**Aalto University
School of Business**

Evaluating the Effects of Logistic Costs in Accounting to Improve Reliability and Efficiency - Case Stora Enso Logistics

Logistics

Master's thesis

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School of Business

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– Case Stora Enso Logistics

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Abstract

The importance of logistic both as competitive and profitability factor for companies has increased due to globalization and nowadays logistics plays a key role in today's business, especially in the field of industry and trade where big products and/or large volumes are handled. Logistics is also a remarkable expenditure for companies and it is one of the largest costs involved in international trade. Economic pressures, uncertainty and harsh competition have lead to the fact that the information about the costs has to be more and more accurate in order to be able to plan the future actions and at the same time avoid unexpected costs that usually are considerable. The nature of logistic costs creates problems in accounting and leads to inaccurate information. Hence, there is a need for accurate accounting for the logistic costs.

The literature part examines the areas of logistic in the forest industry and essential accounting standards interpreted when dealing with revenue and costs. The IAS regulations requires companies listed in EU to use international financial reporting standards (IFRS) and the standards instruct that accrual accounting is to be used as accounting method. Accrual accounting consists of two cornerstones: revenue recognition and matching principle.

The research was conducted as a quantitative study. Quantitative research is the most suitable method when questions related to quantities and percentages and relations between different research objects or changes in research matters are investigated. The empirical data was gathered from the ERP applications of the case company and it consisted of company reports. Additionally, selected written materials provided by case organization were used to provide background information. The empirical data was analyzed by using analytic induction.

The primary research question is: ´*What are the effects of the logistic costs in accounting?*´. Additionally, the paper explores the issues regarding logistic costs within the case company. The study aims to provide a view into the causes of fluctuation in logistic costs and the behaviour of logistic chains in accounting point of view.

As a result of the study the mills under investigation were grouped based on the logistic chain and the fluctuation their logistic costs induce in the accounting. From accounting perspective, suggestions for dealing with logistic costs in bookkeeping were provided.

Keywords logistic costs, accrual accounting, revenue recognition, matching principle, paper industry

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Tiivistelmä

Logistiikan merkitys yrityksille sekä kilpailukyky- että kannattavuustekijänä on lisääntynyt globalisaation myötä ja logistiikalla onkin keskeinen rooli nykypäivän liiketoiminnassa, etenkin sellaisilla teollisuuden aloilla, joilla käsitellään kookkaita ja/tai suuria määriä tuotteita. Logistiikka on myös mittava menoerä yrityksissä ja se onkin yksi suurimmista kustannustekijöistä kansainvälisessä kaupassa. Taloudelliset paineet, epävarmuus ja kova kilpailu ovat johtaneet siihen, että tiedot kustannuksista on oltava yhä tarkempia, jotta voidaan suunnitella tulevia toimia ja samalla välttää odottamattomat kustannukset, jotka yleensä ovat huomattavia. Logistiikan kustannusten luonne aiheuttaa ongelmia kirjanpidossa, mikä johtaa virheellisiin tietoihin. Näin ollen on tarvetta tarkempaan kirjanpitoon logistiikan kustannusten osalta.

Kirjallisuustutkimuksen avulla perehdytään paperiteollisuuden logistiikkaan ja keskeisiin laskentatoimen standardeihin, joita tulkitaan tulojen ja menojen kohdalla. IAS:n asetukset edlyttävät, että EU:ssa pörssilistatut yritykset noudattavat kansainvälisiä tilinpäätösstandardeja (IFRS) ja standardit ohjaavat käyttämään suoriteperusteisen kirjanpidon menetelmää. Suoriteperusteinen kirjanpito koostuu kahdesta kulmakivestä: tuloutuksesta ja kohdistamisesta.

Tutkimus toteutettiin kvantitatiivisena tutkimuksena. Kvantitatiivinen tutkimus on sopivin tapa, kun tutkimuskysymykset liittyvät lukumääriin ja prosenttiosuuksiin sekä tutkittaessa eri tutkimuskohteiden suhteita tai muutoksia. Empiirinen aineisto koostui kohdeyrityksen raporteista ja se kerättiin yrityksen käyttämistä toiminnanohjausjärjestelmistä. Lisäksi erilaiset kirjalliset materiaalit kohdeyritykseltä antoivat taustatietoa. Empiirinen aineisto analysoitiin käyttämällä analyyttistä induktiota.

Päätutkimuskysymys oli: "Mitkä ovat logistiikkakustannuksen vaikutukset kirjanpidossa?". Lisäksi tutkimuksessa tarkastellaan logistiikan kustannusten vaikutusta kohdeyrityksessä. Tutkimus pyrkii antamaan kuvan logistiikan kustannusten vaihteluiden syistä sekä logistiikkaketjujen käyttäytymisestä laskentatoimen näkökulmasta katsottuna.

Tutkimustulosten perusteella tutkimuksen kohteena olleet tehtaat voitiin ryhmitellä logistiikkaketjujen sekä logistiikkakustannusten kirjanpitoon aiheuttaman vaihtelun perusteella. Lisäksi annettiin ehdotuksia, kuinka logistiikkakustannuksia tulisi kirjanpidossa käsitellä.

Avainsanat logistiikan kustannukset, suoriteperusteinen kirjanpito, tulouttaminen, kohdentaminen, paperiteollisuus

Acknowledgements

Table of Contents

List of Abbreviations

CSCMP	Council of Supply Chain Management Professionals
ERP	Enterprise resource planning
EU	European Union
EUR	Euro
FASB	Financial Accounting Standards Board
FIFO	First In – First Out
FTL	Full Truck Load
GAAP	Generally Accepted Accounting Principles
HELCOM	Baltic Marine Environment Protection Commission - Helsinki Commission
IAS	International Accounting Standards
IASB	International Accounting Standards Board
IASC	International Accounting Standards Committee
IFRS	International Financial Reporting Standards
IMO	International Maritime Organization
IPS	Invoice Processing System
LNG	Liquefied Natural Gas
LTL	Less than Truck Load
SAP	Systeme, Anwendungen und Produkte in der Datenverarbeitung
SE	Stora Enso
TL	Truck Load
USA	United States of America

Pictures

Tables

1   INTRODUCTION

This thesis has been made on a request of Stora Enso in order to clarify their cost models concerning logistic costs and improve communications between different departments and to the mills. The focus of this study is on accrual based accounting, revenue recognition and matching principle, what are their effect on bookkeeping and how the figures can be interpreted.

1.1   Background

The Council of Supply Chain Management Professionals (CSCMP) (2010), one of the leading professional organizations of logistic personnel, defines logistics as:

> The process of planning, implementing, and controlling procedures for the efficient and effective transportation and storage of goods including services, and related information from the point of origin to the point of consumption for the purpose of conforming to customer requirements.

Logistics covers the steering and management of the material, knowledge and financial flows of a company. Sectors of logistics include i.a. procurement, warehousing, delivering, and transportation which is considered to be an integral element of logistics supply chain. Nowadays also so called green logistics, i.e. recycling of raw and other materials and taking into consideration the environmental performance, has become an important sector of logistics. (Grant, et al. 2006)

Logistics plays a key role in today's business, especially in the field of industry and trade where big products and/or large volumes are handled. Due to globalization logistics has increased its importance both as competitive and profitability factor for companies and their supply chains (Manuj et al., 2010). Logistics is also a remarkable expenditure for companies, for that reason it affects and is being affected by other economic activities (Grant, et al. 2006). Although the logistics costs in Europe decreased significantly during 1980s and 1990s due to supply chain and network restructuring and better planning, according to Grant et al. (2006), the trend has changed. Global networks, growing requirements for

quality and increased product complexity among others are reasons for increasing logistic costs, not to mention the rising prices of energy and fuel. (Grant, et al. 2006)

According to Bowersox et al. (2005), logistics is one of the largest costs involved in international trade. The global logistics industry is estimated to be approximately 5,4 trillion Euros annually, of which the share of Europe is around 1 trillion Euros (Bowersox, et al. 2005). The logistics costs of the total costs of the final product account for an average of 10 – 15 % (Commission of the European Communities, 2006). The costs depend on the field of a company, products, location and the scale of operations, but generally the costs seem to be high in logistic-intensive industries like food, metal, chemical and paper manufacturing (Memedovic et al., 2008; Farahani et al., 2009). Logistic costs have been identified by several studies as one of the key factors affecting competitiveness (Guasch & Kogan, 2006; Barbero, 2010; Guerrero et al., 2010).

As the expenditure of logistics increases, the need for accurate accounting for the costs becomes increasingly important. Economic pressures, uncertainty and harsh competition in today's markets have lead to the fact that the information about the costs has to be more and more accurate in order to be able to plan the future actions and at the same time avoid unexpected costs that usually are considerable. Grant, et al. (2006) state that the problem with logistical costs is that the freight bills are charged directly to an expense account as they are paid, regardless of when the associated orders are recognized as revenue. In such a case, it is hard to define logistics costs and to control them. This is the situation also in the case company and the reason why this study is conducted.

This issue is not only caused by regulations in accounting but also the different ERP systems that are used. Enterprise resource planning (ERP) systems has been created in order to help companies to run their business by providing information needed to manage daily execution and integrating different functions. As the interest for the supply chain perspective has increased over the recent years, writes Carlsson et al. (2006), information systems, such as ERP systems, have become crucial for the management of most companies by providing updated information about the various parts of the chain within a company. A company can have just

one ERP system covering all the functions of the company or it can choose the best-of-breed software to each or some of its functions. In the markets for ERP software there are several vendors such as SAP, Oracle and i2 Technologies. Carlsson et al. (2006) states though that commercially available planning support is not able to deal with all the planning problems of the pulp and paper supply chain. Large companies and especially international corporations, like Stora Enso, that have been formed somewhat also through acquisitions might have ended up with software systems from different providers. This leads easily to two sets of information that are no longer congruent and time and effort is needed to interpret the differences and make the information more uniform so that sensible decisions can be made. As Carlsson et al. (2006) wisely put it, having information available is, however, not sufficient for appropriate management. (Vollmann & Whybark, 2005)

SAP is highly known and widely used system and although it is also in use at Stora Enso, it is not the only system. As Stora Enso has grown over the years by absorbing several independent companies, the concern gained also the systems of those companies and some systems were uniquely designed for those companies. These systems needed to be incorporated to Stora Enso's system. In spite of the updates and the expansions that have been done to the SAP, it does not cover all the needed functions even if every business unit is using it. SAP systems are used e.g. successfully by the mills in their operations, and the Group level uses SAP as an accounting tool.

Stora Enso Logistics operates as a service function and organizes the logistic services for the mills, so they carry hardly any risk and the mills are responsible of the costs. The SAP, which Stora Enso uses, does not include a module for logistics thus SE Logistics, on most functions, has remained under an ERP system called Fenix which is actually ERP for sales. As two different systems are involved there are deviations in figures when compared. This also leads to that the invoices from the SE Logistics to the mills are not transparent enough and the Group level is unaware how the mills describe their logistic costs with SAP. Even the mills do not know exactly of what their invoices include when they pay for the logistic services the SE Logistic provides.

The general interest in costs has increased as the forest products industry has changed. Globalization has increased tremendously in this business area especially during the 21st century, and as the production has shifted towards east and southern America, and so have somewhat the markets, too. Even if the consuming of paper is growing, Europe already is one of the top users so the growing potential here is quite minimal. The removal of the production closer to the growing markets has led to overproduction in Europe, and even more so as paper is now brought into Europe from countries of lower production costs. Due to the overcapacity the prices of final products has decreased whereas the production costs has increased. In the global level this has led to the weakening of the profitability of forest product enterprises in the past few years.

Costs are often interpreted by those who make the decisions based on the figures brought to their attention. The management level in a company pays most attention to those departments of which figures are most fluctuating as it may often seem without proper knowledge and/or analyze that the costs are rising or even decreasing. The decreasing of costs in logistics department is not always good news, it could mean that also the sales are declining. The problem is that the fluctuations in logistics costs are often considered deriving from accounting issues, and if they happen to be something else, the measures taken might be wrong or mistimed. What can also be confusing is that when different departments use different methods, figures can look very different depending on whether cash flow or sale based method has been used.

1.2   Research Goals and Design

This study aims to explore the concept of accrual accounting and logistic costs. This area is studied within a single case company Stora Enso, and especially in one of its service functions, Stora Enso Logistics. Additionally the research focused on Stora Enso´s internal processes of logistic costs by understanding, analyzing and further developing them.

Stora Enso has various processes for logistic costs and tools to manage them. Stora Enso uses SAP for corporate functions like Accounting, Mill Maintenance, Human Resources and Payroll, and Materials Management. As mentioned before,

logistics module is not included in the SAP which Stora Enso uses thus SE Logistics works with an ERP system called Fenix. In order to combine the payment information from SAP with the order information in Fenix, a system called IPS (Invoice Processing System) is used. The process of logistics invoices includes several phases and different ERP systems which make it complicated to understand for those who are not involved directly in the process. (Stora Enso, 2011d, e)

More importantly, SE Logistics has observed that transportation invoices arriving on other time period than when the sales of an order has happened cause difficulties in the bookkeeping. Transport invoices can occur both before and after the sales. This causes variation in the logistics costs. If the markets are at constant level, the fact that invoices associated with certain sales arrive at different time or that there is longer period between the arrival of the invoice and transport action causing it will not matter, but if the markets are irregular, as nowadays often is, and the final destination vary from one country to the other side of the world; the logistics expenditure fluctuates a lot.

The purpose of this study from case company´s perspective is to show that irregular flow of transportation actions and invoices arriving leads to fluctuations in bookkeeping and in order to fix that, accrual accounting methods are needed. It will be also pointed out that the cost management is more simple and clear when the actions of transport and sales are not too far apart in time.

The reasons for conducting this thesis lie behind the changes made in the corporation of Stora Enso. Different functions have been centralized and service centers have been formed to take over the functions that have been centralized, one of the centralized functions was logistics. Previous to the centralization the mills were responsible of organizing their logistics and keeping records of the invoices. Along with the centralization the responsibility of logistic and its invoices was shipped to Stora Enso Logistics. The transportation invoices arrived now first to SE Logistics instead of straight to mills. While the arrived transportation invoices were processed in the ERP systems of SE Logistics, the mills did not have a vision of the arriving invoice flow and thus could not control it. When the centralization project was started, all the reporting related questions

were not thought through and it took a while until the accrual process was running without problems. This thesis is used to increase understanding of transportation invoicing process and the related accounting standards within the case company. The goals of the research have been formulated to research questions which will be presented in the next subsection.

1.2.1 Research Questions

The primary purpose of this study is to answer the following research question:

Research question: What are the effects of the logistics costs in accounting?

To discern more detailed relationships within the above-stated research question, three case company specific sub-questions were posed:

Sub-question 1: What kind of challenges Stora Enso faced regarding its logistic costs and why?

Sub-question 2: How much Stora Enso's transportation costs fluctuated and why?

Sub-question 3: How Stora Enso can clarify its logistic cost models to improve accuracy and efficiency?

1.3 Definition of the Key Concepts

The definitions of key concepts are derived from previous literature and the material received from the case company. Most of the concepts are discussed in more detail in later chapters of this study.

ERP – Enterprise resource planning represents a comprehensive software approach to support decisions concurrent with planning and controlling the business, i.e. the software system that integrates application programs of departments with each other. (Vollmann & Whybark, 2005)

SAP – The enterprise software system used to manage business operations and customer relations, the most widely used ERP application system. (Vollmann & Whybark, 2005)

IPS – Invoice Processing System is a solution for automating invoice processing, the software is used for matching operational and financial information, creating invoices, transferring information and reporting. (Stora Enso (d), 2011)

Fenix – A custom-designed ERP real-time solution for sales and logistics that covers the entire order through delivery chain of paper and board production. Fenix is used for order handling, logistics, invoicing and sales planning. (Stora Enso (e), 2011)

IASB – The International Accounting Standards Board (IASB) is the independent standard-setting body of the IFRS Foundation and is responsible for creating and issuing the International Financial Reporting Standards (IFRS). (ifrs.org, 2014)

FASB – The Financial Accounting Standards Board (FASB) aims to establish and improve standards of financial accounting and reporting, their standards are known as Generally Accepted Accounting Principles (GAAP). (fasb.org, 2014)

GAAP – Generally Accepted Accounting Principles (GAAP) is a collection of principles, standards and procedures commonly followed by accountants in recording and summarizing and in compiling financial statements. GAAP varies from country to country based on each country's legislation and practices. (Epstain et al., 2006)

IFRS – The International Financial Reporting Standards (IFRS) refers to a series of standards and pronouncements which gives guidance for preparing financial statements. IFRS is the new set of standards that have been originated from International Accounting Standards (IAS) and these two terms are often used overlapping. (ifrs.org, 2014)

Accrual accounting – The standard accounting method used by most companies that measures the performance and position of a company by recognizing economic events regardless of when cash transactions occur. (Harrison & Horngren, 2006)

Revenue recognition – An accounting principle that is a cornerstone of accrual accounting together with matching principle. It determines the specific conditions under which income becomes realized as revenue. (Epstain et al., 2006)

Matching principle – An accounting principle that requires expenses to be recorded during the period in which they are caused, regardless of when the transfer of cash occurs. A company should match expenses with related revenues in order to report a company's profitability during a specified time interval. (Harrison & Horngren, 2006)

1.4 Methodology

This thesis was conducted as a quantitative research. According to Heikkilä (2001) quantitative research is applied when questions related to quantities and percentages and relations between different research objects or changes in research matters are investigated. Anderson et al. (2010) emphasize also that when using the quantitative approach, an analyst will concentrate on the quantitative facts or data associated with the problem and develop mathematical expressions that describe the objectives, constraints, and other relationships that exist in the problem.

The empirical part of the study is conducted based on the data provided by the case company and was retrieved from their ERP applications. The data used is secondary data as it consisted of company reports. In addition to these reports, some documents provided by the case company were used, mainly as background material. Different calculations and statistical methods were used in aid to interpreting the information in the reports.

The research findings are based on the results of calculations made with the quantitative data. The data is composed of information about transportation activities, recorded logistic invoices and sales. The empirical data was analyzed through analytic induction. The idea was to estimate the percentual difference caused by the invoices and transportation activities that are arisen at different times. A more detailed description of methodology used in this study will be provided in the Methodology chapter of this thesis.

1.5 Structure of the Thesis

This study is divided into two main parts: literature review and empirical research. The structure of this thesis contains eight chapters, which are described below.

Chapter 1 provides an introduction and the main elements of the introduction are the importance of logistic and its costs to the production industry and the ERP systems used by companies. The overview on the objectives of the study and key research questions are also included in the introduction. The structure of the thesis including the content of each chapter is described in the introduction.

Literature review of the thesis is covered in Chapters 2 and 3. In Chapter 2 Finnish forest industry is introduced shortly and the logistic related to the industry and its cost factors are described. The focus of the literature review is Chapter 3, which introduces the central standards of accounting and the organizations behind the standards. Special topics, like accrual accounting, revenue recognition and matching principle, are covered.

Chapter 4 and 5 are devoted to a presentation of the case company and its logistic division. Chapter 4 includes a short description of the case company including some basic financial figures and statistic. Chapter 5 entails a description of the ERP systems used in logistic invoicing process and presents few scenarios of the logistic costs' behavior in accounting.

Empirical part of the research is covered in Chapters 6 and 7. Chapter 6 presents the research methodology and design in detail. The research data and variables are described and different methods used in the statistical analysis are introduced and explained. The analyzed results of the quantitative research and key findings will be presented in Chapter 7.

The final chapter, Chapter 8, presents the conclusions of the research based on the analysis of the quantitative research and the related previous literature. Furthermore, recommendations for the case company will be provided in the end of the study. Picture 1 presented below visualizes the content and defined objectives of each chapters of the study.

Chapters	Objectives
Chapter 1 **Introduction**	Provides the reader an overview of study and its objectives
Chapter 2 **Logistic Chain in Paper Industry**	Provides the reader a context of logistic chain in Finnish paper industry
Chapter 3 **Accounting Policies**	Provides the reader a context for understanding the examined phenomenon
Chapter 4 **Case Company –Stora Enso**	Provides the reader an overview of the case company
Chapter 5 **Process of Logistic Invoicing at Stora Enso**	Provides the reader of an overview how logistic invoicing is done by the case company
Chapter 6 **Methodology**	Provides the reader an overview of how the study was conducted
Chapter 7 **Research Findings**	Provides the reader the details on the findings of the study
Chapter 8 **Conclusions**	Provides the readear analysis of the results against the theory, conclusions and suggestions for the case company

Picture 1. Structure of the Study

2 LOGISTIC CHAINS IN PAPER INDUSTRY

2.1 Finnish Forest Industry

Forests have been, and still are, one of the most important natural resources in Finland. Even though the service and electronic sectors have reduced the meaning of forest industry to the exports, still 20% of Finland's net export revenues in 2012 were provided by forest product industry together with the cluster that has built up around it (Metsäteollisuus ry, 2014). According to Diesen (2007) forest industry has an exceptional meaning for Finland as Finnish economy is based on the forest industry more than any other country in the world. Picture 2 shows the value (€) of forest industry exports per capita and its share of total exports. The top ten Finnish export articles included three products of Finnish forest industry: pulp, paper and paper board. The most significant purchases of forest products industry comprise raw wood material, chemicals and energy as well as transport services.

Forest industry exports / total exports	
Finland	20%
Sweden	12%
Austria	7%
Canada	6%
Germany	3%
France	2%
USA	2%
Norway	1%
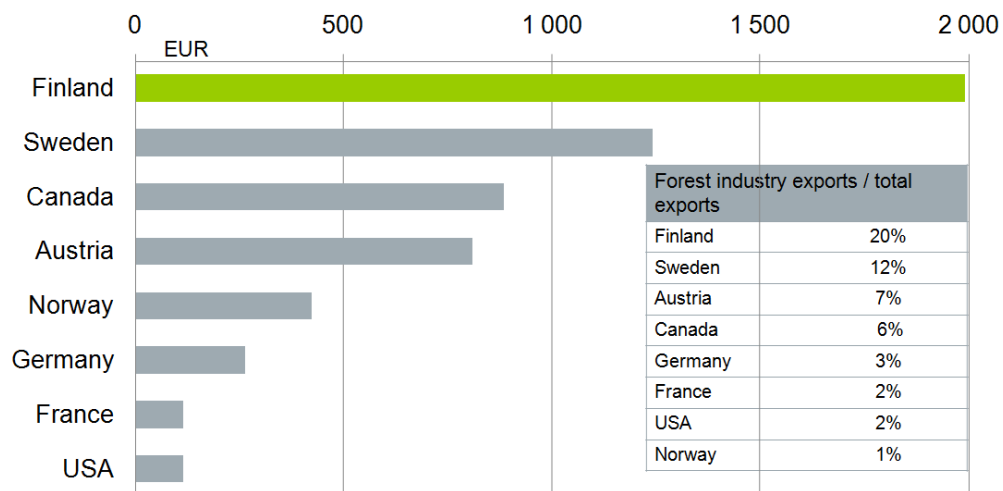
Picture 2. Value (€) of forest industry exports per capita and its share of total exports. (Metsäteollisuus ry, 2012)

The Finnish forest industry is a significant employer as the industry employs directly 48,000 people, that makes ca. 15 % of the industrial jobs, in Finland. This has a great impact in regional areas as all the production units are located away from the Helsinki Metropolitan Area and mostly in small towns. The indirect employment effects of Finnish forest industry are even greater than the direct employment effects. Even though the industry has somewhat decreased in Finland and many production units have been closed there are still 49 paper, paperboard

and pulp mills operating, and 130 mills of wood products industry (e.g. sawmills and plywood mills) in Finland and their industrial output value account for nearly a fifth of Finland's total output. There it has a significant impact on Finnish economy. The share of forest industry investments in the entire factory industry's fixed investments in Finland was nearly 20 % in 2012. And the yearly investments of forest industry companies in research and development have been around 100 million Euros throughout the 2000s. As mentioned the forest industry has a major impact on Finnish exports. All in all, the sector is a major factor for Finnish wellbeing. (Metsäteollisuus ry, 2014)

2.2 Logistics in Finnish Forest Industry

Logistics is becoming the sore point of forest industry's competitiveness. The functionality of the logistics has a great influence on the competitiveness of Finnish industry as a whole and through that also to preserve the manufacturing industry in Finland and entice new investments (Erola, 2012). The logistic competitiveness of Finland is worse than in many of the key competitor countries. The functionality of the logistics is crucial to Finnish forest industry as nearly 90 % of its production is exported. The cost of logistics in Finnish forest industry is about 20 % of the revenue where as in Central Europe it is less than 10 %. It would be important for Finnish forest industry that Finland invests on railroads and maintaining the road network, it should be also considered to introduce the return system of diesel fuel taxes for heavy trafficking (Erola, 2012). (Jaatinen, 2012)

One reason for the high logistic costs is naturally location and long supply chains that Scandinavian mills have. Forest based industry has production all over Finland and the distances to ports and domestic customers are relatively long due the geographical dimensions of Finland. There can be 3 – 4 transportation modes and at least 4 – 5 handling events over a great geographical distance in the delivery chain from the mill to the customer as the product is first transported from inland to harbor then shipped to destination country and transported to inland terminal before delivering to the customer (Räty 2003). Mills located closer to the markets and customers are able to use more direct routes and the delivery

can include only two handling events, an advantage Nordic mills do not have. This highlights the meaning of logistics as key function and restorative factor of competitiveness in the industry.

In Finland all traffic networks, including smaller forest roads, private roads and low traffic volume track sections, are used to handle transportation of forest products industry. These traffic networks have to be in good shape otherwise deliveries become slower and the logistic cost may rise. Water transportation is essential to Finland both inland and especially in export transportation. Seaports and most of our country's inland water harbors' play a crucial role to forest industry exports and imports.

Globally majority of the produced forest industry products are consumed locally but up to 90% of Finnish forest industry production is exported. Picture 3 presents the main markets for Finnish forest products industry.

Main markets	Share
Germany	18 %
UK	10 %
Russia	5 %
USA	5 %
France	4 %
China	4 %
Sweden	4 %
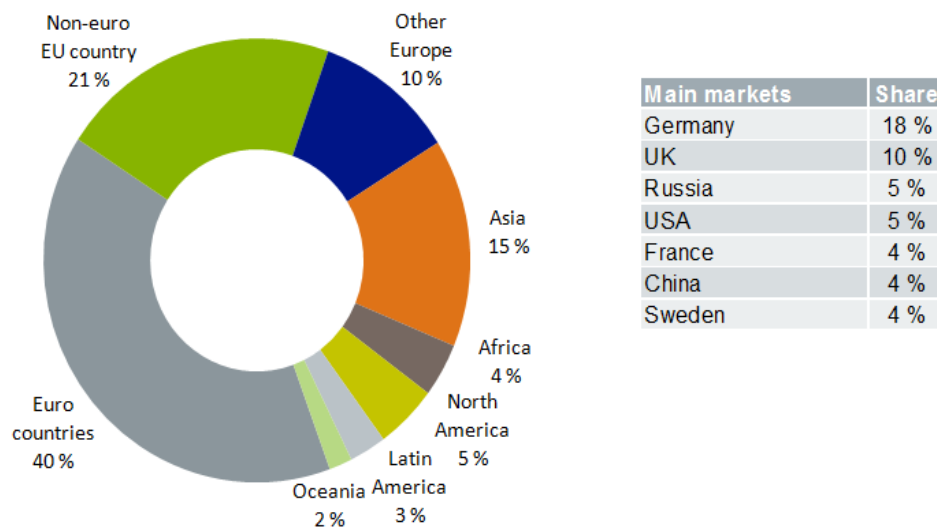
Picture 3. The main markets for Finnish forest products industry. (Metsäteollisuus ry, 2012)

The largest trade flows are between Central European countries and from Scandinavia to Central Europe. In North America Canada exports a lot of paper to the USA, and in Asia South Korea is considerable exporter. Between continents the trade flows are directed from Europe and North America to Asia, from Europe to North America as well as from North America to South America. (Metsäteollisuus ry, 2012)

High transportation costs put a strain on forest based industry. As mentioned over 90 percent of the products in forest based industries are exported, and the transportation distances are long, thus the share of logistic costs in revenue of forest industries is substantially greater compared to the key competitors in Central Europe. Metsäteollisuus ry (2014) is reporting that the amount forest industry products transported on the roads and tracks of Finland sums up to nearly 100 million tons a year, and through the ports of Finland raw materials and finished products are exported and imported as sea transportation approximately 20 million tons a year. Picture 4 presents an example of the daily stream of goods in paper industry in 2000. Metsäteollisuus ry (2014)

Raw materials

5650 trucks

45 railway carriages

20 shiploads

Products

1250 trucks

35 railway carriages

17.7.2009
SOURCE: The Ministry of Transport and Communications

Finnish Forest Industries
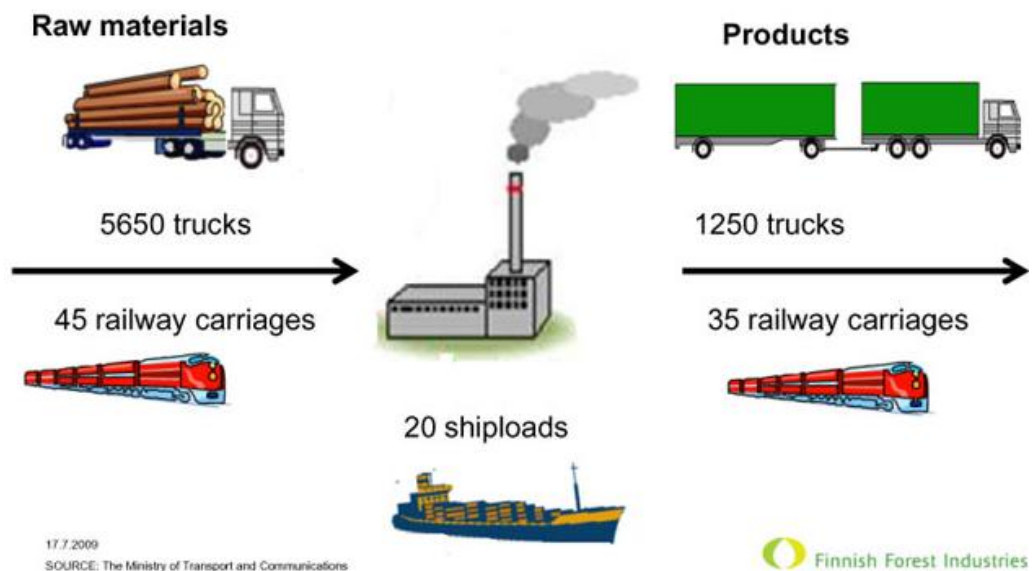
Picture 4. Daily stream of goods in paper industry (Metsäteollisuus, ry, 2014)

Upon freight transport in Finland fall taxes and public payments that the transportation customer usually pays as rising prices of cargos. Some of these payments are set by the EU directives or other international agreements but mostly the payments can be decided on national level. The costs of road transportation has been increasing during past few years because of amongst other things tax increases of diesel fuel and the regulation of drive and rest times. Land transportation needs to be more efficient. One way to do this is to increase the total weight of heavy vehicles which should degrease the transportation cost, energy usage and the stress on the roads. (Metsäliitto ry, 2013a)

As mentioned above, water transportation is important for Finnish forest products industry due to Finland's location and the cost efficiency of this transportation model. The new environmental regulations for marine transportation, so called sulphur directive, pose a significant cost risk for the shipments of Finnish forest products industry. The competitiveness of Finnish forest industry is once again threatened by the directive increasing costs of maritime transportation. A new regulation for the nitrogen content of ship traffic's emissions is planned for the area of the Baltic Sea. The governing body of the Convention on the Protection of the Marine Environment of the Baltic Sea Area HELCOM (Baltic Marine Environment Protection Commission - Helsinki Commission) has been preparing a petition to IMO (International Maritime Organization) in order to nominate Baltic Sea as a special area of nitrogen emissions. The restrictions for nitrogen emissions are going to increase the prices of maritime freights in Finland about 3 – 5 percent and the additional costs are approximately 40 – 80 million Euros a year. The cost impact for Finnish forest industry is going to be 10 – 20 million Euros. It is estimated that at the moment the nitrogen emissions of shipping is 1,5 % of the total nitrogen load of the Baltic Sea.

The functionality and competitiveness of shipping is crucial for Finnish export. The Finnish forest industry is totally dependent on maritime transportation on Baltic Sea as over 90 % of the industry's export is transported through Baltic Sea. The sulphur directive planned to come into effect in 2015 is estimated to increase the cost of the maritime transports in forest industry by at least EUR 200 million a year. In addition to sulphur directive and nitrogen restrictions, the shipping costs are also increased by other international environmental regulation. The cost impact of regulating shipping is greater for Finland than for other EU countries because Finland is dependent on maritime transportation and the distances to markets are long. Finland also has to take into consideration the challenges of winter maritime transporting.

Another regulation that is going to affect Finnish forest industry heavily is the sulphur directive finalized in October 2012 which is going to raise the cost of the forest industry's maritime transports by at least EUR 200 million a year (estimation made in 2013). The directive will reduce the sulphur content of maritime fuels on the Baltic Sea to 0,1% in 2015. In order to achieve the sulphur

content limit of 0,1 % in practice can be achieved with different methods, one of being the replacement of the currently used heavy fuel oil with diesel fuel as maritime fuel. Other suggestions have been the installation of sulphur washers or the adoption of liquefied natural gas (LNG) as a maritime fuel. The problems, however, are that the technology for the washers is not yet advanced enough nor is it always economical to install them, and it is going to take years to develop the infrastructure for LNG distribution as well as the fleet to use it as fuel. In other words, the only option is to change the heavy fuel oil to diesel fuel, which is more expensive fuel. There are also other cost threats associated with environmental regulation of maritime transport, like reduction of maritime carbon dioxide emissions. This sets an enormous challenge for the competitiveness of the forest products industry as already now the logistic cost of Finnish export companies in relation to revenue are considerable higher compared e.g. for Central European companies. (Erola, 2012; Metsäliitto ry, 2013b)

2.3 Transportation Modes

As mentioned previously, transportation plays a key role in logistics. The development of the large scale industry has required efficient transportation of raw materials, components and finished products in broad geographical regions. Transportation is in charge of moving products from production site to where they are required. According to Grant et al. (2006), transportation adds value to the customer when the products arrive on time, undamaged and in required quantities. Transportation is not only in central role in logistics but also responsible for the significant part of the logistics costs. The costs depend also on the choice of transportation mode. The choice of transport depends on the product type and the specification of the customer order (Scott et al. 2011). There are five different transport modes to choose from: air, road/truck, rail, water and pipeline, or some combination of these (Bowersox et al. 2007; Everett & Philpott, 2001; Grant et al. 2006; Mangan et al. 2008; Scott et al. 2011). In addition to these there exists intermodal transportation which combines two or more modes in order to provide an integrated service with lower costs. Picture 5 presents different transportation modes that are used also in forest products industry.

