16. Vendor 9's performance from 1 to 10.

Group	Quality	Weighting %	Vendor 9
A	Capacity	15	7
A	Late deliveries	15	5
A	Claims	15	5
B	Quality of service	7	6
B	Flexibility	7	6
B	Speed	7	3
B	Co-operation	7	4
B	Versatility	7	5
C	Development	4	2
C	Invoicing	4	6
C	Ability to report	4	6
C	Contacts	4	8
C	Financial stability	4	9
	TOTAL	100 %	54,7%

Vendor 9's performance can be seen in Table 16. Vendor 9 has received 54,7 percent from the rating. Vendor 9 is performing on the average level. Actually is performing quite well due to the fact that it is delivering internationally. The Vendor 9 has been able to conquer the main risks when delivering long distances and therefore can be considered a reliable vendor.

TABLE 17. Vendor 10's performance from 1 to 10.

Group	Quality	Weighting %	Vendor 10
A	Capacity	15	5
A	Late deliveries	15	6
A	Claims	15	6
B	Quality of service	7	4
B	Flexibility	7	10
B	Speed	7	2
B	Co-operation	7	7
B	Versatility	7	4
C	Development	4	3
C	Invoicing	4	4
C	Ability to report	4	5
C	Contacts	4	9
C	Financial stability	4	7
	TOTAL	100 %	55,1%

Vendor 10's performance can be seen in Table 17. Vendor 10 has received 55,1 percent from the rating. Vendor 10 has a reporting system that can provide the needed reports. They can provide a lot of vehicles during the peaks.

5.5 Recommendations

The following recommendations can be made based on the results of the case. One of the most important factors affecting the performance can be explained by the lack of information. The information flow should be improved. This concerns both external and internal information flow in both ends. External refers in this case to the information going outside or coming from outside a company. Internal refers in this case to information that is received within a company. The personnel in Uponor and in Vendors should be aware of the ever changing delivery situations. The information should flow fluently between Uponor and the vendors and the information should be easily accessible.

One of the problems seems to be the lack of unified information. This means that the information received from the vendors, for example the monthly reports, is not comparable. Each vendor uses different measurements, for example for volumes, which means that the information could be in cubic metres or loading metres. The divergent information needs then to be converted by personnel of Uponor. This causes excess work loads because the work has to be done manually. Uponor should invest more in developing a proper claims procedure system.

The areas of responsibilities should be defined more clearly in both ends. The problem with responsibilities is not always due to negligence, but because of the unawareness of the responsibility areas. Sometimes it is not so clear who has the authority to place orders or who gets to decide on transportation issues.

Vendors should be considered as an asset to Uponor and vice versa. The performance of vendors is always an entity, consisting of the above mentioned qualities. Usually when buying services the price is the main factor compared, but in the case transportation service providers the price can not be the definite factor. Good quality is costly, but in the case of transportation it is worth it.

If requirements are set on vendors, Uponor should also meet half way. This means giving time and support in order to enable the vendors to develop their

performance. The effort of vendors should be compensated, for example if the vendors are willing to concentrate more on serving Uponor. Enough time should be given to the vendors to develop their performance, if problems have occurred before decreasing the relations.

Although Uponor is demanding reports from the vendors, proper time should be used by Uponor to stay up-to-date with vendor's situation. This means that sitting down together and discussing the current situations - information given personally is more important than a piece of paper. Informal monthly meetings are good way to maintain relationships.

6 SUMMARY

The main purpose of this study was to answer to the question of how the co-operation between the transportation companies and Uponor can be improved. Also the question of what kind of information the transportation companies are able to give to Uponor on a monthly basis was answered. The main limitations in this study were the time, meaning December 2007 and January 2008, mode of transportation, which was road transportation. Ten transportation companies were chosen out of 45. The transportation companies were chosen on basis of the total expenditure. Finally the rating of the transportation companies was made.

The qualities chosen for the transportation companies rating were chosen and weighted by representatives of Uponor. The qualities were divided into three groups according to the priority. The most important qualities belong to group A, the rest in groups B and C. The qualities used in the case study, differ from the ones usually used. These qualities are the ones considered important to Uponor and are more or less opinion-based, but similar to the definitions based on theory. The actual rating of the transportation companies was performed by the authors.

Uponor is a customer to these transportation companies, because these companies provide their services to Uponor. The logistics department buys the transportation services. The logistics manager of Uponor makes the decisions concerning the transportation companies that are used and makes the contracts. It is the transportation planner's responsibility to make the daily decisions on which transportation companies to use and to which purposes.

