How origin consolidation can reduce transportation costs in a typical Finnish company

Janne Matikka

Master's Thesis

Master's Degree Programme in International Business Management

MASTER’S THESIS	
Arcada	
Degree Programme:	International Business Management
Identification number:	17355
Author:	Janne Matikka
Title:	How origin consolidation can reduce transportation costs in a typical Finnish company
Supervisor (Arcada):	Siv Relander
Commissioned by:	

Abstract:
This research was made to understand how origin consolidation can affect to overall transportation costs. Research aims was set to study how transportation charges change, how charges change and are there any other gains than cost benefits. The research theory was built around supply chain strategy, transportation and delivery strategy, inventory strategy, origin consolidation and total cost of ownership. All these theories are behind optimization study which was made and strategic decisions related to the case company supply chain strategy. Main limitation to the research were main data availability which was restricted only to one data pull. Therefore, the author main aim was to make a generic study related to similar shipping profiles rather than making a case study only for one company.
Optimization study results revealed, that companies with similar shipping profile can reduce overall transportation costs with 27 %. Transportation costs in origin were higher than in starting point but overall transportation saving compensated those costs. The research also indicated that there are also side benefits where there is no possibility to put numerical value.

Keywords:	Supply Chain Management, Optimization study, Origin consolidation, delivery terms, incoterms, Total Cost of Ownership, Delivery Strategy, Transportation costs, ocean freight
Number of pages:	91
Language:	English
Date of acceptance:	

CONTENTS

FIGURES

TABLES

1 INTRODUCTION

Increasing customer needs a expectations are demanding constant improvements to companies supply chains. This means companies need to be more cost effective and have more streamlined supply chains than ever. In order to satisfy customers also in future, companies need to change and adapt to new market conditions constantly. From a supply chain point of view, companies have more and more complex supply chains, because of increasing number of suppliers and other partners. This situation has led to a point, where supply chains are not as optimized as they could be.

This thesis is about researching benefits of an origin consolidation from the transportation costs point of view. Today's demanding customers, have pushed the author to think, are there any other ways to achieve cost savings than constant RFQ processes. The author has seen many different Finnish, Swedish and Danish companies' supply chains, because of his current work assignment. The author feels, total maturity of a supply chain management in Finland is not same level as it is in the other Nordic countries. Therefore, this study, is going to research how can small changes in supply chain affect to total transportation spend.

1.1 Background

As a core for this thesis, is received shipping profile from a Swedish case company in 2015. Even though the shipping profile is from the Swedish company, it also reflects a common shipping profile for many Finnish companies. The shipping profile reflects issues which many Finnish companies are facing in their daily life.

In this thesis, the author goes through models for supply chain, delivery strategies, benefits of using certain incoterms, origin consolidation, inventory strategies and cost of transportation. The author uses these principles in an optimization study, where the current situation is optimized from an operational point of view. Most likely these changes have other positive benefits too, but purpose is to keep current operational set up the same. Changing of an incoterm creates new costs compared to an old scenario, but the author also discusses about this in a research part of thesis.

The author has worked in various positions in the field of logistics for more than ten years. He has experience from ground level positions to management positions. During his professional career, the author has worked in three different global forwarding companies and for a one leading retail company. Most recently, he has worked in sales and sales management. In his current position, he has focused on improving customers' supply chains and gain new customers at the same time. Shipping profile which is used in the research has been received as a part of the authors work.

1.2 Structure of thesis

This thesis investigates how the origin consolidation can affect to an overall transportation cost in a lane level and are there other benefits to be achieved. The origin consolidation is a pretty simple concept which means shipments from multiple suppliers is consolidated in consolidation point in origin to a one shipment. This consolidated shipment is shipped as a one shipment instead of multiple shipments. This consolidation process lowers shipping costs because less shipments and bigger shipments. (Lilly. 2016) The author presents origin consolidation more closely in Chapter 2. Data for the research has been received from case company in 2015 and it is approximately one-year's shipping data. The author uses this data, for optimization calculations and analyses made in the study.

First chapter in the thesis is an introduction. This chapter introduces reader to an ocean freight industry and the latest trends in the industry. These trends build a background and a need for the research. Chapter ends to a company introduction, research aims and a timetable. Second chapter presents a theoretical frame which is needed for this research. Besides this second chapter introduces theories behind the optimization study and strategic advantages and disadvantages related to the company. In third chapter the author, explains a methodology which has been used in this research. Chapter 3 ends to an explanation how data has been received and discussion about validity of it. Fourth chapter, is detailed overview about the optimization study and results of it. Lastly, in fifth and sixth chapter the author discusses about the results and the research ends to a conclusion.

1.3 An ocean freight industry

The ocean freight industry has always been, and is going to be also in the future, heavily affected by megatrends around a globe. Major changes in an economy and globalization have been also noticed in the ocean freight industry. These changes have led to a situation where industrial work has shifted from USA and Europe, to cheaper workforce countries in Asia. Besides the workforce changes, also consumption changes and countries who are driving economic growth, are shifting a trade focus points around the globe. All these megatrends have major effect to the ocean freight industry. In past years, trends like an environmental thinking and fuel prices has effected heavily to the ocean freight industry. These trends have led to situation, where ocean carriers are building bigger ships and transit times are longer than ever before. This is a way how ocean carriers try to drive fuel and another cost savings. From Finland and other Baltic sea region point of view, latest big change has been implementing of the Sulphur directive. (Suomen meriliikenteen skenaariot 2030. 2013)

An ocean freight as a transportation mode, is very slow from transit time point of view. When comparing it to other transportation modes, it is clearly slowest. As opposite to other transportation modes, an ocean freight can carry big quantities. This makes an ocean freight the most cost effective way to transport goods around the globe. Globally more than 90 % of all transported goods are transported by ocean. In Finland, more than 90 % from exported goods are transported by ocean and from all imported goods 80 % are transported by ocean. (Meriliitto. 2016)

When comparing to other transportation modes, an air transportation is faster than ocean, but at the same time it is also five times more expensive. A truck transportation is cheaper than the air transportation, but it is good only with short distances. A rail transportation is considered to be most similar to the ocean freight. From continent to continent point of view, the rail transportation is a bit faster than the ocean, but prices are still doubled compared to the ocean transportation. This situation is not changing either, because capacity in rails cannot meet the ocean transportation capacity. (Suomen meriliikenteen skenaariot 2030. 2013)

The ocean freight and a global trade, has been in great turbulence for years now. This turbulence has had a negative effect to companies who use the ocean freight. It has led to situation, where companies cannot forecast their transportation costs and flow of goods to warehouses has become unreliable. In general, situation has shifted companies focus more to control ocean freight rates rather than developing the supply chain which has been the main strategy for many companies to achieve reduced transportation costs.

1.3.1 History of an ocean transportation

Today, 90 % of everything which we buy is transported in containers. That means at least 20 million containers are shipped at this very moment. The ocean freight history is relatively long, but what really changed the ocean freight industry was containerization. Containerization history dates to 18th century, but development in larger scale started in 50's when, for example United States army started to use containers in order to easily deal bulk cargo. Containerization breakthrough happened in 70's when a larger scale standardization happened and ships were built to meet container standards. This standardization did not only affect the ocean freight industry, but it also spread to a road and a rail freight industry. Standardization revolutionized the way of handling cargo from bulk cargo to use of different chassis. (Levinson. 2016)

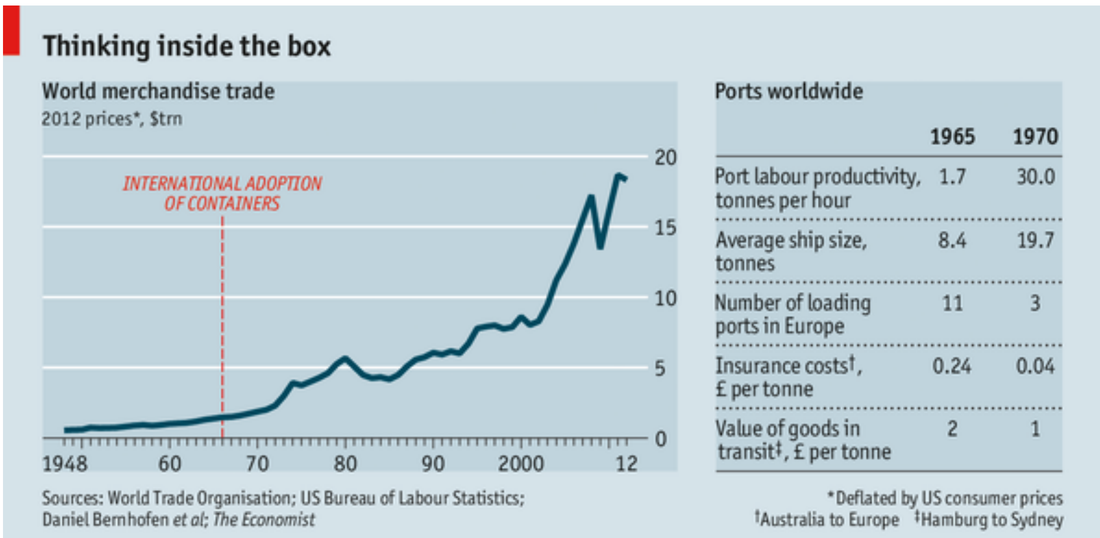


Figure 1. Thinking inside of the box (The Economist 2. 2016)

Standardization had a huge effect on the world trade because it enabled to handle cargo faster, cheaper and seamlessly between the transportation modes. This standardization made the world smaller and companies could reach markets further away quicker and cheaper. Globally container standardization helped economies to grow faster and that can be seen also in statistics. (See Figure 1) After containerization there has been only one year when the ocean industry globally has not grown. (See Figure 2)

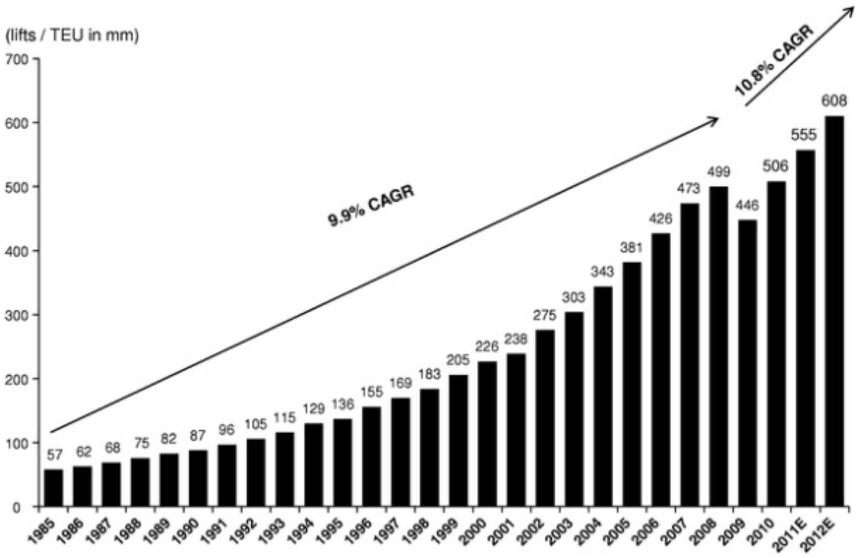


Figure 2. Global container volume (Charles. 2013)

1.3.2 Ocean freight trends

The ocean freight industry is heavily affected by world trade trends. Year 2015 was exceptional because the world trade grew in average 2 % year-on-year. There has been only five other years in past 50 years when the world trade has grown 2 % or less (KPMG Transport tracker. 2016). A forecast for years 2016 and 2017 is also modest. The IMF is projecting growth for 2016 3.1 % and 3.4 % for 2017 (IMF News. 2016). These uncertainties in past years have led to a situation which ocean freight markets have not seen before.

Global trade trends itself would not be catastrophically itself, but at the same time carriers have started to order new vessels to replace old ones. Ocean carriers forecasted before 2008 downturn that demand in markets would stay healthy, which led to decision to invest to larger megaships with a capacity over 18 000 + TEUs. These decisions have led to the situation where capacity kept growing a lot faster than demand in the markets. In 2016 the situation is getting slightly better (see Figure 3) but still the fact is that capacity is growing faster than demand. (Supply Chain Digest 1. 2016)

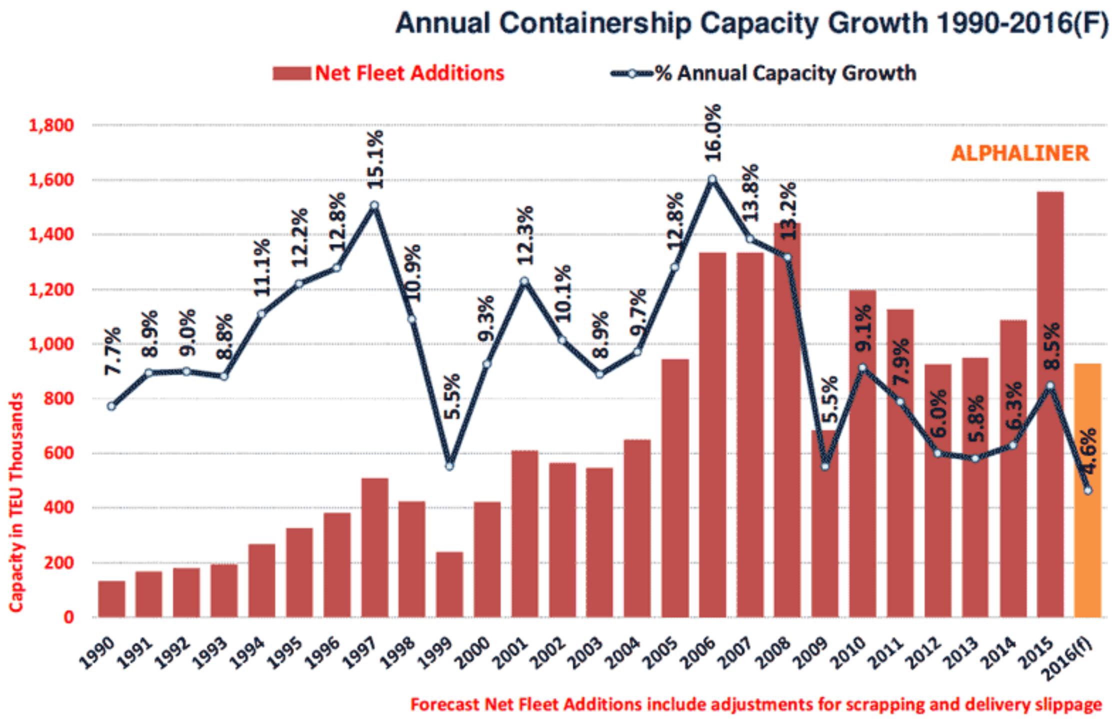


Figure 3. Annual Containership Capacity Growth 1990 – 2016 (Supply Chain Digest 2. 2016)

This over capacity versus lack of demand situation, is causing big economical losses to ocean carriers which has led to alliances between ocean carriers. At the moment, it seems that there is no quick fix to the situation and it leads most likely to more consolidation inside of the ocean freight industry.