Air transport is seen as premium and emergency service as it is fast but also very expensive. In long distances, e.g. from coast to coast, airfreight has its advantages in speed but in short distances trucks are faster as no time is wasted in terminal policies or in unloading and reloading actions. Another advantage of the air transport is the security and the exiguity of loss and damage. For these reasons airfreight is often used for high-value products, like jewellery. The capability if air transport has limitations regarding to the cargo space and lifting capacity as well as to the availability of the aircraft. (Bowersox et al. 2007; Grant et al. 2006)

Truck transportation is flexible, as it offers door to door transport, and versatile, as trucks can transport products of different sizes and weights almost anywhere and over any distances, and yet trucks are limited by weight and volume capacity in comparison to rail and water modes. The road network in the world provides to trucks the widest market coverage of any of the modes. Truck transportation can be efficient if the products can be picked up at the origin and delivered straight to the final destination, no additional transportation modes are needed and unloading/loading can be avoided between origin and destination. The main problems in trucking industry concerns increasing costs of maintenance, fuel and wages as trucking is labor-intensive. Truck shipments are referred to as truckload (TL) or full truck loads (FTL), and smaller shipments are less than truck load (LTL). According to Scott et al. (2011), road transport can be divided into two categories: primary transport which transport raw materials or finished products to distribution centre, and secondary distribution transport the goods from distribution centre to customers. (Bowersox et al. 2007; Grant et al. 2006)

Rail transportation is chosen when large tonnages are needed to be transported over long distances. This transportation mode is suitable for low-value products whose delivery time is not the essence. Transport routes are limited to fixed track and because of it the rail transport is not as flexible and versatile as road transport and can offer only terminal to terminal services as water and pipeline transport. Rail transport enjoys relatively low variable operating costs and is thus cheaper than air or road transport but on the other hand the ratios of loss and damage are greater in comparison. The rail transportation suffers from equipment availability although the railroads use wagons of their own as well as each other's. The problem is that the wagons are every so often not located where required. Wagons can be in use, undergoing repair or just standing idle or lost somewhere in the rail network. Rail transportation is an important factor in intermodal transport and can provide "piggyback" services, which offer low-price rail or water transportation methods combined with the flexible trucking mode. (Grant et al. 2006; Scott et al. 2011)

Water transport is the dominant transportation mode for international movements, according Mangan et al. (2008). The oldest transportation mode can be broken down to separate categories. Grant et al. (2006) present three categories: 1) inland waterways (e.g. rivers, canals, lakes), 2) coastal and intercoastal oceans and 3) international deep sea. In Europe the big rivers play major role in inland transportation although in general water transport is limited by the availability of water ways. The main competitors of water transportation are rail and pipeline. Water carriage is inexpensive and has the capacity to transport remarkably large shipments but is a slow speed mode, thus it is used for shipping high-bulk and low-value articles. Even though water transportation is not the preferred choice in domestic/inland trade, it has increased its importance in international shipping and will be a viable option for transportation also in the future. (Bowersox et al. 2007; Grant et al. 2006)

Pipeline is suitable for transporting products with certain specifications; the product has to be in liquid, powder or gas form. According to Bowersox et al. (2007) and Grant et al. (2006) crude oil and natural gas are the main products transported through pipes. In forest industry pipelines are used on integrated mills where pulp or deinking mill is next to or close by a paper or board mill. Pipelines

are not labor intensive, they operate 24/7 basis and are monitored and controlled by computers. This makes it unique compared to other transportation modes. Pipelines have the highest fixed costs but also lowest variable costs of the transportation modes presented in this paper. Pipeline offer very high level of service dependability but the disadvantage of pipelines is that they are not flexible and has very limited availability. (Bowersox et al. 2007; Grant et al. 2006)

Table 1. presents relative costs and operating characteristics of different transportation modes. (Mangan et al. 2008)

Table 1. Relative costs and operating characteristics of different transportation modes.

Mode	Relative costs and operating characteristics
Air	The main advantages are speed and security, but method is limited by the cargo space, the lifting capacity and the availability of the aircraft. Costs are high due to variable costs like fuel, maintenance and security requirements.
Road	Flexible and versatile service provider, advantages on availability, dependability, frequency and speed on short distances. Infrastructure ensures a wide road network. Very labor incentive and limited capacity on weight and volume. Costs are moderate but increasing due rising fuel and salary costs as well as congestion charges.
Rail	Capacity to move large volumes of freight with moderate speed. Limited routes due to fixed tracks. Variable costs relatively low but fixed costs high due to costly equipments. Important part of intermodal transportation services.
Water	Dominant for international movements but limited availability for water ways in inland/domestic transport. Water carriage is inexpensive, has the capacity to transport large shipments but is a slow mode.
Pipeline	High level of service dependability but can be used in very limited situations. Highest fixed costs but very low variable costs as the need for maintenance is low and the computer surveillance ensures low labor costs.

2.4 Warehousing

Warehousing activity plays an important role in the logistic system, it is an important link between producer and customer (Brockmann, 1999; Grant et al., 2006). Warehouses are used to storage products during all phases of logistic process. CSCMP (2010) defines warehouses as storage places for products. Stored

products can be divided into two main groups: 1) raw materials, components and parts (products that are directly or indirectly used in preparing the end product); and 2) finished goods (ready to be sold further). In addition to these groups there can be a need to storage goods in process and materials either to be disposed or recycled. Products stored in warehouses are also called inventories. The main activities of the warehouse include receipt of product, storage, shipment, and order picking. There are several reasons for companies to hold inventories, Grant et al. (2006) has listed the following:

- achieve transportation economies

- achieve production economies

- take advantage of quantity purchase discount and forward buys

- maintain a source of supply

- support the firm's customer service policies

- meet changing market conditions (e.g. seasonality, demand fluctuations, competition)

- overcome the time and space differentials that exists between producers and consumers

- accomplish least total cost logistics commensurate with a desired level of customer service

- support the just-in-time programmes of suppliers and customers

- provide customers with a mix of products instead of a single product on each order

- provide temporary storage of materials to be disposed of or recycled

The usage of warehouses varies also depending on the line of business and the desired level of customer service. According to Grant et al. (2006) warehouses can be used to support manufacturing, to mix products from multiple production facilities, to breakbulk or subdivide a large shipment of product into several smaller ones, or vice versa i.e. to combine or consolidate a number of smaller shipments into a single high-volume shipment. (Grant et al., 2006)

It is a known fact that a company manufacturing goods needs an inventory policy for each product in order to know when and how much should be produced more. The idea behind a good inventory management is not only to cut costs but also

create new revenues and higher profits. Finding the balance with inventory can be tricky; if there are not enough products it leads to stockout and lost profits, but if there are too much products in the inventory, it hinders free cash flow and may cause forced markdowns. These examples of improper inventory policies are ways to diminish earnings and can even have such an impact on company's performance that the company is unprofitable. As the market conditions are always changing, demand is random and dynamic, relationships between resource and production planning as well as inventory management are complicated, and there are uncertainties in the process, finding a way to match the supply with the demand is a challenge. Often the criterion for choosing the inventory policy is to find the lowest total cost, which in many cases according to Johnson et al. (2002) is equivalent to maximizing the net income. It is wise to pay attention to the total costs of inventory and handling, as according to Sayer (1986) the warehousing, inventory carrying and handling component of total logistic costs alone can account for approximately 30 % of the total production costs. (Johnson et al., 2002)

Nordic producers of pulp and paper industry are forced to consider lead times as the lead time from mill to market is longer than what many competitors face. The disadvantage of long lead times can be balanced with inventories at distribution centers or otherwise near markets. According to Koskinen (2009 a, b) distant deliveries in the Finnish paper industry can take up to one and a half months to proceed, which produces long inventory and costly times. Nordic paper industry has a greater inventory commitment than competitors in Central Europe. Having an inventory produces costs that affect the total costs of logistics. (Lehtonen, 1999)

Although the search for a good inventory control policy for pulp and paper industry has started decades ago and many models have been developed and tried out, still the inventory management remains to be a challenging problem to paper manufacturers and wholesalers. Several authors (Diesen, 2007; Hämäläinen, 2011; Johnson et al., 2002) have mentioned the markets of paper industry to be volatile and random, and that there are heavy fluctuations in paper demand and even costs and prices. This makes the forecasting very difficult, even impossible at times. Incorrectly anticipated paper demand can lead to inaccurate production

and material planning at the paper machine level and increase the inventory values resulting in higher overall logistics costs (Hämäläinen, 2011). Although there are a large number of different types of inventory models, it is often impossible to find a single one suitable for the situation. Johnson et al. (2002) writes that usually the decision is based on a combination of experience, mathematical models, and even on gut feels of a few individuals. (Johnson et al. 2002)

As in other industries the need for inventory in pulp and paper industry depends on the structure of the network and the required service level. The goal is to obtain the required service level for customers and production with a minimum amount of inventory. The main reason behind inventories has been to buffer separate sequential operations in order to protect against different kinds of uncertainty issues concerning quality and timing. Due the bulky nature of the products in pulp and paper industry, there are usually several warehouses in the supply chain, especially in the logistic system of the end product. Picture 6 shows a great example of the warehousing in the transportation chain in paper industry. In most paper mills, the products are stored in warehouse awaiting shipment. If products are to be shipped overseas, the products are stored at port of both departure and arrival.
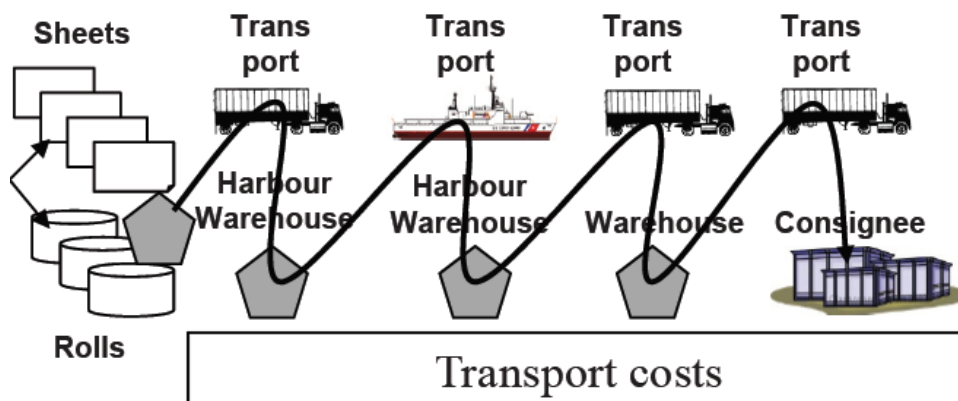
Picture 6. Warehouses in transportation chain of paper industry. (Hämäläinen, 2011)

There are industries of which products become refined when stored, e.g. wine and cheese, but the value of paper industry products either remains the same or more likely decreases with time. In addition to that, storing and handling increases the risk of damaging and thus decreasing profit. The products are not stored unnecessarily as inventories tie up capital, instead they flow through the storage onto being transported to the customer.

3 ACCOUNTING POLICIES

3.1 Accounting in General

Alexander and Nobes (2010) write that accounting has been developed to response to observed needs, therefore the purposes for accounting depend on what information is useful for the end user. As purposes and users for accounting varies, there is no single authoritative and generally accepted definition for accounting. Alexander and Nobes (2010) present few definitions of accounting that have been produced by different accounting authorities. To summarize these definitions, accounting is an activity or a process that indentifies and measures financial transactions in order to produce quantitative information of actions taken. Alexander and Nobes (2006) list different users for this quantitative information, and those are: managers, invertors, other lenders, employees, suppliers, customers, governments and public. Professor Weetman (2006) defines accounting following:

Accounting is the process of identifying, measuring and communication financial information about an entity to permit informed judgements and decisions by users of the information.

According to Harrison and Horngren (2006) accounting is an information system which measures business activities, processes data into reports and financial statements, and communicates results to decision makers. Accounting is "the language of business" (Harrison & Horngren, 2006). One has to pay attention to the fact that bookkeeping and accounting is not the same thing. Accounting is more extensive and includes bookkeeping.

According to Alexander and Nobes (2006) accounting can be divided into two major branch: management accounting and financial accounting. Management accounting produces information that is used inside the company by management when they are deciding direction and actions for the company. Financial accounting produces information about the company but is used by the quarters outside the company. Accounting produces financial statements that contain information about a business entity, they measure performance and reveal where a

business stands in financial terms (Harrison & Horngren, 2006). (Alexander & Nobes, 2006)

Accounting standards developed by the International Accounting Standards Board (IASB) form the accounting system. The companies in EU that are listed are required by the IAS regulation to use international financial reporting standards (IFRS). (Weetman, 2006)

3.2 Organizations behind the Standards

Accounting standards are crucial in an efficient market, as information must be transparent, credible and understandable. There are several official organizations which are responsible of maintaining and developing accounting standards. Due to several organizations, and in addition that every country has their own legislation and practices, there are also several standards with the same idea. This chapter introduces few of the best known organizations and their standards. Some of these standards are opened up later in the thesis.

3.2.1 International Accounting Standards Board – IASB

The International Accounting Standards Board (IASB) is the independent standard-setting body of the IFRS Foundation (ifrs.org). This private sector body has 16 full-time members who are responsible for creating and issuing the International Financial Reporting Standards (IFRS). IASB is the successor to the IASC (International Accounting Standards Committee,) which issued the IAS (International Accounting Standards) between 1973 and 2001. The IASB has continued to develop standards which are now known as International Financial Reporting Standards (IFRS). (IFRS, 2014; Mackenzie & Simmons, 2001)

3.2.2 International Financial Reporting Standards – IFRS

The International Financial Reporting Standards (IFRS) refers to a series of standards and pronouncements. Their purpose is to set standards and guidance for how transactions and other events should be presented in financial statements. As companies have become more international and have accounts in several countries, IFRS have been developed in order to improve the quality of financial reporting information, make the international comparison more understandable

and as easy as possible. The idea is to replace many different national accounting standards and harmonize accounting across the world. IFRS is the new set of standards that have been originated from International Accounting Standards (IAS) and these two terms are often used overlapping. IFRS are issued by the International Accounting Standards Board. (IFRS, 2014)

3.2.3 International Accounting Standards – IAS

The International Accounting Standards (IAS) were issued by the Board of the International Accounting Standards Committee (IASC), which was founded in 1973 by the professional accountancy bodies of Australia, Canada, France, Germany, Japan, Mexico, the Netherlands, the United Kingdom and Ireland and the United States of America. IAS are used by companies governments, accountancy bodies and stock exchanges for a wide range of purposes including company accounts, stock exchange listings and national accounting requirements or as a benchmark for development of such requirements (Mackenzie & Simmons, 2001). IASB continues the work of IASC and passes new standards under the name IFRS. IAS standards will not be renamed and are still applicable even though IFRS exist. (IFRS, 2014; Mackenzie & Simmons, 2001)

3.2.4 Financial Accounting Standards Board – FASB

The Financial Accounting Standards Board (FASB) was formed in 1972 and consists of seven full time members who are accounting professionals with diverse backgrounds. The board has assisting staff of professionals who conduct research. The mission of the FASB is to establish and improve standards of financial accounting and reporting that foster financial reporting by nongovernmental entities that provides decision-useful information to investors and other users of financial reports (FASB, 2014). FASB establish and communicate their standards of financial accounting and reporting in the United States. Their standards are known as Generally Accepted Accounting Principles (GAAP), those standards are officially recognized as authoritative by the Securities and Exchange Commission (SEC). (FASB, 2014)

FASB is working together with the IASB in order to develop a common Conceptual Framework. The idea is to have standards that are objectives-based, internally consistent, and internationally converged. The Conceptual Framework

include: measurement attributes used to measure and report economic transactions, events, and arrangements in financial statements; and accounting principles and assumptions that guide recognition, derecognition, and disclosure, as well as the classification and presentation of information in financial statements (FASB, 2014). At the moment the Conceptual Framework for Financial Reporting is used in the United States.

3.2.5 Generally Accepted Accounting Principles – GAAP

The phrase "generally accepted accounting standards" is a technical accounting term that encompasses the conventions, rules, and procedures necessary to define accepted accounting practice at a particular time. It includes not only board guidelines of general application, but also detailed practices and procedures. Those conventions, rules, and procedures provide a standard by which to measure financial presentations. (Auditing Standard Board, 2007)

Generally Accepted Accounting Principles (GAAP) is a collection of principles, standards and procedures commonly followed by accountants in recording and summarizing and in compiling financial statements. These principles set guidance to measuring economic activity, the time when to make these measurements and how to record them, and the disclosures surrounding the activity, as Epstain et al. (2006) explain it.

GAAP origins date back to the 1930, to the time after the stock market crash of 1929. It was suspected that the lack of uniform and strict requirements for financial reporting led to sloppy markets that culminated with the crash. Different policy boards have been responsible of GAAP from time to time, boards like Financial Accounting Standards Board (FASB) and Committee on Accounting Procedure to name a few. GAAP evolves through rigorous process handled by the authoritative body in charge or over time as customary practices develop till they become accepted guidance. GAAP varies from country to country based on each country's legislation and practices. (Epstain et al., 2006)

3.3 Accrual Accounting

An accrual defined by Harrison and Horngren (2006) is either a revenue or an expense that is recorded before an actual cash transfer has occurred. In other words accruals are liabilities and non-cash-based assets. Weetman (2006) write that when an expense has incurred but is not paid for until a while later, the expense must be recorded into the accounting information relevant to the period when the expense has incurred. The unpaid expense is known as accrued expense. Accrued expenses occur e.g. when paper is transported and the bill of that transportation arrives in the next period or even quarter.

IASB (1989) defines accruals following: *Under the accruals basis, the effects of transactions and other events are recognized when they occur (and not as cash or equivalent is received or paid) and they are recorded on the accounting records and reported in the financial statements of the periods to which they relate.* (Mackenzie & Simmons, 2001)

Harrison and Horngren (2006) divide the basis of accounting into two categories: accrual accounting and cash-basis accounting. In cash-basis accounting the transactions are recorded only when actual cash is handled. Revenues are made up by receipts and expenses by cash payments. Accrual accounting is the method Generally Accepted Accounting Principles (GAAP) requires to be used. The difference between accrual accounting and cash-basis accounting is that in accrual accounting earnings and expenses are recorded when they actually take place whether or not the transaction involves cash, so accrual accounting method records all transactions and their effects not just cash movement and shows better the performance and position of a company. Time-period concept ensures that accounting information is reported at regular intervals (Harrison & Horngren, 2006). The idea behind the accrual accounting is that the economic events are recognized by matching revenues with expenses so the current cash flows combined with the future ones give a more accurate picture of the current financial condition of a company. Accruals basis accounting reports past transactions and events as well as obligations to pay cash in the future and the recourses that represent cash to be received in the future (Weetman, 2006). Accrual accounting is more complex method compared to cash-basis accounting and due this, although accrual accounting is considered to be the standard

accounting practice for most companies, it is not used by small businesses. Accrual accounting was developed as business transactions became more complex and the need for more accurate information about a company's financials was required. With accrual accounting it is possible to record the effects of e.g. sales on credit and projects that provide revenue streams over a long period of time on the bookkeeping at the time the transaction takes place. This being the case, the events that has an effect on financial statement can be reported during the same reporting period that these transactions occur and the fluctuations between income and expenses can be dampened. (Harrison & Horngren, 2006)

When using accrual accounting method some ethical challenges might come along. For example, a prepaid expense is recorded wholly in one time period even though the purchased asset is used during several time periods. This is done in order to make the income for the latter periods to look better; this action is unethical and provides misleading information to the decision makers. (Harrison & Horngren, 2006)

As stated above, accrual accounting is the method used in accounting because in that way more information is included in accounting statements. Before accruals were used only cash transactions were recorded and thus many important information and business activities were ignored. With accruals expected revenues and future property can be measured as well as assets without cash value can be taken into account in financial statement. (Harrison & Horngren, 2006)

3.4 Revenue Recognition

Revenue is the income a company makes performing its normal business activities, i.e. sells the goods or services to customers. In some cases revenue can be derived in form of rent or investment (Weetman, 2006). Revenue is also known with other terms, like sales, turnover (Weetman, 2006) and net sales (Harrison & Horngren, 2006). The IAS 18 defines revenue as follows:

Revenue is defined as the gross inflow of economic benefits during the period arising in the course of the ordinary activities of an entity when those inflows

result in increases in equity, other than increases relating to contributions from equity participants. (IAS 18, 2012)

According to the IAS No 18 revenue consists of the following transactions and events:

1. the sale of goods
2. the rendering of services
3. the use by others of entity assets yielding interest, royalties and dividends

IAS No 18 also states that revenue should be measured at fair value of consideration received or receivable. The same standard defines fair value as *the amount for which an asset could be exchanged, or a liability settled, between knowledgeable, willing parties in an arm's length transaction.* (IAS 18, 2012)

According to Mackenzie and Simmons (2001) revenue is usually measured at the nominal value as it does not vary essentially from fair value since most receivables are due within comparatively short time frame. There are cases, though infrequently, that the compensation is received in the far future. In these cases the nominal value of the compensation is higher than the fair value due to the time value of money. In order to calculate the fair value, future receipts are discounted using an imputed interest rate. In cases where goods are exchanged for goods with a similar nature and value, there is no revenue recognition as the earnings process is not completed. When the goods to be exchanges are dissimilar, the earnings process is completed and if revenue is generated, it is also recognized. (Mackenzie & Simmons, 2001)

IAS 18 lays down disclosures that are required relating to revenue:

(a) the accounting policies adopted for the recognition of revenue including the methods adopted to determine the stage of completion of transactions involving the rendering of services;
(b) the amount of each significant category of revenue recognized during the period including revenue arising from:
    i. the sale of goods;
    ii. the rendering of services
    iii. interest

      iv.   royalties

      v.   dividends; and

(c) the amount of revenue arising from exchanges of goods or services included in each significant category of revenue (IAS 18, 2012).

Revenue is often the biggest number in income statement, or should be if the company wants to succeed. Revenue is the framework for the preparation and presentation of financial statements. Revenue is the evaluating factor of company's performance and prospects so investors pay attention to it among others, thus revenue is often the focus of management's deception as Ciesielski & Weinrich (2011) express. And according to Anderson & Yohn (2002) whenever there are problems or vagueness' in a company's financial statements, revenue recognition problems are often concerning investors more than any other issue in reporting.

Epstein et al. (2006) write that according to Generally Accepted Accounting Principles (GAAP) recognition and disclosure establish the 2 broad categories of accounting principles. Principles of recognition define in which measurements and when the items affecting financial statement are entered into the bookkeeping cycle. Harrison and Horngren (2206) write that the revenue principle gives instructions when to record the revenue and for what amount. Revenue is recorded when it has been earned. Usually revenue is earned when the goods or services has been delivered to the customer. Recognition principles are complemented by disclosure principles which present additional qualitative data and open up assumptions behind the numerical information. Without disclosure principles the quantitative information provided by recognition principles could be misinterpreted. (Epstain et al., 2006)

Recognition is the process whereby an item is incorporated into the financial statements. According to Mackenzie and Simmons the Framework created by IAS for the preparation and presentation of financial statements identifies two criteria that have to be met in order that an item can be recognized. These two criteria are:

(1) it is probable that any future economic benefit associated with the item will flow to or from the enterprise; and

(2) the item has a cost or value that van be measured with reliability (Mackenzie & Simmons, 2001)

There are items that do not meet these recognition criteria but are all the same relevant for the financial statement. Such information need to be disclosed in the financial statement.

CON 5, Recognition and Measurement in Financial Statements of Business Enterprises (FASB, 2008), states following:

Revenues are not recognized until earned. An entity's revenue-earning activities involve delivering or producing goods, rendering services, or other activities that constitute its ongoing major or central operations, and revenues are considered to have been earned when the entity has substantially accomplished what it must do to be entitled to the benefits represented by the revenues.

IASB paragraph 89 sets the conditions for recognizing assets in the balance sheet. *An asset can be recognized when it is probable that the future economic benefits will flow to the entity and the asset has a cost or value that can be measured reliably.* Asset is defined in paragraph 49 as *a resource controlled by the entity as a result of past events and from which future economic benefits are expected to flow.* (Mackenzie & Simmons, 2001)

For revenue recognition IAS No 18 defines detailed instructions and certain conditions that have to be met before revenue can be recognized and recorded in the financial statement. There are separate criteria whether goods are sold, services delivered or revenues are derived from interest, royalties or dividends. These criteria are based on the recognition criteria of probability of future economic benefit and reliable measurement. Simplest revenue can be recognized when a company delivers its product or performs a service and receives a payment for that. Unfortunately revenue recognition is not as easy as it sounds, especially if there are some exceptions involved, like high rate of production returns. (Mackenzie & Simmons, 2001)

IAS 18.14 sets out five conditions that have to be satisfied in order to recognize the revenue from selling goods. These conditions are:

(a) the enterprise has transferred to the buyer the significant risks and rewards of ownership of the goods;

(b) the enterprise retains neither continuing managerial involvement to the degree usually associated with ownership nor effective control over the goods sold;

(c) the amount of revenue can be measured reliably;

(d) it is probable that the economic benefits associated with the transaction will flow to the enterprise; and

(e) the costs incurred or to be incurred in respect of the transaction can be measured reliably (IAS 18, 2012).

Usually the risks and rewards of ownership pass as legal title or possession of good is transferred (a). Still each situation needs to be considered individually because there are a lot of common situations where the risks do not transfer in simple manner, e.g. in case of warranty. If the risks and rewards are not transferred when the title of possession passes, the revenue cannot be recognized. The criterion of continuing managerial involvement and effective control (b) goes hand in hand with criterion (a). Although meeting the conditions of criterion (b) is pretty straightforward still each case has to be considered individually as there may be some rare cases in which continuing managerial involvement does not constitute effective control, e.g. with outsourcing. Criterion (c) does not mean that the compensation has to be received in order to be recognized. Most often the case is that the compensation has been agreed in advance and revenue can be recognized when all the other criteria are met. However, revenue cannot be recognized if the revenue to be received cannot be reliably estimated. If the revenue is not probable, it cannot be recognized as criterion (d) states, one has to wait until the compensation has been received. If revenue has been recognized and it turns out that the related compensation cannot be collected, it is better to recognize expense for bad debts that revise the related revenue. Criterion (e) is based on matching principle which states that as revenue is recognized so are the related costs including an estimate of future costs. If the future expenses cannot be estimated reliably, the revenue is deferred until the expenses can be reliably estimated or until they are incurred. (IAS 18, 2012)

Even though the basic principles of revenue recognition are unambiguous and uncomplicated still a lot of unintentional mistakes as well as deliberate frauds are made when revenue recognition is involved. The errors are mostly due to the fact that many practices have grown into complicated global businesses and/ or transformed from manufacturing businesses into service-based. There are two types of errors that can be made: legitimately earned revenue is reported in the wrong fiscal and such revenue is recognized which has never been earned. (Epstain et al., 2006)

Despite of these detailed instructions for revenue recognition, the standards are often held as extremely diverse, inconsistent at times and even vague (Bloomfield et al. 2010, Bloomfield et al. 2011, Olsen & Weirich, 2012). The explanation is that the rules for revenue recognition have been generated in response to a request from a particular industry that views itself as somehow different from others in the way that revenues get recognized. This has been an issue especially in the U.S. where GAAP is composed of wide concepts for revenue recognition. IFRS does not include as many standards but the two main standards (IAS 18 and IAS 11) are not that easy to apply in transactions of more complex nature.

Weetman (2006) points out that the biggest complications in revenue recognition are caused by timing as revenue is created over a period of time instead at a point of time. The actions of producing of goods or providing services are adequate confirmations that the revenue earned is a result of the efforts of the entity. The critical event that determines the date for revenue recognition is usually the point of delivery when in dealing with produced goods, and for services the critical event is when the service is provided. If revenues are earned over more than one time period (e.g. on long-term contracts) then the revenue is allocated across time periods in proportion to the amount of work completed (Weetman, 2006). (Weetman, 2006)

On June 2010, the Financial Accounting Standards Board (FASB) and the International Accounting Standards Board (IASB) started together a project aiming to develop a single revenue recognition model using a recognition principle that can be applied consistently across different industries and to various transactions (Ciesielski & Weirich, 2011 and Olsen & Weirich, 2010). These

principles will change accounting for revenue and related transactions under both U.S. Generally Accepted Accounting Principles (GAAP) and International Financial Reporting Standards (IFRS). According to Ciesielski & Weirich (2011) the new standard should help preventing several common fraud techniques i.e. sham sales, premature revenue recognition before all the terms of the sale have been completed, improper cutoff of sales and improper use of the percentage-of-completion accounting, to name a few.

3.5 Matching Principle

Expenses arise in the earning of revenue; expenses are the costs of assets consumed and liabilities created during an accounting period. Matching principle is the basis for recording expenses (Harrison & Horngren, 2006), and is an important part of the accruals (Weetman, 2006). Matching concept in accounting according to professor Weetman (2006) is used when the expenses of a period is matched against the revenue earned during that same period. There are two forms of matching, matching losses and gains against time or expenses against revenue. Time matching is used when gains or losses are spread over a certain period of time, whereas matching revenues or expenses occurs when costs are matched against the revenue earned by providing produced goods or services. (Harrison & Horngren, 2006; Weetman, 2006)

The matching principle consists of two points: identifying all the expenses formed during the accounting period, and measuring the expenses and matching them against the revenues earned during the same period. The matching expenses against revenues means that the expenses are subtracted from the revenues is order to find out the net income or net loss. (Harrison & Horngren, 2006)

Expenses occurred in an accounting period must be matched with the revenues earned during the same period. When a benefit has been used, the costs have to be recorded whether or not bill or other documentation has been received. This is what matching concept is about. If any invoice has not been received, the company has to draw an estimate of the accrual of the liability. Estimates are not always the best approach but can be very reasonable when based on past

experience. If an error is made in estimates then adjustments are made by recalculating the profits of the previous period. (Weetman, 2006)

3.6   Inventories

Inventories are often referred as current assets in accounting as inventories can usually be quickly converted into cash. In addition to inventories current assets typically include cash, cash equivalents, short-term investments, accounts receivable, marketable securities, the portion of prepaid liabilities which will be paid within a year and other liquid assets that can be readily converted into cash. Of these current assets inventory is one of the most important that most businesses possess because the turnover of inventory represents one of the primary sources of revenue generation and subsequent earnings for the company's shareholders and owners. (IAS 2, 2012; Mackenzie & Simmons, 2001)

Standard IAS 2 contains a definition for inventory, it states that inventories are assets:

(a) held for sale in the ordinary course of business;

(b) in the process of production for such sale; or

(c) in the form of materials or supplies to be consumed in the production process or in the rendering of services.

The same standard states that inventories shall be measured at the lower of cost and net realizable value. Net realizable value is defined such that the selling price is estimated based on the ordinary course of business, then the cost of completion and the costs necessary to make the sale are also estimated. Finally these costs are subtracted from the estimated selling price and the result is net realizable value. To sum up, net realizable value refers to the net amount that an entity expects to realize from the sale of inventory in the ordinary course of business.

According to the IAS 2, the main idea behind the accounting for inventories is the amount of cost to be recognized as an asset and carried forward until the related revenues are recognized. The cost of inventories shall comprise all costs of purchase, costs of conversion and other costs incurred in bringing the inventories to their present location and condition (IAS 2, 2012). The costs of purchase of

inventories comprise the purchase price, import duties and other taxes, transport, handling and other costs directly consequential to the acquisition of finished goods, materials and services. Any trade discounts or rebates and other similar items are deducted in determining the costs of purchase of an item. The costs of conversion of inventories include costs directly related to the units of production, such as direct material, direct labour and a systematic allocation of the fixed and variable production overheads incurred in converting materials into finished goods. Fixed production overheads are those indirect costs of production that remain relatively constant regardless of the volume of production, such as depreciation and maintenance of factory buildings and equipment, and the cost of factory management and administration, whereas variable production overheads are those indirect costs of production that vary directly, or nearly directly, with the volume of production, such as indirect materials and indirect labour. Other costs are included in the cost of inventories only to the extent that they are incurred in bringing the inventories to their present location and condition. Examples of costs excluded from the cost of inventories and recognized as expenses in the period in which they are incurred are:

(a) abnormal amounts of wasted materials, labour or other production costs;
(b) storage costs, unless those costs are necessary in the production process before a further production stage;
(c) administrative overheads that do not contribute to bringing inventories to their present location and condition; and
(d) selling costs. (IAS 2, 2012)

IAS 2 allows two techniques for the measurement of cost, the standard technique and the retail technique. Standard costs take into account normal levels of materials and supplies, labour, efficiency and capacity utilization. They are regularly reviewed and, if necessary, revised in the light of current conditions (IAS 2, 2012). The cost of inventory with the retail technique is defined by reducing the sales value of the inventory by the appropriate percentage gross margin.

IAS 2 requires that the cost of inventories shall be assigned by using the first-in, first-out (FIFO) or weighted average cost formula. FIFO principle means that the

items that have been in the storage the longest are the first ones to be used or sold. This method makes sure that the items left in the inventory are valued at the most recent price. When the weighted average cost formula is used, the cost of each item is defined from the weighted average of the cost of similar items at the beginning of a period and purchased or produced during the period. The average can be calculated on periodic basis or every time after receiving a new shipment. An entity shall use the same cost formula for all inventories having a similar nature and use to the entity (IAS 2, 2012). (IAS 2, 2012)

IAS 2 states that when inventories are sold, the carrying amount of those inventories shall be recognized as an expense in the period in which the related revenue is recognized. Also the write-downs of inventories to net realizable value and any losses of inventories are to be recognized as an expense during the time period they occur. If some write-downs have to be reversed due an increase in net realizable value, the amount reversed has to be recognized as a reduction as a reduction in the amount of inventories recognized as an expense in the period in which the reversal occurs (IAS 2, 2012). (IAS 2, 2012)

3.7   Summary of Accounting Literature Review

Companies are obligated to present financial statement at the end of an accounting period, which usually is a year. The financial statement includes i.a. balance sheet, income statement and statement of cash flows. The mean to gather the quantitative information of the actions a company has taken and is needed for the financial statement is accounting. There are two types of accounting: management accounting and financial accounting. Management accounting produces information that is used inside the company by management when they are deciding direction and actions for the company. Financial accounting produces information about the company for the parties, like shareholders and investors, outside the company. In order for the financial information to be transparent, credible and understandable, there are rules and standards for accounting. Because there are several official organizations which are responsible of maintaining and developing accounting standards, there are also several different standard sets, but

the listed companies in EU are required by the IAS regulation to use international financial reporting standards.

Accounting can be done with two methods: accrual accounting or cash basis accounting. Accounting standards restrict the choice of an accounting method and IAS 1 requires that all financial statements, except the cash flow statement, must be prepared on the accrual basis. Accrual accounting means that the effects of financial transactions and other events are recognized when they occur, not when cash or equivalent is received or paid. The transactions are recorded on the accounting records and reported in the financial statements of the periods to which they relate. Accrual accounting reports past transactions and events as well as obligations to pay cash in the future and the recourses that represent cash to be received in the future. An accrual is either revenue or an expense that is recorded before an actual cash transfer has occurred. Costs must be recognized as expense in the period when they incur and if not paid until later, recorded as accrued liability into the accounting. The purpose of an accrued liability entry is to record an expense or obligation in the period when it was incurred. Accrual accounting is fundamental to the usefulness of financial accounting information. The idea behind the accrual accounting is that the economic events are recognized by matching revenues with expenses so the current cash flows combined with the future ones give a more accurate picture of the current financial condition of a company and the fluctuations between income and expenses can be dampened.

Revenue is the income a company makes performing its normal business activities and is recorded when it has been earned, usually when the goods or services has been delivered to the customer. The accounting standards say that the revenue can be recognized when it is probable that the company will receive it and it has a measurable value. The simplest case of revenue recognition is when payment is received right after the product or service has been delivered. The critical event that determines the date for revenue recognition is usually the point of delivery when in dealing with produced goods, and for services the critical event is when the service is provided.

Expenses arise in the earning of revenue; expenses are the costs of assets consumed and liabilities created during an accounting period. Matching principle

is the method for recognizing costs. According to the matching principle, the related costs including an estimate of future costs are recognized when revenue is recognized. Matching principle requires that the expenses of a period are matched against the related revenue earned during the same period. Therefore matching principle results in the presentation of a more balanced and consistent view of the financial performance of a company. In ideal situation, the matching is based on a cause and effect relationship: the sales that have caused the costs of goods sold also commissions the expense. If no cause and effect relationship exists, an expense is recorded in the accounting period when a cost is used up or has expired.