The results of the transportation companies rating show that all ten transportation companies are performing relatively well. The performance percentage varied between 34.1% and 77,3%. This shows that although all the transportation companies succeeded quite well in this rating, some differences were found. The size of the company does not have real effect on the performance. Small companies can perform just as well as the large companies and sometimes even better. Smaller companies are more committed than larger companies, but larger companies can

offer more versatile equipment. This shows that the smaller companies perform better in different qualities than the larger companies.

One of the most important factors affecting the performance of the transportation companies can be explained by the lack of information. Therefore the overall information flow should be improved. This concerns both external and internal information flow in both ends. External refers in this case to the information going outside or coming from outside a company. Internal refers in this case to information that is received within a company. The information should flow fluently between Uponor and the vendors and the information should be easily accessible. The key word in this case is communication.

One of the problems seems to be the lack of unified information. This means that the information received from the vendors is not comparable. Each vendor has a slightly different type of measurement, which causes excess work loads because the work has to be done manually. Basically this means that the divergent information needs to be converted by the personnel of Uponor.

When the transportation companies were asked to report their claims from the time period of December 2007 and January 2008, it became evident that the transportation companies do not actually have that information. All transportation companies reported zero claims; therefore it is safe to say that the transportation companies do not have the information about the claims. Since the transportation companies do not have that information, should Uponor invest more in developing a proper claims procedure system?

Uponor should give the time and support to the vendors who are willing to develop their performance in order to improve the overall performance. This requires co-operation. The effort of vendors should be compensated. Although Uponor is demanding reports from the vendors, proper time should be used by Uponor to stay up-to-date with the vendor's situation. Informal monthly meetings are a good way to maintain relationships.

Based on the information gathered and processed in this study, it can be said that Uponor should concentrate on the five transportation companies performing the best. Uponor should also take into consideration the different factors affecting the performance. As said earlier, all the transportation companies are performing relatively well. All the transportation companies examined in this study have their strengths and weaknesses and it cannot be said if one or more relationships with the transportation companies should be terminated.

The overall road transportation situation has an impact on the transportation companies' ability to serve and is a threat to their future. This is because the volumes in road transportation are increasing, which increases the need for vehicles and drivers. The lack of experienced and motivated drivers is causing stress in the industry. Also the increase in the price of oil is causing an increase in the costs of road transportation. Climate change is also causing concern on the whole road transportation industry. Implementing environmentally-friendly solutions is radically increasing the costs in the future.

Uponor will continue to gather information from these transportation companies. The information will be gathered during a longer period of time compared to the time spent on this study. The information gathered in this study will act as a base for the project done by Uponor. Uponors reasons for doing this project are to improve the reliability of delivery, reducing the overall number of transportation companies used, focusing more on the most profitable transportation companies and creating a reporting system.

SOURCES

Baily, B., Farmer, D., Jessop, D. & Jones, D. 1994. Purchasing Principles and Management. 7th edition. Great Britain: Pitman Publishing.

Benson D., Bugg R., Whitehead G. 1994. Transport and Logistics: Elements of overseas trade. Great Britain: Woodhead-Faulkner Limited.

Charmaz, K. 2006. Constructing grounded theory: A practical guide through qualitative analysis. Great Britain: Sage Publications.

Copacino, W. 1997. Supply chain management – the basics and beyond. CRC Press LCC.

Erridge A. 1995. Managing Purchasing: Sourcing and Contracting. Great Britain: Butterworth-Heinemann Ltd.

Faulks, R. 1999. International Transport: An Introduction to Current Practices and Future Trends. Great Britain: Kogan Page Limited.

Gourdin, K. 2001. Global logistics management: a competitive advantage for the new millenium. Great Britain: Blackwell Publishers Ltd.

Hirsjärvi, S., Remes, P., Sajavaara, P. 2003. 9th edition. Tutki ja kirjoita. Helsinki: Kustannusosakeyhtiö Tammi.

Hörkkö, H., Koskinen, H., Mattson, M., Ollikainen, J., Reinikainen, A. & Werdermann, R. 2005. Finland: Suomen Spedservice Oy.

Johnson, J., Wood, D., Wardlow, D. & Murphy, P. 1999. Contemporary Logistics. 7th edition. United States of America: Prentice-Hall, Inc.