Most recent hit to the ocean industry, were collapse of carrier Hanjin Shipping. Hanjin shipping filed bankruptcy leaving more than 60 ships floating in ocean and they were carrying cargo worth more than USD 14 billion. This is a good example of, how the ocean freight industry is in unhealthy situation. A slow global economy and overcapacity in the markets is causing heavy losses. All these growing uncertainties have also effected to their customers. (Profits Overboard. 2016)

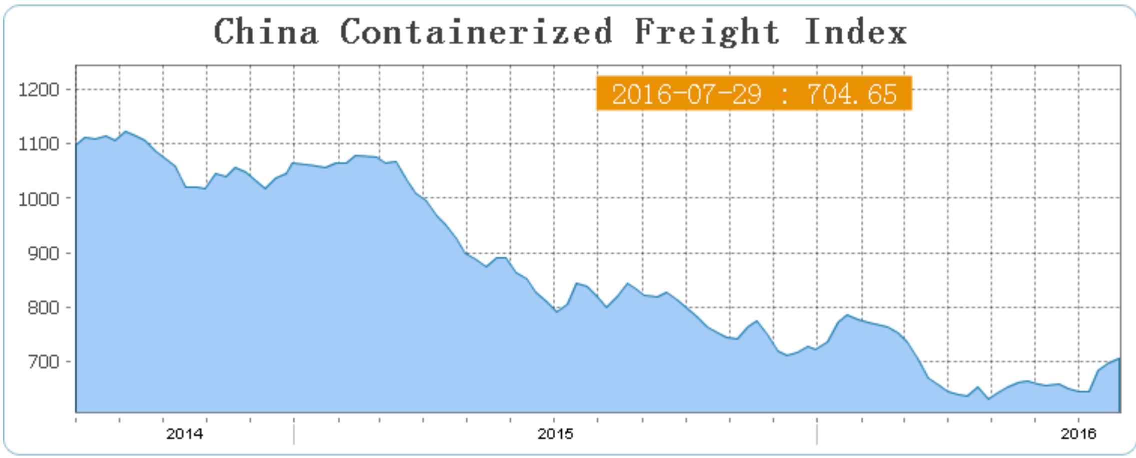


Figure 4. China Containerized Freight Index (Shanghai Shipping Exchange. 2016)

Current price turbulence in the ocean freight market (see Figure 4) is heavily effecting also to companies who use the ocean freight. One of the issues has been, how to predict what is a final cost of transportation and how to measure it year-on-year. In current price turbulence, it has been almost in possible to compare year on year costs. Another bigger issue has been unreliability of transit times. When ocean carriers sell with low rates, they might skip sailings for cheap containers, to improve profitability of sailing. This issue has direct effect to companies' businesses.

1.4 The case company

The case company, where the shipping data has been received, wants to stay anonymous for this research. Collaboration with the case company limits to the shipping data received from them. There is no further possibility to pull out a new data from them and the data is meant to be used only as a shipping profile. From the author point of view this is not a problem because core idea of the study is to research the shipping profile instead of evaluating data quality changes in their ERP system.

The case company is a company who is operating in multiple countries and was founded in 1940s. The company is still a family owned company and they are operating in a retail industry. They develop, manufacture and sell quality products for their customers. Customers which company have, are mainly business to business customers. Company is manufacturing their products overseas in China and other parts of Asia. Throughout history they have grew naturally, through collaborations and as well as through acquisitions. At the moment, they are a market leader in a Nordic region and they are expanding to Europe to countries like UK, Germany, Italy and Russia.

1.5 Current state of the case company

Currents state, in the case company is same kind of situation where many Finnish companies are today. The company has grown naturally and through acquisitions, and there has not been board level attention to a supply chain management. Logistics and transportation has been managed in a side of grow without any a supply chain strategy. The company has a logistic manager but there has not been any deeper level collaboration with other departments inside of the company. This lack of collaboration has led to situation where the logistic manager has been focusing to manage RFQ process and procurement of logistics services.

The company has been historically buying with incoterm CIP and other C-terms from their suppliers which means their suppliers determines how a transportation part of supply chain is happening up to Swedish port. They are also responsible of costs of this transportation to Swedish port. From Swedish port, onwards the case company is responsible of the transportation and costs of it. The case company has multiple warehouses: their own and outsourced. This situation is partly consequence of the natural grow and need for bigger stock due to uncertainties in the supply chain. They have not been able to forecast detailed enough, when do they have finished goods in their stock. This overall situation is causing internal conflicts between departments and company is failing to meet their customer promise. Overall they have been satisfied about state of the supply chain but they have also realized that improvements need to be done.

In normal a situation, the company is using single-echelon strategy but in current situation with high inventory they have an extra warehouse location. This is a 3rd party location which purpose is to have extra space and that space is needed because of high inventory. In current situation, the case company is using multi-echelon strategy which means now they consider these two locations as one from inventory decisions point of view. When their inventory is optimized and they are in the normal situation, they use single-echelon inventory strategy.

1.6 Aim and research questions

Aim of this study is to research can the origin consolidation lower total transportation costs. If it is possible, and cost savings are big enough, purpose is to show for companies in same kind of situation, that savings can be done without jeopardizing operational efficiency.

The Aim of this study is to answer to five different questions.

1. How change of the delivery term affects to transportation costs?
2. Can origin consolidation cut total transportation expenses, and if so, how much?
3. In which part of the supply chain savings are achieved?
4. Are there any parts of the supply chain where costs increase?
5. What other benefits can be achieved with the origin consolidation?

In this study, the author concentrates only to ocean freight FCL and LCL volumes and specifically in Shanghai – Leksand lane via Gothenburg. Shipping data has also other lanes but those are excluded because Shanghai – Leksand lane is over half of volumes. This study does not take into consideration any other routings than via Gothenburg port and all shipments are treated so that an incoterm FOB would be in use. There are also other assumptions which are used in calculations and those can be found detailed from calculations part of the study.

Data to this study has been collected in June 2015 and there is no possibility to refresh or evaluate validity of shipping data with another data pull. Purpose is to find out generally, how consolidation process achieves cost savings instead of resolving how data quality works specifically with this company.

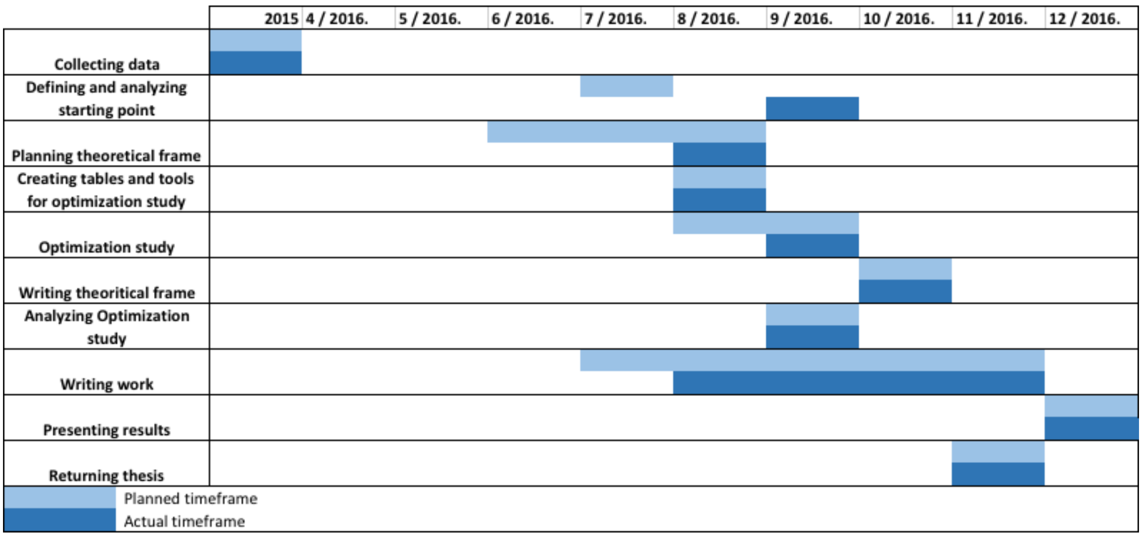
1.7 Schedule of study and project figure

This master thesis is scheduled to be done roughly in six months. The author has a flexible personal situation in terms of time to use for the research, so milestones in a project table is not that strict. Only strict milestone is returning of the thesis. This research is considered to be done when optimizations study calculations have been done and research questions can be answered based on that.

Data for the project was received in 2015 so there was no need to reserve time for collecting data. The authors evaluation of the data validity is done more closely in Section 3.2. Quality of the data was checked during 2015 and it was proven to be good. Few adjustments needed to be done before optimization study but it did not have any significant impact to the data.

Supply chain as a concept is wide and can be extended to numerous different directions. One of the main challenges was to find theory frame which is directly giving a big picture of strategies but at the same time digs into subject close enough. The origin consolidation was known for the author in practise but a theory behind it was not familiar.

Table 1. Project time table (The Author)



1.8 Definitions

The author lists down all definitions used in this research to explain acronyms and concepts used in research text. In remarks column, there is an information where this definition was used.

Table 2. Definitions (The Author)

Acronym	Definition	Remarks
Bullwhip Effect	Phenomenon caused by swings in inventory.	2.3
C	Customer	Figure 4 & 5
CBM	Cubic Meter	3 & 4
CFR	Cost and Freight	2.3.
CFS	Container freight station	2.3.
CIF	Cost, Insurance and Freight	2.3.
CIP	Carriage and Insurance Paid to	2.3.
CY	Container Yard	Calculations
CONSOLIDATION POINT	Forwarder/Agent warehouse	2.4
CO2	Carbon Dioxide	2.2
DC	Distribution Center	Figure 4 & 5
EPA	The Environmental Protection Agency	2.2
ERP	Enterprise Resource Planning System	3
FCL	Full container load	2.3
GOT	Gothenburg	3.4
HC	High Cube	3.4
IATA	The International Air Transport Association	2.2
ICC	International Chamber of Commerce	2.3
IMF	International Monetary Fund	1.3
IMO	International Maritime Organization	2.2
Inbound	Import shipment from origin going to destination	4
KG	Kilos	4.3
LANE LEVEL	Trade lane from SHA to GOT	1.2
LCL	Less than container load	1, 3, 4 and 5
LSP	Logistic Service Provider	2.3
ORIGIN CONSOLIDATION	Consolidating cargo before shipping overseas.	1 – 6
POD	Proof of Delivery	2.3
RDC	Regional Distribution Center	Figure 7
RFQ	Request for quotation	1
SHA	Shanghai	3.4

SCM	Supply Chain Management	2.1
SKU	Stock keeping unit	2.3
SME	Small medium enterprise	2.3
TCO	Total cost of ownership	2.4
THC	Terminal Handling Charge	2.3
TEU	Twenty-foot equivalent unit	1.3
UK	United Kindom	2.3
USA	United States of America	1.3
USD	United States Dollar	Multiple

2 THEORETICAL FRAME

The aim, background and limitations for the research have been explained in Chapter 1. In Chapter 2, the author explains theory behind the research and explain how it supports this study. The theoretical frame for the study consist of six different subjects: Supply chain strategy, Incoterms, Origin consolidation, inventory strategy, total cost of ownership and delivery strategy. These subjects are directly related to research questions of the study. By using these theories in optimization study, the author discusses how study results answer to research aims. This discussion has been done in Chapter 5.

In Section 2.1 the author goes through a supply chain strategy and a transportation strategy. The Basic theories and differences between the supply chain strategy and the supply chain management are explained. After that, the author gives a brief look of developing the supply chain strategy and in last part of this chapter the author explains theory behind a transportation strategy. A transportation strategy is part of a supply chain strategy and theories are directly linked to each other. These theories help reader to understand the theory behind the optimization study and starting point for the case company. The author also discusses, what kind of strategy changes the optimization study makes and how is it going to affect current situation.

Section 2.2 aims to describe a transportation as itself but also nature of it. Transportation decisions are trade-offs between costs and a transit time. Transportation decisions and trade-offs which this research studies effect to the whole supply chain. End of Chapter two the author discusses about trade-offs related to this research.

Section 2.3 is dedicated to explanation of incoterms and history of them. First the author explains history of the incoterms and why those were developed. Incoterms 2010 are in key position in an international trade. Section ends to comparison of C and F-terms, which are most essential from the study point of view. Discussion focuses to difference in costs.