For inventory accounting the standards stipulate that the amount of cost is to be recognized as an asset and carried forward until the related revenues are recognized. The cost of inventories includes all costs of purchase, costs of conversion and other costs incurred in bringing the inventories to their present location and condition. When the inventories are sold, the carrying amount of those inventories shall be recognized as an expense in the period in which the related revenue is recognized.

Transportation costs are as any expenses, according to the standards of accrual accounting, recognized in the time period in which they incur not when they are actually paid and they are recorded in the accounting records and reported in the financial statements of the periods to which they relate. The unpaid expense is accrued because it is a liability with an uncertain timing or amount as no invoice has been received yet. If no invoice has been received, the amount of transportation costs has to be estimated based on e.g. agreements and/or historical data in order to be recorded as accrued expense. According to matching principle, the transportation costs ought to be matched with the related sales within the same time period. If no cause and effect relationship exists, as often is the case with transportation costs, an expense is entered as an adjusting entry in the bookkeeping. Transportation costs are costs of sales and will appear as a selling expense in the period in which they occur.
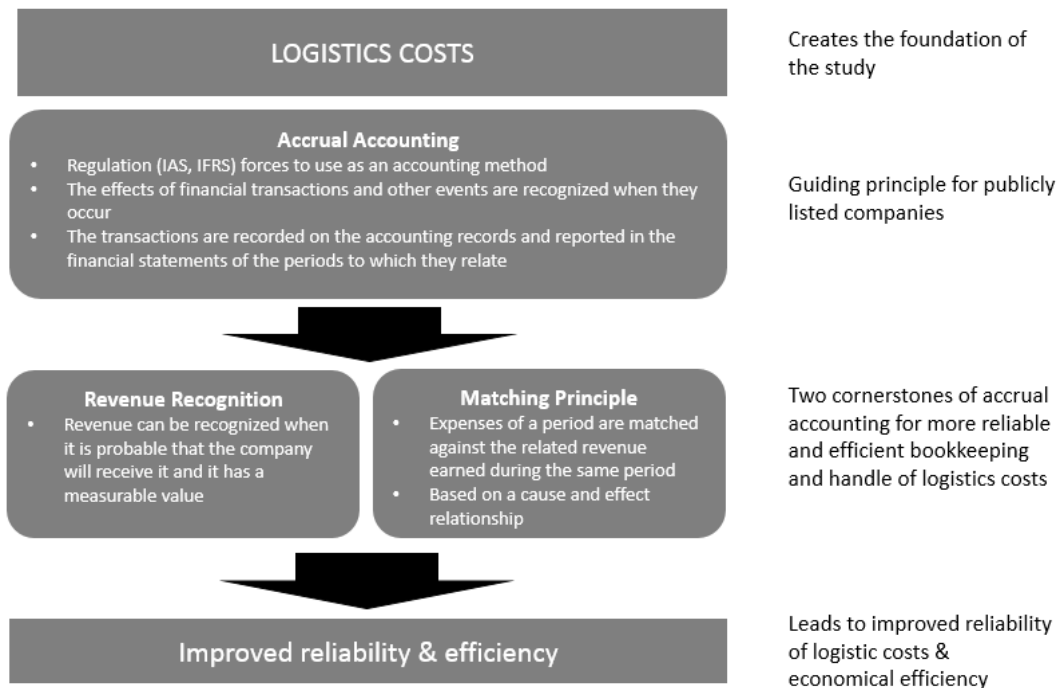
Contextual Framework of the Study

As it was presented earlier the logistics costs creates the foundation of this study. The study is aim to evaluate the effects of logistics costs which have crucial impact on such as accounting and company´s performance (Grant, et al. 2006; Guasch & Kogan, 2006; Barbero, 2010; Guerrero et al., 2010). Typically companies are struggling with logistics costs since it is difficult to define and control those (Grant et al., 2006).

However, there is a guiding principle for publicly listed companies (such as the case company Stora Enso is) to define and control their logistics costs: accrual accounting. From regulatory perspective it is mandatory to use the accrual accounting as an accounting method if the company is publicly listed. As it was stated earlier accrual accounting refers to the rule that the effects of financial transactions and other events are recognized when they occur. Furthermore the transactions are recorded on the accounting records and reported in the financial statements of the periods to which they relate.

Accrual accounting has two cornerstones for more reliable and efficient bookkeeping and handle of logistics costs: revenue recognition and matching principle. Revenue recognition means that the revenue can be recognized when it is probable that the company will receive it and it has a measurable value. Matching principle means that the expenses of a period are matched against the related revenue earned during the same period. It is also based on a cause and effect relationship.

With proper use of these methods organization improve its reliability of logistics costs and economic efficiency. However, typically this requires not only know-how of regulation and other rules, but also know-how of practicalities and efficient systems and tools such as ERP and SAP to use which need to be aligned.

The following picture 7 forms the contextual framework to evaluate the effects of logistics costs in order to improve reliability and efficiency which are crucial factors for accurate accounting and company performance.

LOGISTICS COSTS — Creates the foundation of the study

Accrual Accounting
- Regulation (IAS, IFRS) forces to use as an accounting method
- The effects of financial transactions and other events are recognized when they occur
- The transactions are recorded on the accounting records and reported in the financial statements of the periods to which they relate

Guiding principle for publicly listed companies

Revenue Recognition
- Revenue can be recognized when it is probable that the company will receive it and it has a measurable value

Matching Principle
- Expenses of a period are matched against the related revenue earned during the same period
- Based on a cause and effect relationship

Two cornerstones of accrual accounting for more reliable and efficient bookkeeping and handle of logistics costs

Improved reliability & efficiency

Leads to improved reliability of logistic costs & economical efficiency

Picture 7. The contextual framework of the study.

41

4 METHODOLOGY

This chapter covers the research methodology used and explains the choices that have been made. The research methodology used is formed around statistical test of the sample data. First, the basic idea of quantitative study is explained in section 4.1. Second, section 4.2 opens up the research process done for this thesis. Section 4.3 explains the how the data was handled for the analysis, last section evaluates the reliability and validity of this research.

4.1 Quantitative Study

When using the quantitative approach, an analyst will concentrate on the quantitative facts or data associated with the problem and develop mathematical expressions that describe the objectives, constraints, and other relationships that exist in the problem (Anderson et al. 2010). With one or more quantitative methods the recommendations for solving the problem can be drawn from the quantitative data. Quantitative research is applied when questions related to quantities and percentages and relations between different research objects or changes in research matters are investigated (Heikkilä, 2001). Quantitative methods are mainly used when a large number of objects are studied and common patterns are analyzed. According to Nau (1995) quantitative research look for distinguishing characteristics, elemental properties and empirical boundaries and tend to measure how much or how often.

Using quantitative methods in research has many advantages. Unlike qualitative research methods, in quantitative research there is no dependence between researcher and subject being observed. The measurements in qualitative research are done by objective methods rather than being inferred through sensation, reflection or intuition. Quantitative methods enable comparison and replication, this is why reliability and validity may be determined more objectively than with qualitative methods. The lack of ascertaining deeper underlying meanings and explanations is considered to be a weakness of quantitative research (Amaratunga et al. 2002). That can result in incorrect conclusions if the subject of the research is not known to the researcher. Often by using quantitative research methods

reasoning associated with the situation are not discovered (Heikkilä, 2001). (Amaratunga et al. 2002)

Quantitative research is conducted through analysis of numerical data, which may be collected using primary (e.g., questionnaire) or secondary (e.g., existing company reports or macroeconomic data) sources. Secondary data, according to Ghauri and Grønhaug (2005), are useful to find information in order to solve the research problem. In addition to that secondary data are helpful in understanding and explaining the research problem. Secondary data has been collected by someone else than the user and may have been collected for a different purpose. There are numerous types of secondary data available, e.g. books, journal articles, online data, reports, but the sources are divided into two groups, internal sources and external sources. The benefit of secondary data analysis is that it saves time and money. And in the case of quantitative data, the database is more extensive and usually of higher quality than what the researches could produce on their own. Most of the data collected by international organizations or governments are of high quality and reliable as they are collected and complied by experts using rigorous methods. The data used in this thesis have been collected by international organization. The drawback of secondary data is that the data is usually collected for another study with different objectives and they may not completely fit the problem of the user of secondary data. Naturally this is not the case in thesis. Another problem is that the accuracy of the data is on the responsibility of the researcher, inaccuracies cannot be blamed on the secondary source. (Ghauri & Grønhaug, 2005)

4.2 Research Process

As different ERP systems are used in the case company it has led to differences in the reporting of logistic cost. This thesis tries to explain some of the main reasons for variations in the logistic costs of the case company. The specific subject for the research was chosen because it has not yet been studied by the case company and due the triviality of the problem it has not been in the main interest of the academic world. For the case company the research subjects is not insignificant, and even the management has implied that the subject altogether is very

important. The research was conducted as quantitative study because quantitative method was the most suitable approach dealing with large number of numerical objects.

What has been studied in the empirical part of the thesis is that how much of the invoices during a certain period of time have been caused by the activities during the same period and how much of the invoices are due to activities before that period. This should give an indication of how much of the variation in the logistic cost are due to the fact that activities can be undertaken on a different time period than the cost of it is recognized.

An order can be transported in several ways and in several shipments (e.g. with several trucks). The products can be stored in warehouses for some time and there is also a possibility that the activity and the invoice do not occur until after the sales. All this affects on the variation of the logistic costs. It has also been studied in this thesis how much of the activities are undertaken during the same time period as the sales occur. The amount of sales has been compared to the amount of invoices in the same time period.

The main data used in this study was secondary data from internal sources of the case company. This data comprehended reports including dates of invoices, activities and sales from different production units. In addition to these reports, some documents provided by the case company were used, mainly as background material. Different calculations and statistical methods were used in aid to interpreting the information in the reports.

The secondary data were considered to be the most appropriate method to investigate how grand an effect the activities and invoices that arrive in different time periods have on the variation of logistic costs. The case company collects data, which is relevant considering this study, for their own reporting purposes so it made no sense to try to figure out a proper method for collecting primary data of the subject. From the reporting data necessary calculations and statistical analysis can be conducted.

The analyzed data was collected as reports through ERP system Fenix which SE Logistic uses for sales and production planning as well as for administrating the

flow of goods in paper, board and pulp business. Two types of invoicing reports were loaded from Fenix: Transport Invoice report and Invoice List report. The Transport Invoice report contains information like the dates when the transportation has taken place/started (activity date) and when the invoice has been booked into SAP (cost appear in accounting) by SE Logistic (invoice date), the mill order number, amount of tons that have been transported, the transportation method (train, truck, ship) and the total costs. As for the Invoice List report, it contains the mill order number also and the bookkeeping period among other things. The bookkeeping period represents the sales date, i.e. the date when the sales have been entered into the bookkeeping.

The evaluation was made for every production unit of Stora Enso the Fenix covers. The sample size included one quarter's, i.e. three months', data. Each month for each production unit was reported on their own and then the monthly reports were combined into quarterly report.

4.3 Data Analysis

Having described how the data was collected, this section covers the methods of data analysis.

In order to do certain types of data analysis, like discussing the characteristics of a frequency distribution or comparing data across categories, as in this thesis, the raw data needs to be processed to some common base. Blaikie (2003) introduces two related ways to do this: by calculating either proportions or percentages. Percentages are another way of expressing a proportion and more commonly used, perhaps due to the fact that whole numbers are easier to read and are less prone to recording and reading errors than numbers starting with a decimal point. The equation for calculating percentages is following:

$$Percentage\ (\%) = \frac{f}{n} \cdot 100 \qquad\qquad (I)$$

where f is the frequency for any category, and n is the total number of responses or units for all categories. (Blaikie, 2003)

Terms like invoice, activity and sales are used in the analysis. Invoice indicates the arrival of the actual bill that has been occurred due to transportation of the products. Activity refers to action performed by the transport service provider. Sales stand for the actual sales of the products, when the sales invoice has been entered into the bookkeeping (revenue recognition may postpone the sales).

The data derived from the IT systems was modified in Excel into an analyzable form. Sales date for each mill order was defined with VLOOKUP-function. Picture 8 presents a part of an Excel table of typical Transport Invoice report. Column Sales Date has been added in order to define the sales date from Invoice List report, which in the function has been referred as MOL. The Invoice List report contains the sales dates for each order number that was sold during the time period under consideration.

	A	B	C	D	E	F	G
1	Stora Enso Oyj						
2							
3							
4							
5							
6	Mill order number	Sales Date	Invoice Date	Activity Date	Tons	Invoice Number	Invoice Date
7637	UPRU-100195	=IF(ISNA(VLOOKUP(A7637;MOLIC$3:E$4933;3;FALSE)=TRUE);"";VLOOKUP(A7637;MOLIC$3:E$4933;3;FALSE))					
7638	UPSE-100005	5.8.2011	24.08.2011	05.08.2011	2,549	1788780	24.8.2011
7639	UPTR-100005		30.08.2011	26.03.2011	0,000	1789211	30.8.2011
7640	UPTR-100006		30.08.2011	26.03.2011	0,000	1789211	30.8.2011
7641	UPTR-100007		30.08.2011	26.03.2011	0,000	1789211	30.8.2011
7642	UPTR-100018		05.08.2011	27.05.2011	1,860	1787533	5.8.2011
7643	UPTR-100021	17.8.2011	18.08.2011	30.07.2011	8,580	1788495	18.8.2011
7644	UPTR-100021	17.8.2011	18.08.2011	30.07.2011	0,000	1788495	18.8.2011
7645	UPTR-100021	17.8.2011	18.08.2011	30.07.2011	0,000	1788495	18.8.2011
7646	UPTR-100022	13.8.2011	30.08.2011	13.08.2011	0,000	1789211	30.8.2011
7647	UPTR-100022	13.8.2011	30.08.2011	13.08.2011	10,150	1789211	30.8.2011
7648	UPTR-100022	13.8.2011	30.08.2011	13.08.2011	60,900	1789211	30.8.2011
7649	UPTR-100023	13.8.2011	30.08.2011	13.08.2011	0,000	1789211	30.8.2011
7650	UPTR-100023	13.8.2011	30.08.2011	13.08.2011	10,094	1789211	30.8.2011
7651	UPTR-100023	13.8.2011	30.08.2011	13.08.2011	60,564	1789211	30.8.2011
7652	UPTR-100024	13.8.2011	30.08.2011	13.08.2011	0,000	1789211	30.8.2011
7653	UPTR-100024	13.8.2011	30.08.2011	13.08.2011	0,475	1789211	30.8.2011
7654	UPTR-100024	13.8.2011	30.08.2011	13.08.2011	2,850	1789211	30.8.2011
7655	UPTZ-100013		18.08.2011	18.07.2011	0,000	1788495	18.8.2011
7656	UPTZ-100013		18.08.2011	18.07.2011	2,781	1788495	18.8.2011

Picture 8. View of the Transport Invoice report with the sales dates for mill orders.

Pivot table shown in picture 9 was conducted from the Transport Invoice report after the sales dates have been defined. Pivot table compresses the information so that if a mill order number has several rows with identical dates, they can be merged as one. With the information from the Pivot table the necessary calculation were made. With Excel's VLOOKUP- and IF- functions the amount of invoices and activities per month were determined as well as the amount of activities before the time period at hand.

3	Sum of Actual□Cost			
4	Mill order number ▼	Sales Date ▼	Invoice Date ▼	Activity Date ▼
5	UFAE-100029		18.08.2011	04.08.2011
6	UFAE-100030		18.08.2011	04.08.2011
7	UFAE-100031		18.08.2011	04.08.2011
8	UFAE-100032		18.08.2011	04.08.2011
9	UFAE-100033		18.08.2011	04.08.2011
10	UFAE-100034		18.08.2011	04.08.2011
11	UFAE-100035	4.8.2011	30.08.2011	04.08.2011
12	UFAE-100036	4.8.2011	30.08.2011	04.08.2011
13	UFAE-100037	4.8.2011	30.08.2011	04.08.2011
14	UFAE-100038	4.8.2011	30.08.2011	04.08.2011
15	UFAE-100039	4.8.2011	30.08.2011	04.08.2011
16	UFAE-100040	4.8.2011	30.08.2011	04.08.2011
17	UFAE-100041	4.8.2011	30.08.2011	04.08.2011
18	UFAE-100042	4.8.2011	30.08.2011	04.08.2011
19	UFAR-000725		11.08.2011	14.02.2011
20	UFAR-000726		11.08.2011	14.02.2011
21	UFAR-000728		11.08.2011	14.02.2011

Picture 9. View of the PIVOT-table conducted from the Transport Invoice report.

Defined was also the quantity of how many of the activities during certain time period also had a sales date in the same period. The same was also defined for invoices and sales. The amount of activities, either during a certain time period or before it, with a sale in certain time period was calculated. After that the different ratios of the numbers gained from the calculations were defined. Table 2 presents these ratios for a one month time period.

Table 2. Different ratios of the amounts of sales, invoices and activities calculated for the analysis.

Mill	Share of Activities during July out of Invoices in July	Share of Activities during July linked to Sales in July out of all Activities	Share of Invoices linked to Sales in July out of all Invoices	Share of Activities preceding July linked to Sales in July out of all Activities	Share of Activities during July linked to Sales in July out of Activities during July
1	33,01 %	27,68 %	44,48 %	16,80 %	83,86 %
2	40,99 %	39,07 %	41,44 %	2,37 %	95,32 %
3	36,32 %	33,36 %	53,94 %	20,58 %	91,85 %
4	41,42 %	38,36 %	61,50 %	23,14 %	92,61 %
5	47,46 %	43,20 %	63,80 %	20,60 %	91,02 %
6	21,25 %	14,68 %	40,01 %	25,32 %	69,10 %
7	32,84 %	31,98 %	54,19 %	22,21 %	97,40 %
8	53,74 %	53,11 %	67,97 %	14,86 %	98,82 %
9	50,94 %	49,13 %	67,41 %	18,28 %	96,44 %
10	39,44 %	38,23 %	63,74 %	25,50 %	96,94 %
11	24,80 %	22,55 %	48,35 %	25,80 %	90,94 %
12	29,51 %	22,29 %	43,24 %	20,95 %	75,54 %
13	60,13 %	60,04 %	70,44 %	10,41 %	99,85 %

4.4 Quality of the Study

This section provides an assessment of the quality of this study. According to Koskinen et al. (2005), validity and reliability defines the quality of empirical study. Validity refers to the extent to which the observed differences in responses reflect true differences in the measured characteristics (Aaker et al. 1998). What that means to say is, whether the selected method truly measures what it is supposed to measure. Whereas reliability refers to the extent to which measures are free from random error and the results are consistent across repetitions (Aaker et al. 1998).

The validity of this thesis is based on the appropriate selection and utilization of the research methods that were used. Quantitative method was a natural choice as the research data consisted on numbers and the number of studied objects was large. According to Heikkilä (2001) quantitative research is applied when questions related to quantities and percentages and relations between different research objects or changes in research matters are investigated, as is done in this thesis. The credibility of this thesis has been achieved through transparency of the research process, high quality data, careful data analysis, and presenting findings continuously to the case company. Furthermore, the arguments in the empirical analysis are supported by graphs of the results to provide the reader the possibility to evaluate the validity of interpretations and estimate the quality of conclusions.

Reliability refers to the repeatability of the research, the extent to which findings would be repeated if the study is replicated. In this thesis the reliability is achieved through giving a detailed description of how the study is conducted, including a detailed research process, using large samples of data and conducting statistical tests to ensure the significance of results.

Conducting totally neutral research is not really a possibility due to researcher´s own values, assumptions and ethics unavoidably will influence at some level. Denzin and Lincoln (2003), however, state that a researcher has to believe that he can with objectivity, clarity and precision report on his own observations. According to Lincoln and Guba (1985), objectivity refers to the extent to which interpretations are the results of the participants and the phenomenon as opposed to the bias caused by the researcher. In this thesis the objectivity is ensured by the

credibility of the empirical data, analysis and the reporting. During the research process, the findings were presented and discussed with the case company constantly.

5 CASE COMPANY – STORA ENSO

The case company in this thesis, Stora Enso, is a global packaging, paper and wood products industry. This chapter presents the case company, reveals the main points of its history and tells the present situation of the company as well as its visions.

5.1 History

Stora Enso's history extends back over 700 years and the company has operated uninterruptedly since. This makes Stora Enso the world's oldest limited company that has operated continuously since its founding. Originally Stora was a mining company and was world's largest producer of copper in the 14th century. Into the forest product industry Stora moved in 1885. Enso Oyj does not possess roots extending so far into the past as Stora but the origin in the forest products industry is similar as Enso Oyj also derived from a sawmill. This sawmill was founded by the Norwegian firm W. Gutzeit & Comp. in 1872 (Stora Enso, 2011a)

As a result of the merger in 1998 Stora Enso became the second-largest forest products company in the world in terms of capacity and the company held leading positions in its core product areas: magazine paper, newsprint, fine paper and packaging board. In addition the company gained better logistics and financial strength. A new CEO Jouko Karvinen took over in 2007 and around the same time Stora Enso established its new strategy. Along with the new strategy further restructuring of the Group would take place in the near future. (Stora Enso, 2011a)

5.2 Stora Enso today

Nowadays Stora Enso is a global company which operates in packaging, paper, biomaterials and wood products industry. The company has three main business areas which are Renewable Packaging, Biomaterials (pulp) and Printing & Living (papers and wood products). Stora Enso is one of the leading companies in its business and has employees as well as production units in over 35 countries worldwide but most of them are situated in Europe. (Stora Enso, 2014)

Stora Enso's annual production capacity is 11.7 million tonnes of paper and board, 5.4 million tonnes of chemical pulp, 1.3 billion square meters of corrugated packaging and 5.6 million cubic meters of sawn wood products, including 2.9 million cubic meters of value-added products. In 2013 Stora Enso's annual sales totaled EUR 10.5 billion of which operating profit was EUR 34 million (0,3 %). The Group has approximately 28 000 employees. (Stora Enso, 2014)

According to Finnish Forest Industries Federation (Metsäteollisuus ry) Stora Enso was 5th biggest forest products company in the world measured by revenue (picture 10). In 2012 Stora Enso was the biggest forest products company in Finland as well as in Europe measured by revenue, as the picture 11 shows.
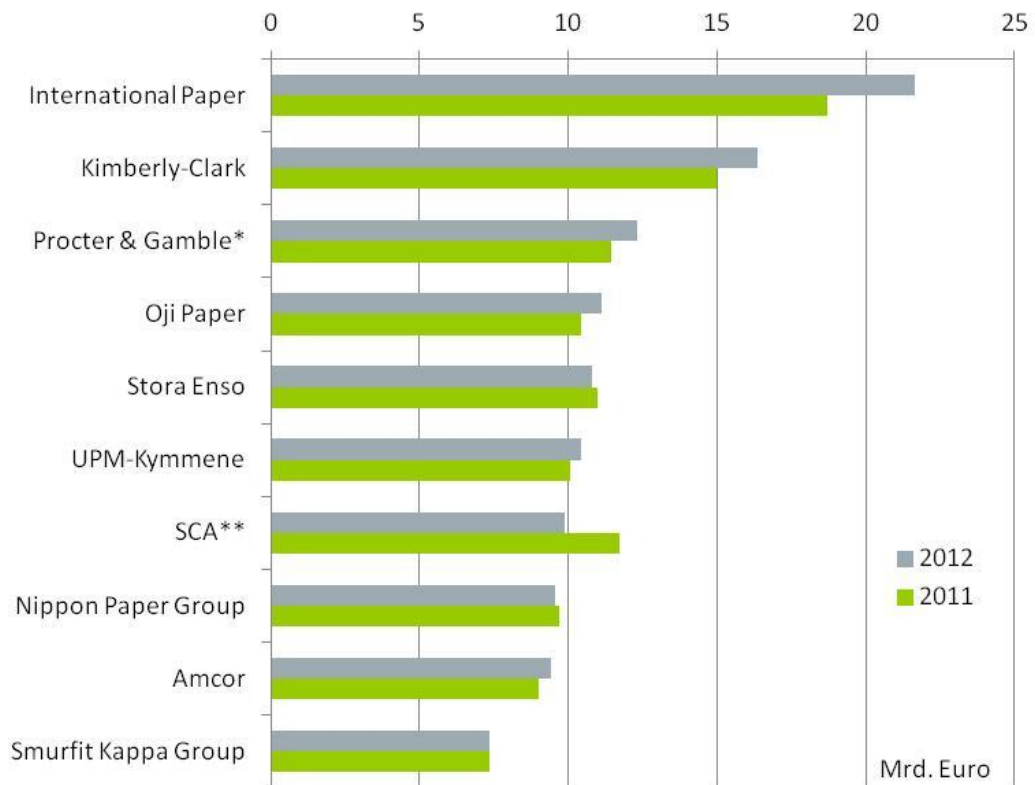
Picture 10. World's biggest forest products companies measured by revenue (billion €) in 2012. (Metsäteollisuus ry, 2013c)
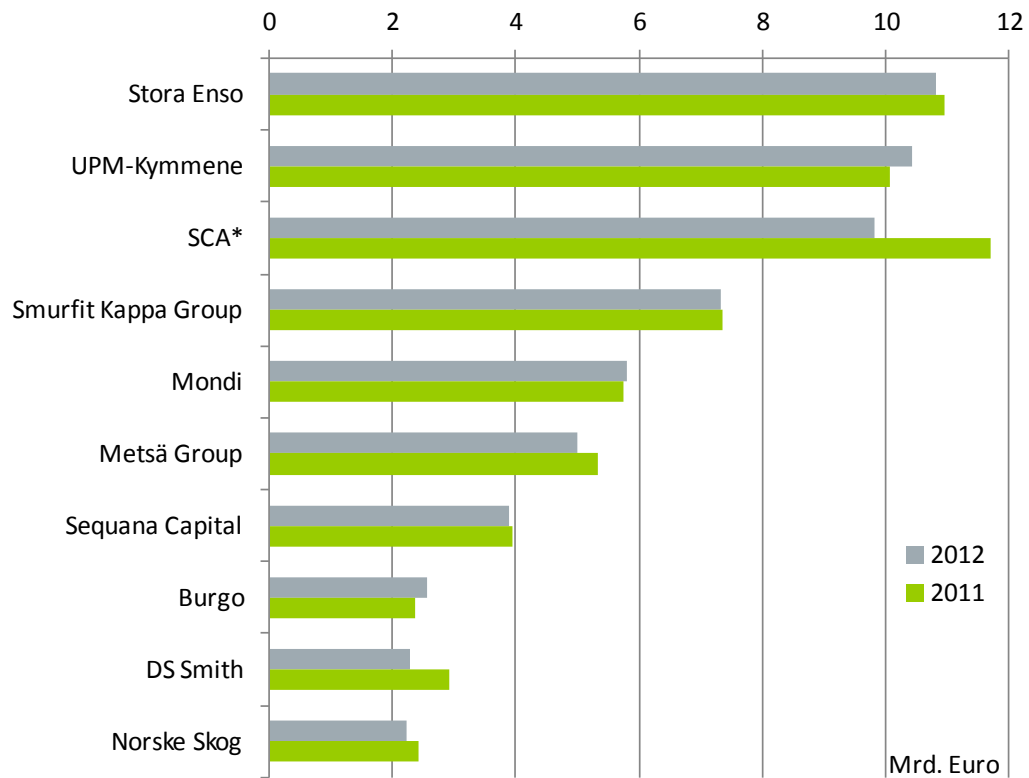
Picture 11. Europe's biggest forest products companies measured by revenue (billion €) in 2012. (Metsäteollisuus ry, 2013c)

Most of the company's personnel and production capacity are in Europe where the main market area still is but Stora Enso as well as other European paper manufacturers has faced the challenges created by the overcapacity in paper production in Europe. The company is nowadays investing in renewable materials and mills with potential in the long run in order to stay competitive. As the world and the way of making business is changing Stora Enso needs to stay up to date in order to maintain its position as a leading forest products company. The corporate has made a commitment to sustainable development as it enlarges its business in Latin America and in China. (Stora Enso, 2014)

The pulp and paper industry is in the middle of turbulence of structural changes, and has been for a while now, as Calsson et al. (2006) wrote about it eight years ago. One of the biggest changes has been the growing paper market in Asia. Due to the lack of forests in China to be used as a raw material in the pulp and paper industry, the demand of paper products has been satisfied through imports of finished products and, more importantly, pulp. Latin America is considered to be the major source of pulp due to the fast growing eucalyptus. Nowadays there are

big eucalyptus plantations and pulp mills providing supply to the need overseas. Figure 12 shows Carlsson et al. (2006) view of the global flow of wood fibers. With the growing demand in Europe is meant that there was seen a small growth of demand in Eastern Europe. Still the figure 10 presents fairly good view of where the growth potential of markets lies.
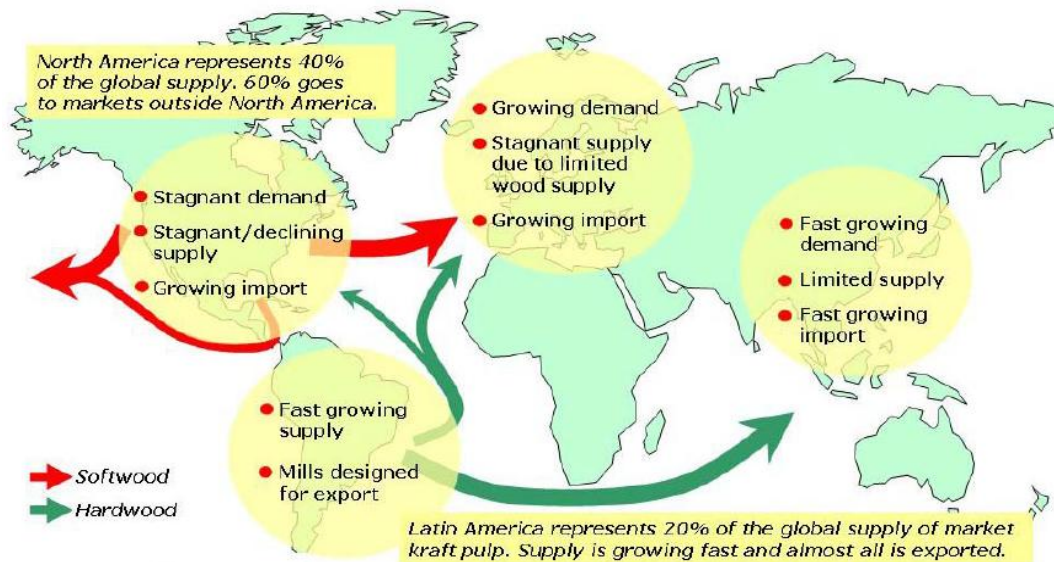
Picture 12. The global flow of the wood fibers (Carlsson et al., 2006).

As the markets in China and in Latin America are growing and believed to be notable markets in the near future, the focus of Stora Enso is also on the markets in Asia and Latin America with products of fiber-based packaging, plantation-based pulp, innovative biomaterials, competitive paper grades and sustainable building solutions. The rapidly expanding Asian paper and paperboard market offers huge demand for Stora Enso's products. Latin America has become a cornerstone of Stora Enso's strategy of low-cost pulp from tree plantations. (Stora Enso, 2014)

5.3 SE Logistics

Stora Enso Logistics is the shared transport and distribution organization of Stora Enso. The aim of the organization is to design, procure and manage the solutions for transport, storage and distribution of the Group's products as well as for the related information that creates value for Stora Enso. The services needed for the material flow are purchased from subcontractors. Enso-Gutzeit Oy used to

practice as a ship-owner as well but transportation equipments no longer belong to Stora Enso's assets. Picture 13 shows how the processes of Stora Enso Logistics are linked to the order process of the whole organization. (Stora Enso, 2011b)

Stora Enso Order Process

Pre Sales → Order → Production → Delivery → Invoicing → After Sales

Stora Enso Logistics

Design & Procurement → Capacity management → Dispatch (planning and booking) → Invoice and payments handling → Admin and Control

Logistic service suppliers

Mill — Customer
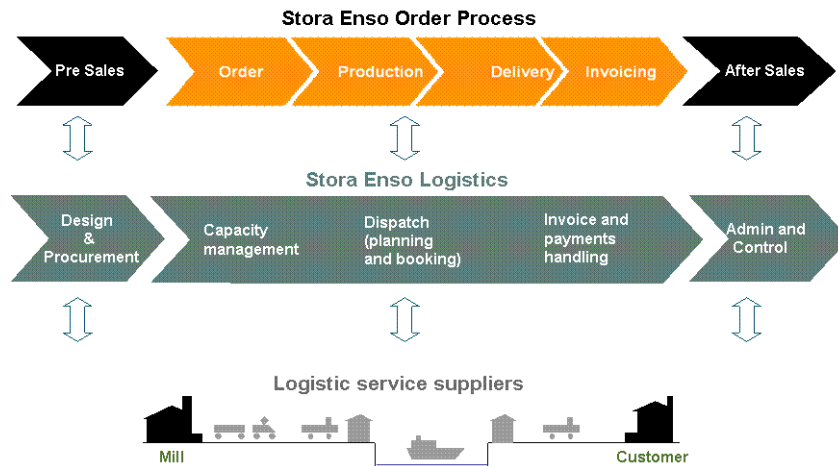
Picture 13. Links between logistics and order processes at Stora Enso (Stora Enso, 2011b).

In 2010 transportation volumes for Stora Enso Logistic were over 13 million tonnes of pulp, paper and board, and approximately 6 million cubic meters of saw wood and value-added products. The organization has 150 employees around Europe and the transportation/logistics cost for Stora Enso in 2010 ended up to be 10 % of the company's turnover. Picture 14 presents a graph of what are the elements causing the transportation costs and what are their shares of the total logistic costs. (Stora Enso, 2011b)

2%
30%
31%
12%
13%
12%

- ■ Road
- ■ Rail
- ■ Oversea
- ■ Ports
- ■ Shortsea
- ■ Terminals
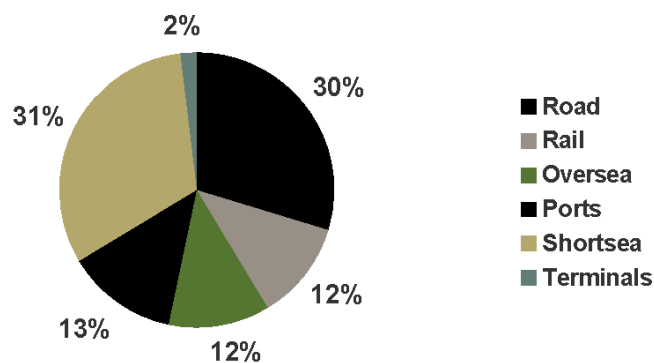
Picture 14. Shares of elements causing costs in Stora Enso's logistics (Stora Enso, 2011b).

54

6 PROCESS OF LOGISTIC INVOICING AT STORA ENSO

This chapter introduces the different ERP systems SE Logistics uses in dealing with the logistics invoices. Also the invoicing process will be illustrated in the light of logistic chains.