Lambert, D. & Stock, J. 1993. Strategic Logistics Management. 3rd edition. United States of America: Richard D. Irwin, Inc.

Lambert, D., Stock, J. & Ellram, L. 1998. Fundamentals of Logistics Management. United States of America: The McGraw-Hill Companies, Inc.

Leenders, M., Johnson, P., Flynn, A. & Fearon, H. 2006. Purchasing and Supply Management: With 50 Supply Chain Cases. 13th edition. United States of America: The McGraw-Hill Companies, Inc.

Lysons, K. 2000. Purchasing and Supply Chain Management. 5th edition. Great Britain: Pearson Education Limited.

Sakki, J. 1999. Logistinen prosessi: Tilaus- ja toimitusketjun hallinta. Espoo.

Sartjärvi, T. 1992 Logistiikka kilpailutekijänä – tavaroiden varastoinnista tilausohjautuvaan logistiikkaan. Keuruu: Otava OY

Slack, N., Chambers, S., Harland, C., Harrison, A. & Johnston, R. 1995. Operations Management. Great Britain: Pitman Publishing

Soin, S. 1992. Total quality control essentials: key elements, methodologies and managing for success. United States of America. McGraw-Hill.

Sussman, J. 2000 Introduction to transportation systems. Artech House.

Uusitalo, H.. 1999. Tiede, tutkimus ja tutkielma: Johdatus tutkielman maailmaan. Juva: WSOY.

Other sources:

12 Manage. 2008. Vendor Rating Description. Available at the www-address:<URL:http://www.12manage.com/description_vendor_rating.html (Read 25.3.2008).

Ajoneuvohallintakeskus. 2008. Driver's license classifications. Available at the www-address:<URL:http://www.ake.fi/AKE/Ajokortit_ja_tutkinnot/Ajokortit/Ajokorttiuokat.htm (Read 6.4.2008).

Analytical Hierarchy Process. 2008. Available at the www-address:<URL:[http://www.rfp-templates.com/Analytical-Hierarchy-Process-\(AHP\).html](http://www.rfp-templates.com/Analytical-Hierarchy-Process-(AHP).html) (Read 21.3.2008).

DHL. 2006. Freight instructions. Available at the www-address:<URL:http://www.dhl.fi/publish/etc/medialib/fi.Par.0124.File.tmp/rahditus_ohje.pdf (Read 4.4.2008).

DHL. 2006. Industry glossary. Available at the www-address:<URL:http://www.dhl.fi/publish/fi/fi/information/Common_Information.hi gh.html (Read 4.4.2008).

Gartner. 2008. Vendor Rating by Gartner. Available at the www-address:<URL:<http://www.gartner.com/pages/story.php.id.9328.s.8.jsp> (Read 23.2.2008).

Inman, R. 2006. Vendor Rating. Available at the www-address:<URL:<http://www.referenceforbusiness.com/management/Tr-Z/Vendor-Rating.html> (Read 5.3.2008).

Kauppi, J. 2004. Measures. Available at the www-address:<URL:<http://koti.mbnet.fi/loge/convert/mass.php> (Read 4.4.2008).

Kuljetus Kovalainen. 2007. Basis for freight charges. Available at the www-address:<URL:http://www.kuljetuskovalainen.com/media/tiedostot/rahdituspainop_erusteet.pdf (Read 27.3.2008).

Kuusisto, H. & Kukkonen, I. 2007. FIN-pallet. LOCUS. Available at the www-address:<URL:<http://www.glossary.fi/index.php?a=term&d=19&t=118> (Read 8.4.2008).

Larmix Oy. 2007. HIAB. Available at the www-address:<URL:www.larmix.com/index32.html (Read 20.3.2008).

Qc industries. 2008. Heavy duty conveyor. Available at the www-address:<URL:<http://www.qcindustries.com/conveyors/400-Series/heavy-duty-conveyor/> (read 20.3.2008).

Tilastokeskus. 2008. Truck traffic cost index 2008. Available at the www-address:<URL:http://www.stat.fi/til/kalki/2008/02/kalki_2008_02_2008-03-17_tie_001_fi.html (Read 3.4.2008).

Transpoint. 2008. Basis for freight charges. Available at the www-address:<URL:<http://www.transpoint.fi/hinnoittelu/netpoint-palvelumaksut> (Read 4.4.2008).