Section 2.4 concentrates to explain the origin consolidation, single and multi-echelon inventory systems. These are strategies which effect to which part of the companies supply chain inventory concentrates. This is directly related to the case company current situation and situation after the optimizations study.

Last sections numbers 2.5 and 2.6 explains different costs concepts related to purchasing decisions and a supply chain. These concepts explain how purchasing decisions should not be made blindly focusing only to purchase price. Last chapter has a summary of theories and discussion about it.

2.1 A supply chain strategy

Today's customer no longer wants to buy a lot of products at the same time, but instead of they expect added value provided by a supplier at the same time when they buy small portions. This makes trades of today completely different than it was in mass production era. Trading have become more than just a simple transactional sale (Hines. 2014). But at the same time, purchasers in many companies are driving cost reductions and improvement in the supply chain (Quayle. 2005). This means today's customers are more demanding and they expect that the supplier of today can react properly when demand is either high or low. Therefore, companies need to have the supply chain strategy, which is responsive to customer requirements and meets customers service levels (Hines. 2014). This is a key to deliver customer centric supply chain strategy, which ultimately reflects back as customer satisfaction. Besides that, the supply chain strategy needs to connect seamlessly together other partners within supply chain (Gattorna. 1998).

These new supply chains are networks, which link to each other, all parties in supply chain. In these networks are: suppliers, raw material providers, manufacturers, distributors, retailers. When all these parties are connected to a same value network it eliminates hick ups, duplications and provides better information flow. All these benefits ensure better transportation inside of the network and smoother delivery to customers. Ultimately it leads to better customer satisfaction. (Gattorna. 1998)

2.1.1 Developing a supply chain strategy

A supply chain strategy is often confused with a supply chain management. The supply chain management purpose is to control and lower costs in a supply chain but the supply chain strategy is really a larger concept. The supply chain strategy is constant process which assesses trade-offs between a customer service and costs. It also defines which way company's supply chain should be operated (Happek. 2005). The supply chain strategy purpose is to create operational efficiency and effectiveness at the same time integrate with other partners within the supply chain. The supply chain management role is to work as a business function across departments (Bidgoli. 2010).

The first thing, that a good supply chain strategy needs to be, is that it aligns with company overall business strategy. This is essential, because if strategies do not align, then these two strategies are pulling rope to different direction. This forces supply chain operations to act as a customer service function, which serves whole enterprise targets. Traditionally operations see themselves as an operational department rather than a customer service department. In perfect scenario, the supply chain strategy is enabler for business strategies to achieve an enterprise level goals. This also applies to other strategies like marketing etc. so it is not different for supply chain strategy either. (Happek. 2005) In many instances, the supply chain strategy is a key component when driving enterprise targets. (Mangan, Lalwani, Butcher. 2008) If enterprise target is to be a low-price provider, then the supply chain strategy needs to be aligned with that goal. (Happek. 2005) In practise, this means cost of transportation should be as low as possible instead of creating costly added values (Happek. 2005).

Before a company can start to develop, or implement, chosen supply chain strategy, it needs to assess realistically company's capabilities and assets. For instance, if the company has big overhead costs and heavy logistics organization, it is difficult to start to develop a low-cost strategy. In other hand, it is difficult to start to implement a complex supply chain strategy, if there are no staff to do it. It is important that realities match with resources.

2.1.2 Aligning a supply Chain Strategy with a business strategy

A business strategy is an overall strategy for whole a company. The business strategy purpose is to use core competences within the company to achieve goals set in the business strategy. The business strategy gives high level direction where the company wants to be in certain time. It is also a competitive tool and decision making process for what, when and where to offer. (Happek. 2005)

Professor Hau L. Lee (2004) has researched that top supply chains have three different qualities: agile, ability to adapt changes in market strategies and structures, supply chain is aligned to all partners in a supply chain network. First, Lee (2004) noticed that agile supply chains are fast to react to changes in supply or demand. Secondly, when a supply chain has an ability to adapt changes in market conditions, it always reflects accordingly in supply chain strategy. Third, when all partners interest to the supply chain were taken into consideration, it maximized performance in the supply chain. When all these three factors are in place, it creates competitive advantage to the company. (Lee. 2004)

2.1.3 What good looks like

As mentioned above, the supply chain strategy needs to be: realistic, align with business strategy and be customer centric. Besides this according to Mangan, Lalwani and Butcher (2008): “Formulating a strategy for logistics and SCM should not be restricted to the logistics function: instead it should involve taking a cross-functional process based perspective.” (Mangan, Lalwani, Butcher. 2008)

Unlike other strategies, within a business strategy the supply chain strategy is cross-functional. This cross-functionality means the supply chain strategy needs to be integrated with all functions to get full benefit from it. This means also that 3rd parties outside of the company needs to be aligned with the supply chain strategy. (Mangan, Lalwani, Butcher. 2008)

In recent decades, there have been two more frequently used supply chain strategies: lean and agile logistics. This thesis does not go into details of these strategies because nowadays supply chain strategies are more tailored which means “one size fits all” kind of thinking does not work anymore. (Mangan, Lalwani, Butcher. 2008)

Most important thing, like with all strategies, is the implementation. It does not matter how good strategy the company has developed if implementation of it fails. It is crucial, to consider before implementation, that employers are committed, leadership is in place and measurements are in place (Kourdi. 2009). All this means, there is a full implementation plan in place and project management group to observe it. When measurements are in place, corporate directors and the project group can closely follow up implementation process. When measurements are clear and well communicated to personnel, it makes personnel understand their responsibilities and contribution. It is important that results are frequently communicated and corporate rewards personnel from good achievements. (Happek. 2005)

In this research, the case company has chosen one of their core business strategies to be close to their customer and have always products to deliver. This business strategy has led to a situation where the case company has unnecessary inventory in their supply chain. Another reason for this situation, is that their business strategy and supply chain strategy are not aligned. The author noticed; the case company supply chain strategy is not implemented properly throughout an organization. As Mangan, Lalwani and Butcher (2008) mentioned the supply chain strategy needs to be cross-functional strategy instead of one department strategy. Besides above mentioned negative sides, promising thing is the case company has a strategy which is customer centric.

2.1.4 Summary of the supply chain strategy

Customers nowadays are more demanding and it has evolved supply chains to be more customer centric. In past decade, corporates have started to think their supply chains more strategically. This change in behaviour has led to a situation, where many corporates today have a supply chain strategy. The key factor behind great companies are properly implemented strategy. The good supply chain strategy, which is executed with cross-functional operational excellence, provides extra value to customers and success to the company. (Happek. 2005)

2.2 Transportation strategy, costs and trade-offs

In this chapter, the author goes through theory behind a transportation strategy. A transportation strategy is part of a supply chain strategy so these two theories are directly linked to each other. The author discusses, further in the research, how a supply chain strategy and a transportation strategy decisions effect to business costs. The author also goes through, how these two combined strategies are related to the optimization study.

In today's fast moving world, transportation management and a transportation strategy must be innovative and flexible enough to react business environment changes (Scott, Lundgren, Thompson. 2011). One of the key element, in the transportation strategy, is to design the most effective way to transport goods across the company's supply chain. The key element for the successful transportation strategy is, to choose correct transportation mode that meets company's production strategy and a customer promise. Good transportation strategy balances costs and transport time needed (Shah. 2009). Variables where to choose from are: speed, reliability, security, quality, environment and cost. From these variables companies, can choose among five different transportation modes: Air, road, rail, water, and pipeline. All these five different transportation modes have their own unique features (Scott, Lundgren, Thompson. 2011).

2.2.1 What means a transportation in the supply chain

Transportation is divided to two main categories in the supply chain: Primary transport and secondary transport. Primary transport is considered to be movement between companies' facilities. These are so called line-haul movements. Primary focus with these movements is traditionally price. According to Rushton, Croucher and Baker (2014) companies seldom see these movements as a value-added service. Companies typically miss to see how these movements adds value to a customer. Primary transport is targeted to have as full as possible vehicles and operating at minimum cost. (Rushton, Croucher, Baker. 2014) Unlike common perception, the author sees also value in primary transports. Based on his experience, when clinches and unnecessary work can be minimised in primary transports, the company's supply chain is more transparent. This can be seen as cost savings in side costs and transparency can be used to create extra value to a customer. The author continues discussion about this in Chapter 5.

Secondary transport is movement of goods to end user or to a customer. These movements are usually called final delivery or final mile. Final mile deliveries are seen often as a customer service function because in several industries these are only touch points with customers. Therefore, these deliveries are seen as valued added service so companies are willing to do trade-offs between a cost and a service. There are industries where delivery window is very tight and missing one of them might cause penalties. Often companies see these final deliveries as differentiator to competitors. (Rushton, Croucher, Baker. 2014)

Addition to two main categories in transportations there is one additional transportation category called a reverse logistics. A reverse logistics means goods collection and return back to a distribution centre or a factory. Typically, companies plan one-way logistics through the supply chain and take care of returns and reverse-logistics in spot basis. (Rushton, Croucher, Baker. 2014) This can end up to be costly for the companies if it is not managed well.

2.2.2 Transportation modes

Important factor, to take into consideration with different transportation modes, is that they can compete with each other. Air transportation can be cheap to most popular destinations and this drives costs down. In those cases, air transportation mode can compete with road and water transportation mode. In the other hand, water transportation has invented new products which can take volume from air and road. For example, temperature controlled container within Europe can be also shipped as an ocean freight. (Scott, Lundgren, Thompson. 2011)

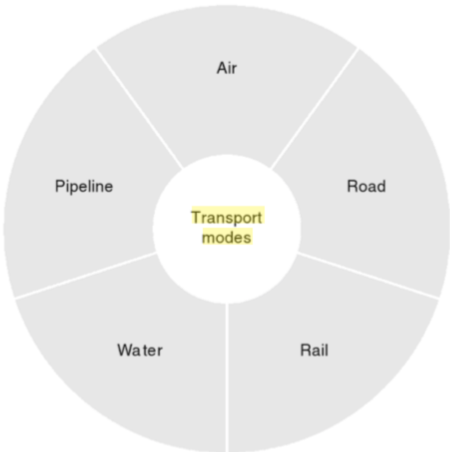


Figure 5. Different modes of transportation. (Scott, Lundgren, Thompson. 2011)

Air as a transportation mode is fast compared to other transportation modes. Truck transportation within in continent and country can be quite fast but usually transit time is a week and over. Rail transportation is medium fast from continent to continent point of view which means transportation time is usually from two weeks to four weeks. Ocean as a transportation mode is slowest from all transportation modes. Only ocean transportation part takes normally around three to four weeks and typically customer must add additional week in origin and in destination. All transportation modes are quite reliable. Air and ocean transportation are most effected by weather and other service interruptions. There are a lot of flights nowadays, so interruptions do not have such a big effect to air transportation. In ocean transportation when delays occur, normally there is no chance to gain that delay back. From environment point of view, ocean transits are most environmental. This is because environmental effect is spread to all masses which are transported by ocean. Air freight is most polluting transportation mode.

From costs point of view, all transportation modes are priced from transportation time point of view. The faster transit it is, the more expensive it is. Therefore, an air transport mode generally is most expensive and in another hand ocean is the cheapest one.

Table 3. Differences between transport modes from overseas point of view. Excluding pipeline. (The Author)

Transport mode	Transit Time	Reliability	Quality	Environment	Cost
Air	Fast	Good	-	Red	High
Truck	Medium	Good	-	Yellow	Low
Water way	Slow	Medium	-	Green	Low
Rail	Medium	Good	-	Green	Medium

For most companies who manufacture a product, their biggest driver of choosing a transportation mode is cost. Cost is easiest component to understood when choosing between all variables. Besides cost, big driver when making transport mode decision, is nature of goods. Certain products as pharmaceuticals, requires certain transport mode. (Shah. 2009) Transportation costs is covered more detailed in Chapter 2.4.

2.2.3 Transportation cost and transit time

Transportation cost is a cost which a buyer is paying for a transport provider. Transport cost forms from fixed infrastructure costs and operating costs. Operating costs are built from different elements such as: geography, energy, how freight is carried, infrastructure and administration barriers (Rodrigue, Nottebook. 2016). Transportation rates are commonly divided to freight rate and additional fees. Additional fees can be for example: terminal fees, handling fees, fuel, security etc. According to Shah, (2009) price per kilo in cargo transportation is lower, if volume is high or distance is short. Cost per kilo is relatively lower for big shipments compared to small shipments and short distances. Reason for this, is that fixed costs in transportation are spread for more kilometres and kilos. This is how economic of scale works in transportation costs (Shah. 2009). Transportation cost from buyer's perspective is explained in Chapter 2.4.

Transportation time is always trade of business goals and costs. Transportation time is one piece of products total lead time from production to a customer. According to Fleischmann, Nunen, Speranza and Stähly (2012) other pieces are purchasing time and, assembly and production time. Depending of products nature, transportation time can have a long or short effect to whole a lead time (Fleischmann, Nunen, Speranza, Stähly. 2012). A company can influence to a transportation time with safety stocks and different inventory systems which are looked at more closely in Section 2.4. A transportation time includes all time used to transportation in a supply chain from a supplier to a customer.