6.1 Invoice Processing System

Invoice Processing System (IPS) is an application used for handling transport cost related suppliers. IPS is used by group accounting. For Stora Enso, IPS has four main tasks: matching operational and financial information, creating invoices, transferring information and reporting. (Stora Enso, 2011c)

Stora Enso Accounting services use IPS to handle transport costs which are divided among the selected transactions, and to match the operational information with the financial information. The purpose with the matching function is to make sure that the exact amounts are paid, no less and no more. Matching also enables the follow up of the transportation costs alter on from Fenix. (Stora Enso, 2011c)

Suppliers can send their invoices as traditional paper form or as electronic invoices. The paper form invoices are scanned into SAP and sent to IPS and electronic invoices can be sent straight to IPS. When the invoice has been sent to IPS, it creates an automated invoice. Sending invoices electronically is possible as IPS is a web application. The advantage with an automatic invoice is that the operational information is matched automatically with the financial information. The only requirement for automatic invoices is that agreed references from the transport information also can be found on the invoice. Invoices can also be created in IPS and sent as a credit note (known as selfbilling) to the supplier instead the common way. It has been defined in the invoice what has been delivered and how much the costs are. The supplier needs to approve the invoice in order to receive the payment from SE Logistic. The purpose of this uncommon way is to reduce the invoice flow and have better control of the matching between financial and operational information. (Stora Enso, 2011c)

IPS transfers information to other systems for book keeping and cost follow up. IPS operates as a link between SAP and Fenix. IPS handle transport cost related supplier invoices and provides the actual transport cost for Fenix's cost reporting. (Stora Enso, 2011c)

6.2 FENIX

Fenix is a business application which covers sales and customer service. It has been developed for the needs of Stora Enso, thus it is one of a kind and has not been commercialized. Fenix is used for order handling, logistics, invoicing and sales planning. It comprehends also tools for production planning as well as for administrating the flow of goods in paper, board and pulp business. Fenix's operational environment consists of service organizations, logistics services and business units and areas. Service organizations contain customer service centers and sales companies, logistical services are in charge of distribution capacity and delivery chain management. Business units and business areas are responsible for business decisions in the whole business process and also manage the capacity of the paper and board machines. Fenix has an own application for messaging which enables the automatic processing of orders, production, unit, delivery, invoicing and other information. The messaging application connects Fenix to SE mills, Logistics and with customers and partners. Fenix is also connected to SE SAP through SAP/R3 connector. Fenix is constantly improved and developed further; there are hundreds of changes done for every new release which are announced about five times a year. Fenix workflow and order to delivery process is presented in picture 15. (Stora Enso, 2011d)
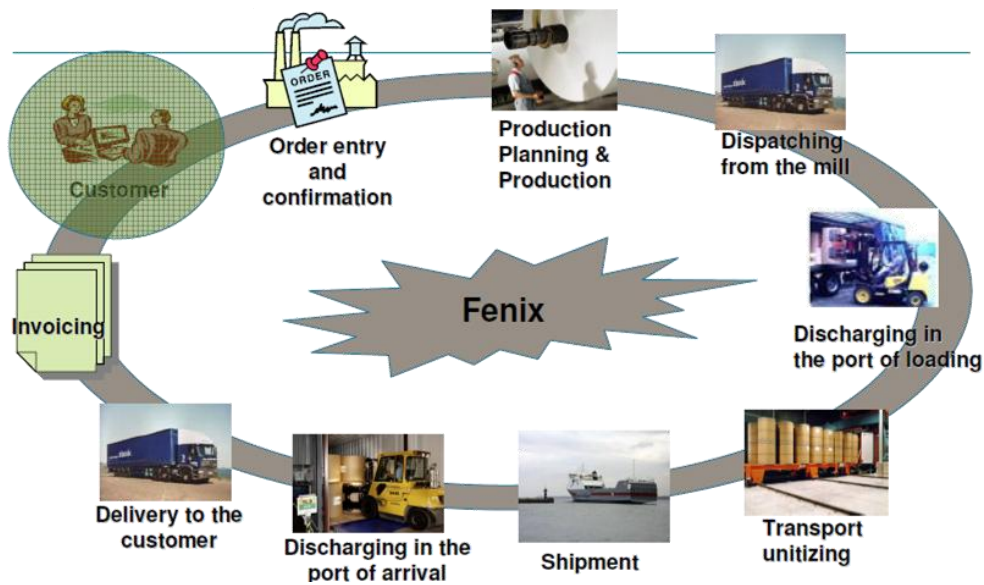
When a customer places an order, it is entered into the system and confirmed. Before entering the order data into Fenix, it has been decided which mill will produce that order, unless the customer has required a certain product form a certain mill. The production needs to be planned in order to avoid idling and reject. When the produced goods are loaded into the trucks in order to be delivered from the mill to port, the mill systems creates a waybill into the Fenix and Fenix transfers the information to the port. When the products arrive at the port and the trucks are unloaded, the port registers which units have arrived and taken into the warehouse, this information in send back to Fenix. When the units are loaded in the container, supplier at the port informs Fenix which ones. When the containers are full they are loaded in the ship. Port informs Fenix which units have been loaded on to a ship and then Fenix informs the next location. As the ships arrive to right destination and they are unloaded, Fenix gets the information from the port. The same information loop is gone through as the products are moved into a warehouse. Internal call-off with delivery instruction can be used to inform the delivery of goods from the port to Inland Terminal, this instruction Fenix delivers to the port. Units are loaded based on the call-off. Loading specification is created and all required delivery documents are produced. Port sends the unit information through Fenix to the warehouse. (Stora Enso, 2011d)

6.3   SAP at Stora Enso

Stora Enso has used SAP's system since 1998. Over the years the concern has been formed by absorbing several independent companies which all had their own systems. These systems needed to be incorporated to Stora Enso's system. In 2001 and 2003 the system has been updated and expanded target being a European wide operating base. Although the expansion has met many business units still exceptions can be found, e.g. SE Logistics. Mills are now using SAP systems successfully in their operations and the Group level uses SAP as an accounting tool. (Stora Enso, 2011e)

SAP is used by Stora Enso for administrative purposes in mills and other units for the following corporate functions:

- Accounting
- Plant Maintenance
- Human Resources and Payroll
- Materials Management

Stora Enso uses SAP version R/3, the system consolidates data from different departments into a common database which the entire group has an access to. SAP R/3 is used in management processes and support processes. Core processes are dealt with Fenix. The processes handled with SAP and Fenix are shown in picture 16. (Stora Enso, 2011e)
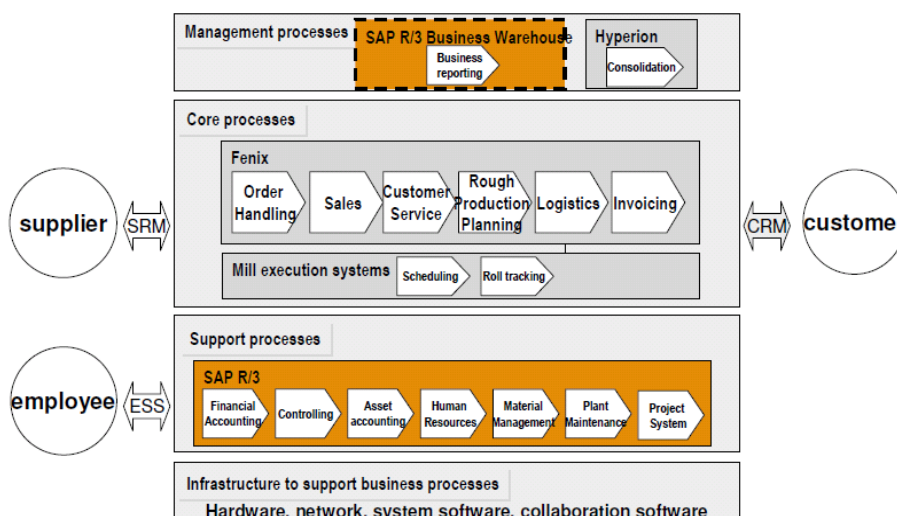
Picture 16. Processes handeled by SAP and Fenix. (Stora Enso, 2011e)

6.4 Hyperion

Hyperion is a general name for a product family of different software applications targeted at the business intelligence (BI) and business performance management markets. The software products are actively developed and sold by Oracle as Oracle Hyperion products after the acquisition in 2007. (Hyperion, 2014)

Oracle Hyperion Planning is an agile and centralized planning system that supports planning, budgeting and forecasting, and integrates both financial and operational planning processes aiming to improve business predictability. Oracle Hyperion Planning is web-based and can be used with Microsoft Office interfaces so the data can easily be modified for example in Excel. The software is a useful tool for communication of financial details between different business units, it aligns financial plans, models and forecast across cost centers enabling better decision making. Oracle Hyperion Planning can be used for generating reliable statistical predictions as it uses historical data over a long period of time and it captures the impacts of seasonality. An example of what the spreadsheet of Oracle Hyperion Planning might look like is shown in picture 17. (Oracle Data Sheet, 2014)
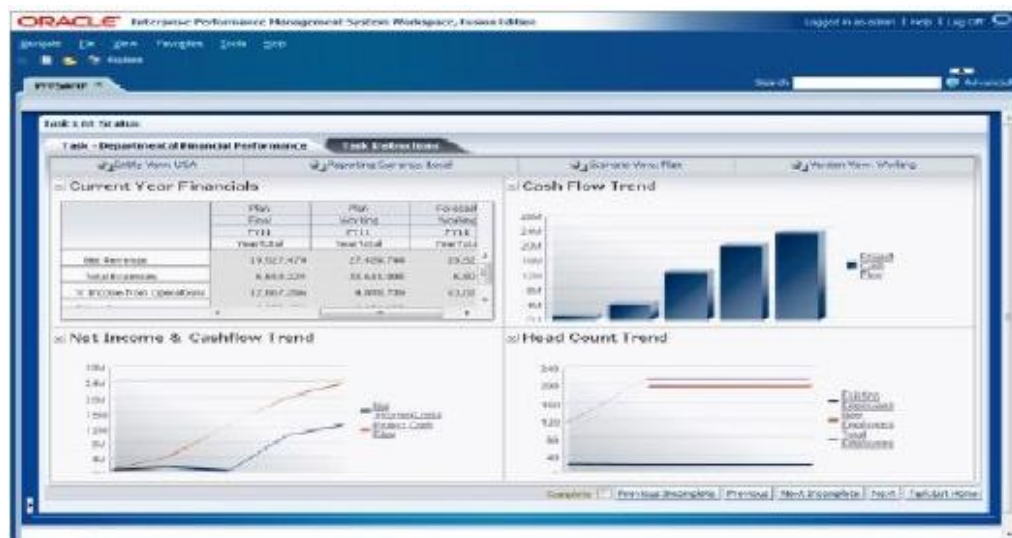
Picture 17. An example outlook of a spreadsheet of Oracle Hyperion Planning.

At Stora Enso Oracle Hyperion Planning is used to consolidate different reports and forecasts from SAP for management reporting. All data needed for financial statements and balance sheets are recorded in SAP according to the regulations of IFRS. This data can be consolidated to Oracle Hyperion Planning and can be

worked into forecasts and other reports necessary for management reporting. The management reports do not have to be drawn after the regulation of accounting standards, thus the data can be modified with Hyperion into a form that is easier to interpret. (Stora Enso, 2011f)

6.5 Different Scenarios of Logistic Cost versus Accounting at Stora Enso

Stora Enso Logistics operates as a link between different company business areas and suppliers such as shipping company, expediter and carrier. Logistics organization is responsible of arranging the transportation chain from mill to final customer. When the centralization of logistic functions was conducted, major changes took place in the internal processes. The transportation invoices no longer arrived to the mills but were first delivered to SE Logistics which processed the invoices before forwarding them to the mills. The mills had been responsible for organizing the truck transportation needed and paying the transportation invoices. All this changed and the mills lost the sight of their transportation invoices as well as the control over them. When the transportation invoice came to SE Logistics, none of the systems processing the invoice can link the invoice to the mill it regards before the invoice has been processed.

The transportation invoices are forwarded to the mills after the invoices are first processed by SE Logistic. The invoices do not need to be accrued by the mills because the invoices are already accepted and being paid by SE Logistics. Before the logistic functions were centralized, some of the investigated mills had used cash-based accounting method for their transportation invoices and some had a very manual way to execute the accrual accounting method.

After the centralization the accrual process operated fine on the Group level but not internally. The mills required that the internal accrual process should be organized so that the mills could better follow their transportation invoice flow. The illustrated invoicing processes hereinafter present the initial situation of the process at the time when this thesis was started.

As mentioned earlier, SE Logistics uses three different ERP systems for processing customer orders, sales, transportation and logistics costs. The differences of the three systems used cause their own challenges for accounting and in addition to that the way the costs of transportation behave can cause substantial fluctuations in bookkeeping making it hard to analyze.

The time between the moments that the product is transported and the costs of that transportation are paid is relatively long. The time between the transportation and actual sales can be even longer. And the sales can be recorded into the bookkeeping on different month, quartile or even different year than the transportation costs related to that sale. When markets are stable and the costs of transportation do not vary much, there are no problems or questions. Unstable markets and varying sales and transportation costs create variation in accounting figures and this raises confusion and questions in other department as well as in the mills. One of the main measures for transportation cost is €/sales tn.

One of the simplest cases in logistical as well as accounting point of view is probably what the following picture represents (picture 18). Often the customer is invoiced at the same time as the transportation of the order is dispatched from the mill, this is usually the invoicing condition of the case company especially in Central Europe. In this case the sales and the transportation costs can be matched and recorded at the same time period. If the invoice has not arrived by the end of the month when the transportation has taken place, the costs are accrued. In picture 16 the transportation invoice from the transportation supplier arrives in the following month. Even more simple were if the transportation invoice would arrive in the same period as the sales and transportation activity take place.
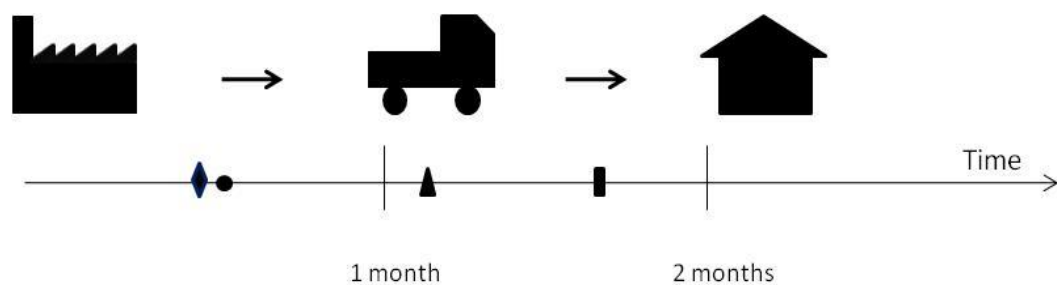
Picture 18. Logistic chain with one transportation mode and two months accounting period.

Picture 19 presents and explains all the symbols used in picture 16 and pictures following it in this chapter.

◆ Transportation activity starts (recorded as accrual if no invoice)

▲ Invoice from the supplier arrives

▮ Invoice transferred into payment process

● Sales recorded

🚚 Truck

🚂 Train

🚢 Ship

🏭 Mill

▪ Warehouse

⬆ Customer
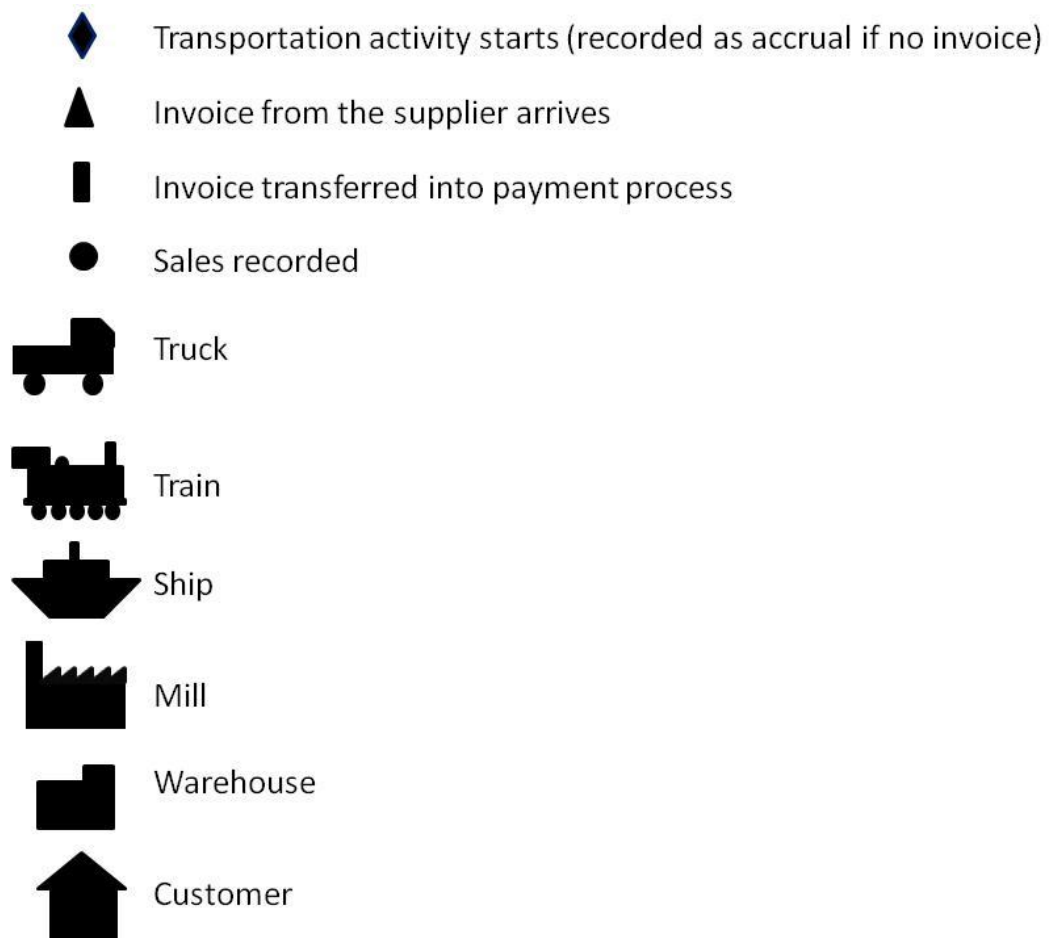
Picture 19. Symbols indicating invoices and sales in the time line pictures.

The transportation activity takes place (◆), and if the transportation invoice has not arrived by the end of the period, the transportation costs are accrued. The invoice arriving from the supplier (▲) is first entered into SAP and in there to SE Logistics. SAP transfers the invoice into IPS, where the invoice is eventually processed. IPS compares the information in the invoice to the information of customer orders in Fenix, and if an order matches with the invoice, the invoice is accepted and returned into SAP. In SAP the invoice is transferred to payment process (▮) and simultaneously another invoice is created in order to be sent to the mill which products have been transported. Sale invoice is created when the delivery reach invoicing point, usually this is when the last delivery leg starts. The sales invoice is recorded as sales (●) when the order reaches delivery point (IFRS

62

revenue recognition rule). This procedure is relative simple and rarely causes any fluctuation or confusion.

The scenario presented in picture 20 shows already problems regarding accounting. The invoice from the supplier has arrived on different time period than when it is accepted and paid by Stora Enso. More complexity creates the sales that do not take place until few months after the first transportation and the transportation invoices that arrive only after the sales are already recorded. This creates fluctuation into the logistics costs in accounting point of view. If the sales are generated in the constant pace, it does not matter if the logistic invoices arrive on different time periods. But if the markets are unsteady and depending also the location of the customer, the logistic costs can vary a lot.
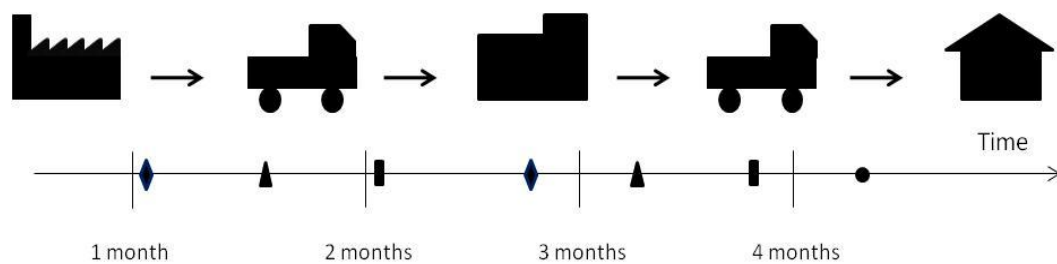
Picture 20. Logistic chain with two transportation modes and four months accounting period.

Even more complicated the situation evolves as the product is stored for different periods of time in warehouses and is shipped to abroad. Picture 21 presents a situation in which the product is moved around with different means of transportation and stored for longer periods of time in warehouses. Invoices from the transportation is arriving throughout the delivery process and the sales of the product takes place in totally different accounting year than what the first transportation costs related to this order. Additionally there are storing expenses related to this product before it is sold, the effect of these expenses are not dealt in this thesis. Their existence is mentioned to point out the many logistic costs related to a product before any earnings can be turned in.
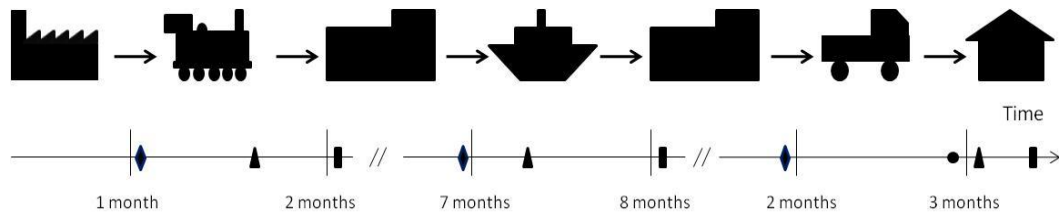
Picture 21. Logistic chain with several transportation modes and handling events and 18 months accounting period.

Then there are cases with such orders of which destination and/or customer changes somewhere in the middle of the delivery process. When that happens, the order number of course changes too. All costs of transportation that have occurred before the change of customer are recorded to the first order number. This of course leads to that there will not be any earnings covering those costs until a new customer is recognized. When the new customer is invoiced the sales income and the transportation costs can be matched. This is more of an issue in the point of view of the different ERP systems rather than that of accounting.

7 RESEARCH FINDINGS

This chapter presents the research findings of this study. The first section describes the historical situation (as-is) when the research was started. The second section focuses on the quantitative part of this research by analyzing transportation activities, recorded logistic invoices and sales in order to study the discrepancy, reliability, variation, and fluctuation regarding the logistics costs and processes related to them. The final section presents the current situation (to-be) including the actions and changes what the case company has done in order to improve the reliability and efficiency regarding logistic costs, and what kind of other benefits these actions and changes have included.

7.1 The Historical Situation

The starting point of this research was the fact that Stora Enso had centralized some of its functions in order to make cost savings and increase efficiency. Hence several internal processes had changed including process of transportation invoices. In logistic cost point of view it means that the transportation invoices are delivered to SE Logistics instead of the mills as previously. When the invoices arrive to the SE Logistics, the systems used for processing the transportation invoices cannot inform to which of the mills the arrived invoices belong. This leads to a situation that the total amount of open logistic costs could be seen but without the information of which costs are under which mill. As the transportation invoices are no longer going straight to the mills, they have lost the control of their logistic costs. It is after the transportation invoice is processed and transferred into the payment by SE Logistic that the invoice can be linked to the right mill and delivered there.

The centralization had several consequences for the performance of the case company. The situation after the centralization caused mistrust at the mills. The mills lost their sight for the transportation invoice flow and all the issues related to reporting were not thought through as the centralization process was started. The internal accrual process was in trouble with the logistic costs. The first accrual model was very inaccurate and manual as well as burdensome calculation had to be implemented before the data system learned to check automatically the paid

shipments. The requirement from the mills was that they could see the incoming transportation invoices earlier and that the internal accrual model would be rectified so that it would work as well as previously when the transportation invoices were delivered directly to the mills. On the other hand, there were mills that used more or less cash-based accounting regarding to the logistic costs, their logistic costs following improved after introducing accrual accounting method.

The case company also suffered from inefficiency and misunderstandings when the accrual method was harmonized. The most difficult to comprehend was why the transportation invoice is not automatically linked to the same month as the sales volume (transportations take place during a long period of time) and why the costs for €/sales tn can vary so much (changing markets and delivery terms). Time was wasted in concentrating in wrong issues as the puzzlement due to the increased logistic costs had to be cleared at Group Controlling level. The processes used by SE Logistics were not familiar to the management level and the aim is to modify the process so that the costs for €/sales tn would correspond to the development of transportation costs also in the short term. The purpose of this study is to increase understanding of the invoice processes of SE Logistics as well as the peculiar nature of transportation invoices.

7.2   Quantitative Data and Analysis

The empirical part of this study gathered information about transportation activities, recorded logistic invoices and sales. With these parameters different calculations were made in order to study the following four key items:

1. To analyze how much **discrepancy** there is between transportation activities, recorded logistic invoices and sales within a month and one quarter, i.e. three months

2. To analyze how **reliable** the reports retrieved from the ERP systems in use are at the moment

3. To present how much **variation** the logistics cost create that should be taken in consider when dealing different internal company reports

4. To give explanation to the question **why the logistic costs fluctuate monthly**

The idea was to estimate the percentual difference caused by the invoices and transportation activities that are arisen at different times so that the values of

different mills can be reliably compared. Different proportions were calculated between the amounts of invoices, sales and transportation activities per month. Table 3 shows a summary of the calculated proportions per a quarter. Below the table 3 are presented graphs and analysis of these proportions (pictures 22 - 31).

Table 3. Calculated proportions of transportation activities, invoices and sales during a time period of one quarter.

	Sector 1	Sector 2	Sector 3	Sector 4	Sector 5
Mill	Share of Activities during Q3 out of Invoices in Q3	Share of Activities during Q3 linked to Sales in Q3 out of all Activities	Share of Invoices linked to Sales in Q3 out of all Invoices	Share of Activities preceding Q3 linked to Sales in Q3 out of all Activities	Share of Activities during Q3 linked to Sales in Q3 out of Activities during Q3
1	69,51 %	62,19 %	75,12 %	12,93 %	89,47 %
2	77,49 %	76,53 %	77,71 %	1,17 %	98,76 %
3	73,32 %	69,65 %	80,00 %	10,34 %	95,00 %
4	75,29 %	72,77 %	84,91 %	12,14 %	96,65 %
5	80,47 %	78,08 %	87,27 %	9,19 %	97,03 %
6	58,54 %	45,57 %	59,30 %	13,73 %	77,84 %
7	72,02 %	70,52 %	83,24 %	12,73 %	97,91 %
8	84,52 %	83,03 %	89,00 %	5,97 %	98,25 %
9	82,72 %	81,22 %	88,22 %	7,01 %	98,18 %
10	73,37 %	71,81 %	82,91 %	11,10 %	97,88 %
11	65,59 %	63,65 %	78,96 %	15,31 %	97,04 %
12	66,00 %	56,28 %	69,55 %	13,27 %	85,27 %
13	84,60 %	63,31 %	67,15 %	3,84 %	79,45 %
Optimal value	100%	100%	100%	0%	100%

Table 3 comprehends of six columns the first being the number of the mill in question and the latter five columns contain the values that have been calculated. The latter five columns are from now on referred as sectors 1 - 5 accordingly. The first sector shows how many of the invoices arrived in quarter 3 are caused by the transportation activities taken place during the same period. The second sector tells the share of the transportation activities taken place as well as have sales during the quarter 3 out of all the transportation that have been invoiced in quarter 3. The third sector presents the values for how many of the quarter 3 invoices have sales during the same period. As for the forth sector, it shows how many of the transportation activities invoiced in the quarter 3 have taken place previous to this period but are linked to the same period as the invoices. The fifth and last sector shows how many of the transportation activities taken place in quarter 3 have also sales during the same period. The purpose of accrual accounting is that the values can be reported as accurate as possible for every accounting period.

Thus the ideal value for every sector presented in table 3 is 100 % with the exception of sector 4 which ideal value would be 0 %.

For each of the sectors in table 3, two pictures are presented below. The first picture for each sector shows the values of the time period of one month where as the other picture presents the values of one quarter. The values are presented in form of bar chart which shows clearly the fluctuations of the values and the differences between the mills. The purpose of these figures below is to show how much fluctuation there can be in the logistic costs and to demonstrate the importance of accrual accounting by showing how much of the costs and sales revenue incur in the different time periods. By presenting the values and their differences in illustrated form, the understanding of the difficulties when dealing with logistic costs can be increase better than just by looking plain numbers.

Sector 1: Share of Activities during a time period out of Invoices in a time period

There is great variation between different mills when it comes to comparing the amount of transportation activities versus the amount of the invoices recorded during July. And as can be seen in picture 22 many of the invoices in July are due to activities taking place in preceding months. The situation with mill number 6 is the worst, their transportation costs of the month is huge compared to the amount of activities actually taking place in the billable month. Depending on the transportation amounts in preceding and subsequent months the variation evens out in the long run but when observing statistics of one month, as often is in status meetings, these variations can create concern and give wrong impression about the logistic cost.
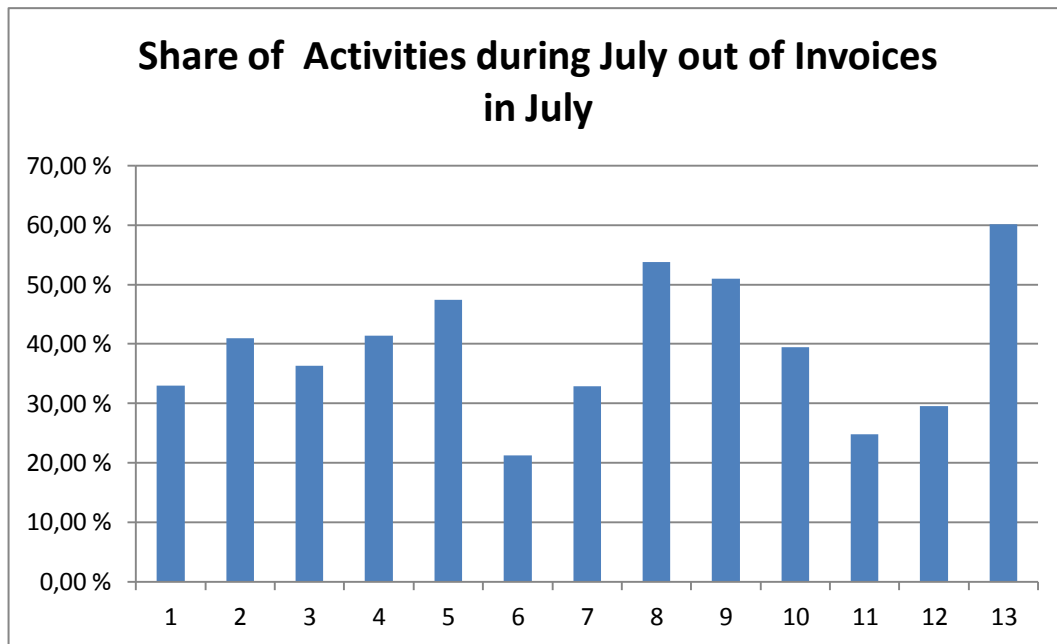
Picture 22. The amount of activities in July compared to the amount of invoices recorded in July.

When looking back at the scenarios of logistics chains presented in pictures 18, 20 and 21 in chapter 6.5, it could be concluded that the mills that have lower share of activities out of invoices in July have longer transportation chains and more handling points before the products reach the customer and thus have similar logistic chains as presented in picture 20 or even 21, which shows products being in warehouses and in sea transportation. Being in the global markets means of course that the customer can be practically anywhere in the world and every mill have customers within long distances and products can be stored for a while therefore every mill have logistic chains like presented in picture 21, some mills more than others. For the future reference the logistic chains presented in pictures 18, 20 and 21 are numbered as logistic chain 1, 2 and 3 reciprocally.

Picture 23 presents the figure of the situation of variation evening out with time. In picture 23 can be seen the statistic during a three month's time period and it can be clearly seen how the variation has decreased comparing to the July's statistic. The same mills that had the biggest discrepancy between the amounts of invoices and transportation activities in July still have it although it has somewhat stabilized.

Share of Activities during Q3 out of Invoices in Q3
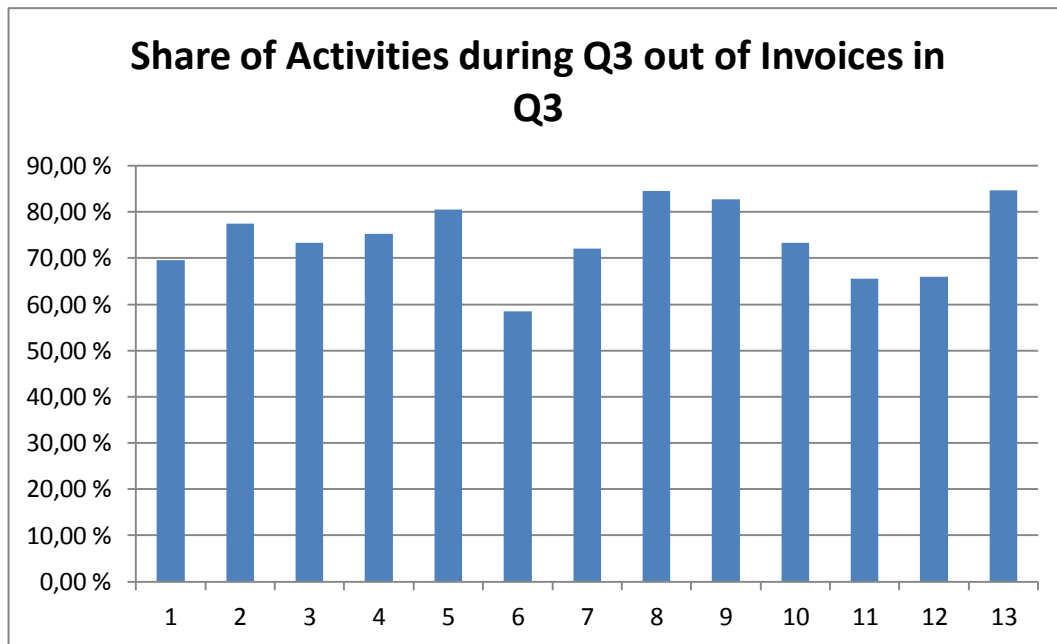
Picture 23. The amount of activities in 3rd quarter compared to the amount of invoices recorded in 3rd quarter.

As there have not been as many transportation activities concerning the products of mills number 6, 11 and 12, it could be an indication that their products are stored in warehouses or shipped in large quantities with trains and ships. In general there are a lot of activities when using train and/or ships for transportation as there are more handling events because the products need to be transported to port, loaded to the ship, unloaded and transported to the customer. But when stored or in loaded in ships for longer distances the products are moving slowly and the activities are spread over a longer period of time, therefore the invoices from transportation occurred in previous months still keep coming and are recorded. This consolidates the assumption that mills number 6, 11 and 12 belong to the group number 3 in logistic chains established earlier whereas mills number 8, 9 and 13 are more number 1 in logistic chains.