Uponor. 2005. Short introduction to Uponor's history. Available at the www-address:<URL: http://www.uponor.com/about/about_6.html (Read 21.2.2008).

Uponor. 2007. Businesses. Available at the www-address:<URL:<http://www.uponor.com/businesses> (Read 21.2.2008).

Wikipedia. 2008. Cubic metre. Available at the www-address:<URL:http://en.wikipedia.org/wiki/Cubic_metre (Read 4.4.2008).

Wikipedia. 2008. Containers. Available at the www-address:<URL:http://en.wikipedia.org/wiki/Intermodal_freight_transport (Read 6.4.2008).

Wikipedia. 2008. Forklift truck. Available at the www-address:<URL:http://en.wikipedia.org/wiki/Forklift_truck (Read 20.3.2008).

Wikipedia. 2008. Trailer. Available at the www-address:<URL:http://en.wikipedia.org/wiki/Trailer_%28vehicle%29 (Read 6.4.2008).

Wikipedia. 2008. Trucks. Available at the www-address:<URL:<http://en.wikipedia.org/wiki/Truck> (Read 6.4.2008).

Interviewee A, Vendor 1, Sales Manager, 8.2.2008.

Interviewee B, Vendor 2, Owner, 8.2.2008.

Interviewee C, Vendor 3, Owner, 8.2.2008.

Interviewee D, Vendor 4, 9.2.2008.

Interviewee E, Vendor 5, 10.2.2008

Interviewee F, Vendor 6, Marketing Manager, 12.2.2008

Laiho Antero, Transportation Planner. Uponor Finland Oy, 2.3.2008.

APPENDICES

1. Questionnaire
2. Vehicles and equipment
3. Driver's licence classifications
4. Vendor rating tool
5. Rating

APPENDIX 1

KYSELY
4.3.2008

Kuljetusliikkeiden ja Uponorin yhteistyö- ja
kehittämishanke

Vastatkaa ystävällisesti seuraaviin kohtiin:

1. Onko yrityksellänne raportointijärjestelmä? Jos, niin mikä? Millaisia raportteja pystyisitte Uponorille kuukausittain lähettämään? Jos teillä ei ole raportointijärjestelmää, tai ohjelmistoa, jonka kautta raportteja saisitte, onko teillä suunnitelmassa hankkia sellainen?
2. Käytössänne oleva laskutusyksikkö? (kappaleittain, kilot, kuutiot, lavametrit ym.)
3. Yrityksenne käyttämät laskutusperusteet? (kuutiot, lavametrit + kilometrit, rahti ym.)
4. Joulukuun sekä tammikuun lukemat Uponorin toimeksiannoista:

	JOULUKUU 2007	TAMMIKUU 2008
tilausmäärä /kpl		
toimitetut kuutiot/lavametrit		
laskutetut eurot		
reklamaatiot		

5. Voitte vielä vapaamuotoisesti kertoa ideoitanne siitä miten yhteistyötä Uponorin sekä yrityksenne välillä voisi kehittää. Onko mielessänne ideoita, miten Uponor voisi vaikuttaa tilausten toimitusten tehostamiseen, sekä tilausten toimitusvarmuuteen? Miten teidän yrityksenne voi tehostaa toimintoja Uponorin kanssa?

APPENDIX 2

Truck

A truck is a large vehicle used for transporting bulk goods, materials, or equipment. The word "truck" comes from the Greek "trochos", meaning "wheel." In North America, the big wheels of wagons were called trucks. When the gasoline-engine driven trucks came into fashion, these were called "motor trucks." Lorry is a term from the UK, but is only used for the medium and heavy types (see below), i.e. a van, a pickup or a Jeep would never be regarded as a "lorry." Other languages have loanwords based on these terms, such as the Malay language and the Spanish language in northern Mexico.

In Australia and New Zealand a small vehicle with an open back is called a ute (short for "utility vehicle") or a pick-up and the word "truck" is reserved for larger vehicles.

In most countries, a special driver's license is required to drive any type of truck greater than 4.5 tonnes (10,000 lb).

Truck



(Wikipedia 2008. Truck.)