2.2.4 Transportation security and environment

Transports are vital for a company or a country. Without secured transportation a company or a country cannot work. Security is defined as the way of protect companies inventory, staff, buildings and another infrastructure. This means also, securing 3rd party assets, like planes and people, from company's own cargo. Every companies primary goal is to deliver their goods to a customer secured, to turn those goods to revenue. Security legislation and requirements are controlled by many different organization such as the IMO, the IATA etc. but ultimately companies and their workers are always responsible of their shipments. These security organizations work under a legal mandate. (Edwards, Goodrich. 2016)

According to the EPA (2016) a transportation industry is causing nearly 14 % of worlds Co2 emissions (US Environmental Protection Agency. 2016). Therefore, environmental focus is one of the most rapidly growing trends among companies. More and more, companies are building greener supply chains to meet companies' values and promises. Companies have noticed by implementing environment-friendly processes they can save from financial point of view and stand out themselves from the competitor. There are also other parties which drive companies towards a greener supply chain. Governments have started to regulate environmental affects and those have led to different regulations which companies must implement. Besides governments also customers demand visibility to a Co2 emissions and they have also started to demand different factors to implement. (Sople. 2016)

A transportation strategy decision has major effects to transportation costs. Companies nowadays makes transportation strategy decisions based on the business strategy and values of the company. In this research, the author looks the current transportation strategy from another point of view and is it going to have a direct affect to transportation costs. The optimization study concentrates only to ocean shipments. It is important to understand nature of other transportation modes because the research pros and cons can be also replicated to other transportation modes and future studies. In next chapter, the author explains more detailed incoterms and how a transportation strategy and costs are related to incoterms.

2.3 Incoterms

When companies across the globe want to do business with each other first thing is to ensure that both of parties speak the same language. In many cases companies think they are talking same language, but because of cultural differences and meaning of words can be different. These differences are why there is a need for common rules and those are called incoterms. At first the author explains how incoterms were born and history of them until latest version of these delivery terms. After that, the author gives a brief look at terms itself and in last section the author concentrates to C terms and F terms because those are essential from the research point of view. (Reuvid, Sherlock. 2011)

2.3.1 Born of the incoterms

Incoterms are in advance determined commercial terms published by the ICC (International Chamber of Commerce). Incoterms are three letter codes which define obligations in terms of delivery costs, insurances, terms of payments, risks and duties and taxes. These terms of delivery define when a seller and a buyer have fulfilled their obligations. (Gath. 2016)

Today incoterms as delivery terms are commonly accepted by companies, countries, authorities and everyone who are doing business globally. Delivery terms were created to have common rules across the globe for international business. Nowadays delivery terms are standard for international trade and rules of incoterms help to avoid misunderstandings between a buyer and a seller. Incoterms was first published 1936 and latest version is called incoterms 2010 and it is eight version from incoterms. (Gath. 2016)

2.3.2 History of the Incoterms

Nature of a global trade changed to more complex trading when different countries started to implement tolls, taxes and different ways of paying. At the same time trade was no longer trade between two parties but there was also possibility for multiple parties. At this time the ICC started to create standard for a global trade and 1928 pre-incoterms were created. The ICC published six terms of trade to describe most commonly used ways of trade. These six terms were: FOB, FAS, FOT, FOR, free delivered CIF and C&F. In 1936 first version of incoterms was published and these six terms were basis for it. Now a global trade had it first standards for international trade. (Räty. 2006)

First version of these delivery terms was used nearly 20 years before terms were updated by the ICC in year 1953. After 1953 incoterms, have been modified to adapt to changes in a global trade. Traditionally when incoterms have been modified there have come new terms, updated ones and some of old terms have been deleted. These updates have been done 1980, 1990, 2000 and latest ones are 2010 incoterms (Cook. 2014). The ICC recognizes as a biggest change in update history, creation of FCA terms in 1980 which determined more closely reception point for goods. Next big change was in 1990 when POD process was amended so that also electronic version of it were approved. Latest amendments before incoterms 2010 were in 2000, when responsibility of export clearance were changed from a buyer to a seller in FAS term. Second big change was that a seller was responsible of loading goods to buyers collecting vehicle in FCA term. Also, a buyer was obligated to receive sellers arriving vehicle unloaded (ICC. 2016). In incoterm 2010 terms were cut down from 13 terms to 11 terms. Terms DAF, DES, DEQ and DDU were replaced with two totally new terms DAT and DAP. In 2000 terms were divided to four different categories but in 2010 terms are divided to 2 categories based on mode of transport. Four rules can be used only in an ocean transportation and rest seven can be used in all modes of transportation. Terms which are in first category are: EXW, FCA, CPT, CIP, DAT, DAP and DDP. Four terms which are applicable only to transportation by water are: FAS, FOB, CFR and CIF. (Cook. 2014)

All thought incoterms are nowadays a standard it is important to remember that there are no rules or governance requirements which would require use of these delivery terms. Incoterms is part of a law and a legal jurisdiction and have a legal standing when used. (Cook. 2014)

2.3.3 Terms of Delivery and Terms of Payment

As mentioned above, incoterms core purpose is to determine where and when the seller have fulfilled their responsibilities and when goods have been delivered as per contract. This is also normally the point where risk passes to a buyer and commonly a point when payment is processed. Figure 6 shows in detailed how responsibilities and transports costs are divided between a buyer and a seller in each delivery term. (Reuvid, Sherlock. 2011)

Incoterm 2010	Export-Customs declaration	Carriage to port of export	Unloading of truck in port of export	Loading charges in port of export	Carriage (Sea Freight/Air Freight) to port of import	Unloading charges in port of import	Loading on truck in port of import	Carriage to place of destination	Insurance	Import customs clearance	Import taxes
EXW	Buyer	Buyer	Buyer	Buyer	Buyer	Buyer	Buyer	Buyer		Buyer	Buyer
FCA	Seller	Buyer	Buyer	Buyer	Buyer	Buyer	Buyer	Buyer		Buyer	Buyer
FAS	Seller	Seller	Seller	Buyer	Buyer	Buyer	Buyer	Buyer		Buyer	Buyer
FOB	Seller	Seller	Seller	Seller	Buyer	Buyer	Buyer	Buyer		Buyer	Buyer
CFR	Seller	Seller	Seller	Seller	Seller	Seller	Buyer	Buyer		Buyer	Buyer
CIF	Seller	Seller	Seller	Seller	Seller	Seller	Buyer	Buyer	Seller	Buyer	Buyer
CPT	Seller	Seller	Seller	Seller	Seller	Seller	Seller	Seller		Buyer	Buyer
CIP	Seller	Seller	Seller	Seller	Seller	Seller	Seller	Seller	Seller	Buyer	Buyer
DAT	Seller	Seller	Seller	Seller	Seller	Seller	Seller	Seller		Buyer	Buyer
DAP	Seller	Seller	Seller	Seller	Seller	Seller	Seller	Seller		Buyer	Buyer
DDP	Seller	Seller	Seller	Seller	Seller	Seller	Seller	Seller		Seller	Seller

Figure 6. Incoterms 2010 (Marine-business. Incoterms 2010)

EXW is easy term for a seller. Basically, a seller points where to pick up properly packed cargo. A buyer is also responsible of loading cargo to a vehicle. After that, a buyer has all responsibilities of the cargo even though a seller should be involved in export clearance process. (The eleven rules in brief. 2016)

FCA term defines that a seller is responsible of export clearance and delivery to defined place. In an international trade this normally means that a seller is responsible of delivering cargo to a defined terminal and unloading cargo there. FCA is commonly used for containerized goods. (The eleven rules in brief. 2016)

FAS or Free alongside ship is used only in an ocean transportation and responsibility of the cargo moves to a buyer when the cargo is in determined point alongside of a ship. This is not a good term to use with containerized goods because it is more meant for example a timber business. A seller is responsible of an export clearance. (The eleven rules in brief. 2016)

FOB is one of the original six terms and is one of those terms which is only used in waterway transportation. Responsibility of goods changes to a buyer when goods are export cleared in pointed vessel. A buyer determines used vessel and is responsible of all costs after loading. (The eleven rules in brief. 2016)

CFR is meant only for waterway transportation and generally is meant for a bulk cargo. A seller responsibility is to deliver goods export cleared to named vessel. A seller is also responsible of ocean transportation costs and costs of unloading from a vessel. Risks in other hand are transferred to a buyer when goods are loaded to a ship. (The eleven rules in brief. 2016)

CIF is last of the terms which is only meant for a waterway transportation. CIF is meant to be used with a bulk cargo rather than containerized cargo. A seller is responsible of costs up to unloading cargo in destination port as in CFR. Risks move to a buyer when the cargo is loaded to a vessel in origin port. All this is same as in CFR but in CIF a seller is responsible of insurance up to a named port. Problem in CIF is that there is no defined level of insurance. This means that requirement is only minimum level of insurance. (The eleven rules in brief. 2016)

CPT is used in all transportation modes. A seller is responsible of arranging cargo to named place but a seller is not responsible of an insurance or risks after release to a carrier. In CPT, a buyer is responsible of THC costs. (The eleven rules in brief. 2016)

CIP can be used with all transportation modes and combination of transportation modes. Transportation costs are seller's responsibility up to a name destination station. In CIP, a seller is also responsible of a cargo insurance up to a destination named station. THC charges are responsibility of a buyer. (The eleven rules in brief. 2016)

DAT is first so called a door to door delivery term. A seller is responsible of delivering the cargo and cover costs up to a named destination terminal. In DAT, a seller is responsible of unloading goods in a destination terminal. A seller is also responsible of risks and arranging insurance for goods up to a named terminal. A buyer is responsible of import clearance and all local taxes and duties. (The eleven rules in brief. 2016)

DAP is the same as DAT but with a difference of buyer is responsible of unloading goods into a named destination terminal. Risks change to a buyer when goods are ready for unloading. A buyer is responsible of local taxes and import duties. (The eleven rules in brief. 2016)

DDP is all-in solution for a buyer. This means a seller is responsible of everything a buyer only needs to name location where to deliver. In DDP a buyer is responsible of all transportation costs, import taxes, import duties and responsible of risks and insurance. Responsibility of the goods changes to a buyer when goods are made ready for unloading. (The eleven rules in brief. 2016)

Table 4. Incoterm definitions (The Author)

Incoterm	Explnation	Incoterm2	Explanation.
CIF	Cost Insurance and Freight	DDP	Delivered Duty Paid
CIP	Carriage & Insurance Paid To	EXW	Ex Works
CFR	Cost and Freight	FAS	Free Alongside Ship
CPT	Carriage Paid To	FCA	Free Carrier
DAT	Delivered At Terminal	FOB	Free on Board
DAP	Delivered At Place		

2.3.4 Current situation and C-Terms from a cost point of view

Choosing of a delivery term used in company's international trade needs to be align to their purchasing and selling strategy. In all international trade, there is normally two different companies who both might have different supply chain strategies. In trade negotiations, these two parties agree which terms should be used. The seller of course, should take into consideration requests from the buyer, because ultimately it is matter of customer satisfaction. (UK Essays. 2013)

In this thesis, the case company is currently buying their goods from Asia mostly with C-terms. This means their suppliers are responsible of paying transportation costs to named place in Sweden. The case company is responsible of risks after goods have been loaded to a vessel and they are covering domestic delivery costs and duties and taxes. (Seyoum. 2009)
Supplier's benefits of using C-term are that a seller can choose a carrier and they are procuring transportation locally. In some cases, this might be cheaper than a buyer would procure locally from destination. It is also beneficially to use C-term if government of seller requires use of national shipping line (Seyoum. 2009). Another benefit is that a seller can export goods right away from their warehouse instead of waiting a buyer to arrange transportation. Negative factors are that they must cover most of the cost of transportation. A seller also has risks in terms of customer satisfaction. If their chosen transportation company fails in most cases seller gets blame from that. That may lead to loss of sales and in worst cases losing the customer.

C-terms can be seen tempting for a buyer, because a seller is covering major part of transportation costs. Other benefit for a buyer, is that they only need to deal locally with the local transportation companies (iContainers. 2016). This might be tempting especially for a small importer. There are also negative factors for a buyer: lack of control for a transportation, lack of visibility, reactive position in terms of force major cases and possibility of hidden costs in goods price. Sellers typically hide freight, insurance etc. costs into their rates. These rates normally have buffers for bigger fluctuations in freight prices. Usually this means a buyer is paying higher price for transportation than if they would choose carrier by themselves. Overall it is considered that, importers who are unfamiliar with import logistics and import trade, using of C-delivery term makes it easy to start. More experienced and bigger importers typically use F-delivery term, (Kaye. 2012) C-term and especially CIF can be also beneficially for small businesses. Due to low level of risks it is easy way to start international trade for a smaller company. When a chosen carrier has a sophisticated shipment tracking and an order fulfilment system, it can work as well as F-term trade. (Onistsuk. 2016)

2.3.5 Benefits of F-terms and costs of it

Changing of a delivery term usually creates extra costs. Especially in this case, when the idea is to change from C-delivery term to F-delivery term, to get more control of the company own supply chain. It would mean, the case company would take approximately 30 – 40 % more transportation costs than they previously had. Of course, when there is change of the delivery term also buying prices should be negotiated lower because responsibilities of the seller reduce. (Kaye. 2012)

Today, even bigger companies do not realise how much flexibility can be achieved by choosing F-delivery term. Typically, inexperienced importers see only downsides. At first appearance buyers' biggest downside is more transportation costs. The buyer also must have a logistic organization who deal transportations from overseas.

If the buyer can overcome these downsides there are many benefits of using F-delivery term. First of all, when using F-delivery term company's inbound shipments are in their own control. This allows companies to control, manage and track and trace their shipments by themselves. When having full control, companies can control when cargo is shipped from the origin port. When the company has the control, it can manage when goods are transferred to their inventory (Kaye. 2012). If the company choses F-deliver term instead of E-delivery term, it still keeps export declaration as the sellers' responsibility, which is generally recommended (McGuire. 2015). For the seller F-delivery terms means minimal liabilities (Kaye. 2012).