Sector 2: Share of Activities during a time period linked to Sales in a time period out of all Activities

The paragraph presented in picture 24 shows how many of the transportation activities taken place in August have also been sold during the same month, and that amount has been compared to the number of all transportation activities that

have been invoiced in that month, i.e. the amount of invoices recorded in August. This answers the question how many of the recorded invoice are linked to both sale as well as transportation activity that are both occurred in the same time period. With mills number 5, 8, 9 and 13 the ratio is over 50 % which means that over half of the invoices recorded in August are due transportation taken place in August, and the transported products have been sold during the same time period. Again mills number 6, 11 and 12 are bottom in this comparison. Most of the transportation activities has occurred before August and are probably still on the road or in warehouse as the sales have not yet taken place. All this gives the indication that the products of mills 6, 11 and 12 spent longer time in transportation than the products of mills 5, 8, 9 and 13.
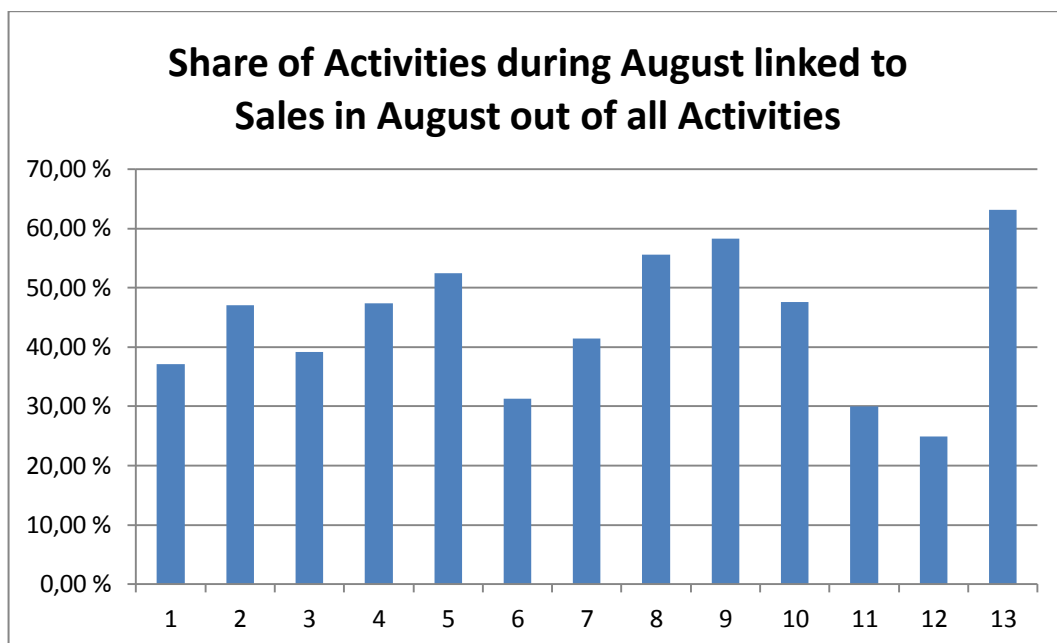
Picture 24. Share of activities during August linked to sales in August compared to all activities taken place in August.

Let's now see the same graph but for three months' time period as presented in picture 25. When studying a longer period of time, the ratio for many of the mills has improved except for mill number 13, it seems to be as good as during a one month's time period. (And when checking the figures in Appendix III, can be seen that the ratio for mill number 13 is relatively stable.) It could be concluded that the markets in which the mill number 13 operates are rather stable and/or there are regular customers that place orders steadily. The situation for mill number 6 has improved quite remarkably when observing longer time period, this can be seen in

figures found in Appendix III. Nevertheless, the ratio of mill number 6 is relatively poor compared to the other mills. The ratios for mills number 11 and 12 have improved remarkably. When checking the individual graphs for each of the two mills in Appendix III can be seen that the ratio for the quarter is over twice as much as just for one month. This means that the majority of the activities is linked to sales in the three months period and indicates that the mills have longer logistic chains, something between the groups 2 and 3.

Share of Activities during Q3 linked to Sales in Q3 out of all Activities

Sector 3: Share of Invoices linked to Sales in a time period out of all Invoices

Next we review the ratio of invoices linked to sales in September to the amount of all transportation invoices recorded in September. In picture 26 can be seen the share of invoices ended up in sales, which means that the billing amount of these invoices should have been covered by the sales that have made profit for the mills. With mill number 9 the ratio is over 75 %, this could mean that the products of the mill in question are not transported far whereas mills number 2, 6 and 12 might suffer from their locations. If the ratio is low, it means that there are costs from logistics but the products have not reached the customer and thus the sales income cannot be recognized, like the case with group 3 in the logistic chains. This leads often to questioning and misunderstandings as the logistic cost are high but no

revenue seems to come in. The higher this ratio stays in the long run, the less varying there is in the logistic costs.

Share of Invoices linked to Sales in September out of all Invoices
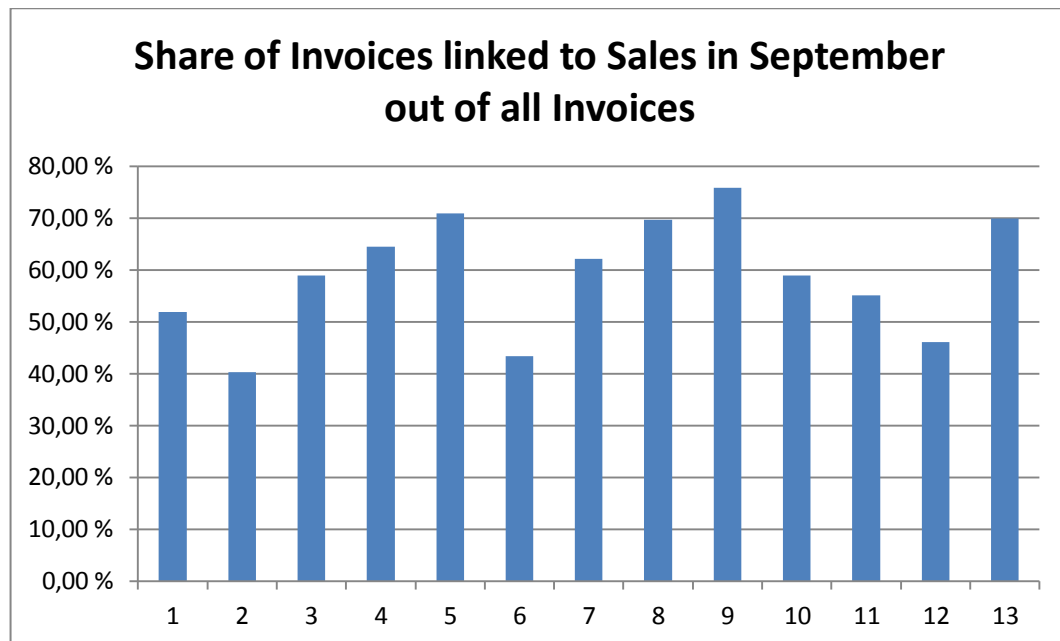
Picture 26. Share of invoices linked to sales in September out of all invoices of the time period.

During a longer period of time presented in picture 27, for most of the mills the ratio has risen up to 70 % or even over 80 %. This is a sign that the products are transported to the customers quite fast and that the products do not lay on warehouses. This is also an indication that in the long run the variation between logistic cost and sales income will be reduced.

The ratio is over 60 % for all the mills except one, mill number 6. This means that during the period of Q3 there are a lot of invoices recorded which have been caused by transportation activities taken place already before the time period in question and many of the transported goods are yet to be sold. The amount of invoices indicates that the logistic chains for the products of mill number 6 are long and rather complicated with several handling points.
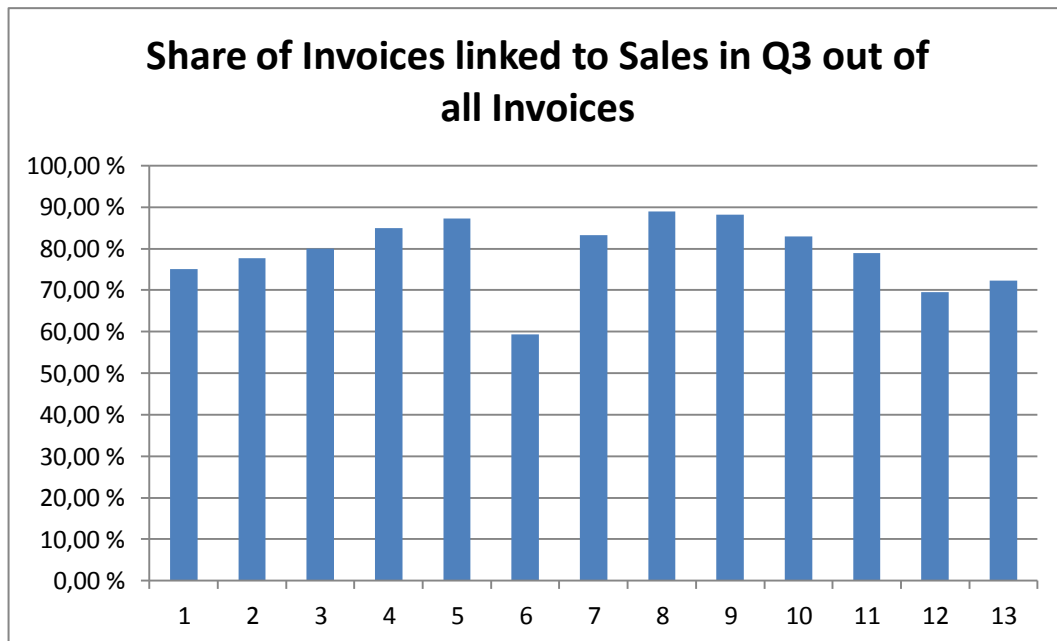
Picture 27. Share of invoices linked to sales in Q3 out of all invoices of the time period.

In addition to the location and long storage times, a reason for this low ratio could be that the customer for the products could have changed during warehousing. When this happens, the order number is changed and the costs that have been created before this change are registered to the first order number which will never recognize revenue, thus the there are costs but no income. These fluctuations in the logistic costs occur only in this thesis as the change of the order number is a problem only in the calculation model that has been used. In reality considering the subject of the study it is more of a matching problem. Luckily the order number does not change often and the fluctuation the changes might have caused in this study fits in the margin of error.

Sector 4: Share of Activities preceding a time period linked to Sales in a time period out of all Activities

Picture 28 presents a chart of transportation activities that have taken place before July but the sales of the products transported are recorded in July. This gives an indication about how many of the sales have costs due to transportation already before the month of sale. The ideal situation would naturally be the steady demand of the products and followed by steady costs of logistics as well as sales income. But the reality is that transportation of products can take longer and the products might be stored for a while before sales and transportation invoices come

74

in long before sales income. This graph shows that approximately one fifth of the invoiced transportation activities are taken place previous to the month of sales. With mill number 2 the amount of transportations prior to the month of sales is just over 2 % of the total transportation activities. This means that the income of these sales is repatriated either in the same month as the transportation invoices are recorded or before they appear. When reading this chart it has to be borne in mind that the sales included in these calculations are only the ones that have transportation invoices recorded during the month of July.
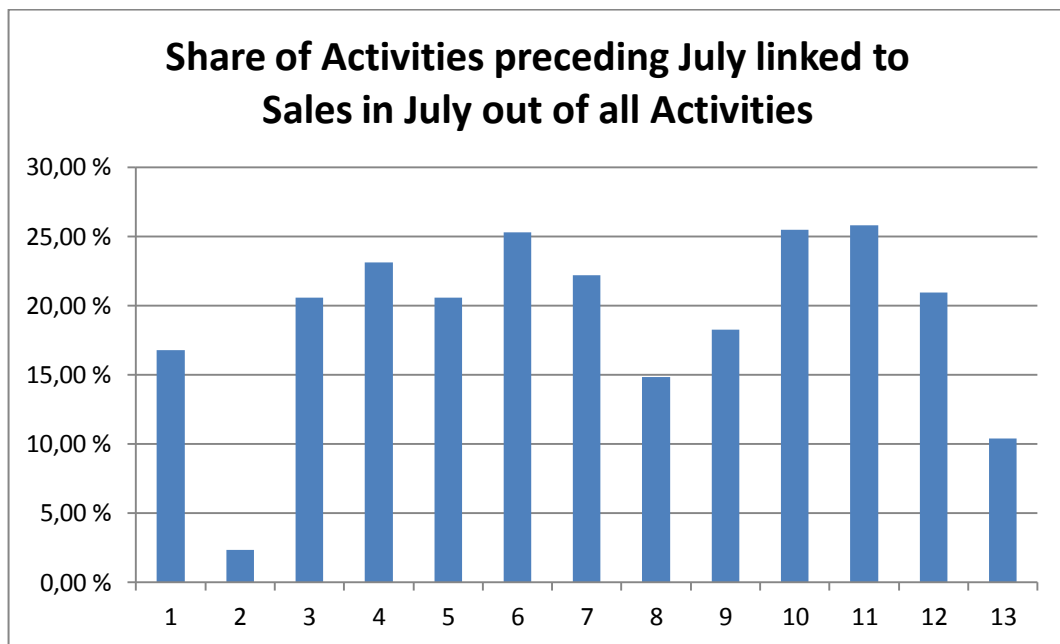
Picture 28. The share of activities preceding July linked to sales in July out of all activities invoiced in July.

When the data is gathered from an extended time period, it shows that the amount of transportation activities taking place prior to the month of sales decreases like picture 29 represents. Now it seems that the amount of transportation prior to the months of sales is approximately 10 %. Of course the three months period that one quarter is enables longer transportation times and even short period of warehousing. It is a good sign that this ratio decreases when sales can take place during longer period of time as it means that transported products are sold and is not laying around in warehouses as current assets and losing value.

Share of activities preceding Q3 linked to Sales in Q3 out of all activities
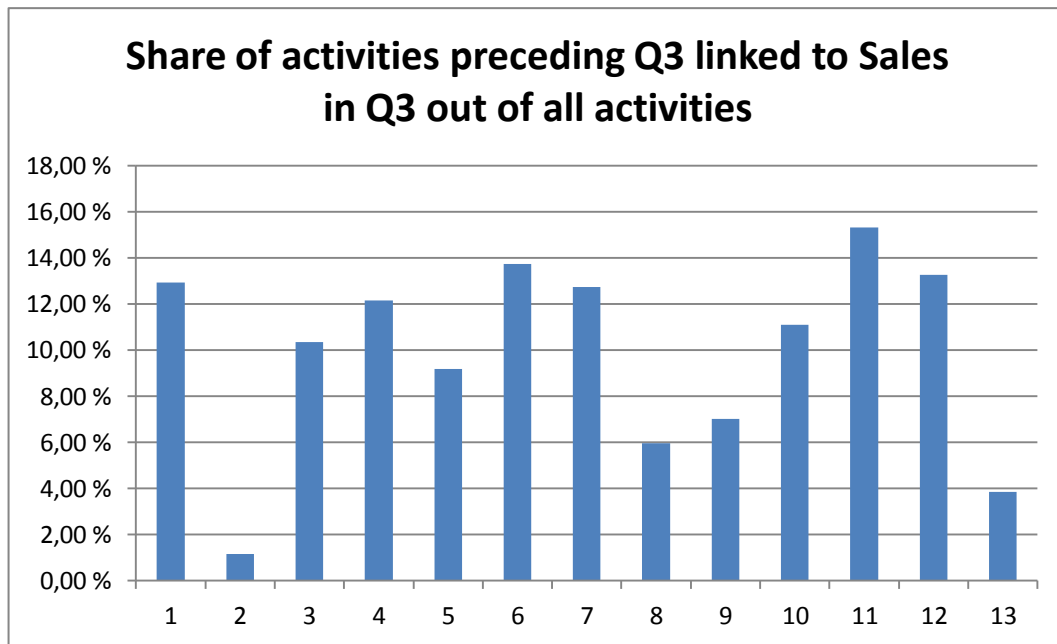
Picture 29. The share of activities preceding Q3 linked to sales in Q3 out of all activities invoiced in Q3.

Sector 5: Share of Activities during a time period linked to Sales in time period out of Activities during a time period

The picture 30 presents the relative amount of transportation activities taken place in August that are liked to sales happened in the same time period. As can be seen only two mills are below 80 % but still over 70 %. The exact ratios for each mill can be checked in Appendix III. The high ratio means that most of the products transported in August reach customers already in August. But it has to be remembered that some of these products can have been in the transportation chain for longer. The cost fluctuation is greater for the two mills that had the ratio lower than 80 % as for others. The ratio for mill 13 is close to 100 %, this indicates that almost all the products transported in August are also sold in August. But this does not exclude the possibility that there have been transportation activities concerning these products prior to August.

Share of Activities during August linked to Sales in August out of Activities during August
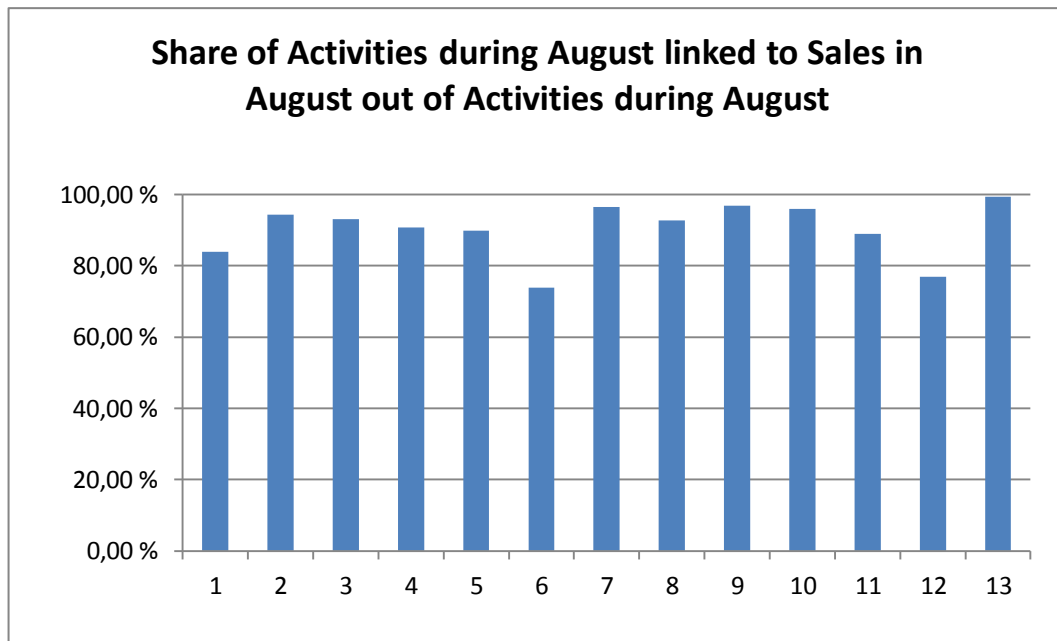
Picture 30. Share of activities in August liked to sales in August out of all the activities in August.

The graph in picture 31 shows clearly how the logistics cost can vary in the long term. For nearly all of the mills the ratio increases which indicates that more of the transportation activities take place during the same time period as the sales. The only ratio that decreases is the ratio for mill number 13. When looking the reports for mill 13 can be spotted that quite a lot of sales are divided to two or several different months. This means that there are more transportation activities for the sales in the long run than compared to the values of just one month.

Share of activities during Q3 linked to Sales in Q3 out of activities during Q3
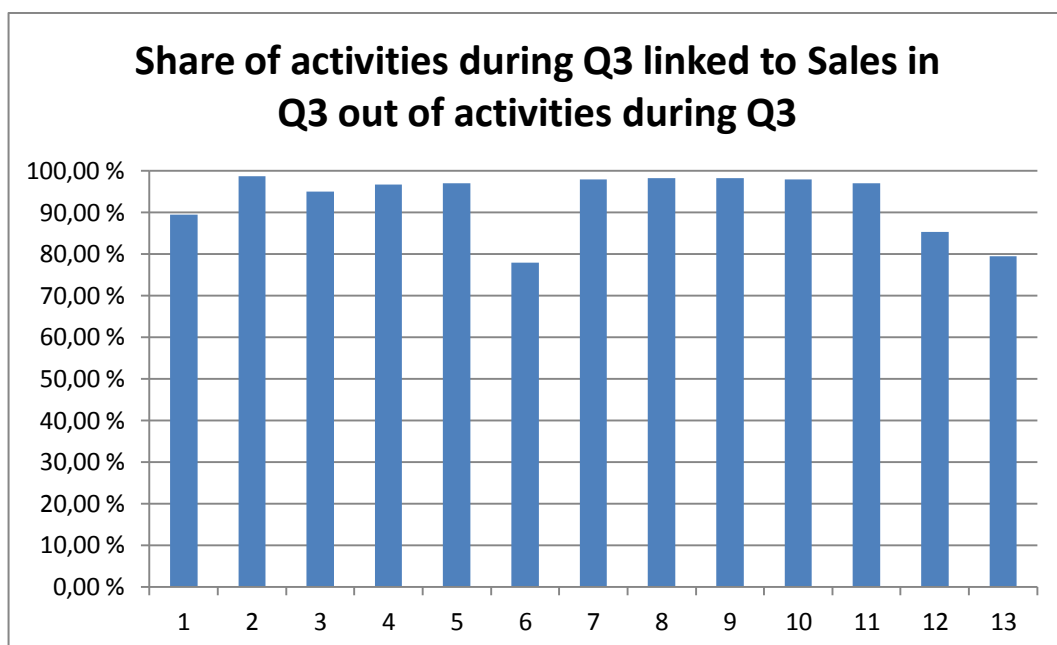
Picture 31. Share of activities in Q3 liked to sales in Q3 out of all the activities in Q3.

Sales versus Logistic costs

Picture 32 presents the share of invoices that have been caused by the transportation of goods sold in July out of the total amount of invoices recorded in July, i.e. these invoices are linked to sales of the same period. In the picture these invoices are referred as "sales during July". The picture 32 also shows the share of the costs of transportation of the goods sold in July out of the total costs of transportation recorded in July. These costs of transportation for the goods sold are referred in the picture as "costs during July".
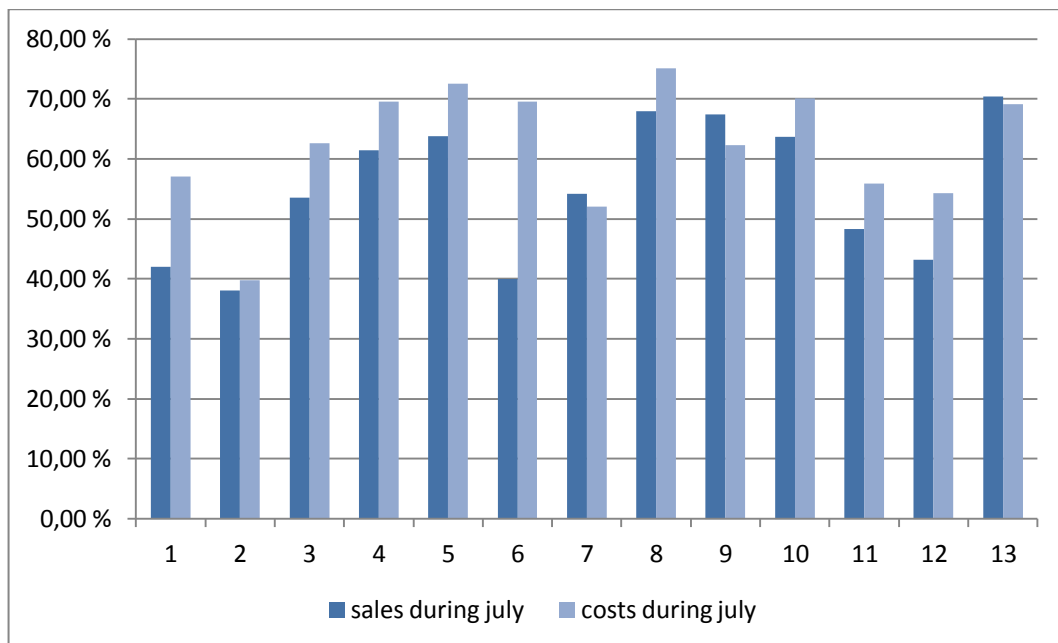
Picture 32. Invoices linked to sales in July compared to the costs of transportation of the goods sold.

What can be seen in the picture 32 is that how big of the share of invoices have caused how much of the total costs in percents. For most of the mills the share of costs is higher than the share of transportation invoices causing them. This can give indications for the reasons of high logistic costs. For some reason the cost of transportation has been higher for the sold goods than for the goods that are still in the transportation chain. The reason could be for example that the amount of transported tons has been high or there has been a sea transportation which is invoiced per ship not per weight. It could also be so that the goods sold in July have had transportation in previous months but the invoices of those transportations are not recognized until in July. The same graphs concerning the data of August and September can be seen in Appendix II.

78

Picture 33 presents the same values but the time period observed has been longer, three months instead of one at a time. The difference between the sales and costs during the time period seems to diminish compared to the values of July, August or September. One mill is again a clear exception to the rule, as for mill number 6 the difference does not change even though the values itself are higher when observing a longer period of time rather than just one month. The smaller the difference between sales and costs the less fluctuation there is in the logistic costs. In this comparison also the mills can be grouped to the logistic chain groups similarly as above and the results are pretty much the same.
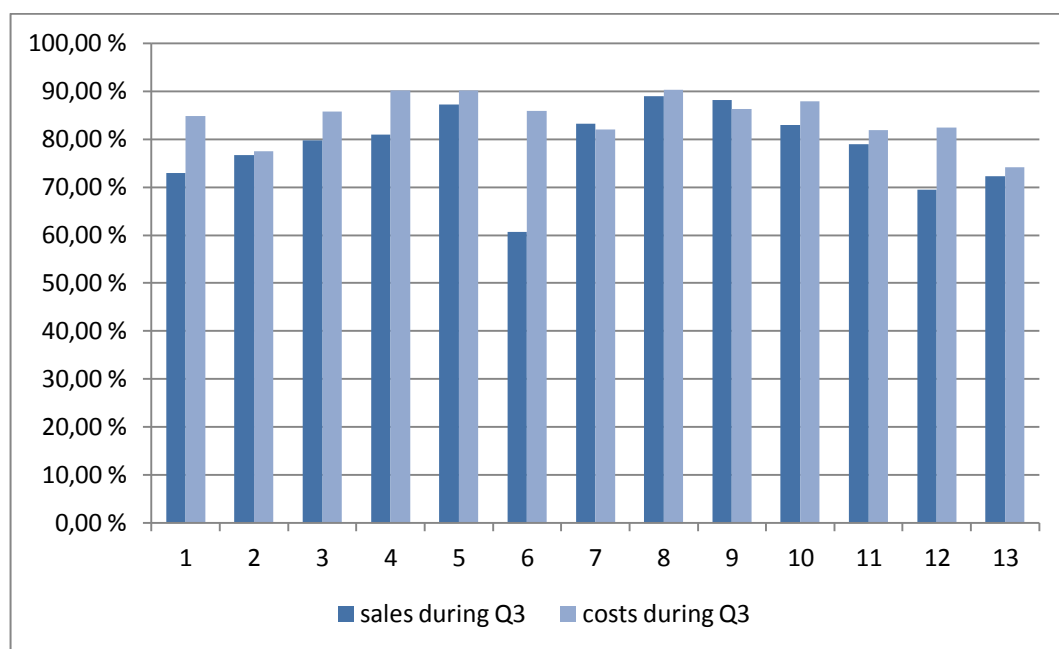
Picture 33. Invoices linked to sales in the 3rd quarter compared to the costs of transportation of the goods sold.

The values presented and analyzed above are ratios calculated from hard data. The ratios are the best way to analyze in this case as the hard values differ greatly from mill to mill. The mills are different sizes and have different products which all have an effect on the hard values and by calculating ratios the values are easier to be compared with each other. What can be seen from the actual costs is the average cost per ton transported. The average cost varies greatly between the mills. If the Euro value of the costs is analyzed, the values could lead to other conclusion about the mills' logistic chain group, but of course one has to look how much the values varies with time and that tells how much there is fluctuation in the costs. With that said, the grouping made based on the ratios should give the right conclusions. Still it was peculiar to notice that highest values of average cost

was not on those mills that one might have suspected. But one thing was similar to most of the mills, the average cost of transportation per ton was higher for the transported goods of which sales have taken place during the observed time period than for the transported goods that have yet to be sold. This should be seen in the figures where the ratios of costs and sales have been presented.

Key findings

To summarize the key findings of empirical research the four key areas presented above will be discussed below.

1 To analyze how much **discrepancy** there is between transportation activities, recorded logistic invoices and sales within a month and one quarter, i.e. three months

As the pictures presented above show discrepancy between the parameters and mills can be observed. For some of the mills the calculated values are very good even if not reached the ideal level where as the values for some mills are rather poor. When studying the pictures 22 and 23 that are linked to the sector 1 in table 3, can be seen that the values for one month varies between ca. 20 – 60 % which is quite great range, where as the range for the values for one quarter is ca. 58 – 85 %. The values increase for each mill when the time period is longer, which is a good sign and quite logical, however the range decreases only by one fourth. The values for sector 2 are presented graphically in picture 24 and for one month period in picture 25. The range for the values for one month is ca. 25 – 65 %, and for one quarter ca. 45 – 83 %. Although the values increase in general the range stays pretty much the same which indicates that the discrepancy between mills does not degrease with longer period of time which is not desirable. When looking pictures 26 and 27 presenting the graphs linked to sector 3, can be seen that the range for the values of one month is 40 – 75 % and the range for values of longer time period is ca. 60 – 90 %. The values increases with time which is naturally good in this case but the range hardly decreases which is not good because the discrepancy between mills does not change and the in the logistic costs does not decrease. The values in sector 4 are the better the closer the value is to 0. Pictures 28 and 29 present the graphs for this sector. The range for the values for one month is ca. 2 – 26 % and for three months ca. 1 – 15 %. The two pictures of the sector 5 are pictures 30 and 31. The values for one month vary between ca. 75 –

98 %, and the values for three months are between ca. 77 – 98 %. In this case the values hardly increase nor does the range decrease because the value that has been calculated is rather good during one month period for every mill so the longer time period does not make much of a difference.

In general the ranges for the calculated values are quite wide, which is a sign of the discrepancy between the mills and leads to fluctuation in the total costs of logistic. The values improved when longer time period was taken into account which is logical as there is more time for the invoices to arrive and sales to take place. The differences between the mills were so clear that the mills could be divided into groups based on their performance. This is discussed later in this chapter.

2 To analyze how **reliable** the reports retrieved from the ERP systems in use are at the moment

The reports used in this study are derived from Fenix which is the business application used for order handling, logistics, invoicing and sales planning. It contains the most accurate information in the company about the sales and transportation activities. The system contains very detail information about the parameters studied in this thesis but it is not the reporting system used for reporting for the Group which uses Hyperion. Therefore there has been a miscommunication between SE Logistics and the Group.

The challenge is that the cost fluctuations create unnecessary discussion at the Group level. The required information such as logistics costs already exist in Fenix but it is not in the Group level reporting tool which is Hyperion. Therefore people at Group level are not aware of the accurate level of logistics cost which causes inefficiency through unnecessary clarification. This time should be used to tackle other issues, such as different discrepancies. There is a risk that some actual errors cannot be seen. Hence there is a need to improve the way of working.

However, the case company does not see a need for new or other systems. The needed information, such as logistic costs, already exists but the challenge is that it needs to be communicated to the Group, not just to SE Logistics. Hence there is a need to develop communication between these two levels.

To present how much **variation** the logistics cost create that should be taken in consider when dealing different internal company reports

Pictures 32 and 33 presented above show the variation of the transportation costs for each of the studied mill. The greater the difference between the sales of the period and the transportation costs of the same period, the greater the variation in logistic costs. If a low share of the sales cause a higher share of the costs it also shows that the transportation costs in general are higher for the mill in question. This usually means that the transportation chains are long and the distance from the mill to the customer is also long. But when studying a longer period of time and picture 33, the difference between the sales and transportation costs of the period is generally decreased. This indicates that even though the transportation costs variate monthly they usually even out with longer period of time.

To give explanation to the question **why the logistic costs fluctuate monthly**

With longer logistic chains the possibility that the logistic costs fluctuates is greater as invoices are created throughout the chain and the invoices of sea and rail transportation is based on the amount of ships or carriages needed rather than the amount of tons to be transported. If the ships or trains cannot be filled fully, then the transportation invoice is greater per ton in transport. Also the location of the customer affect on the transportation costs and the length of the transportation chain. If there are a lot of different customers on different locations or if the clientele changes, the fluctuation of the logistic costs most likely increases.

In conclusion, there are different kinds of logistic chains and the time a product spends in transportation varies greatly. What can be seen in the graphs presented above is that even if there are great differences between the mills, the individual behavior of the mills is rather stable in a way that the mills can be grouped into the different logistic chains presented in chapter 6.5. The mills with the best values in every calculated ratio can be seen to belong in group 1 of the logistic chains, which means that the logistic chains are relatively short and the possible fluctuation in logistic costs is more likely caused by the fluctuation in demand. The mills with the worst values in calculated ratio are part of group 3 of the logistic chain. In this group the transportation times are usually long and the

logistic chains are rather complex with multiple handling points. The grouping of the mills is presented in picture 34.

Like mentioned before, all mills have logistic chains of these three example groups but most of the mills had clear characteristic towards just one group. Some of the mills on the other hand were harder to group, for example especially when longer time period was scrutinized, mill number 7 had improved values and showed indications of group 2, whereas the values of mill number 13 degenerated slightly and showed also more signs of group 2 of the logistic chains.

7.3 The Current Situation

After the case company had identified the existing challenges within its transportation invoice process it started to develop the process. This study supported creating more understanding of the existing problem, and what could be done for tackling it. The recommendations for the case company are presented in Chapter 8 whereas the current situation and its consequences, and actions taken are presented in this section.

The main focus of process development was on accrual process. It was introduced to all units which used IPS tool including SE Logistics and mills. This has created a harmonized model for accrual accounting helping to decide to which accounts to allocate and on what basis. The processing of transportation invoices has been transferred to single unit (SE Logistics) from different mills. Furthermore the awareness of seeing changes in warehousing as multiple logistic costs has increased.

The case company has solved all the challenges regarding logistic costs but there is still one area which it is working on. It is considering whether to record logistic costs of products currently in warehouse at the value of stock or not. However, the amount of investments (work) needed versus the gained benefits is still under discussion. The mills which face bigger problems are supporting that discussion but other mills are against that. The case company will do the final decision during fall 2014.

The case company has done and/or faced several changes at different levels. At Group level the understanding of process of logistic costs has increased due to this research. At mill level the accrual process is working better and the cost level has balanced. The mills are now using the same logistic costs process as SE Logistics which has improved the reliability and reduced workload. At bookkeeping level the costs are now recorded when the purchase activity takes place as the accrual accounting method requires. Previously the costs were recorded when the transportation invoice arrived or when there was a major transportation event. Finally at SE Logistics level the accrual accounting work is done with harmonized way, and not separately at each mill.

Due to these changes and actions there have been several benefits for the case company. Since the use of accrual accounting is now harmonized the process is more efficient and reliable. The logistics costs are now more transparent and understandable, and the comparison between mills is easier for example to track discrepancies. The communication has also improved, and the unnecessary hassle has decreased. The Group has now better trust for the validity of logistic costs. This research has also improved the general knowing inside the case company through in-depth analysis and raising new questions and taking topics further.

Different levels, such as the Group, SE Logistics, and mills have now better overall understanding of the logistics cost processes, and their effects and benefits due to this study.

8 CONCLUSIONS

In this final chapter, the main conclusions of this study are presented. It provides a research summary, offers the main findings, and explains the managerial recommendations for the case company. Finally there are some suggestions for further research.

8.1 Research Summary

This section answers the research questions and restates the importance of topic and purpose of the study.

The aim of this thesis was to explore the concept of accrual accounting and logistic costs. The research was practical, geared towards solving a problem of how to understand and analyze the nature of logistic costs. The study focused on Stora Enso´s internal processes of logistic costs by understanding, analyzing and further developing them. The study was motivated by the general lack of understanding how the logistic invoice process operates and how the logistic costs behave in accounting. The research questions that the study was set out to answer consist of one main research question and three sub-questions.