Container

Containers, also known as intermodal containers or as ISO containers because the dimensions have been defined by the ISO, are the main type of equipment used in intermodal transport, particularly when one of the modes of transportation is by ship. Containers are eight feet (2438 mm) wide by eight feet (2438 mm) high. Since introduction, there have been moves to adopt other heights, such as eight feet six inches (2591 mm), nine feet six inches (2896 mm) and ten feet six inches (3200 mm). The most common lengths are 20 feet (6096 mm) nominal or 19 feet - 10½ in (6058 mm) actual, 40 feet (12192 mm), 48 feet (14630 mm) and 53 feet (16154 mm), although other lengths exist. They are made out of steel and can be stacked on top of each other (a popular term for a two-high stack is "double stack").

Container



(Wikipedia 2008. Container.)

Trailers

A semi-trailer is a trailer without a front axle. A large proportion of its weight is supported either by a road tractor or by a detachable front axle assembly known as a dolly or by the tail of another trailer. A semi-trailer is normally equipped with legs which can be lowered to support it when it is uncoupled.

A road tractor coupled to a semi-trailer is often called a semi-trailer truck or *semi*. Though most road trailers meet this definition, the term is most often applied to heavy trailers appropriate for use in such a rig.

In Australian English, the tractor unit is usually referred to as a *prime-mover* and the combination of a prime-mover and trailer is known as a *semi-trailer* or *semi*. Semi-trailers with two trailer units are *B-Doubles* or *Road Trains*. A B-double consists of a prime mover towing two semi-trailers where the first semi-trailer is connected to the prime mover by a fifth wheel coupling and the second semi-trailer is connected to the first semi-trailer by a fifth wheel coupling. A *Road Train* means a combination, other than a B-Double, consisting of a motor vehicle towing at least two trailers (counting as a single trailer a converter dolly supporting a semi-trailer).

Semi-trailer



(Wikipedia 2008. Trailer.)

Lift trucks

There are different types of lift trucks. Some lift trucks use forks to raise the load and some use platforms to raise the load. Lift trucks are most suited for lifting many small things that are unitised. The main types of lift trucks are:

1. Pallet trucks. These are trucks that roll under the pallet or spillage and raise it from the floor. These trucks are mostly manually operated.
2. Narrow-aisle trucks. These trucks are either reach trucks or turret trucks. Reach trucks can move the load forward to place in a shelf on either side of the aisle. Turret trucks travel through very narrow aisles over a guide-rail and it can turn the turret head to right and left to put the pallet on racking.
3. Counterbalanced trucks. These trucks can lift, raise and stack palletized loads. These trucks are weighed at the rear of the truck to prevent any forward tipping of the truck that could occur when lifting a load.

4. Heavy-duty side-loaders. As the name implies, these trucks are mostly used for lifting heavy containers. These trucks have forks on the side of the vehicle.
5. Rough-ground trucks. These trucks are mostly used on building sites.
6. Order-pickers. These trucks do not actually lift goods, but it lifts personnel to the level of the goods.
7. Cold-store trucks. These trucks are operated as the name implies on low temperatures.
8. Hazardous-area trucks. These trucks are enclosed to prevent any explosions due to overheating.
9. Heavy-duty lift trucks. These trucks are used for lifting heavy loads. (Benson et al. 1994, 238-241)



(Wikipedia. 2008. Forklift truck.)

HIAB



(Larmix Oy. 2007.)

Conveyor



(Qc industries. 2008.)

APPENDIX 3

Ajokorttiluokat

Muuta moottorikäyttöistä ajoneuvoa kuin pienitehoista mopoa tai kävellen ohjattavaksi tarkoitettua moottorikäyttöistä ajoneuvoa saa kuljettaa vain se, jolla on ajoneuvon luokkaa vastaava ajo-oikeus.

M-luokka:

mopot lukuunottamatta pienitehoisia mopoja sekä kevyet nelipyörät.

A-luokka:

moottoripyörät niihin kytkettyine hinattavine ajoneuvoineen.

A-LUOKAN AJO-OIKEUTTA KOSKEVAT ERITYISET RAJOITUKSET

·18-vuotiaana henkilö voi saada A-luokan ajokortin, joka oikeuttaa moottoripyörän kuljettamiseen, jonka teho on enintään 25 kW eikä moottoripyörän tehon suhde omamassaan ylitä 0.16 kW/kg. A-luokan ajokortin saaminen ei edellytä A1-luokan ajokortin haltijoilta uutta tutkintoa, mutta uusi ajokorttihakemus on jätettävä asuinpaikan poliisille.

·Yli 25 kW moottoripyörän kuljettaminen edellyttää A-luokan ajo-oikeutta vähintään kahden vuoden ajalta tai erikseen suoritettua ajo- ja käsittelykoetta vähintään 35 kW moottoripyörällä. Erillisen kokeen voi suorittaa 21-vuotiaana.