2.3.6 Summary of delivery terms

When the company chooses the delivery term it has a significant impact to the company's transportation costs. These transportation costs apply both inbound and outbound shipments. Nowadays, especially in Finland, Small Medium Enterprise (SME) companies are not educated enough for incoterms which can lead to unnecessary transportation costs. In typical situation, a purchase department chooses an incoterm without knowing a total cost effect for the supply chain.

In this research the incoterm is changed to F-delivery term which creates more transportation costs than in the current scenario. Following sections looks how this change of incoterm effects to inventory management. In last sections of the theory, the author explains how a total cost of ownership should absorb extra transportation costs caused by change of the incoterm.

2.4 Origin Consolidation

All companies face a challenge of controlling perfect inventory, which meets a customer demand but does not impact too much to profitability. Nowadays also many companies have more than one supplier in their supply chains. These suppliers locate more and more overseas in Asia or in North America. This makes supply chains more complex and more difficult to manage. Multiple suppliers also require increasing time for managing quality, regulations, norms and standards. All this is taking time away from managing shipments and goods inbound flow. (Damco. 2016)

Origin consolidation benefits are better container utilization by employing supplier management programs and purchase order management. When using these programs, a company uses right kind of equipment and empty space in containers is utilized (Levesque. 2011). This leads to lower shipping costs and other charges, easier and less customs events, faster transits, consistent schedules. Other benefits are increased control, streamlined systems, fewer manual inputs and less manually made errors and overall better visibility (Damco. 2016). Better visibility allows companies to start planning already from a supplier and it gives benefits for a whole supply chain (MIQ Logistics. 2016).

As more and more companies are taking over their supply chain and responsibility of their import cargo, it means they control their inventory earlier in the supply chain. By doing this companies can make multiple pick-ups in origin and use forwarders Cargo Freight Station (CFS) as a consolidation point for their movements. Cargo freight station is a terminal or a warehouse which is either provided by 3rd party or a company owned warehouse. These CFSs gives greater control of inbound flow and efficiently deducts overall transportation costs. (Levesque. 2011)

Supply chain formation is process where a company determines parties in a supply chain, and how an inventory is moved between locations. Traditionally this work has been made through human interactions, but because of business environment pressure, companies have need for more effective decision making. Fluctuations in productions and other business areas, creates environment where there is a need for an automated supply chain formation. This essentially saves costs which leads to better profits. (Walsh, Wellman. 2011)

2.4.1 Single-Echelon Inventory system

A single-echelon inventory system is a network, where there is a one central inventory point called a distributions center. This distribution center is working as a warehouse between a supplier and a customer. (See Figure 7) Characteristic feature for a single-echelon inventory system is large safety stocks. A Distribution Center (DC) is controlled by an internal department or an enterprise (Lee. 2003). Characteristic feature for a single-echelon system is, that it works individually and materials in other locations are not effected to decision making. When a company is selling goods from one location, then it is categorized to be a single-echelon inventory system. Group of single-echelon systems can be considered as a multi-echelon inventory system, when decisions are made based on inventory in whole system. (Arkieva. 2014)

In a single-echelon inventory system lead time for one product forms between a supplier and a DC. New orders are made to suppliers, depending on stock levels and other internal and external business reasons. From DC products are distributed to customers. (Lee. 2003)

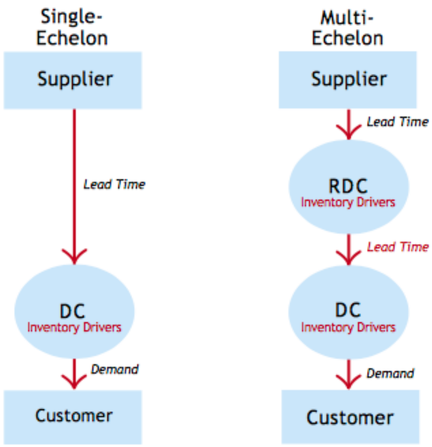


Figure 7. Inventory Drivers. (Multi-Echelon Inventory Optimization. Lee. 2003)

2.4.2 Multi-Echelon Inventory system

Multi-echelon inventory optimization is a system where each facility is considered as an individual member of whole network. In this system, it is strategically decided which facility has a safety stock. Controlling of an inventory in a multi-echelon inventory system is more complex than in a single-echelon inventory system. In a multi-echelon inventory network, there are multiple locations from central warehouses to customer facing locations. (See Figure 7) All locations are controlled by one internal department or an enterprise. In these multi-location networks, companies cannot simply restock one warehouse, but they must take into consideration other locations in between. The purpose of a multi-echelon inventory system is to keep an inventory in minimum using multiple locations, but at the same time deliver the customer promise. Therefore, one most commonly known issue for a multi-network, is how to forecast demand precisely enough and keep all parties informed. This requires multiple control functions, which combines demand and inventory drivers (Lee. 2003). Nowadays there are multiple software companies who are providing inventory optimization software's. These software's purpose is to monitor inventory levels in whole multi-echelon system. Software's developed to monitor inventory holistically in a supply chain from a supplier all the way to a retail location.

2.4.3 Multi-Echelon network vs Single-Echelon network

When controlling a multi-echelon network versus a single-echelon network, a company can face many different obstacles. Maybe one of the biggest obstacle is that, benefits from complex network are not achieved. Companies can create complex multi-echelon networks, but in the end, those fall on to networks own absurdity. In these cases, networks fail to achieve inventory optimization which leads to high inventory costs. Another networks failure can be: (Lee. 2003)

- Out of stock situation even if network have inventory
- Too much inventory because of excess safety stock
- Customer-facing location stock outs.
- External supplier failures because of unsatisfactory demand forecast
- Wrong allocation between stocks in limited availability situations

Other known issues are: lack of visibility up and down in the supply chain (see Figure 7), bullwhip effect between RDC and DC and total costs of network are not evaluated (Lee. 2003). In a single-echelon inventory planning, one pitfall is that all locations are considered as a one unit. It means strategic decision are made based on needs and wants of the one location. In a multi-echelon network, all locations are considered as a one big unit from inventory point of view. This way inventory in other locations are taken into consideration when making strategic decisions. (Snapp. 2009)

2.4.4 Centralized delivery strategy vs Decentralized delivery strategy

Delivery strategies are often considered as direct delivery or echelon-delivery based. In a direct delivery system, products are delivered directly from manufacturer or companies own factory. This way all warehouses and distributions centres are bypassed. Advantages of direct deliveries are: (Ross. 2015)

- Expenses from distributions system are avoided, such as transportation costs etc.
- Fast to markets – short lead time
- Manufacturer has close contact to markets and good control of branding and pricing
- The market knowledge

Biggest disadvantage is transportation expenses for small quantities. Volumes can be small for customers so transportation expenses are higher than in an echelon-delivery based strategy. Also, a seller and a manufacturer needs to have strong relationship in this model. (Ross. 2015)

In an echelon-delivery system, products are stored and transported between company owned distribution centres, warehouses and retailers. After a product, has gone through the distribution channel it is delivered to a customer. Benefits of this strategy is that products are available to a customer with minimum lead time. Disadvantage can be if inventory is not controlled properly, safety stocks in an echelon system can be too high. (Ross. 2015)
Delivery strategies are also either centralized or decentralized strategies. In a centralized system, decisions concerning the supply chain are made centrally in one function. Centralized systems have minimal safety stocks, decreased inbound transportation costs, minimal safety stocks, minimum operating overhead costs, only few channel warehouses and target to minimize total system costs. In centralized system, lead time from a manufacturer to a customer are longer than in decentralized systems. This is due to a fact that a product needs to travel through all locations before final delivery to a customer. Often outbound transportation costs are covered by a shipper or the customer.
Essential for a decentralized system is that decisions are made oppositely on echelon-level. Locations are responsible of increased costs to support warehouses. Warehouses are responsible of excess safety stock levels and transfers between locations. Overall this might lead to higher overall costs. Benefits of decentralized system is that they are closer to a customer and delivery times for the end customer are short. Also, cost of transportation to the customer is low. (Ross. 2015)

2.4.5 Inventory optimization

Inventory is defined as overall number of raw materials, working-process items and finished goods. Raw materials are goods which are source material for production (Kerber, Dreckshage. 2016). Production process turns these materials to components or to finished products. Work in progress goods are goods in manufacturing process which are about to be converted to finished goods. Finished goods are goods which are ready for sales and those goods can be converted to turnover. These three stocks are supporting all functions inside of an enterprise. (Investopedia. 2016)

There are two different kind of demand for inventory: dependent and independent (Kerber, Dreckshage. 2016). Dependent inventory is inventory which is dependent on indirect demand of some other product. For example, in a car tyre company demand of rims and bolts are dependent on demand of tyres (Daft. 2007). Independent inventory is vice versa situation which means inventory demand is direct demand for that specific product.

Inventory optimization is way of balancing capital investment and customer promise, without jeopardising business profitability. It forecasts inventory needs and automatically adapts to changing demand without over large stocks. Inventory optimization ultimate goal is to serve a customer promise with minimal stock. Companies who achieve this have a significant market advantage compared to their competitors. The Financial benefits of optimized inventory systems are substantial. Financial benefits come from: less safety stock, decreasing manufacturing and transportation costs and carrying costs. This leads to profit increases because of less inventory is spoiled, oldness and disappearance. (Gilmore. 2008)

In order companies to achieve real inventory optimization, a company must model entire supply chain from end to end. This means that all echelons are following same inventory optimization strategy. If each echelon has an own strategy, then information from customers and suppliers are not considered. When having visibility to upstream and downstream, it minimizes inventory held because of bullwhip effect, and at the same time company gets visibility to cost of your customers' inventory policies. (Gilmore. 2008)

2.4.6 Summary of inventory and delivery strategy

Origin consolidation and choosing correct inventory strategy, are key theories which are used in this research. The optimization study uses these theories in practice. The optimization study calculates benefits of consolidating cargo in the origin and how it effects to total transportation costs. Before pros or cons of the optimization study, or implementation of it, there is a need to understand strategic decisions and consensuses of them. These strategic changes should affect to the company's inventory management so that the company can start inventory optimization after changes. This should affect positively to the value of inventory. Lower inventory values reduce costs and those costs are considered as a side costs for changing transportation strategy. This is part of total cost of ownership concept which evaluates total price of purchase.

2.5 Total cost of ownership

Commonly companies tend to focus only to a purchase price when making a purchase or a supplier selection decision. A product or a service usually have also indirect costs related to it, which often are not taken into consideration when making a purchase decision. The Total Cost of Ownership (TCO), is a supplier evaluation method, which evaluates purchase option from total cost point of view and considers direct costs and indirect costs. When companies evaluate transportation options this is essential model for it.

A traditional supplier evaluation method is based on price only. These evaluations do not take into consideration internal costs at all. There are also other supplier evaluation methods such as: zero-based pricing, cost-ratio method, cost-based supplier performance evaluation, life-cycle costing and all in cost. None of these methods have not had a major breakthrough, like TCO, and those are considered to be too complex. (Bhutta, Huq. 2002)

2.5.1 Core idea of total cost of ownership

TCO is a financial tool to help business directors evaluate direct and indirect costs related to purchase. Indirect costs include all costs related to purchase in its life cycle (Li. 2007). The idea is to understand full cost of buying a service or a product from certain supplier and think deeper than just a purchasing price (Ellram. 1993). Buyers should be able to take into consideration long-term costs and not only short-term costs. Term for a long-term cost is commonly known TCO and for a short-term cost purchase price. TCO is essential when estimating final purchasing or supplier decisions. (Ellram. 1995) Using TCO concept is more and more important today because companies are trying to understand and manage their total cost structure better than before. According to Bhutta and Huq (2002) TCO looks at cost structure throughout integrated supply chains and evaluates total lowest transaction costs but TCO fails to take into consideration quality side of the supplier, because main focus is in costs (Bhutta, Huq. 2002). Ellram (1995) researched that even though model is not perfect, consequences of not using TCO can be costly for a company. Bad decisions made because of a poor information, is likely to hurt company's competiveness, profitability, pricing decisions and product mix strategies (Ellram. 1995).

Total cost of ownership aims to understand total costs from a product or from a supplier point of view. In a TCO model these costs are divided to pre-transaction costs, transactions costs and post transaction costs. Pre-transaction costs are costs which are related to transferring a supplier or costs related to bidding process. Transaction costs are purchasing, implementation, delivery, inspection and mix of other costs. Post transaction cost elements are elements which occur after transactions. These costs can be such as: maintenance costs, cost of returns, warranty costs, line fallout costs and so forth. Post transaction costs are depended of nature of business or purchase which have been made. This way TCO provides a financial analyse which combines total economic value of an investment. These dollar-based models are usually used in supplier selection, supply base reduction and make versus buy or outsource. (Ellram. 1995)

TCO models can be classified to two different groups: standard models and unique models. Standard models can be used widely across industries and functions in different situations. These models are standardized and require a little or not at all modification. Unique models are specially made for certain purchase analyse which normally cannot be repeated. Unique models require more time and are commonly more complex that standard ones. (Skott-Larsen. 2007)

In more detailed level, TCO methods are called dollar-based model and value-based model. Dollar-based model evaluates total cost of ownership in a dollar form. Value-based model combines cost data with other performance data. Both performance data and dollar data, is converted to points, to be able to compare them equally. In a value-based model certain factors can be weighted per company priorities. Value- based models easily get more complex than cost-based models. Therefore, it can lead to complex models which are hard to manage and time consuming to create. Value-based model is commonly used in supplier selection, make versus buy or outsource and process improvements. (Ellram. 1995)

2.5.2 Benefits of total cost of ownership

TCO has many benefits and advantages to companies. Ellram (1993) found out from her research, that main benefits from TCO are: improved supplier performance measurement, continues improvement, improved decision making results, choosing of a low-cost supplier instead of a low-price supplier, improved internal communication and better data.