Research question: What are the effects of the logistics costs in accounting?

This study has found that logistics costs have an important impact on accounting. Typically it is difficult to define and control logistics costs. The reasons for that include the long time frame (when the costs incur versus they are actually paid), complexity of transportation chain and types, insufficient use of accrual accounting, and complexity of reporting tools and systems. Therefore it is important to harmonize the processes regarding logistics costs. For example it is vital that the accrual method works properly otherwise the reported values are not accurate. With accrual method the costs are recognized when they incur, and not when they are paid. Additionally the costs are to be matched with the related revenue if they occur during the same period.

If the companies fail to follow these principles there might be several negative consequences, including inefficiency, lack of reliability and accuracy, misunderstanding and general hassle. Furthermore, all of these can eventually reduce the overall performance of the company. This research question will also be covered in the next section by using the theoretical framework developed in Chapter 3.

Sub-question 1:   What kind of challenges Stora Enso faced regarding its logistic costs and why?

Stora Enso had centralized some of its functions in order to make cost savings and increase efficiency. Therefore several internal processes had changed including process of transportation invoices. After the centralization transportation invoices are delivered to SE Logistics instead of the mills as previously. Hence the mills lost the control of their logistic costs.

The centralization had several consequences for Stora Enso. First, the internal accrual process was in trouble with the logistic costs since the first accrual model was very inaccurate and manual. Second, it caused mistrust at the mills since they lost their sight for the transportation invoice flow, and all the issues related to reporting were not thought through when the centralization process was started. Thirdly, the case company suffered from inefficiency and misunderstandings when the accrual method was harmonized. The most challenging to comprehend was why the transportation invoice is not automatically linked to the same month as the sales volume (transportations take place during a long period of time) and why the costs for €/sales tn can vary so much (changing markets and delivery terms). This sub-question was examined in sections 6.5 and 7.1.

Sub-question 2:   How much Stora Enso's transportation costs fluctuated and why?

This research has analyzed 13 mills of Stora Enso and their transportation costs in three months period from July to September 2011 (Q3 2011). The study has found that the greater the difference between the sales of the period and the transportation costs of the same period, the greater the variation in logistic costs. The research also found that, if low share of the sales cause a higher share of the

costs, it also presents that the transportation costs in general are higher for the mill in question. This study made multiple analyses for transportation costs. For example, when dealing with the share of the transportation activities taken place as well as have sales during the Q3 2011 out of all the transportation that have been invoiced in Q3 2011, the fluctuation between the mills varied from approximately 45% to 83%. This means that the higher the ratio, more sales there is to compensate the costs with the optimal value of 100%. More detailed and multiple analyses were made in section 7.2.

This study found several reasons why Stora Enso´s transportation costs fluctuated. First, the company used inaccurate and manual internal accrual process which was a consequence of centralization of different Stora Enso´s functions. Stora Enso struggled with matching of sales volumes to the related logistics costs as the transportation and the sales of the same products rarely took place in the same month. Second, the length of logistic chain has impact on transportation costs. With longer logistic chains the possibility that the logistic costs fluctuates is greater as invoices are created throughout the chain, and the invoices of sea and rail transportation is based on the amount of ships or carriages needed rather than the amount of tons to be transported. Third, the use of different transportation types causes fluctuations. For example, if the ships or trains cannot be filled fully, then the transportation invoice is greater per ton in transport. Fourth, the market demand causes fluctuation. For example, when the demand is stable, the logistic costs are also relatively stable, and this does not create confusion inside the case company. However, when the demand is not stable the case is different: costs fluctuate which create confusion. Finally, the location of the customer affect on the transportation costs and the length of the transportation chain. This sub-question was examined more detailed in section 7.2.

Sub-question 3:   How Stora Enso can clarify its logistic cost models to improve accuracy and efficiency?

This study has supported Stora Enso by creating more understanding of the existing problem regarding logistic costs and the related processes, and what could be done for tackling it. The main focus of process development was on accrual process. It was introduced to all units which used IPS tool including SE

Logistics and the mills. This helped to create a harmonized model for accrual accounting helping to decide to which accounts to allocate and on what basis. The processing of transportation invoices has been transferred to single unit, SE Logistics, from the mills.

Stora Enso has also made or faced several changes which this study also supported. At Group level the understanding of process of logistic costs has increased due to this research. At mill level the accrual process is working better, and the cost level has balanced. The mills have started to use the same logistic costs process as SE Logistics which has improved the reliability and reduced workload. At bookkeeping level the costs are now recorded when the purchase activity takes place as the accrual accounting method requires. Finally at SE Logistics level the accrual accounting work is done with harmonized way, and not separately at each mill. Overall, since the use of accrual accounting is now harmonized, the process is more efficient and reliable. This sub-question was examined especially in section 7.2. More information can also be found in section 8.3 where the recommendations for the case company are presented.

8.2 Key Findings in the Light of Earlier Research

This study has researched the effects of logistics costs in accounting. The findings of the study present that logistics costs have crucial impact on accounting. Companies are typically struggling with logistics costs since it is difficult to define and control them. This section presents the main findings in the light of earlier research.

Number of previous studies pointed out that the effects of logistics costs to company´s accounting and performance has major impact (see e.g. Grant, et al. 2006; Guasch & Kogan, 2006; Barbero, 2010; Guerrero et al., 2010). This study has strongly supported that area. The findings from this study also support the claim of Grant et al. (2006) that typically companies are struggling with logistics costs since it is difficult to define and control those. Hence, there is a need for more systematic and appropriate processes and use of accounting methods regarding logistics costs. This was also the case at Stora Enso where this was done

through centralization of the processing of transportation invoices from different mills to one operator, SE Logistics.

One important way to manage logistics costs processes is the use of ERP systems. They have become crucial for the management of most companies by providing updated information about the various parts of the chain within a company (Carlsson et al., 2006). However, Carlsson et al. (2006) claim that the available planning supports are not able to deal with all the planning problems of the pulp and paper supply chain. Especially if the companies are using several software systems from different providers there is a risk for two sets of information that is no longer congruent when time and effort is needed to interpret the differences and make the information more uniform so that sensible decisions can be made (Vollman & Whybar, 2005). This was also the case at Stora Enso which did several acquisitions and ended up with multiple systems including SAP, Hyperion, Fenix and IPS. Therefore there was a need to start to harmonize the processes and look at the different systems more carefully to improve communication, reliability and efficiency.

In section 2.2 it was presented that logistics is becoming the sore point of forest industry´s competitiveness (Erola, 2012). It was also presented that logistics costs tend to be twice higher in Finland than its competitive market areas such as in Central Europe (Jaatinen, 2012). One reason for the high logistics costs is location and long supply chains that Scandinavian mills have. Therefore there can be $3-4$ transportation modes and at least $4-5$ handling events in the delivery chain from the mill to the customer. (Räty, 2003) Within the case company the logistics costs were also concerned carefully due to their high impact on company´s performance. Therefore the company wanted to develop its processes regarding logistics costs in order to improve its competitiveness.

From theoretical perspective the main focus area was on accrual accounting, and on its core principles revenue recognition and matching principle. It was presented that in accrual accounting earnings and expenses are recorded when they actually take place whether or not the transaction involves cash, so accrual accounting method records all transactions and their effects not just cash movement and shows better the performance and position of a company. The idea behind the

accrual accounting is that the economic events are recognized by matching revenues with expenses so the current cash flows combined with the future ones give a more accurate picture of the current financial condition of a company. The main findings in the light of earlier research regarding accrual accounting will be presented by using the contextual framework of this study below. (Harrison & Horngren, 2006)

Contextual Framework & Case Company

The following picture 35 presents the contextual framework of this study from Stora Enso´s perspective in order to increase the reliability and efficiency of Stora Enso´s logistics costs and economic performance.

Logistics costs has been the key area to evaluate throughout the study in order to increase the reliability of the costs in accounting and bookkeeping, and also to improve efficiency. The problem with the logistics costs of Stora Enso has been that from time to time there exists great variation in the monthly costs due to how the logistic chains work and how the transportation invoices are processed in the accounting.

These challenges could be tackled through accrual accounting as the theory presents (see e.g. Weetman, 2006; Epstain et al., 2006; Harrison & Horngren, 2006). However, Stora Enso has already used the accrual accounting, but the use has not been in the most optimal level. The theory presents that with accrual method the costs are recognized when they incur, and not when they are paid as some of the mills did. Additionally the costs are to be matched with the related revenue if they occur during the same period. These refer to the two cornerstones of accrual accounting: revenue recognition and matching principle. By following these principles more carefully Stora Enso can improve its reliability and efficiency regarding its logistics costs.
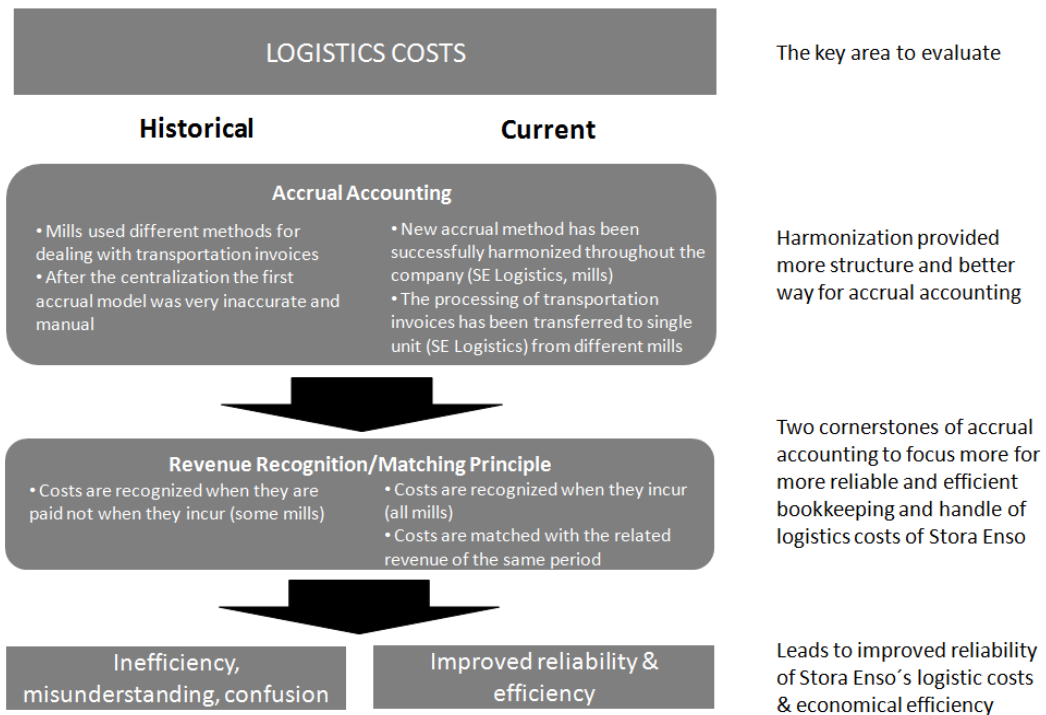
Picture 35. The contextual framework from the perspective of Stora Enso.

8.3 Recommendations for the Case Company

Based on the findings on empirical and earlier research, recommendations to SE Logistic are presented here.

The problem with the logistics costs of Stora Enso has been that from time to time there exists great variation in the monthly costs due to how the logistic chains work and how the transportation invoices are processed in the accounting. Stora Enso has struggled with matching of sales volumes to the related logistics costs as the transportation and the sales of the same products rarely take place in the same month. This has also been considered to be the main reason for fluctuation in logistical costs. The costs that occur before sales revenue is recognized but the transportation invoice has arrived, as well as the same type of costs but without the invoice from the transportation are causing the problems.

As the IFRS standards only dictate the method for accounting when the financial statements are in question, the case company can choose the method for internal accounting between two methods: accrual accounting and cash-based accounting. Many of the studied mills used cash-based accounting for their transportation invoices and recorded the transportation costs when the transportation invoice was arrived and paid. This method would increase the fluctuation of the logistic costs in accounting because the transportation invoices do not arrive at a steady flow. Because the costs are recorded after the transportation invoice has arrived and not when the actual cause of the costs (transportation) takes place, the costs in the accounting are not accurate and the quality of the internal accounting suffers.

In order to tackle the problems mentioned above, this study suggests to follow the accrual accounting and its two cornerstones: revenue recognition and matching principle. Furthermore allocating the costs to different accounts would make the internal reports more accurate and increase the efficiency of the communication between departments and decision making – and eventually the whole performance of the company.

To sum up, with more proper use of accrual accounting principles Stora Enso can increase the reliability and efficiency of its bookkeeping and handle of logistics costs which can lead to enhanced performance and better decision making. However, this also requires more aligned use of different systems and tools such as SAP and Fenix. These systems should communicate effectively between each other. However, these systems cannot be the directing force: they are just the ways to increase the reliability and efficiency, not the absolute value.

8.4 Suggestions for Further Research

While numerous opportunities arise as potential areas of future research, this study highlights two areas. The first area is related to the need for increase the validity of the study. The research was carried out by single case study focusing only on one company (Stora Enso) and one industry (paper). Therefore it would be beneficial to study other companies within the same industry, and other logistics heavy industries, such as manufacturing to explore the effects of logistics costs in a broader audience. This would also increase the extrapolation of the

studied area. Another option would be study how are the recommendations implemented at Stora Enso, and what kind of impact they have for logistics costs. This would also increase the longevity of the studied area, and help to evaluate the effectiveness and meaningfulness of the recommendations which focused on to improve the performance of the company.

REFERENCES

Publications:

Aaker, D.A., Kumar, V. & Day, G.S. (1998). Marketing research. 6th Edition. New York: Wiley.

Alexander, D. and Nobes, C. (2010) Financial Accounting – An International Introduction. 4th Edition. Pearson Education Limited, Essex, England.

Amaratunga, D., Baldry, D., Sarshar, M. & Newton, R. (2002). Quantitative and qualitative research in the built environment: application of "mixed" research approach. *Work Study*. Vol. 51, No. 1, pp. 17–31.

Anderson, D.R., Sweeney, D.J., Williams, T.A., Camm, J.D., & Martin, K. (2010) Quantitative Methods for Business. 11th Edition. South-Western Cengage Learning, Mason, USA.

Anderson, K.L. and Yohn T.L. (2002) The Effect of 10-K Restatements on Firm Value, Information Asymmetries, and Investors' Reliance on Earnings. Working paper: Georgetown University.

Barbero, J.A. (2010) Freight Logistics in Latin America and the Caribbean: An Agenda to Improve Performance, Inter-American Development Bank Infrastructure and Environment Department, TECHNICAL NOTES No. IDB-TN-103.

Blaikie, N. (2003). Analyzing Quantitative Data. SAGE Publications Ltd, London.

Bloomfield, R., Christensen, T.E., Colson, R.H., Jamal, K., Moehrle, S., Ohlson, J., Penman, S., Stober, T., Sunder, S. & Watts, R.L. (2010). Response to the Financial Accounting Standard Board's and the International Accounting Standards Board's Joint Discussion Paper Entitled *Prliminary Views on Revenue Recogniton in Contracts with Customers*. *Accounting Horizons.* Vol. 24, No.4, pp. 689 – 702.

Bloomfield, R.J., Biondi,Y., Glover, J.C., Jamal, K., Ohlson, J.A., Penman, S.H., Tsujiyama, E. (2011). Accounting for Revenues: A Framework for Standard Setting. *Accounting Horizons.* Vol. 25, No.3, pp. 577 – 592.

Bowersox, D., Calantone, R. & Rodrigues, A. (2005) Estimation of Global and National Logistics Expenditures: 2002 Data Update. *Journal of Business Logistics*. Vol. 20, No. 2, pp. 1 – 16.

Bowersox, D.J., Closs, D.J. & Cooper, M.B. (2007) Supply Chain Logistics Management. 2nd Edition. McGraw-Hill Companies, Inc.

Brockmann, T. (1999) 21 warehousing trends in the 21st century. *IIE Solutions*. Vol. 31, No. 7, pp. 36 – 40.

Carlsson, D., D'Amours, S., Martel, A. & Rönnqvist, M. (2006) Supply Chain Management in the Pulp and Paper Industry. Working Paper DT-2006-AM-3. Université Laval, Quépec, Canada.

Cielsielski, J.T. and Weirich T.R. (2011) Convergence Collaboration: Revising Revenue Recognition. *Management Accounting Quarterly*. Vol. 12, No. 3, pp. 18 – 27.

Commission of the European Communities. Communication from the Commission to the Council, the European Parliament, the European Economit and Social Committee and the Committee of the Regions. Freight Transport Logistics in Europe – the key to sustainable mobility. Brussels (2006).

Denzin, N. and Lincoln, Y. (2003) Collecting and interpreting qualitative materials. Beverly Hills: Sage.

Diesen, M. (2007) Economics of the Pulp and Paper Industry. 2nd Edition. Pub. Finnish Paper Engineers' Association/Paperi ja Puu Oy. Gummerus Oy.

Epstain, B.J., Nach, R. and Bragg, S.M. (2006) GAAP 2007 – Interpretation and Application of Generally Accepted Accounting Principles. John Wiley & Sons, Inc.

Erola, M. (2012) Kolmas pyörä – Logistiikan paluu teollisuuspolitiikan ytimeen. EVA Analyysi No. 20. Elinkeinoelämän valtuuskunta.

Everett, G. & Philpott, A. (2001) Supply Chain Optimization in the Paper Industry. *Annals of Operations Research*. Vol. 108, No. 1, pp. 225 – 237

Farahani, R.Z., Asgari, N. & Davarzani, H. (2009) Supply Chain and Logistics in National,International and Governmental Environment – Concepts and Models. Physiga-Verlag, Berlin, Germany.

Financial Accounting Standards Board (2008). Statement of Financial Accounting Concepts No. 5 Recognition and Measurement in Financial Statements of Business Enterprises. FASB Statement of Concepts.

Ghauri, P. and Grønhaug, K. (2005) Research methods in business studies : a practical guide. 4th Edition. Financial Times Prentice Hall.

Grant, D.B., Lambert, D.M., Stock, J.R. & Ellram, L.M. (2006) Fundamentals of Logistic Management. McGraw-Hill Companies, Inc.

Guasch, J.L. & Kogan, J. (2006) Inventories and Logistic Costs in Developing Countries: Levelsand Determinants—A Red Flag for Competitiveness and Growth. Policy Research Working Paper 2552. Washington DC: World Bank.

Guerrero, P., Lucenti, K. & Galarza, S. (2010) Trade Logistics and Regional Integration in Latin America and the Caribbean, ADBI Working Paper Series No. 233.

Harrison, W.T. and Horngren C.T. (2006) Financial Accountings. 6th Edition. Pearson Education, Inc.

Heikkilä, T. (2001) Statistical Research. Oy Edita Ab. Helsinki, Finland.

Hämäläinen, E. (2011) Economic geographical analysis of the Finnish paper industry. Doctoral dissertation, University of Turku. Annales Universitatis Turkuensis. Series AII, Vol. 263.

International Accounting Standard No 2 (2012). IAS 2 Inventories. Issued at 1 January 2012 by IFRS.

International Accounting Standard No 18 (2012). IAS 18 Revenue. Issued at 1 January 2012 by IFRS.

Johnson, N.E., Liu, H. & Yin, K.K. (2002) Markovian inventory policy with application to the paper industry. *Computers and Chemical Engineering*. Vol. 26, pp. 1399 – 1413.

Koskinen, I., Alasuutari, P. & Peltonen, T. (2005) Laadulliset menetelmät kauppatieteissä. Gummerrus Kirjapaino Oy, Jyväskylä.

Koskinen, P. (2009a). 'Supply chain strategy in a global paper manufacturing company: a case study'. *Industrial Management & Data Systems*. Vol. 109, No. 1, pp. 34 – 52.

Koskinen, P. (2009b). Supply Chain Challenges and Strategies of a Global Paper Manufacturing Company. Turku School of Economics, Series A7, Turku.

Lehtonen, J-M. (1999) Supply Chain Development in Process Industry. Doctoral dissertation, Helsinki University of Technology. Acta Polytechnica Scandinavica, Industrial Management and Business Administration Series. No. 4.

Lincoln, Y. and Guba, E. (1985) Naturalistic inquiry. Beverly Hills: Sage.

Mackenzie, B. and Simmons, A. (2001) International Accounting Standards: A Guide to Preparing Accounts. 3rd Edition. Deloitte & Touche, ABG Professional Information.

Mangan, J., Lalwani, C. & Butcher T. (2008) Global Logistics and Supply Chain Management. John Wiley & Sons, Inc.

Manuj, I., Swartz, S.M. & Yazdanparast, A. (2010) Co-creating logistic value: a service-dominant logic perspective, *The International Journal of Logistics Management*. Vol. 21, No. 3, pp. 375 – 403.

Memedovic, O., Ojala, L., Rodrigue, J-P. & Naula, T. (2008) Fuelling the global value chains: What role for logistics capabilities? *International Journal of Technological Learning, Innovation and Development*, Vol. 1, No. 3, 2008, pp. 353 – 376.

Ohlsen, L. and Weirich T.R. (2010) New Revenue Recognition Model. *The Journal of Corporate Accounting & Finance*. November/December 2010.

Oracle Data Sheet (2014). Oracle Hyperion Planning.

Räty, A. (2003) Internal material of Stora Enso.

Sayer, A. (1986). New development in manufacturing: the just-in-time system. *Capital and Class*. Vol. 30, No. 1, pp. 43 – 72.

Scott, C., Lundgren, H. & Thompson, P. (2011) Guide to Supply Chain Management. Springer-Verlag Berlin Heidelberg.

Stora Enso Annual Report (2014). Rethink Stora Enso 2013. Vol.4. Transformation and Opportunity.

Stora Enso. Internal Material. (2011a).

Stora Enso. Internal Material. (2011c).

Stora Enso. Internal Material. (2011d).

Stora Enso. Internal Material. (2011e).

Stora Enso. Internal Material. (2011f).

Weetman, Pauline. (2006) Financial Accounting – An Introduction. 4th Edition. Pearson Education Limited. Essex, England.

Vollmann, B. & Whybark, J. (2005) Manufacturing Planning and Control for Supply Chain Management. 4th Edition. McGraw-Hill Companies, Inc.

Internet sources:

Auditing Standard Board (2007). *AU Section 411*. Available at: http://www.aicpa.org/Pages/default.aspx [Accessed 18.3.2014]

Financial Accounting Standards Board (2014). Available at: http://www.fasb.org/home [Accessed 17.3.2014]

Council of Supply Chain Management Professionals (2010). *Definition of Logistics Management*. Available at:

http://cscmp.org/about-us/supply-chain-management-definitions

[Accessed 28.11.2011]

Hyperion. Oracle Home Page. Available at:

http://www.oracle.com/us/solutions/index.html [Accessed 18.4.2014]

International Financial Reporting Standards (2014). Available at:

http://www.ifrs.org/Pages/default.aspx [Accessed 17.3.2014]

Jaatinen, T. (2012) *Logistiikka nousemassa metsäteollisuuden kilpailukyvyn kipupisteeksi.* Metsäteollisuus ry. Available at:

http://www.metsateollisuus.fi/uutishuone/tiedotteet/Logistiikka-nousemassa-metsateollisuuden-kilpailukyvyn-kipupisteeksi-699.html [Accessed: 8.4.2014]

Metsäteollisuus ry (2012). *The Finnish forest industries in figures*. Available at:

http://www.forestindustries.fi/statistics/The-Finnish-forest-industry-in-figures-1274.html [Accessed 14.9.2012]

Metsäteollisuus ry (2013a), *Metsäteollisuutta rasittavat korkeat kuljetuskustannukset*. Available at:

http://www.metsateollisuus.fi/painopisteet/logistiikka-ja-liikennevaylat/logistiikka/Metsateollisuutta-rasittavat-korkeat-kuljetuskustannukset-189.html [Accessed: 8.4.2014]

Metsäteollisuus ry (2013b). *Merenkulun ympäristömääräykset huomattava kustannusuhka metsäteollisuuden kuljetuksille*. Available at:

http://www.metsateollisuus.fi/painopisteet/logistiikka-ja-liikennevaylat/logistiikka/Merenkulun-ymparistomaarrykset-huomattava-kustannusuhka-metsateollisuuden-kuljetuksille--190.html
www.metsateollisuus.fi [Accessed 8.4.2014]

Metsäteollisuus ry (2013c). *The Finnish forest industries in figures*. Available at:

http://www.forestindustries.fi/statistics/The-Finnish-forest-industry-in-figures-1274.html [Accessed 9.4.2014]

Metsäteollisuus ry (2014). *Suomen metsäteollisuus numeroina*. Available at: http://www.metsateollisuus.fi/tilastot/Suomen-metsateollisuus-numeroina-169.html [Accessed 8.4.2014]

Nau, D. (1995). Mixing Methodologies: Can Bimodal Research be a Viable Post-Positivist Tool? *The Qualitative Report* [On-line serial]. Vol. 2, No. 3. Available: http://www.nova.edu/ssss/QR/QR2-3/nau.html [Accessed 29.4.2014]

Stora Enso (2011b). Stora Enso homepage. Available at: http://www.storaenso.com/about-us/organisation/logistics/Pages/logistics.aspx, Accessed: [12.8.2011]

List of Appendixes

The share of transportation activities during a time period out of the invoices of the same time period.

Share of Activities during July out of Invoices in July

Share of Activities during August out of Invoices in August

Share of Activities during September out of Invoices in September

Share of Activities during Q3 out of Invoices in Q3

The share of transportation activities of a time period linked to sales in the same time period out of all the period's transportation activities.

Share of Activities during July linked to Sales in July out of all Activities

Share of Activities during August linked to Sales in August out of all Activities

Share of Activities during September linked to Sales in September out of all Activities

Share of activities during Q3 linked to Sales in Q3 out of all activities
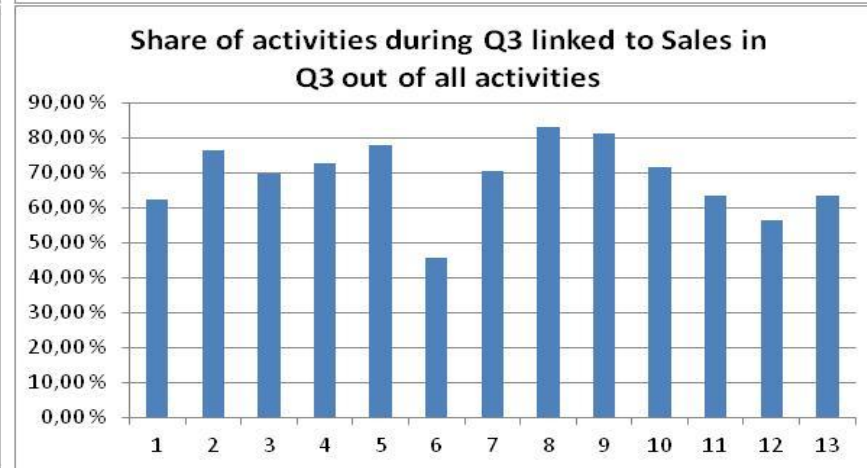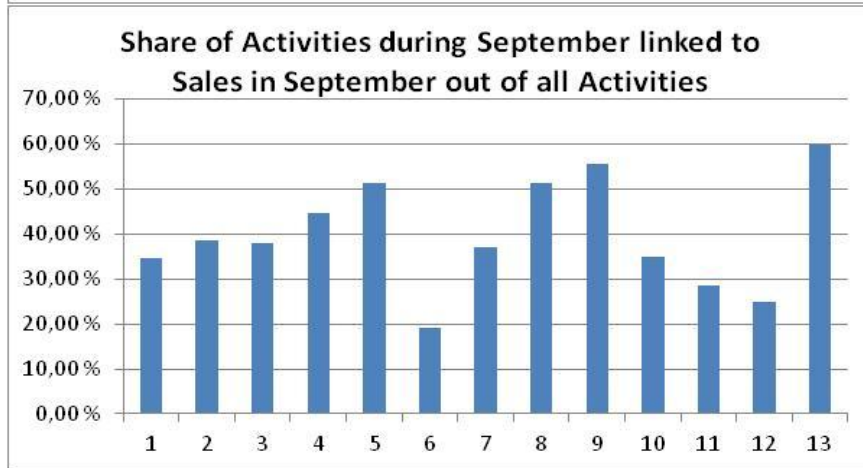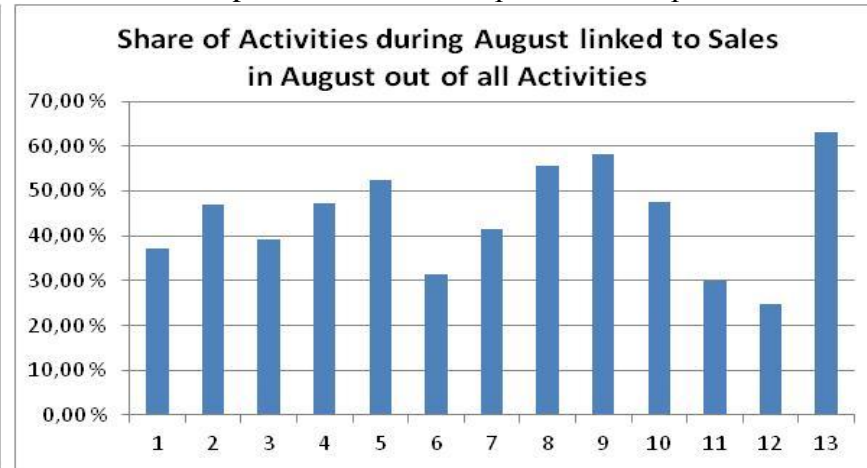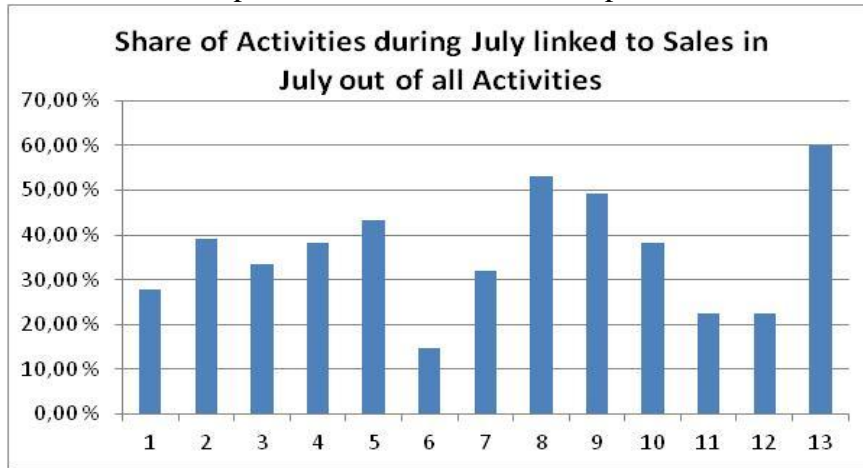
The share of transportation invoices in a time period linked to sales of the same time period out of all transportation invoices of the period.