A1-luokka:

moottoripyörät, joiden sylinteritilavuus on enintään 125 cm³ ja teho enintään 11 kW, sekä invalidimoottoripyörät niihin kytkettyine hinattavine laitteineen.

B-luokka:

ne henkilöautot, pakettiautot ja muut ajoneuvot, joiden kokonaismassa on enintään 3500 kg ja joissa on kuljettajan lisäksi tilaa enintään kahdeksalle henkilölle, sekä ajoneuvoyhdistelmät, joiden vetoauto kuuluu tähän luokkaan ja joissa hinattavan ajoneuvon kokonaismassa on enintään 750 kg tai koko yhdistelmän kokonaismassa enintään 3500 kg eikä hinattavan ajoneuvon kokonaismassa ylitä vetoauton omamassaa.

ESIMERKKEJÄ B- JA BE-LUOKAN AJONEUVOYHDISTELMISTÄ

B-LUOKAN AJOKORTTI:

1. B-luokan ajoneuvoon voidaan kytkeä maksimissaan 750 kg painava perävaunu. Tällöin yhdistelmän kokonaismassa voi olla korkeintaan $3500 + 750 = 4250$ kg.

2. B-luokan ajoneuvoon voidaan kytkeä painavampikin perävaunu kuin 750 kg.

Tällöin on voimassa seuraavat rajoitukset:

- yhdistelmän kokonaismassa voi olla enintään 3500 kg
- perävaunun kokonaismassa ei saa ylittää vetoauton omamassaa.

BE-LUOKAN AJOKORTTI:

1. Kaikki ne tapaukset joissa perävaunun kokonaismassa ylittää vetoauton omamassan.
2. Kaikki ne tapaukset, joissa perävaunun kokonaismassa on yli 750 kg ja yhdistelmän kokonaismassa yli 3500 kg.

HUOM:

- B-luokan vetoauton kokonaismassa ei saa ylittää 3500 kg
- Hinattavan ajoneuvon kytkennästä annetut säännökset voivat rajoittaa sallittuja enimmäismassoja.
- Tarkemmat tiedot sallituista kytkentämassoista on yleensä merkitty ajoneuvon rekisteriotteeseen.

C-luokka:

kuorma-autot ja muut ajoneuvot, joiden kokonaismassa ylittää 3500 kg ja joissa on kuljettajan lisäksi tilaa enintään kahdeksalle henkilölle, ajoneuvoyhdistelmät, joiden vetoauto kuuluu tähän luokkaan ja joissa hinattavan ajoneuvon kokonaismassa on enintään 750 kg, sekä liikennetraktorit niihin kytkettyine hinattavine ajoneuvoineen.

Myös maatalouskäytössä olevien liikennetraktoriin kuljettamiseen vaaditaan C-luokan ajo-oikeus.

C1-luokka:

kuorma-autot ja muut ajoneuvot, joiden kokonaismassa on yli 3500 kg, mutta enintään 7500 kg ja joissa on kuljettajan lisäksi tilaa enintään kahdeksalle henkilölle, sekä ajoneuvoyhdistelmät, joiden vetoauto kuuluu tähän luokkaan ja joissa hinattavan ajoneuvon kokonaismassa on enintään 750 kg.

ESIMERKKEJÄ C1E-AJOKORTTILUOKASTA

C1E-LUOKAN AJOKORTTI:

C1E-luokan ajokortilla saa kuljettaa yhdistelmää jossa:

1. Vetoauton kokonaismassa on enintään 7500 kg
2. Yhdistelmän kokonaismassa enintään 12000 kg

Perävaunun kokonaismassa ei ylitä vetoauton omamassaa.

D-luokka:

muut kuin D1-luokan linja-autot ja muut ajoneuvot, joissa on kuljettajan lisäksi tilaa useammalle kuin kahdeksalle henkilölle, sekä ajoneuvoyhdistelmät, joiden vetoauto kuuluu tähän luokkaan ja joissa hinattavan ajoneuvon kokonaismassa on enintään 750 kg.

D1-luokka:

linja-autot ja muut ajoneuvot, joissa on kuljettajan lisäksi tilaa useammalle kuin kahdeksalle, kuitenkin enintään 16 henkilölle, ja ajoneuvoyhdistelmät, joiden vetoauto

kuuluu tähän luokkaan ja joissa hinattavan ajoneuvon kokonaismassa on enintään 750 kg.