TCO features improved case companies' suppliers' performance measurement because needed measurements are built in. This in fact is also to improve companies' internal communication. Companies have also noticed because of TCO structure they are making better decision based on facts. Overall having an analyse tool with accurate and relevant data benefitted in all case companies from many points of view. (Ellram. 1993)

As a final and as a key benefit, Bhutta and Huq (2002) found out that after a purchase decision TCO can be used as a consistent supplier evaluation tool or a purchase evaluation tool. TCO tools can be used evaluating a supplier together and create value overtime. These tools help a supplier to understand performance expectations and TCO drives continues improvement (Bhutta, Huq. 2002). This continues improvement means benefits of TCO model does not only stop when short-term analyse is done but it can be used also after the analyse longer-term. Ellram (1993) researched companies who use performance data to allocate purchase volumes between suppliers are more likely to succeed. (Ellram. 1993)

2.5.3 Criticism of total cost of ownership

The total cost of ownership is quite easy to understand as a concept, but in reality Ellram (1993) noticed that data issues are commonly known problem for companies. Ellram (1993) researched that five out of seven case companies claimed, that a data and lack of resources are one of the key issues for them (Ellram 1993). Research from Handfield and Nichols (2002) also noticed that data issues are still relevant issue for companies (Handfield, Nichols. 2002).

Besides data issues biggest obstacles which companies classically have, are related to companies' internal issues. One of the most common issue is a lack of proper cost data (Handfield, Nichols. 2002). Besides a cost data, Ellram (1993) also noticed common barriers are lack of data resources, training, education and company culture (Ellram. 1993). These factors can lead to a situation where an analyse is not trustful or accurate enough. Besides this, definition of total costs can mean something else for different departments inside of the company. This can lead to misinterpretation of an analyse or results (Handfield, Nichols. 2002). Schmidt (2016) also noticed that TCO gives great cost saving data for companies but it fails to count other benefits from businesses point of view. This failure means that synergy benefits from acquisitions, projects and initiatives are not always taken into consideration. Positive effects of TCO can improve product quality, increased sales revenues, savings in operational costs, faster information access and improved competitiveness. If TCO is used blindly it means management is assuming that above mentioned factors are the same for everyone. (Schmidt. 2016)

2.6 Total cost in the supply Chain

Jönsson and Lundgren (2010) researched in their master thesis concept of total logistics costs from several authors point of view. They noticed that multiple authors have different ways to define what is included in total costs of logistics but overall models are quite similar. Jönsson and Lungren (2010) uses Oskarssons (2006) model (see Figure 8) to explain which costs are included to concept total logistics costs.

Total costs of logistics consist five different costs: inventory carrying costs, administration costs, warehousing costs, transportation costs and other costs. Inventory costs are money which is tied up to products. Value of inventory can change during product life cycle so there is a possibility to lose this capital during products life cycle. Cost related to order processing and salary costs are considered to be administrative costs. Administrative costs include also overhead costs from logistics support functions and costs are typically distributed to an order level. Warehousing costs are simply costs related to a store inventory. All costs which are related to operate a warehouse are considered warehousing costs. Transportation costs are typically considered as a biggest cost in total logistics costs and to transportation costs are considered all costs which occur outside of companies' facilities. These costs include all transportation from suppliers to company facilities and transportation to customers. Besides these four costs there are also other costs. Other costs is all logistic related costs which does not fall under previous four costs such as material and information costs. (Jönsson, Lungren. 2010)

Total Logistics Costs

Inventory carrying costs
Warehousing costs
Transportation costs
Administration costs
Other costs

Figure 8. Total Logistics Costs. (Oskarsson. 2006)

2.6.1 What does the total cost of transportation contains

According to Jönsson and Lundgren (2010) total cost from transportation suppliers' perspective contains three different elements: fixed cost, variable costs and overhead costs. Fixed costs are normally around 60 – 70 % from total transportation costs. For fixed costs are considered such costs as: vehicle related costs, driver costs, insurance costs and garage costs etc. Variable costs are directly related to use of a vehicle. These variable costs usually cover 30- 35 % from total transportation costs. Typical variable cost is for example fuel costs. Overhead costs are considered to be indirect costs which do not have direct connection to a vehicle itself or operating of it. Overhead costs can be fleet related operation costs such as back up vehicles or it can be company's overhead costs which are distributed to all departments. (Jönsson, Lundgren. 2010)

2.6.2 Transportation cost from buyers' perspective

According to Jönsson and Lundgren research (2010) a goal for every transportation buyer is to buy fast and reliable service with as low costs as possible. The transport buyer's goal is to find solution which transportation time is as short as possible and there is always capacity for needed shipments (Oskarsson. 2006). Transportation mode decision is always trade between a cost and a service and all relevant operational factors are taken into consideration (Rushton, Croucher, Baker. 2014). Typically, transportation costs for companies are from five to ten percent of total value of product. (Rodrigue, Nottebook. 2016)

One of the key factors in this research is that buyers cannot make transportation related decisions based on purely to price. Reason for this is because of lower shipment sizes increase overall transportation costs. Faster transit time but lower quantities looks good from an inventory cycle point of view but a total cost of transportation is higher. Shah (2009) states clearly that transportation decisions must be made from a total cost of transportation point of view. (Shah. 2009)

It is clear nowadays that a transportation cost is not as black and white as it has been before. A transportation cost is big portion of the total supply chain cost but many authors state that traditional transportation tendering does not work anymore. Authors highlight that cheapest purchasing price does not equal to cheapest total cost. It is also noticeable that economic of scale affects to transportation price. This factor means companies transportation buyers need to focus to consolidating shipments in order to achieve overall cheapest total cost. All in all, this cannot be ignored because transportation costs have biggest effect to total cost.

2.7 Summary of theoretical part

The theoretical frame combines tools from strategies to actual tools which can be used to optimize parts of the supply chain. The author has chosen a theory behind supply chain strategy, delivery strategy and inventory strategy to support discussion about effects of strategy decisions. Above mentioned strategies are to be reviewed in the case company after the optimization study and total costs of changing an incoterm is discussed end of the research.

The optimization study calculation, combines three tools from the theoretical frame: total cost of ownership and transportation cost, origin consolidation and delivery strategy. Based on these theories the optimization study builds an optimized scenario from current set up. The origin consolidation and theory behind the single-echelon inventory strategy suggests to consolidate cargo in origin and have the inventory close to the customer. Idea is to reduce total transportation costs by consolidating cargo to reduce shipments. This suits for the case company current supply chain set up and the optimization study calculates difference in the total transportation cost compared between these two scenarios.

3 METHODOLOGY

In this chapter, the research method and a data collection and modification is explained. Data collected from the case company, is essential for this thesis and all research questions are related to it. The data is secondary data and the author had only one opportunity to pull out this data. Quality of the data and validity of it is discussed further in this chapter.

3.1 Methodologies

Evaluating of the research can be reviewed based on how well it gives answers to the research problem. Therefore, defining the research problem is essential from validity point of view. When the research has a clear aim then the research data can be collected accordingly. (Mäntyneva, Heinonen, Wrange. 2008)

3.1.1 Qualitative research method

Qualitative research method is a method which is used widely in many sciences but also in non-academic situation. Non-academic situation can be such as business environment and market researches. Qualitative research data collection can be done in several different ways. Data collection can be divided to five different categories:

- Focus groups
- Theme interviews
- Observation
- In-detail interviews
- Projective methods

Qualitative method is commonly used for example in marketing to understand, how people feel about something. Idea is to gather data from people behaviours and why they behave so. For those behaviours, or other data, is then modified to form where results can be analysed and compared. (Mäntyneva, Heinonen, Wrange. 2008)

Typical limitation in qualitative research is that focus groups and data is gathered from a small group. This sample data does not necessarily present whole group which is under researched (Mäntyneva, Heinonen, Wrange. 2008). It is also possible, if a focus group or a person does not see value in research, they might give false or inaccurate data. Last disadvantage is that authors opinion or background can be seen when interpreting results. The author should be able to keep distance to data which he processes. (SkillsYouNeed. 2016)

3.1.2 Quantitative research method

Quantitative research method is usually a numerical data and involves statistical analyses. The core idea, is to collect numerical data to explain an occurrence and answer to research questions. Sources for a quantitative data can be for example: (SkillsYouNeed. 2016)

- Surveys
- Secondary data
- Observations

Positives factors of a quantitative research data is that data is typically trustful and objective. The data is usually highly processable and comparisons to other data can be easily made. Disadvantages are that methods of analyse quantitative data can be seen complex and frightening. Nowadays there are multiple computer software's to overcome this obstacle. (Mujis. 2004)

3.1.3 Mix methods

There is also a possibility to mix these two research methods. It is possible to collect data with qualitative methods and convert results to numerical form. This way results can be analysed in quantitative methods (Muijs. 2004). In this thesis, qualitative research method or mix of methods is not used. The author discusses more about reasons in following chapters.

3.1.4 Secondary quantitative research

Secondary data is a data which has been found by someone else than the author. Sources for this kind of a data can be official statistics, other researches, governments, organizations and companies. In this case, the data has been received from a Swedish company. Biggest benefit of quantitative secondary sources is that usually data which these sources provide is typically extremely trustful data. The data is official data or already researched. Other benefits are such as: the data is ready and in analysable form, free or cheap to get, wide range of data, covers long time frames and data is comparable to similar kind of data. (Revise Sociology. 2016)

There are also negative sides. As biggest negative sides are often seen favouritism in data and in some industries, the data is not showing full picture. These issues are mostly seen in a governmental data. For example, in a crime data, material only contains crimes what have been caught instead of all committed crimes (Revise Sociology. 2016). In this thesis, when there is no possibility to pull out a second data, it is important that research method is generally seen as trustful and methodology issues are typically seen in other industries.

3.2 Methodology used in this research

The research approach which has been used in this thesis is quantitative research from a secondary data. This is best method to answer to research questions and keep the research as repeatable as possible. In this type of a research, there would not be any major advantages of adding aspects from qualitative research. The author wants to keep the research in a shipping profile level which means the author wants to have this research and research results as repeatable as possible. That is the core reason why interviews and penetrating to smaller details are left away from the research.

Secondary data for the research has been pulled from the case company ERP system which is linked to other internal systems. Challenge for the research was that there is no possibility to review data validity if data would be imported second time. The data analyse has been done without using any computer software analyse tool.

According to Mäntyneva, Heinonen and Wranger (2008), a secondary data needs to be reviewed with three different points to ensure data validity. These points are: Review of all factors related to data collection, timely of data and reason for collecting data.
Questions where good secondary research data needs to answer is:

- How research data was collected?
- Data quality?
- How many people is responsible of data?
- How old is data?
- Have data been collected once or in several occasions?
- Why was research collected?

- Is this research data relevant to this research?

A research data needs to be collected trustfully or source needs to be trustful. Based on same kind of data a research should be possible to repeated. Secondary data needs to be relatively new in order to use it in a research which of course depends on research environment. In some researches a data is old already after a week and in some other researches data is still valid after years. (Mäntyneva, Heinonen, Wrange. 2008)

3.3 Data collection and validity of data

Secondary data has been collected in year 2015 from the Swedish company who develops, manufactures and markets high-quality products. The research data was collected from a single source in one occasion. The secondary data is a shipping data for one year. The case company has facilities in multiple countries, but a data is only covering traffic to Sweden. The data has been pulled out from company's ERP system in March 2015 in excel (.xls) form. There are multiple people using company's ERP system and this ERP system combines all data from different departments. The data is updated all the time but after a shipment or a product have been received internally there is no major change in the data. It can be assumed that the research data would not change dramatically because of this factor. The data is a shipping data and it gives a good picture of the case company shipping profile. The data has enough information to be processed for the study purposes. The author has analysed the data quality is good and there are no bigger mistakes in the data. The secondary research data also answers positively to Mäntyneva, Heinonen and Wranger (2008) validity check questions.

The data is filtered and amended before starting calculations. The case company has also confirmed the validity of data would not change dramatically if the data would be pulled out six months later. Even though, there is no possibility to do another data pull to ensure a data quality it does not affect negatively to the research. Purpose of the study, is to research would a company with this type of a shipment profile benefit from an origin consolidation, instead of correct mistakes in their ERP system.

3.4 Data modification

The data is almost one-year shipping data and it contains all FCL and LCL shipments between 01.03.2014 to 28.02.2015 (Appendix 1). The data contains multiple origins and multiple destination but in calculations there is used only their major lane from Shanghai to Leksand. Reason for this is that SHA – GOT lane represents 51.97 % from all shipments and biggest advantages of the origin consolidation can be shown in major lanes. There are also multiple incoterms used but in calculations the author is assuming that all shipments are shipped with an incoterm FOB and transportation is paid in destination. A shipment data includes multiple data fields (see more Table 5 and Table 6) from container information to origin and destination information. The data does not contain any shipment expense data. There are few shipments which data quality is poor. Those shipments are removed from the data before calculations. Besides this few extra columns and other information are added before start of calculations.

3.4.1 Cleaning data

A raw data (Appendix 1) was not accurate from all points of view, so the author has made assumptions and simplified the data before starting optimization calculations. The author has analysed effects of these assumptions in Section 3.4.2 and Section 3.5. At first, the author started by deleting all other shipments from the raw data. This is to ensure there are no data mix up from other origins. After that a new raw data sheet was created in order not to mix up with old one (Appendix 2). Firstly, clean-up process started from shipment type column data with LCL status. Some of those shipments had also container count so those have been changed to FCL status. Those shipments are calculated to FCL data. In second phase, column E was removed because it had a data which was not consistent with number of container columns. At the same time three 20' container shipments which did not had any container count were added. In third phase, the author made a column Y called "total number of 40' HC containers" in order to differentiate 40' DC containers from 40' HC containers.