Share of Invoices linked to Sales in July out of all Invoices

Share of Invoices linked to Sales in August out of all Invoices

Share of Invoices linked to Sales in September out of all Invoices

Share of Invoices linked to Sales in Q3 out of all Invoices
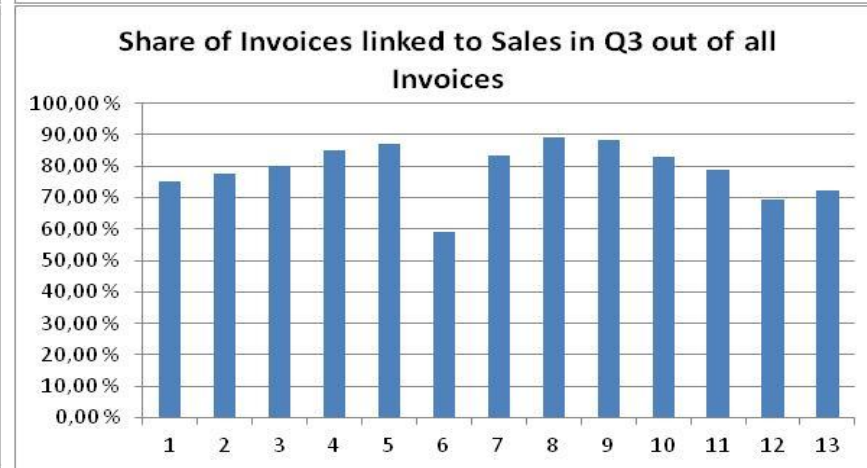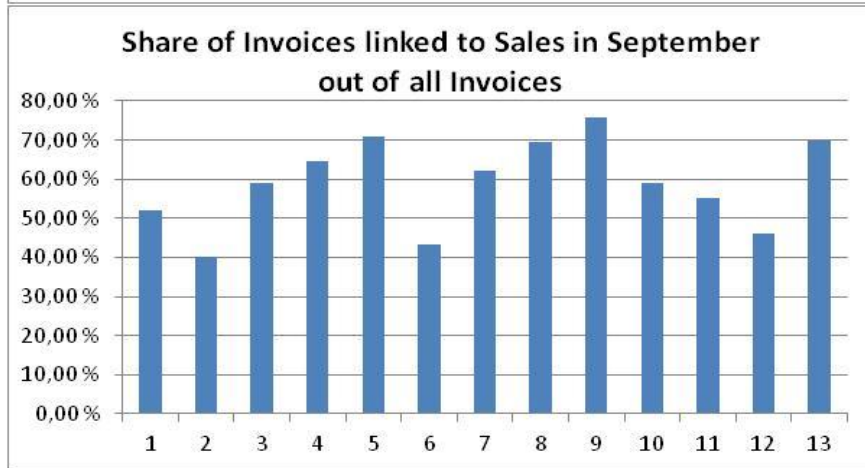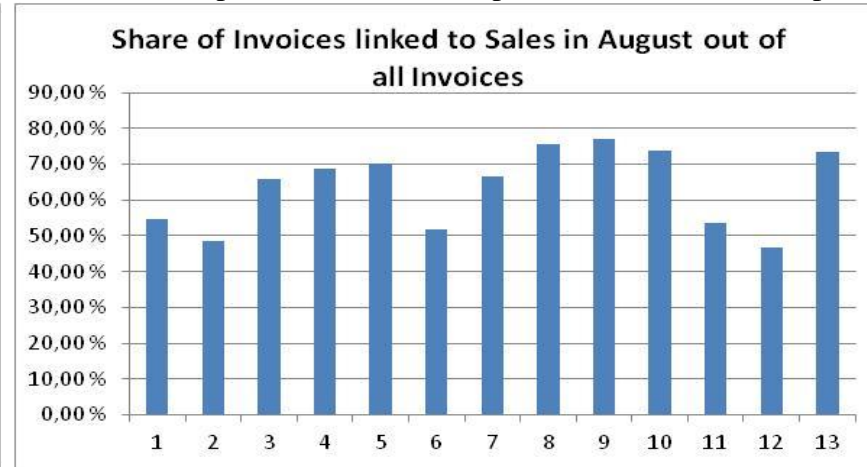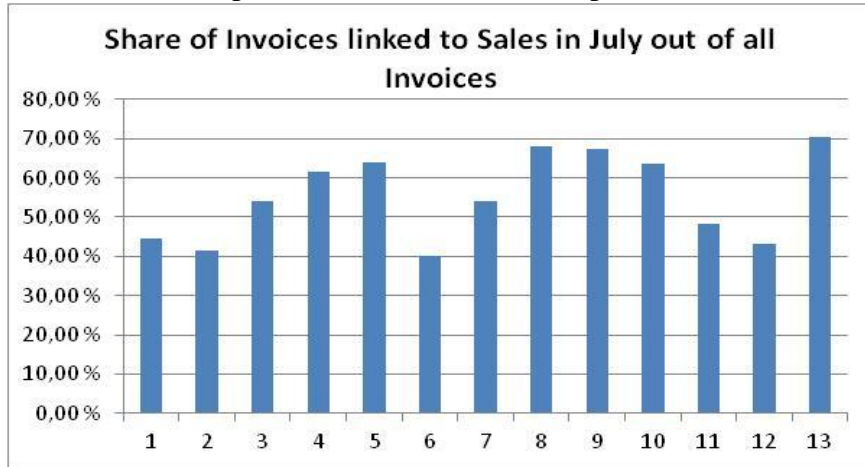
The share of transportation activities before a time period linked to sales of the time period out of all transportation activities.
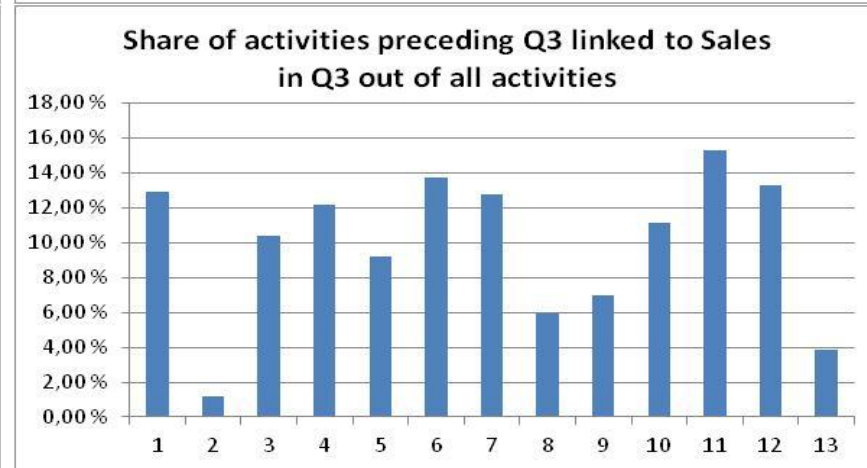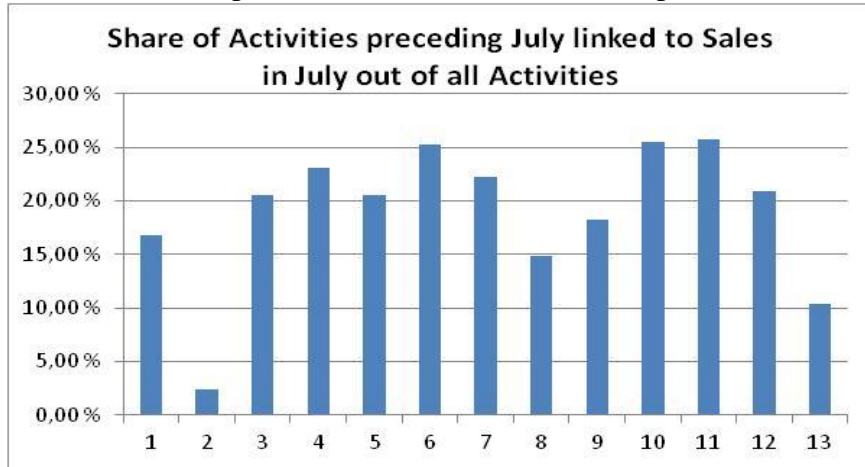
The share of transportation activities during a time period linked to sales of the time period out the activities of the same time period.
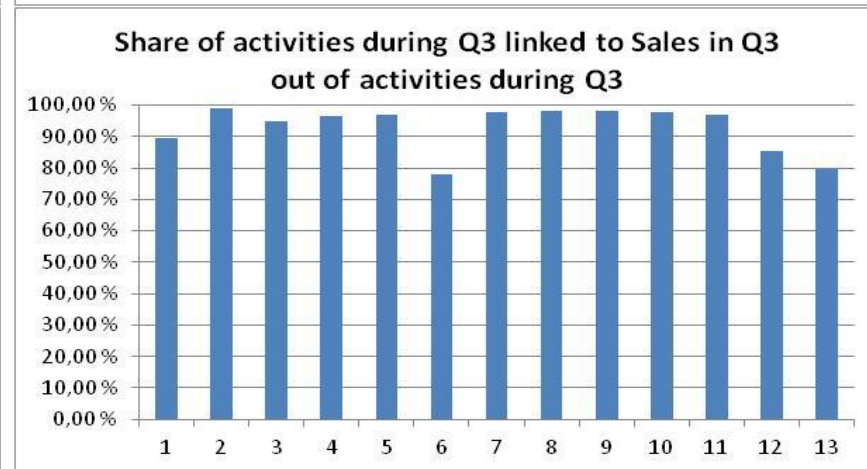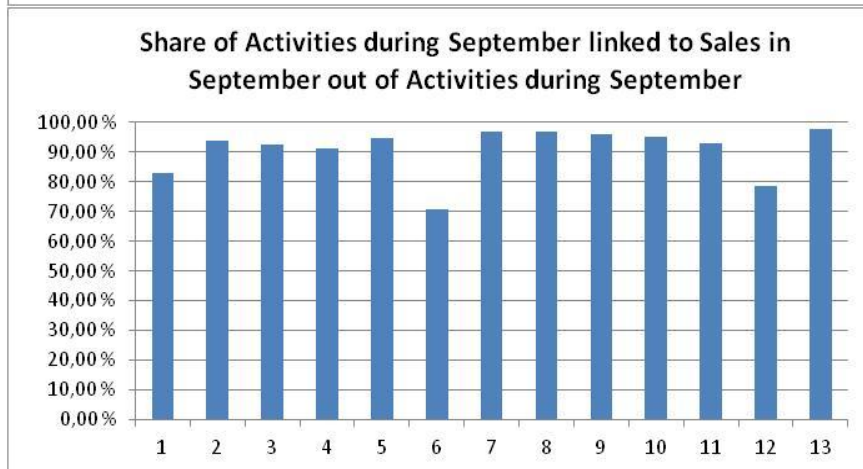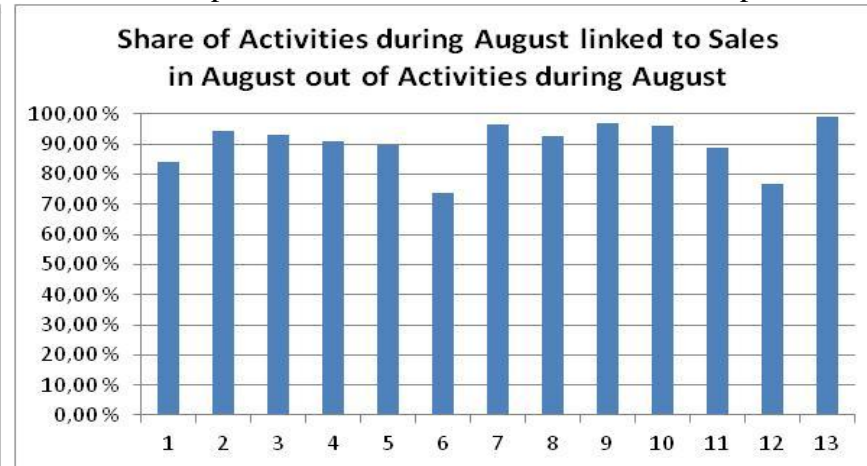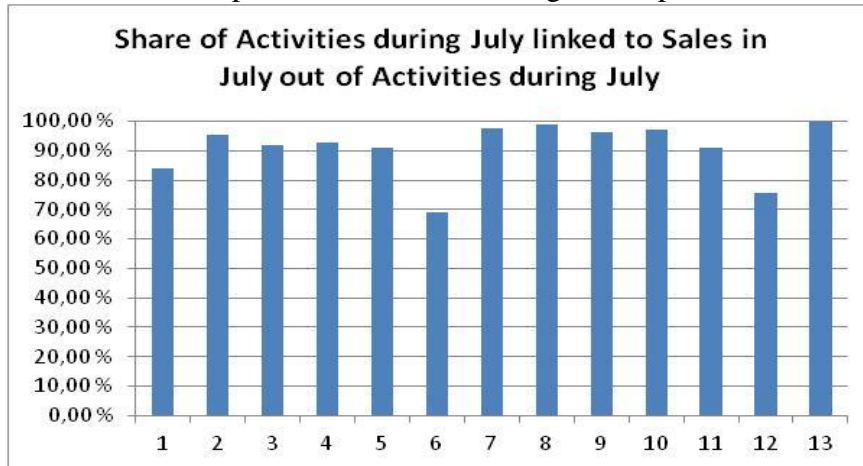
Share of Activities during July linked to Sales in July out of Activities during July

Share of Activities during August linked to Sales in August out of Activities during August

Share of Activities during September linked to Sales in September out of Activities during September

Share of activities during Q3 linked to Sales in Q3 out of activities during Q3

The share of transportation activities during a time period linked to sales of the time period out the transportation activities of the same time period and their share of costs.
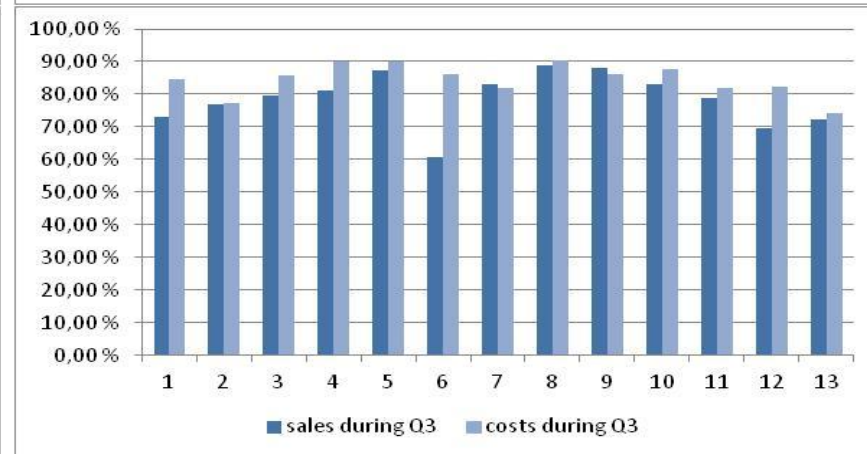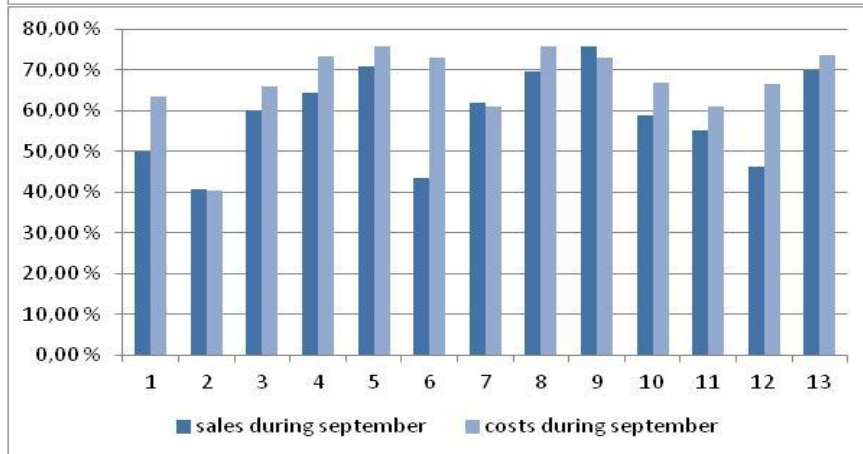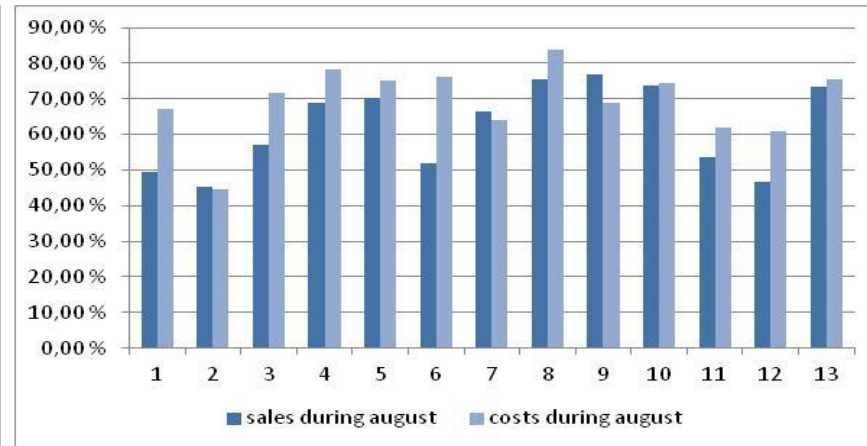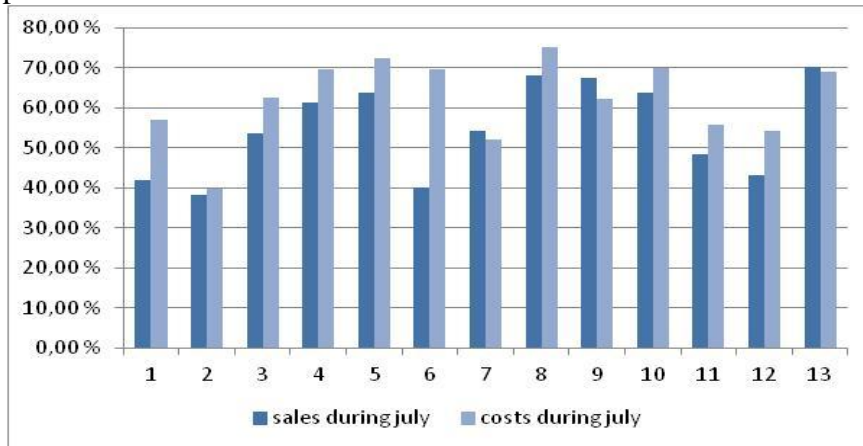
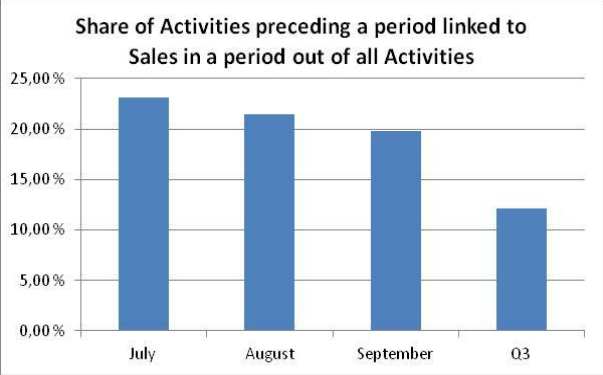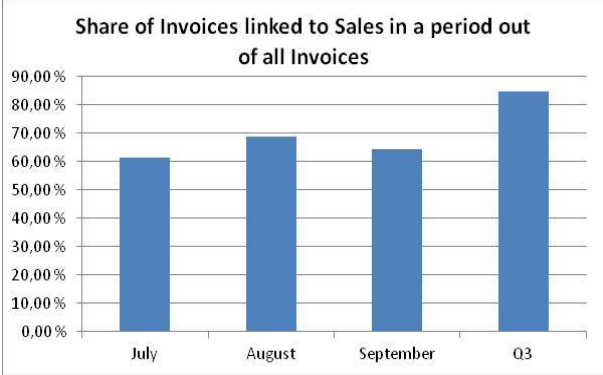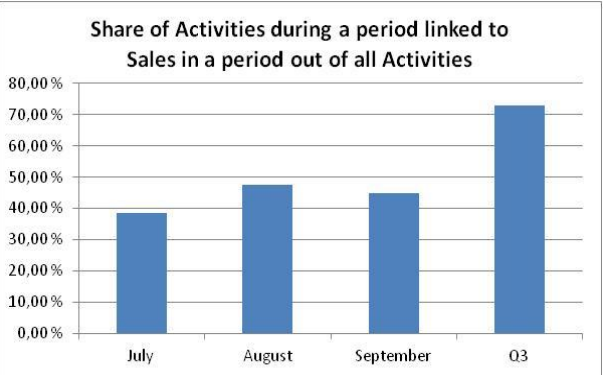The calculated ratios of transportation activities, sales and transportation invoices of the mill number 1.

Time Period	Share of Activities during a period out of Invoices in a period	Share of Activities during a period linked to Sales in a period out of all Activities	Share of Invoices linked to Sales in a period out of all Invoices	Share of Activities preceding a period linked to Sales in a period out of all Activities	Share of Activities during a period linked to Sales in a period out of Activities during a period
July	33,01 %	27,68 %	44,48 %	16,80 %	83,86 %
August	44,17 %	37,07 %	54,56 %	17,49 %	83,92 %
September	41,59 %	34,51 %	51,91 %	17,40 %	82,98 %
Q3	69,51 %	62,19 %	75,12 %	12,93 %	89,47 %
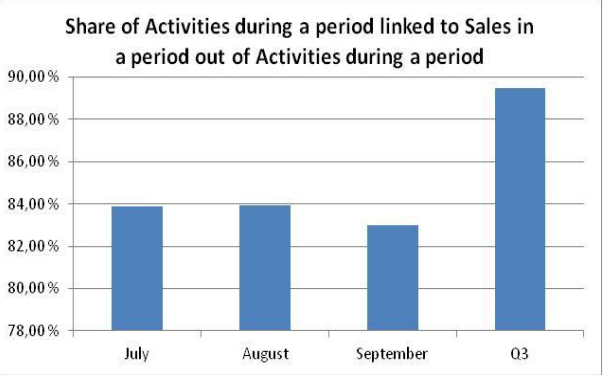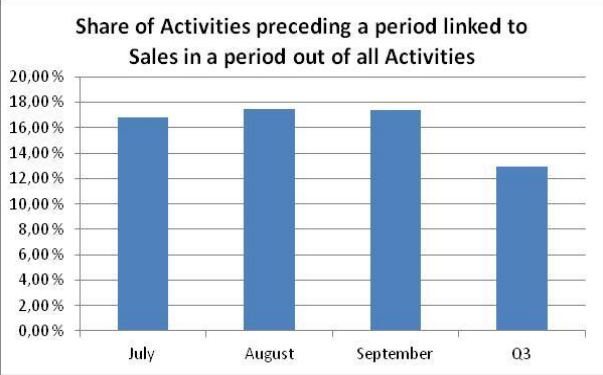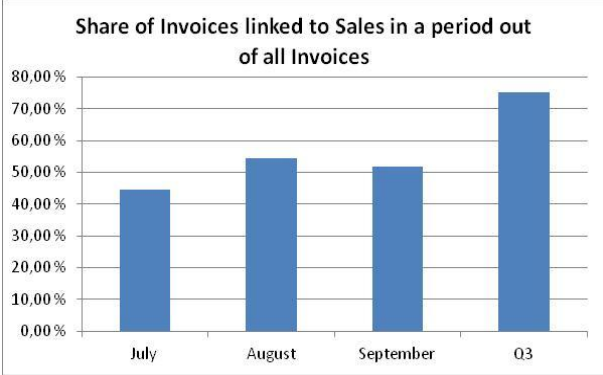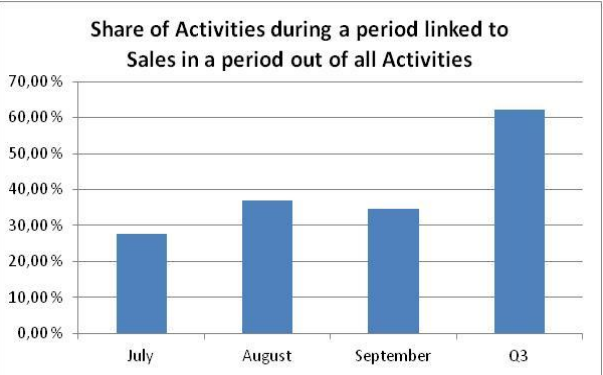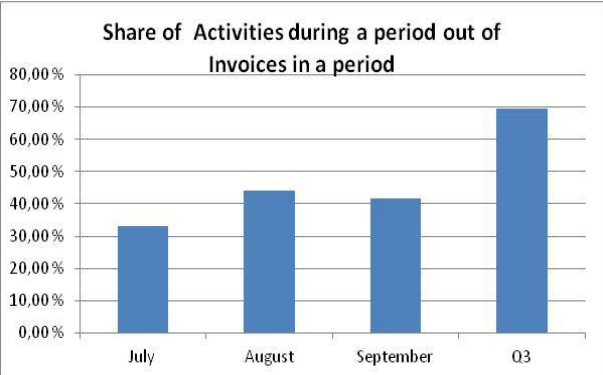
Share of Activities during a period out of Invoices in a period

Share of Activities during a period linked to Sales in a period out of all Activities

Share of Invoices linked to Sales in a period out of all Invoices

Share of Activities preceding a period linked to Sales in a period out of all Activities

Share of Activities during a period linked to Sales in a period out of Activities during a period
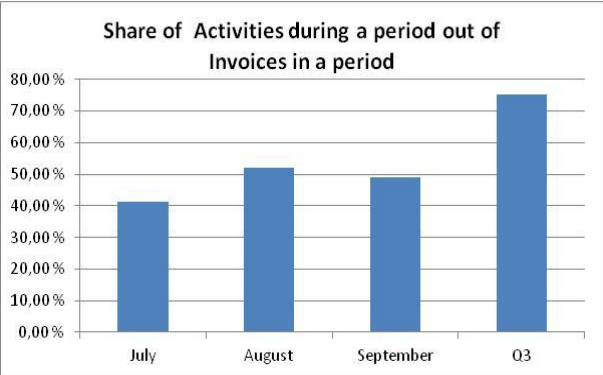
The calculated ratios of transportation activities, sales and transportation invoices of the mill number 2.

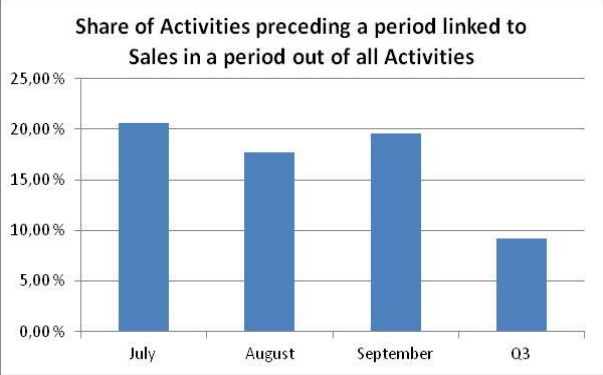| Time Period	Share of Activities during a period out of Invoices in a period	Share of Activities during a period linked to Sales in a period out of all Activities	Share of Invoices linked to Sales in a period out of all Invoices	Share of Activities preceding a period linked to Sales in a period out of all Activities	Share of Activities during a period linked to Sales in a period out of Activities during a period
July	40,99 %	39,07 %	41,44 %	2,37 %	95,32 %
August	49,90 %	47,02 %	48,51 %	1,48 %	94,24 %
September	41,23 %	38,63 %	40,32 %	1,69 %	93,69 %
Q3	77,49 %	76,53 %	77,71 %	1,17 %	98,76 %
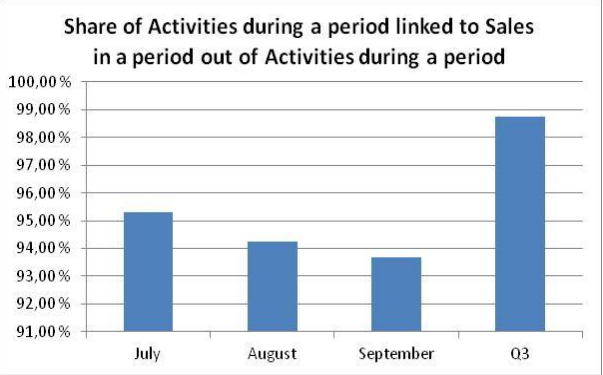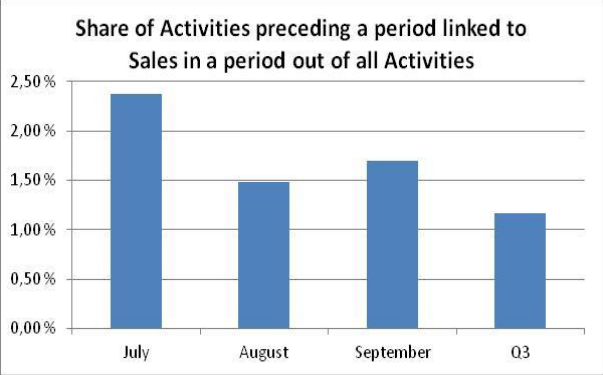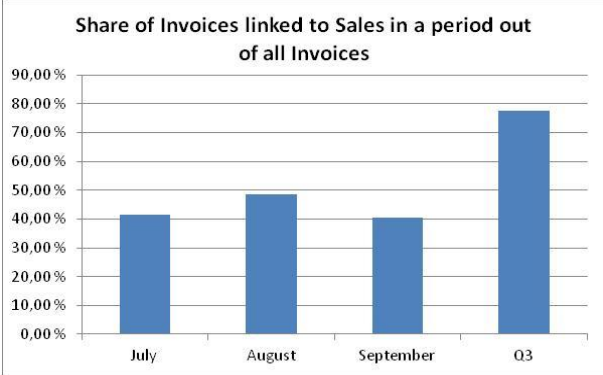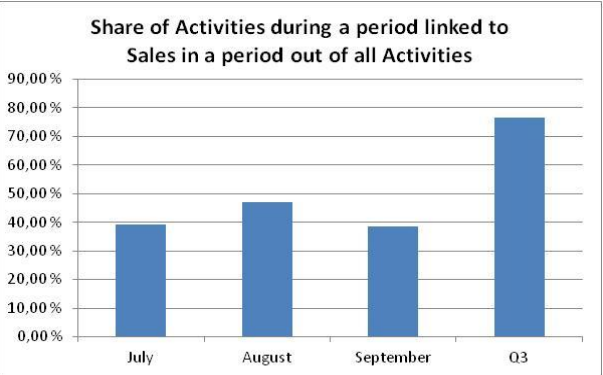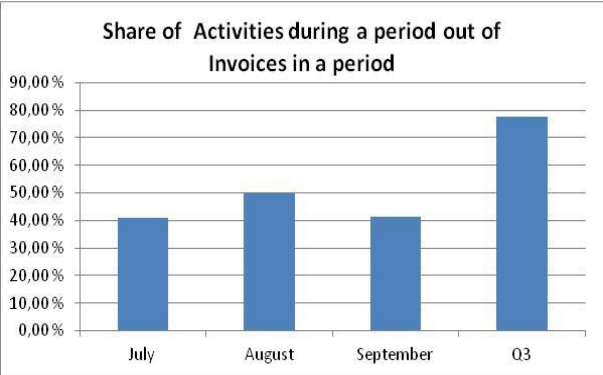
Share of Activities during a period out of Invoices in a period

Share of Activities during a period linked to Sales in a period out of all Activities

Share of Invoices linked to Sales in a period out of all Invoices

Share of Activities preceding a period linked to Sales in a period out of all Activities

Share of Activities during a period linked to Sales in a period out of Activities during a period
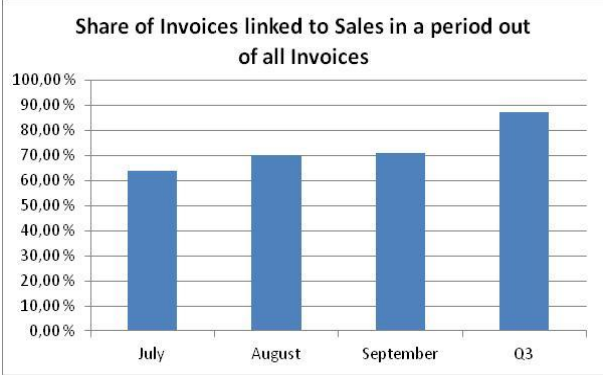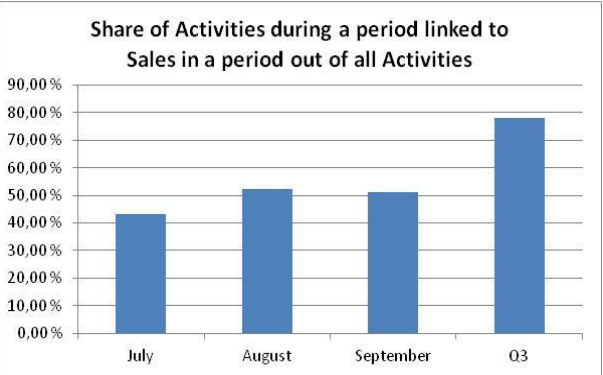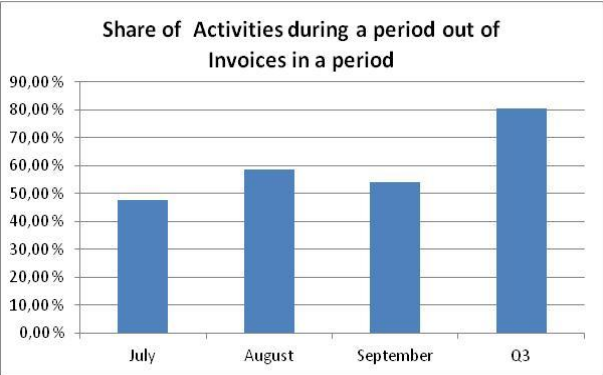
The calculated ratios of transportation activities, sales and transportation invoices of the mill number 3.

Time Period	Share of Activities during a period out of Invoices in a period	Share of Activities during a period linked to Sales in a period out of all Activities	Share of Invoices linked to Sales in a period out of all Invoices	Share of Activities preceding a period linked to Sales in a period out of all Activities	Share of Activities during a period linked to Sales in a period out of Activities during a period
July	36,32 %	33,36 %	53,94 %	20,58 %	91,85 %
August	42,10 %	39,15 %	65,71 %	26,56 %	92,99 %
September	40,87 %	37,91 %	58,92 %	21,01 %	92,74 %
Q3	73,32 %	69,65 %	80,00 %	10,34 %	95,00 %
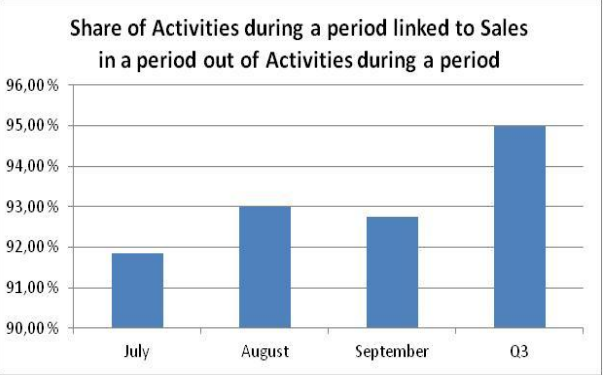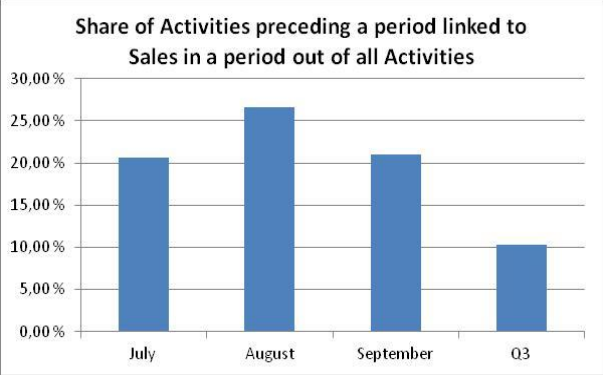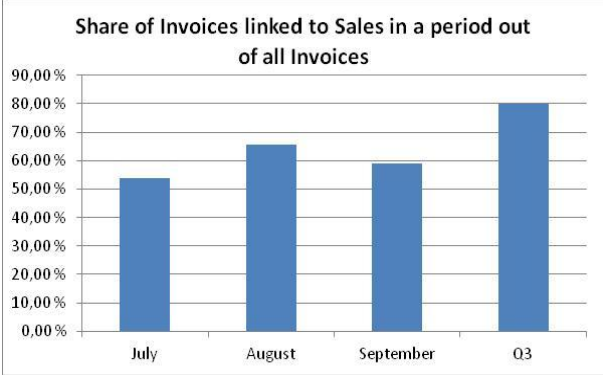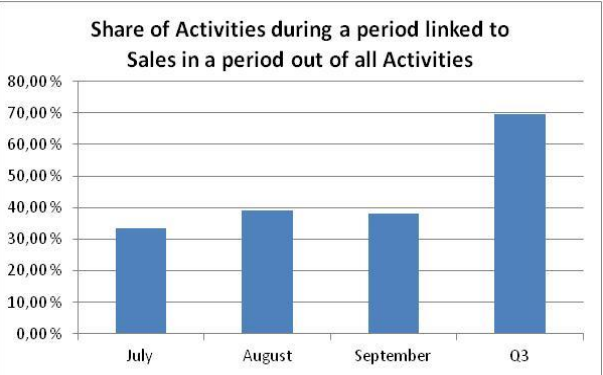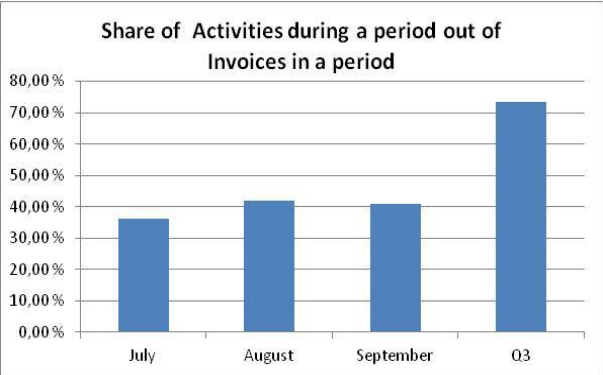
Share of Activities during a period out of Invoices in a period

Share of Activities during a period linked to Sales in a period out of all Activities

Share of Invoices linked to Sales in a period out of all Invoices

Share of Activities preceding a period linked to Sales in a period out of all Activities

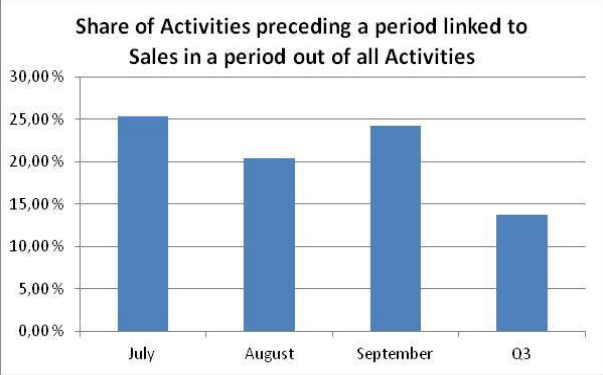Share of Activities during a period linked to Sales in a period out of Activities during a period
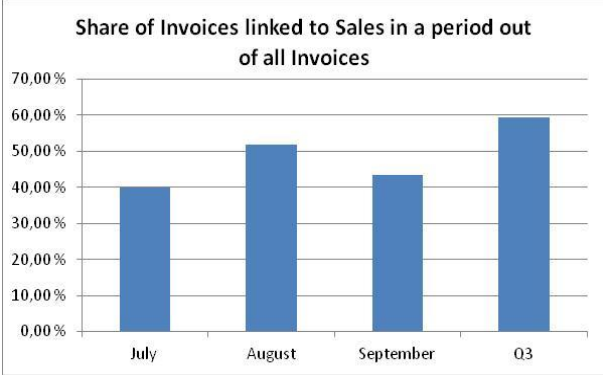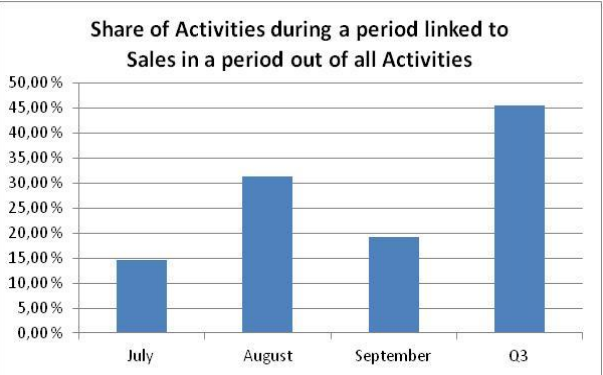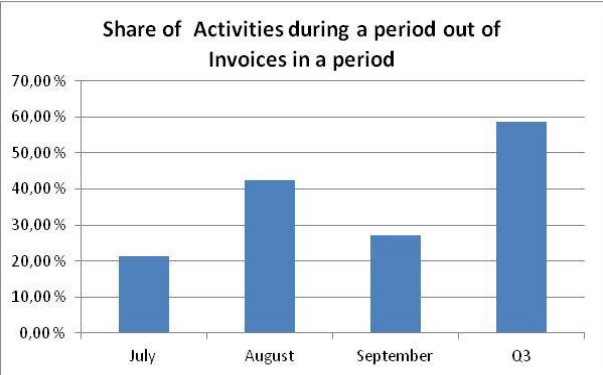
The calculated ratios of transportation activities, sales and transportation invoices of the mill number 4.