E-luokka:

ajoneuvoyhdistelmät, jotka eivät kuulu edellä mainittuihin luokkiin.

T-luokka:

traktorit, liikennetraktoreita lukuun ottamatta, moottorityökoneet ja moottorikelkat niihin kytkettävine hinattavine ajoneuvoineen.

A-luokan ajoneuvon ajo-oikeuden haltija saa kuljettaa myös A1-luokan ajoneuvoja, A1-, A- tai B-luokan ajoneuvon ajo-oikeuden haltija saa kuljettaa myös M- ja T-luokan ajoneuvoa.

VENDOR RATING TOOL

For each EHR product you are considering, assign a ranking from 1 to 5 (with 5 being best) for each of the criteria listed in the functionality and vendor characteristics categories below. Total the rankings for each vendor to determine a combined score for each category, then assign an overall ranking. For the cost section, supply a dollar amount for each criteria listed and then rank each vendor based on your assessment of its total initial and total annual costs. Next, consider the relative importance of the three categories and assign a percentage to each (e.g., functionality = 40 percent, cost = 20 percent and vendor characteristics = 40 percent). Finally, use these percentages to calculate the weighted scores for each vendor.

FUNCTIONALITY	VENDOR 1	VENDOR 2	VENDOR 3	VENDOR 4	VENDOR 5
Quality/presence of features we prioritized (see demo rating summaries)					
Ease of use (e.g., minimizes typing, is intuitive, simple layout)					
Speed (network/hardware configuration, minimizes keystrokes)					
Individual user flexibility <ul style="list-style-type: none"> • Multiple note creation options (transcribe, voice, template) • Provider can modify/create own templates • Provider can create own macros 					
Preloaded templates and patient education					
Combined functionality score (total the rankings for each vendor)					
A Overall functionality ranking					

COST	VENDOR 1	VENDOR 2	VENDOR 3	VENDOR 4	VENDOR 5
Initial hardware and network upgrades					
Initial interfaces					
Initial software					
Total initial cost					
Annual software maintenance (includes upgrades and support)					
Annual interface upgrades					
Total annual cost (excludes initial costs)					
B Overall cost ranking					

VENDOR CHARACTERISTICS	VENDOR 1	VENDOR 2	VENDOR 3	VENDOR 4	VENDOR 5
Training					
Support					
Implementation					
Software upgrades					
Company stability					
Combined vendor characteristics score (total the rankings for each vendor)					
C Overall vendor characteristics ranking					

D Functionality	%
E Cost	%
F Vendor characteristics	%
	should total 100%

OVERALL RANKING	VENDOR 1	VENDOR 2	VENDOR 3	VENDOR 4	VENDOR 5
G Weighted functionality score $((A \times D) \div 100)$					
H Weighted cost score $((B \times E) \div 100)$					
I Weighted vendor characteristics score $((C \times F) \div 100)$					
Weighted overall score $(G + H + I)$					
Final Ranking					



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APPENDIX 5

Group	Quality	Weighting %	Vendor 1	Vendor 2	Vendor 3	Vendor 4	Vendor 5	Vendor 6	Vendor 7	Vendor 8	Vendor 9	Vendor 10
A	Capacity	15	6	3	4	9	10	8	2	1	7	5
A	Late deliveries	15	3	8	9	10	4	1	7	2	5	6
A	Claims	15	2	8	9	10	4	1	7	3	5	6
B	Quality of service	7	7	5	10	8	1	2	9	3	6	4
B	Flexibility	7	7	1	5	2	3	8	9	4	6	10
B	Speed	7	4	5	9	10	8	1	7	6	3	2
B	Co-operation	7	8	5	10	9	3	6	1	2	4	7
B	Versatility	7	3	7	8	9	6	10	1	2	5	4
C	Development	4	4	9	10	8	7	6	1	5	2	3
C	Invoicing	4	9	1	3	5	2	8	10	7	6	4
C	Ability to report	4	9	1	2	3	4	8	7	10	6	5
C	Contacts	4	10	3	6	1	2	5	4	7	8	9
C	Financial stability	4	6	2	8	1	3	5	10	4	9	7
	TOTAL	100 %	52%	51%	74%	77,3%	48,9%	46,7%	55,7%	34,1%	54,7%	55,1%