In next phase column X "Total number of LCL" shipments were created to identify number of LCL shipments per a week. After that a container type data were synchronized with number of container columns. There were few differences between these which were corrected. In same process two shipments were deleted from the data because of incorrect destination station data. As a final step column C "Week" was created. This column is needed to identify all shipments within a week from Monday to Sunday which is essential to create a weekly shipment profile to optimize shipment flow. After these measures, the data quality is high enough in order to use it in optimization calculations.

Before making final grouping calculations the SHA – GOT data (Appendix 3) was modified by sorting fields in ascending order in order it to be easier to use. There was column C added to group all shipments within a week to identify total volume of a week and shipments were sorted by date from oldest to latest.

Table 5. Headlines for raw data grouping part 1 (Appendix 2)

Customer Booking Received (Local)	day	Week	month	year	Container Typ	Container Volume	Container Weight	Destination Station Name	Number of Packages	Number of TEU	Origin Station Code	Port of Loading
18/03/2014	18	12	3	14	20'	28.700	5925.0	GOTHENBURG	728.00	1.00	SHA	SHANGHAI
20/03/2014	20	12	3	14				GOTHENBURG	152.00		SHA	SHANGHAI
25/03/2014	25	13	3	14	20'	28.700	5925.0	GOTHENBURG	728.00	1.00	SHA	SHANGHAI
26/03/2014	26	13	3	14	20'	30.180	5846.6	GOTHENBURG	1 036.00	1.00	SHA	SHANGHAI
31/03/2014	31	14	3	14	40'; 20'	52.700; 30.000	5632.5; 5632.5	GOTHENBURG	2 650.00	3.00	SHA	SHANGHAI

Table 6. Headlines for raw data grouping part 2 (Appendix 2)

Port to Port Transit Days	Shipment Type	Shipper Country	Terms of Delivery	Total Chargeable Weight	Total number of LCL shipements	Total Number of 20 ft Containers	Total Number of 40 ft Containers	Total Number of 40 ft HC Containers	Total Number of Containers	Total Volume	Total Weight	Type of Packages
50.00	FCL	CN	FOB	28 700.00	0.00	1.00	0.00	0.00	1.00	28.7	5 925	CTN
	LCL	CN	CPT	10 155.00	1.00	0.00	0.00	0.00	0.00	7.9	10 155	CTN
50.00	FCL	CN	FOB	28 700.00	0.00	1.00	0.00	0.00	1.00	28.7	5 925	CTN
	FCL	CN	CIF	30 180.00	0.00	1.00	0.00	0.00	1.00	30.2	5 847	CTN
	FCL	CN	CPT	82 700.00	0.00	1.00	1.00	0.00	2.00	82.7	11 265	CTN

3.4.2 Final data used in calculations

In the calculation data, what has been used is a cleaned-up data from lane Shanghai to Leksand. All in all, there are 185 shipments out of 356 shipments in this lane. Biggest lanes after Shanghai were Yantian and Karachi with total number of 61 shipments. (see Appendix 4). These lanes in total are less than half from Shanghai volume therefore focus of the calculation is in Shanghai lane. Shanghai lane represents 51,97 % from all shipments (see Table 7).

The modified data does not compromise data validity compared to the original data. Shipments which were removed from the raw data represents less than 5 % from total shipments so it does not have an effect to data validity. Changes what was made to the data sheet were supportive measures which means the data content was not anyhow modified and validity of data stayed the same.

Table 7. Summary data from shipments in SHA – GOT lane (Appendix 2)

Shipments	Total
All shipments	356
Shanghai - Leksand (FCL&LCL)	185
Deleted data (SHA-GOT)	2
SHA- GOT lane % from all shipments	51.97

From 185 shipments, there is 48 LCL shipments and 137 FCL shipments. Two shipments are not counted because the data were not accurate. In total, there are 140 containers and major part of them being 20´ containers. Overall volume of those containers was 4 586 CBM. Besides containers there are 48 LCL shipments with total volume of 520 CBM which combined all together there is 5 106 CBM used in these calculations (see Table 8 – Summary of shipment data). From that 5 106 CBM at the moment 4 586 CBM is going CY-CY and rest 520 CBM CFS – CFS.

Table 8. Summary of shipment data (Appendix 2)

GOTHENBURG	20' Containers	40' Containers	40' HC Containers	LCL	Grand total
Total CBM	2615.5	1123.1	847.4	519.8	5105.8
Total containers	94	28	18	-	140
Total Shipments	94	28	15	48	185

3.5 Observations before calculations

First thing that above summaries show is that major part of containers is going straight from suppliers to distribution center. This set up means if container is not full then empty space inside of the container is not used at all. That empty space could be filled for example with part of 48 LCL shipments volume. Also, there is high number of 20’ containers which is not always a cost-efficient way to transport goods.

In calculation, there is a focus in elimination use of 20’containers and maximizing loadibility in containers by using of 40’ HC containers. Seven-day grouping time is used because there is no purpose to change the current operational set up or extend transit time. One-week consolidation from Monday to Sunday also fits to ocean carriers sailing dates and way of operating. Taking into consideration ocean carriers set up ensures that there would not be any hick ups in the operational set up. The idea of seven-day grouping is to collect cargo for a week and ship all the consolidated cargo to next week sailing. The purpose is to use forwarders or an agents CFS facility to do physical consolidation. Most likely this raises up origin costs but savings in transportation costs and destination costs should cover this difference.

4 THE COST REDUCTION OPTIMIZATION STUDY

In Chapter 4, the author starts by presenting briefly situation now and issues that current situation is causing for the case company. After current situation, the author presents the aim and a background for the optimization study calculations.

4.1 Situation now

The author was working few months with the case company and within these months there were several discussions about their supply chain and transportation set up. During these discussions, it was discovered that currently the case company is buying their ocean transportation with C-delivery term. Using if C-delivery term means they do not have full control of their transportation cost or a flow of goods. The author also noticed the case company supply chain strategy is not fully followed by whole organization.

At the moment, a cargo is leaving from an individual supplier straight to container yard and from there containers depart to Sweden without any consolidation (See Figure 8). As shipments are departing from multiple ports, there is no consolidation done before shipments land to Swedish ports. In Sweden, shipments continue their journey individually without any consolidation. From ports shipments are shipped straight to DC and from DC to customers. The case company is responsible of transportation from Swedish port onwards.

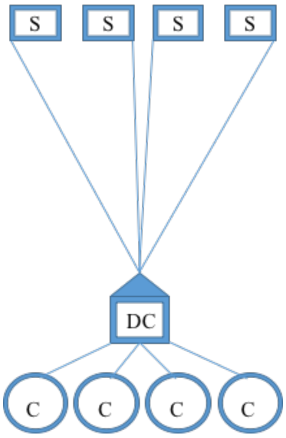


Figure 9. Transportation flow at the moment (The Author)

In current situation, a supplier is deciding who and how goods are shipped to Swedish ports. This set up means basically their supplier is handling the case company's inbound logistics to Sweden. The situation has led to a point where the case company do not have all information visible for them and information is spread across the supply chain (Kemph. 2011).

The company has reacted to lack of transparency by filling their warehouse full and now they are forced to rent extra warehouse space from same area. The company has a customer service promise where they guarantee to always have goods to ship from their warehouse. Unreliability of the transportation flow has caused bigger buffers in the warehouse, slower turnaround time and high cost of inventory. The situation is also causing extra workhours for operational and office staff. In this research the author us using a model (see Figure 9) where there is a consolidation point in origin before shipping goods overseas to company's distribution center. This model is still considered as a single-echelon inventory system because CFS is only a consolidation point which means there is no long-term warehousing in CFS. When there is no long-term warehousing it means that this location is not holding any of the inventory.

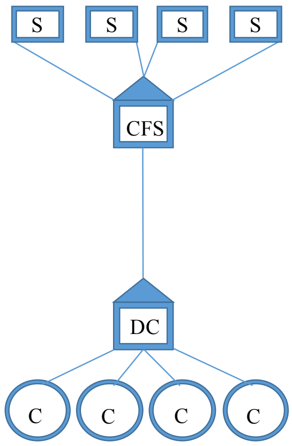


Figure 10. Transportation flow after change of delivery strategy (The Author)

The case company uses in a normal situation the single-echelon strategy where the company has one main distribution location. In that warehouse the company processes all the cargo and distributes cargo to their customers. The case company do not have any warehouse in origin and their customers are mainly retailers. That means they do not have inventory in other places than their distribution center. Now in current situation, where the case company has been forced to rent 3rd party warehouse they are using the multi-echelon strategy. They make purchasing decisions based on total inventory in their both locations. They do not have an own strategy for each location. The author assumes if the company would have better control to the supply chain they would need only one location for their goods.

4.2 Aim of calculations

The aim of calculations is to research can the case company achieve overall reduction of transportation cost through origin consolidation process. Levesques (2011) anticipated that different origin consolidation models deduct transportation costs through better container utilization. The author does not use maximum container utilization in optimization calculations because consolidation time is seven days. The author does not want to change current operational set up and one week is enough for processing shipments through CFS and loading a container. The container is not going to be always full because of container loading guidelines (Universal cargo. 2016) and possible low volume weeks. Extra volume from previous weeks are considered in next week consolidation.

4.3 Calculations

Starting point before beginning of calculations were to split all volume to weeks in order to see how volume spreads to certain weeks. This split was made by creating a Table 8 which is showing first a year and then a week. After that, table shows number of LCL shipments, 20’/40’/40 HC container count, total CBM and total weight for that certain week. Container data and LCL data allows the author to analyse how many containers and LCL shipments less can be used after the optimization. Total CBM data is used to split the volume to optimize use of correct equipment and total weight is to ensure that total weight of one container is not exceeding maximums.

Table 9. Weekly shipment flow (Appendix 2)

Row Labels	LCL shipments	20' Containers	40' Containers	40' HC Containers	Total CBMs	Total Weight Al
⊟ 14	**45**	**0**	**0**	**0**	**486.521**	**95963.2**
12	1	0	0	0	7.93	10155
14	2	0	0	0	17.54	2968.3
15	2	0	0	0	31.49	5056
18	2	0	0	0	27.99	6061
19	3	0	0	0	28.3	4312
20	2	0	0	0	24.09	4257.5
21	2	0	0	0	16.6	2708
22	2	0	0	0	23.53	4720.4
23	2	0	0	0	15.89	2473.1
26	1	0	0	0	5.52	1042.1
27	3	0	0	0	40.119	6740.1
28	2	0	0	0	26.165	4302.6
29	2	0	0	0	11.85	2100
32	1	0	0	0	2.62	477
34	1	0	0	0	10.881	1692
35	2	0	0	0	38.875	7940
36	3	0	0	0	33.262	6439.4
38	4	0	0	0	46.34	8417.8
40	1	0	0	0	4.949	790
41	1	0	0	0	7.9	1451
42	1	0	0	0	9.18	2074.9
43	2	0	0	0	15.4	3216
44	1	0	0	0	11.63	1617
45	2	0	0	0	28.47	4952
⊟ 15	**3**	**0**	**0**	**0**	**33.23**	**7317**
1	1	0	0	0	11.33	2714
7	1	0	0	0	8.9	1661
8	1	0	0	0	13	2942
Grand Total	**48**	**0**	**0**	**0**	**519.751**	**103280.2**

4.3.1 Defining breakpoints

Next step was to set up maximums for volume and weight per container. At the moment shipments, average loadability for 20’ container is 26.50 CBM, for 40’ container 41.60 CBM and for 40’ HC container 44.35 CBM. (see Table 10) When calculating averages, shipments with multiple containers have been excluded because of volume in a specific container cannot be specified. Current loadability is clearly less than industry leader Maersk advisable total loadability (www.maerskline.com) in their containers. In calculation, smaller loadability is going to be used (see Table 10) because hardly ever maximum loadability can be achieved because of carton shape and weekly volume variations. Purpose of these calculations is not to extend consolidation to next week because the author wants to keep the same operational set up. Also, maximum weight of container is limited to 20 000 kg instead of maximum weight of container. This is because cranes in all harbours does not support lifts over 20 000 kg.

Table 10. Container average loadability (The Author)

Container	Industry loadibility	Loadability used in calculations	Current average loadabilitty	Maximum weight
20'	33.00	29.00	26.50	20 000.00
40'	67.00	60.00	41.60	20 000.00
40' HC	76.00	70.00	44.35	20 000.00

Following phase in calculations, were how to determine the starting point. After summarizing of totals, next step was to calculate how much current scenario costs. For that the author uses sample prices from 2015 price level to calculate percentage how much is it possible to save with the optimized transportation set up. All different costs (Appendix 5) are combined to three different cost elements: origin costs, freight costs and destination cost (See Table 10). All costs are divided to cost elements to easily compare what kind of changes happens in certain cost elements. All currencies are converted to United States Dollar (USD) to simplify calculations.

As a final step, breakpoint between LCL cargo and 20’ container was calculated. That breakpoint is calculated by deducting LCL per shipment cost USD 120 per shipment away from 20’ container all in price. As a result, USD 1 510 was divided with cost of one cubic LCL USD 83.33 which means breakpoint for LCL is less than 18 CBM (see Figure 11). This measurement is needed to specify in optimizations calculations that less than 18 CBM shipment should go as LCL cargo rather than 20’ container from cost perspective.