Time Period	Share of Activities during a period out of Invoices in a period	Share of Activities during a period linked to Sales in a period out of all Activities	Share of Invoices linked to Sales in a period out of all Invoices	Share of Activities preceding a period linked to Sales in a period out of all Activities	Share of Activities during a period linked to Sales in a period out of Activities during a period
July	41,42 %	38,36 %	61,50 %	23,14 %	92,61 %
August	52,18 %	47,37 %	68,86 %	21,48 %	90,79 %
September	48,87 %	44,69 %	64,48 %	19,79 %	91,44 %
Q3	75,29 %	72,77 %	84,91 %	12,14 %	96,65 %
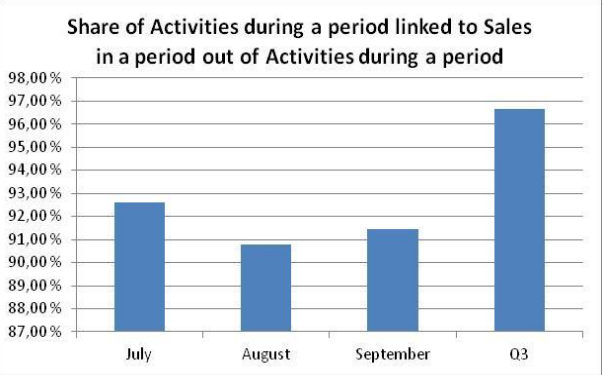
Share of Activities during a period out of Invoices in a period

Share of Activities during a period linked to Sales in a period out of all Activities

Share of Invoices linked to Sales in a period out of all Invoices

Share of Activities preceding a period linked to Sales in a period out of all Activities

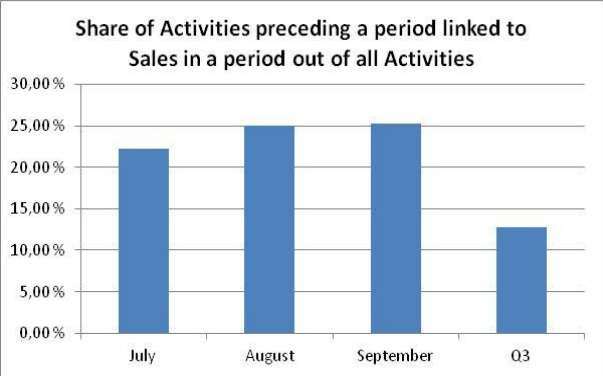Share of Activities during a period linked to Sales in a period out of Activities during a period
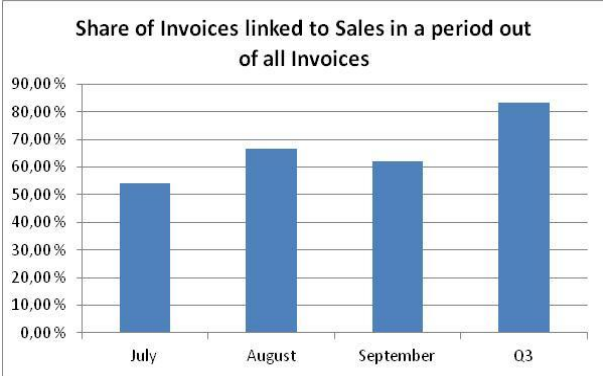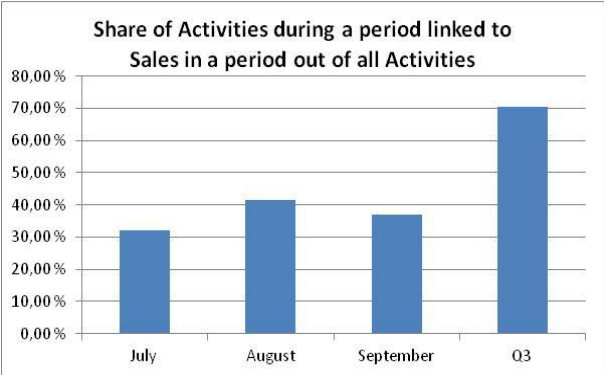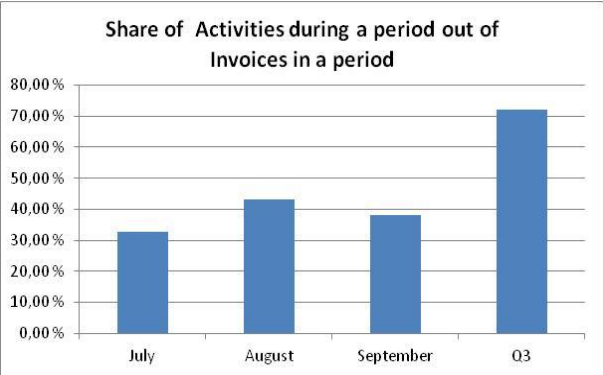
The calculated ratios of transportation activities, sales and transportation invoices of the mill number 5.

Time Period	Share of Activities during a period out of Invoices in a period	Share of Activities during a period linked to Sales in a period out of all Activities	Share of Invoices linked to Sales in a period out of all Invoices	Share of Activities preceding a period linked to Sales in a period out of all Activities	Share of Activities during a period linked to Sales in a period out of Activities during a period
July	47,46 %	43,20 %	63,80 %	20,60 %	91,02 %
August	58,41 %	52,43 %	70,18 %	17,75 %	89,76 %
September	54,22 %	51,31 %	70,91 %	19,59 %	94,64 %
Q3	80,47 %	78,08 %	87,27 %	9,19 %	97,03 %
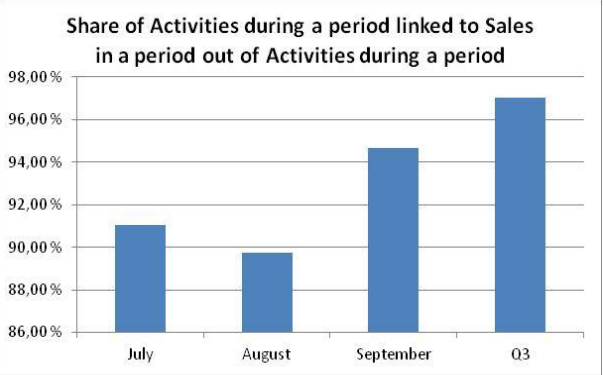
Share of Activities during a period out of Invoices in a period

Share of Activities during a period linked to Sales in a period out of all Activities

Share of Invoices linked to Sales in a period out of all Invoices

Share of Activities preceding a period linked to Sales in a period out of all Activities

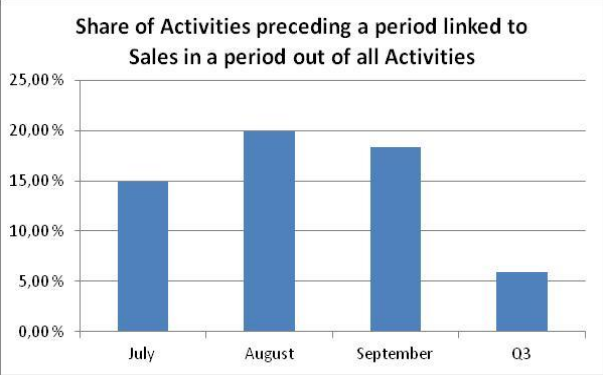Share of Activities during a period linked to Sales in a period out of Activities during a period
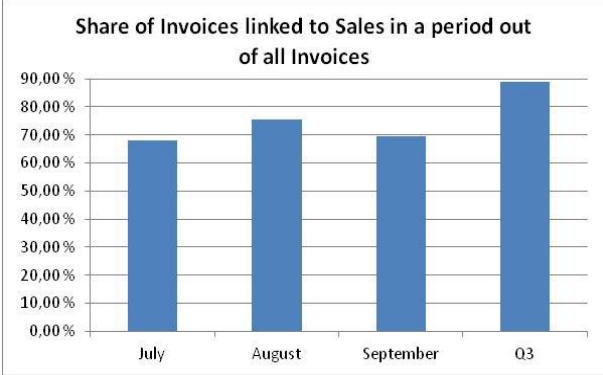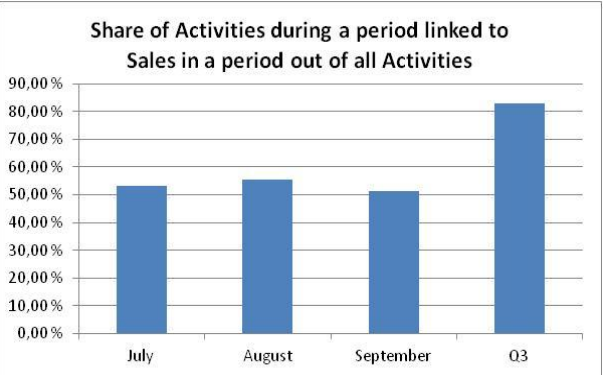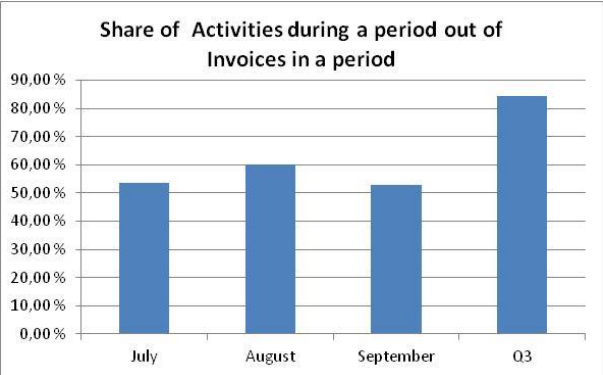
The calculated ratios of transportation activities, sales and transportation invoices of the mill number 6.

Time Period	Share of Activities during a period out of Invoices in a period	Share of Activities during a period linked to Sales in a period out of all Activities	Share of Invoices linked to Sales in a period out of all Invoices	Share of Activities preceding a period linked to Sales in a period out of all Activities	Share of Activities during a period linked to Sales in a period out of Activities during a period
July	21,25 %	14,68 %	40,01 %	25,32 %	69,10 %
August	42,38 %	31,33 %	51,78 %	20,45 %	73,93 %
September	27,04 %	19,15 %	43,43 %	24,29 %	70,81 %
Q3	58,54 %	45,57 %	59,30 %	13,73 %	77,84 %
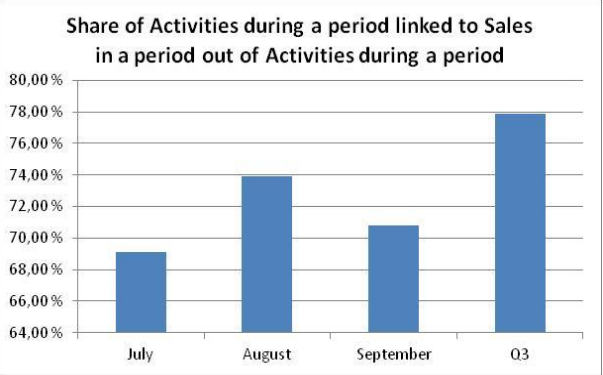
Share of Activities during a period out of Invoices in a period

Share of Activities during a period linked to Sales in a period out of all Activities

Share of Invoices linked to Sales in a period out of all Invoices

Share of Activities preceding a period linked to Sales in a period out of all Activities

Share of Activities during a period linked to Sales in a period out of Activities during a period

The calculated ratios of transportation activities, sales and transportation invoices of the mill number 7.

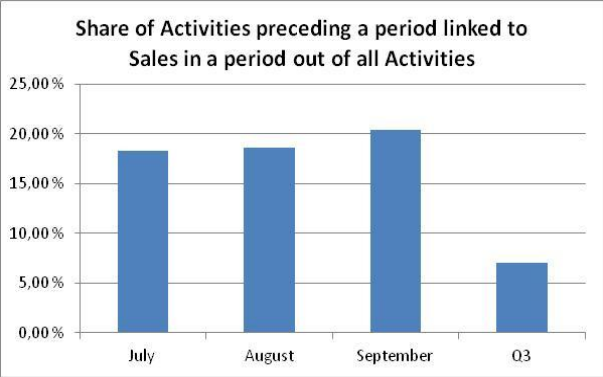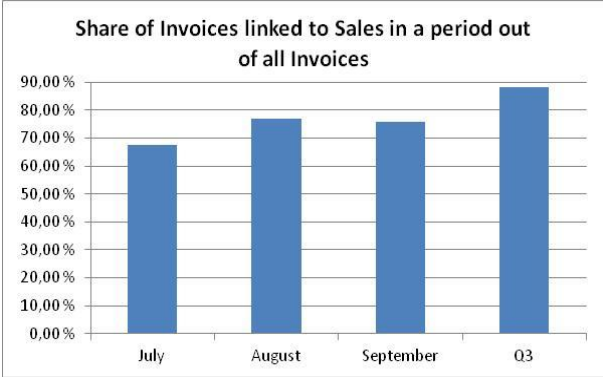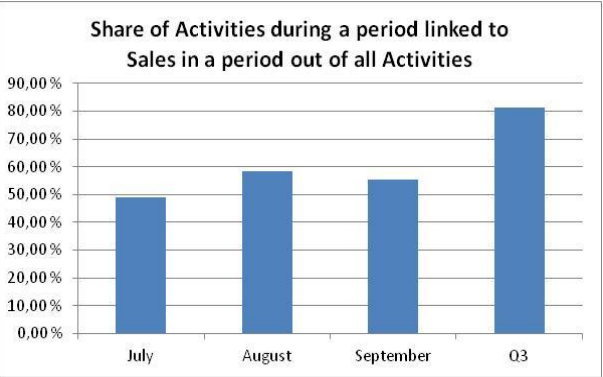| Time Period	Share of Activities during a period out of Invoices in a period	Share of Activities during a period linked to Sales in a period out of all Activities	Share of Invoices linked to Sales in a period out of all Invoices	Share of Activities preceding a period linked to Sales in a period out of all Activities	Share of Activities during a period linked to Sales in a period out of Activities during a period
July	32,84 %	31,98 %	54,19 %	22,21 %	97,40 %
August	43,05 %	41,49 %	66,52 %	25,02 %	96,38 %
September	37,99 %	36,89 %	62,12 %	25,23 %	97,10 %
Q3	72,02 %	70,52 %	83,24 %	12,73 %	97,91 %
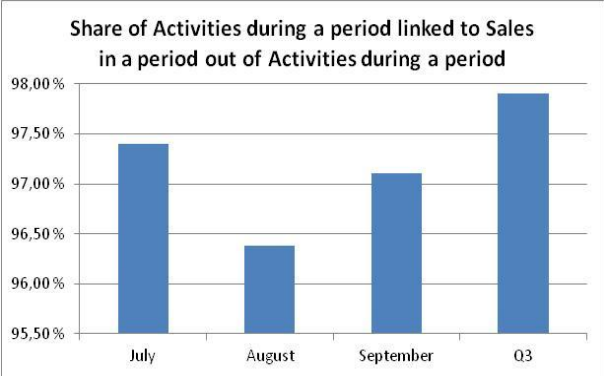
Share of Activities during a period out of Invoices in a period

Share of Activities during a period linked to Sales in a period out of all Activities

Share of Invoices linked to Sales in a period out of all Invoices

Share of Activities preceding a period linked to Sales in a period out of all Activities

Share of Activities during a period linked to Sales in a period out of Activities during a period
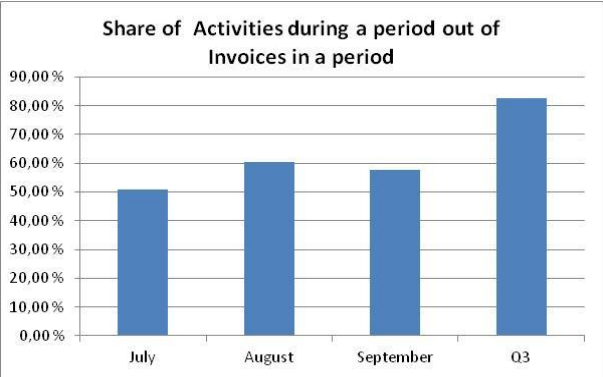
The calculated ratios of transportation activities, sales and transportation invoices of the mill number 8.

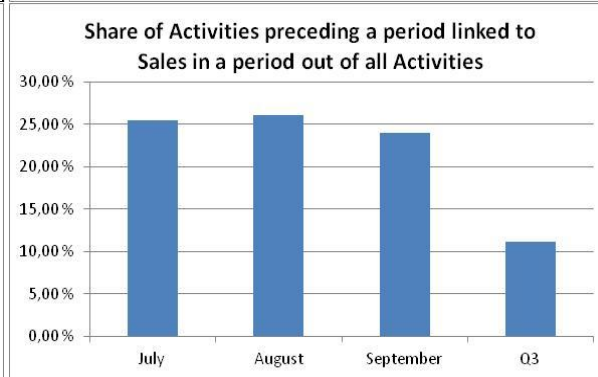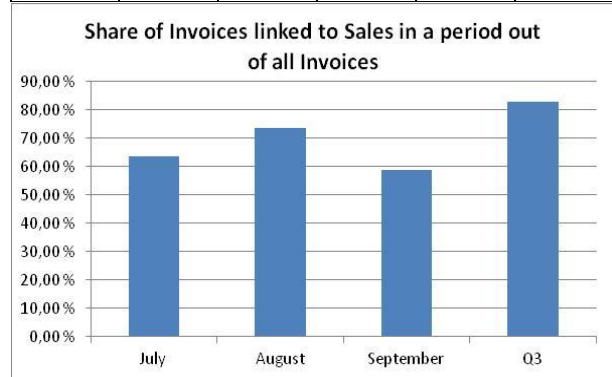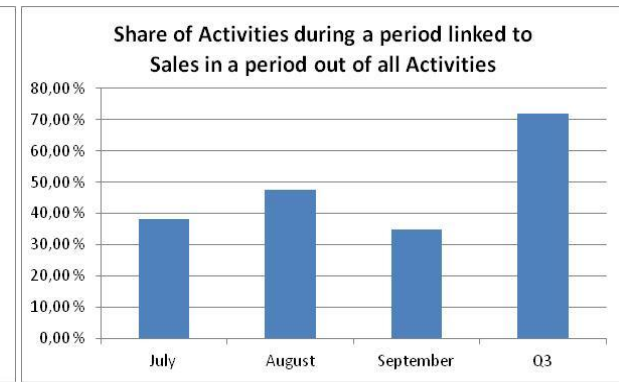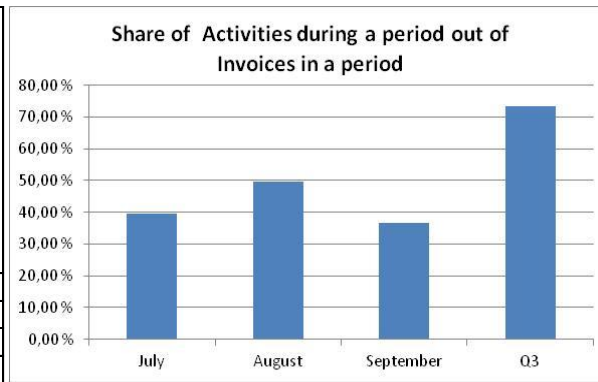| Time Period	Share of Activities during a period out of Invoices in a period	Share of Activities during a period linked to Sales in a period out of all Activities	Share of Invoices linked to Sales in a period out of all Invoices	Share of Activities preceding a period linked to Sales in a period out of all Activities	Share of Activities during a period linked to Sales in a period out of Activities during a period
July	53,74 %	53,11 %	67,97 %	14,86 %	98,82 %
August	59,98 %	55,59 %	75,55 %	19,96 %	92,69 %
September	52,89 %	51,25 %	69,65 %	18,40 %	96,90 %
Q3	84,52 %	83,03 %	89,00 %	5,97 %	98,25 %
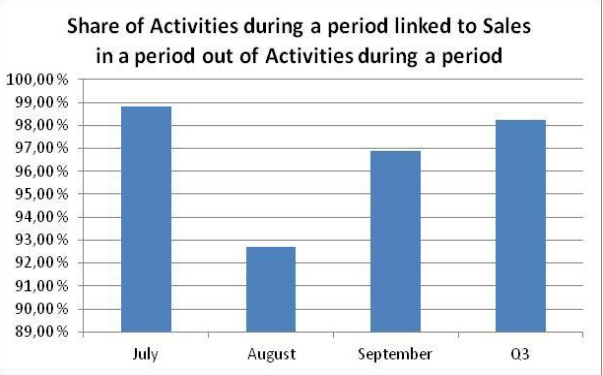
The calculated ratios of transportation activities, sales and transportation invoices of the mill number 9.

Time Period	Share of Activities during a period out of Invoices in a period	Share of Activities during a period linked to Sales in a period out of all Activities	Share of Invoices linked to Sales in a period out of all Invoices	Share of Activities preceding a period linked to Sales in a period out of all Activities	Share of Activities during a period linked to Sales in a period out of Activities during a period
July	50,94 %	49,13 %	67,41 %	18,28 %	96,44 %
August	60,26 %	58,32 %	76,98 %	18,65 %	96,78 %
September	57,73 %	55,41 %	75,85 %	20,44 %	95,98 %
Q3	82,72 %	81,22 %	88,22 %	7,01 %	98,18 %
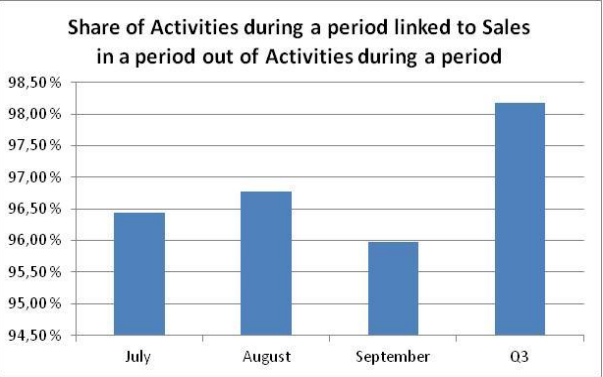
The calculated ratios of transportation activities, sales and transportation invoices of the mill number 10.

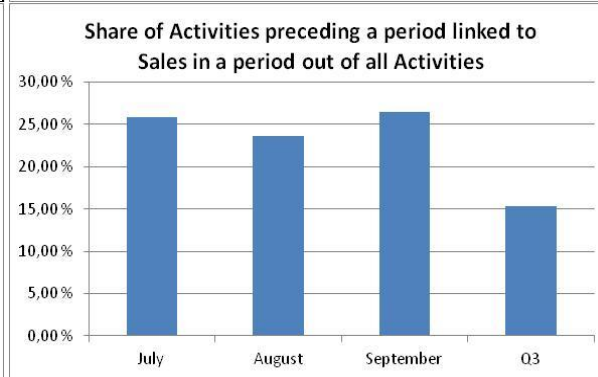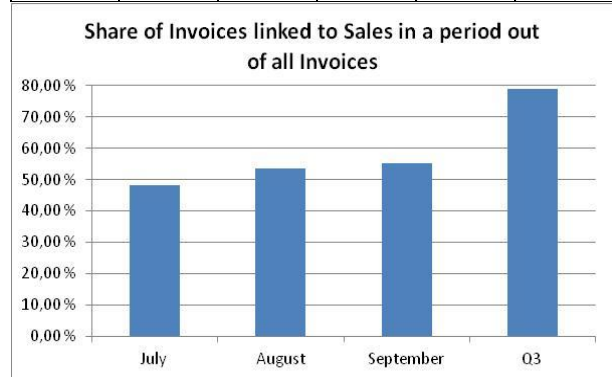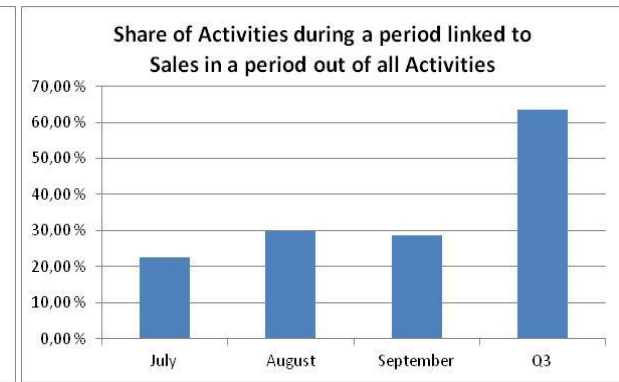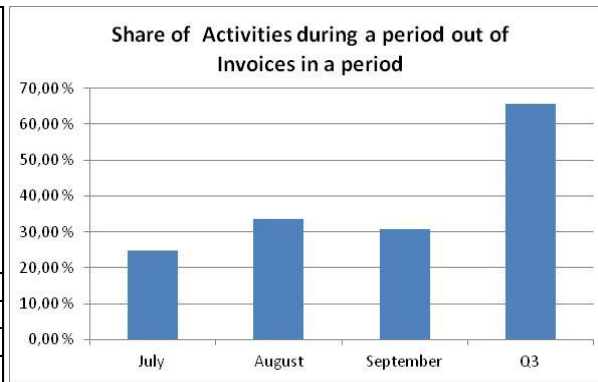| Time Period	Share of Activities during a period out of Invoices in a period	Share of Activities during a period linked to Sales in a period out of all Activities	Share of Invoices linked to Sales in a period out of all Invoices	Share of Activities preceding a period linked to Sales in a period out of all Activities	Share of Activities during a period linked to Sales in a period out of Activities during a period
July	39,44 %	38,23 %	63,74 %	25,50 %	96,94 %
August	49,65 %	47,63 %	73,69 %	26,06 %	95,92 %
September	36,66 %	34,90 %	58,92 %	24,03 %	95,20 %
Q3	73,37 %	71,81 %	82,91 %	11,10 %	97,88 %
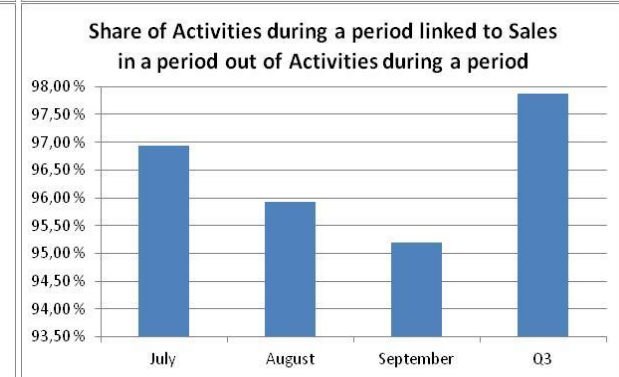
The calculated ratios of transportation activities, sales and transportation invoices of the mill number 11.

Time Period	Share of Activities during a period out of Invoices in a period	Share of Activities during a period linked to Sales in a period out of all Activities	Share of Invoices linked to Sales in a period out of all Invoices	Share of Activities preceding a period linked to Sales in a period out of all Activities	Share of Activities during a period linked to Sales in a period out of Activities during a period
July	24,80 %	22,55 %	48,35 %	25,80 %	90,94 %
August	33,68 %	29,96 %	53,50 %	23,54 %	88,95 %
September	30,75 %	28,63 %	55,07 %	26,44 %	93,11 %
Q3	65,59 %	63,65 %	78,96 %	15,31 %	97,04 %
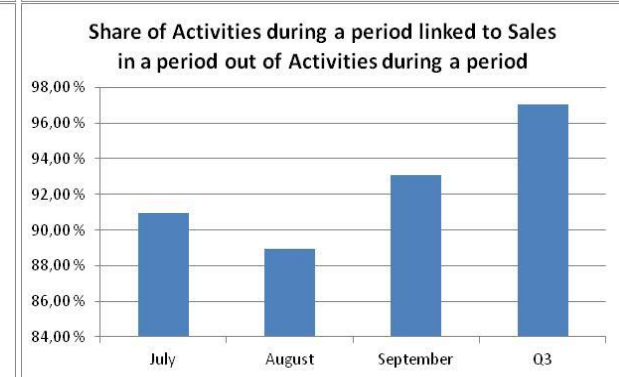
Share of Activities during a period out of Invoices in a period

Share of Activities during a period linked to Sales in a period out of all Activities

Share of Invoices linked to Sales in a period out of all Invoices

Share of Activities preceding a period linked to Sales in a period out of all Activities

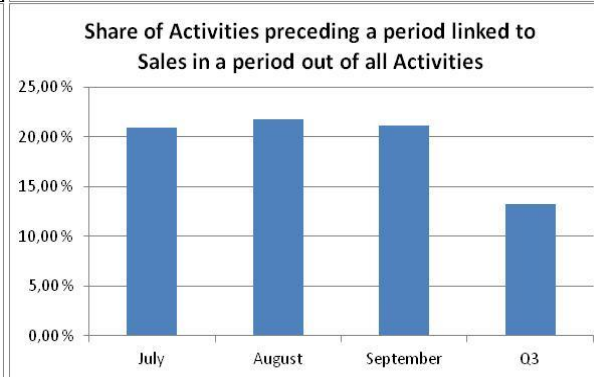Share of Activities during a period linked to Sales in a period out of Activities during a period
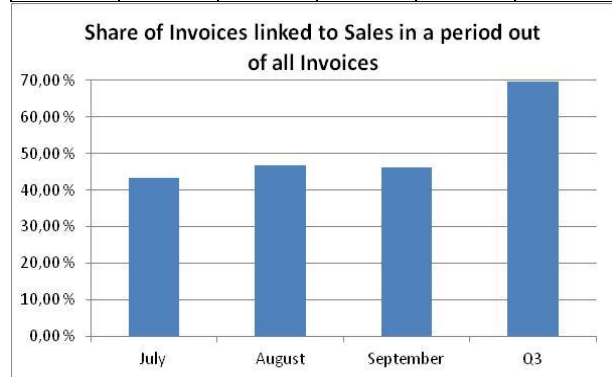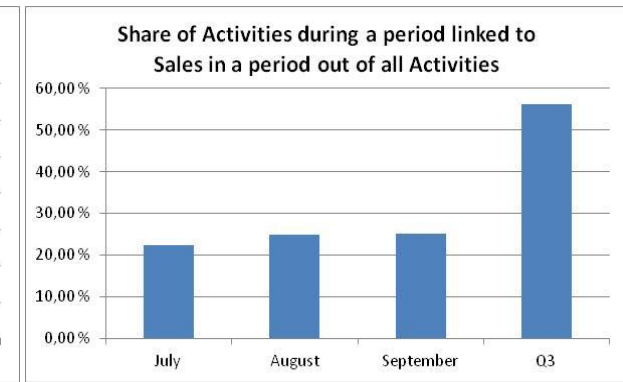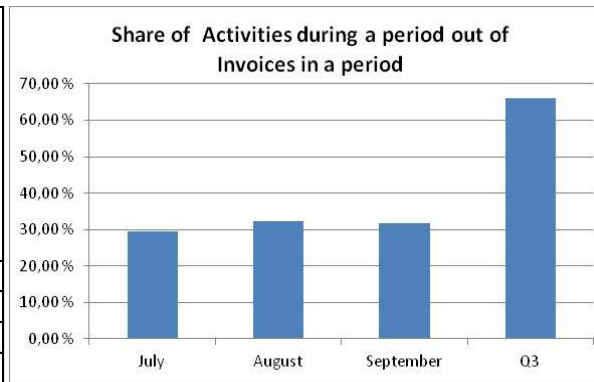
The calculated ratios of transportation activities, sales and transportation invoices of the mill number 12.

Time Period	Share of Activities during a period out of Invoices in a period	Share of Activities during a period linked to Sales in a period out of all Activities	Share of Invoices linked to Sales in a period out of all Invoices	Share of Activities preceding a period linked to Sales in a period out of all Activities	Share of Activities during a period linked to Sales in a period out of Activities during a period
July	29,51 %	22,29 %	43,24 %	20,95 %	75,54 %
August	32,38 %	24,90 %	46,62 %	21,72 %	76,91 %
September	31,83 %	25,01 %	46,13 %	21,12 %	78,59 %
Q3	66,00 %	56,28 %	69,55 %	13,27 %	85,27 %
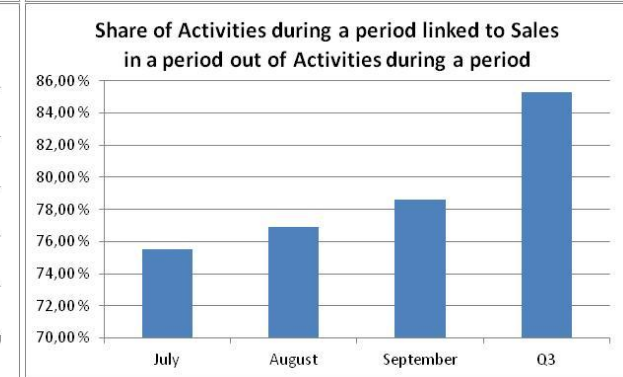
Share of Activities during a period out of Invoices in a period

Share of Activities during a period linked to Sales in a period out of all Activities

Share of Invoices linked to Sales in a period out of all Invoices

Share of Activities preceding a period linked to Sales in a period out of all Activities

Share of Activities during a period linked to Sales in a period out of Activities during a period

The calculated ratios of transportation activities, sales and transportation invoices of the mill number 13.

Time Period	Share of Activities during a period out of Invoices in a period	Share of Activities during a period linked to Sales in a period out of all Activities	Share of Invoices linked to Sales in a period out of all Invoices	Share of Activities preceding a period linked to Sales in a period out of all Activities	Share of Activities during a period linked to Sales in a period out of Activities during a period
July	60,13 %	60,04 %	70,44 %	10,41 %	99,85 %
August	63,57 %	63,10 %	73,33 %	10,22 %	99,26 %
September	61,01 %	59,75 %	69,93 %	10,18 %	97,93 %
Q3	84,60 %	63,31 %	72,27 %	3,84 %	79,53 %

Share of Activities during a period out of Invoices in a period

Share of Activities during a period linked to Sales in a period out of all Activities

Share of Invoices linked to Sales in a period out of all Invoices

Share of Activities preceding a period linked to Sales in a period out of all Activities

Share of Activities during a period linked to Sales in a period out of Activities during a period