FREIGHT	Ocean Freight	20'	40'	40 HC		LCL / CBM	CFS Fee / CBM (Origin cost)
SHANGHAI	GOTHENBURG	710.00	1 070.00	1 170.00		47.33	10.00
DESTINATION CHARGES		**20'**	**40'**	**40 HC**		**LCL / CBM**	**LCL / Per Shipment**
		920.00	920.00	920.00		26.00	120.00
TOTAL CHARGES PER SHIPMENT		**20'**	**40'**	**40 HC**		**LCL / CBM**	**LCL / Per Shipment**
		1 630.00	1 990.00	2 090.00		83.33	120.00
Breakpoint between LCL and 20'	(1630-120) / 83.33 = 18.12 CBMs Less 18 CBM = LCL						

Figure 11. Sample prices (Appendix 5)

4.3.2 Current situation table

As a second last step, current situation table was created (see Appendix 6). This table is showing following information: LCL shipment data, FCL (20', 40' and 40' HC) container count, LCL volume, Total Volume, Total weight of shipment, Origin cost, Freight cost, destination cost and current cost of shipment. The table was created to basis of weekly shipping flow table (see Table 9) but with new columns. From new columns LCL volume is needed to calculate LCL origin cost, cost columns are created to see how optimization affects to different cost elements and total cost of shipments to compare current scenario costs to optimizes scenario.

These calculations show that overall costs for this shipment profile is USD 297 318 for the current scenario. That cost is almost split half between freight and destination cost with split of USD 143 319 for freight and USD 148 600 for destination costs. Origin costs are USD 5 400 (See Table 11).

Table 11. Cost of current scenario (Appendix 6)

Current Scenario	
Origin Cost	$5 399.80
Freight Cost	$143 319.05
Destination Cost	$148 599.48
Total Cost	$297 318.33

4.3.3 Optimization calculation

After determine of starting point it was time for the actual optimization calculation. For that new table (see Appendix 7) was created using basis from previously made table (see Appendix 6). For new table, few new columns were created: Optimized cost, Cost saving, Remarks. Optimized cost column was created to show the cost of optimized scenario, cost saving column is coming from difference between old and new scenario and remark column is showing CY or CFS and other information.

Next step was to create optimized scenario. The author calculated shipment by shipment what would be the optimized scenario, by using origin consolidation process and right container equipment. This calculation was made based on total volume information and total weight which was based on earlier set variables and limitations. For example, week 27 in old scenario was in total 10 separate shipments: 3 LCL shipments with volume of 40.12 CBM, four 20' containers, two 40' containers and one 40' HC container. In optimized scenario, this total volume of 254.16 CBM fitted to one 40' container and three 40' HC container (see Appendix 7) without need of LCL. From cost perspective, this means instead of paying USD 16 293 in the old scenario in the optimized scenario it would cost USD 10 802. Major difference can be seen, in rise of origin costs which is 533.50 % from USD 401.19 to USD 2 541.55. In other hand, even bigger effect was shown in freight and destination costs where the ocean freight cost declined 43.10 % from USD 8 048.97 to USD 4 580 and the destination cost decline from USD 7 843.09 to USD 3 680. Overall save in transportation costs were 33.71 % and total of USD 5491.70 (see Table 12). Savings in transportation costs and destination costs covered losses in origin costs.

Table 12. Example from optimization (The Author)

Week 27	Origin cost	Freight cost	Destination cost	Total
Old Scenario	401.19	8048.97	7843.09	16293.25
New Scenario	2541.55	4580.00	3680.00	10801.55
Difference	2140.36	-3468.97	-4163.09	-5491.70
Difference in %	**533.50 %**	**-43.10 %**	**-53.08 %**	**-33.71 %**

4.3.4 Results

Results with other shipments, were similar like it was with example from week 27. From 35 out of 44 shipments the optimized scenario was cheaper than the old scenario. Besides that, five shipments did not have any savings and in four shipments costs were higher than in the old scenario. Reason for this is, that those shipments include LCL and FCL shipments. After switching cargo movements to go through CFS it also creates origin costs for FCL shipments which used to be shipped directly as a direct factory load through CY. In two shipments, a small volume was left to next week which were not taken into consideration in calculations.

After all shipments were counted results are similar as it were in week 27 results. Overall savings with optimized scenario is USD 78 429.48. (see Table 13) That is 26.54 % cheaper than the current set up. Origins costs were significantly higher than in the current set up because of manual work was required in origin. In the old scenario origin costs were 5 180.81 USD which mainly came from LCL shipments. In optimized scenario costs came both FCL and LCL and were USD 46 898.45 which is 805.23 % higher. Total costs for ocean freight ended up to USD 91 974.27 and that is 35.36 % less than original cost of USD 142 282.50. In destination costs optimized scenario costs were 47.18 % less than in the old scenario. This means overall transportation costs came down from USD 148 030.11 to USD 78 191.22. (Appendix 7)

Table 13. Summary of optimized scenario (The Author)

All shipments	Origin cost	Freight cost	Destination cost	Total
Old Scenario	5180.81	142282.50	148030.11	295493.42
New Scenario	46898.45	91974.27	78191.22	217063.94
Difference	41717.64	-50308.23133	-69838.892	-78429.48
Difference in %	**805.23 %**	**-35.36 %**	**-47.18 %**	**-26.54 %**

Besides cost reduction, there was a significant impact to the shipping profile and number of shipments. In the old scenario, the company shipped 140 containers and 137 shipments in total and major part of them going directly from suppliers to CY in harbour (see Table 14). From those 140 containers 94 were 20’ containers, 28 40’ containers and 18 40’ HC containers.

Table 14. Summary of old scenario (Appendix 6)

Old Scenario								
Origin	Destination	Total CBM	CFS-CFS (FCL & LCL)	CY-CY	20'	40'	40' HC	Total containers
SHA	GOT	5012	512	4493	94	28	18	140

In the optimized scenario, total number of containers were 78 which is 44.29 % less than in the old scenario. Most significant change was shown in 20’ containers with reduction from 94 containers to 13 containers. In other hand, biggest increase in number of containers were shown in 40’ HC containers from 18 to 52. Another big change was that instead of shipping all volume directly to CY in port, in optimized scenario that volume went through CFS. (see Table 15)

Table 15. Summary of optimized scenario (Appendix 7)

Optimized Scenario								
Origin	Destination	Total CBM	CFS-CFS (FCL & LCL)	CY-CY	20'	40'	40' HC	Total containers
SHA	GOT	5012	4689	323	13	13	52	78

4.4 Findings

Results of the optimization study, were quite close to what the author already expected in observations from data before the study. Besides expected results, the study had also other findings. In the base data, there were many weeks, where the case company had multiple shipments within one week without any consolidation. This indicated that, consolidation of cargo most definitely affects positively to ocean freight costs and destination costs. In the other hand, this was also indication that origin costs would most likely increase because of more volume is processed through CFS.

Optimization calculations results show significant drop in total container and LCL shipment count. Total container count dropped from 140 containers to 78 containers and number of LCL shipments dropped from 48 shipments to 17 shipments. This reduction saves total of 26.54 % in transportation costs. Major factor achieving this was when using free space from containers and using right equipment, the company can utilize free space to reduce overall transportation costs. This utilization of free space was one of perceptions before calculations and it was therefore proven correct.

Besides savings in total transportation costs, assumption before calculations were that origin costs would be higher than in the old scenario. This assumption was also proven to be true in the optimization study. Besides higher origin costs, some shipments were more expensive in the optimized scenario than it was in the old scenario. These higher costs were caused by shifting whole supply chain from old CY mode to CFS mode. It means that origin costs are now also calculated for container shipments and not only for LCL shipments as in the old scenario. These extra costs were not anticipated before the optimization study. In the previous scenario LCL shipments have been moved through CFS but containers directly to CY. Overall CFS fee itself has not been changed.

Above changes created over 500 % more origin costs compared to the old scenario. It was unsure before the optimization research; how much new costs in origin is going to affect to total savings but the optimization study showed it is approximately a half from achieved savings. These results show it would still be profitable to use the origin consolidation. Destination costs are also cheaper in the optimized scenario because shipments are consolidated which means less shipments and less handling costs in destination.

5 DISCUSSION

Results from optimization study are quite clear. As mentioned end of Chapter 3 optimized scenario saves about 27 % in total transportation costs. New way of transporting also reduces approximately 44 % of container usage. Levesque (2011) noticed when empty space is used in containers, it reduces total transportation costs and container usage. This was also proved in the optimizations study. In the beginning of the research, the author expected there would be higher costs in origin costs compared to old scenario but it was unsure are other cost reductions going to overcome these new costs. The optimization study results show that these new costs were covered by another savings. The optimized scenario would also mean less shipments, which means less work for numerous departments inside of company. This would add savings to total cost of purchase compared to old scenario.

5.1 Research questions

In section 5.1 the author goes through the research questions and how the optimization study results answers to aim of the study. In the end of this section and to be continued in Section 5.2, the author has summarized results and discusses about strategic changes and effects related to these changes.

The first research question was how changing of delivery term will affect to transportation costs. Currently, the case company is using C-delivery term which means changing the delivery term to F-delivery term is going to create extra origins and freight costs. The optimization study revealed with current shipment portfolio the case company can save in total transportation costs. Issue what the research has is that currently the case company does not have these costs so they are not actually, in this situation, saving in any costs. From that point of view this study does not fully answer to the first research question. The research indicates the change of a delivery term is going to create costs in this situation but it does not give a numerical value how much. The research also indicated that there are other benefits and potential savings which will help to cover these extra costs. The author would change delivery term based on other benefits achieved but the optimization study from numerical point of view does not support the change. The author will continue discussion about this in Section 5.2.

Second, third and fourth research question are all related. Second research question was can origin consolidation cut transportation costs. The optimization study gave an answer that with this kind of shipping profile there is possibility to save 27 % in total transportation costs. In this case, it meant approximately USD 78 000 less transportation costs in the case company biggest lane from Shanghai to Leksand. Actual savings would have been more if whole shipping profile would be taken into consideration. From this point of view the optimization study answered to research question.

Third and fourth research question asked which part of the supply chain costs benefits were achieved and was there any part where costs increased. The optimizations study results show significant decrease in freight and destination costs. In total these costs savings were from 35 % to 47 % which answers positively to research question that from transportation costs point of view savings are achieved from freight and destination costs. The research also indicated there would be additional savings in the supply chain but the research could not give a numerical value for savings. Therefore, there is a need for additional research to clarify how much of potential savings can be still achieved. Besides cost savings there was also clear answer to fourth research question. The optimization study results show significant increase in origin costs from transportation costs point of view. Origin costs increased over 800 % and with the case company profile it meant approximately USD 42 000 increase. The author suspected of raise of these costs but scale of it was a surprise. The result clearly answers to research question.

Fifth research question was asking are there any other benefits achieved with origin consolidation. The optimizations study didn't answer clearly to the question but it gave indications that there would be most likely also other benefits. The optimizations study results show decrease in shipments and containers which in many companies reduces internal administrative work and possibly also extra staff costs related to unloading containers. The optimization study does not clearly answer what kind of benefits companies could get but the author is discussing more about potential benefits in following chapters. Therefore, there is a need for further research to completely answer to the fifth research question.

The research has already proved that company with this kind of shipment profile can save in transportation costs by consolidating cargo. It also indicates companies with bigger shipment profile most likely saves in total transportation costs by consolidating. What is still unsure would this kind of strategy change and consolidation save in transportation costs for smaller companies. The author suspects benefits are smaller or none if shipment count is significantly lower. This would still need further research to confirm. The optimization study also indicates that reduction in number of shipments, there is going to be most likely reduction also in side costs. These savings would come from inventory costs, workforce cost, possible costs from loss of sales and saved time for processing shipments. This would still need more research to find out numerical value for these cost savings.

Currently, the company lives in C-term world, which means they do not have origin costs or ocean transportation costs. The author discusses in next chapter, is it worth to change incoterm and add costs to company's total transportation expense. Are there any other factors which would support this change?

5.2 Is it worth it? Is it too expensive to change?

Starting point for the study, were that the case company is currently using C-incoterms which means they are not paying at all transportation costs. This extra transportation cost would be most likely the biggest obstacle to overcome for a company who would like to change from C-incoterm to F-incoterm. Biggest question is, how to justify for company's board of directors, they need to significantly increase current transportation costs. In this case, it would mean increase of 40-50 % in transportation costs which is approximately USD 147 000 in the old scenario and USD 138 000 in the optimized scenario. Let's look few pros and cons.

First, let's start by looking at pure numbers. This optimized scenario and origin consolidation is not possible without full control of your inbound cargo. It means in the case company, that you are not able to consolidate your cargo in destination in same way as you can in origin, to achieve savings in destination charges. Now in optimized scenario the company saves almost USD 70 000 in destination costs which is possible only to achieve with the origin consolidation. Besides this number there are indirect savings which can be achieved with new negotiations with destination carrier because of steadier and more forecasted inbound volume. From numbers point of view, the company can cover about half from this new costs from lower destination costs.

There are also other factors which save money compared to the old scenario but in this study, there is no possibility to put a number for those. First and most important of those are new negotiations with suppliers to reduce purchasing price of goods which now have been bought with C-incoterm. When buying with C-incoterm there is always shipping costs included in overall price or shipping is invoiced separately. This might mean the supplier is improving their margins using shipping costs as a tool for it. In scenario where the supplier is invoicing freight separately there is of course possibility of freight rate increase if supplier is buying with larger volumes.

Second indirect place to save is need of less inventory. Especially the study case company has higher level of inventory because they do not have reliable supply chain. This extra inventory creates costs in terms of cost of inventory but also as a need of 3rd party warehouse. If there is a possibility to get rid of 3rd party warehouse because of better forecasts and lower inventory that is direct savings which can be calculated away from new transportation costs. Cost of inventory in this study is not possible to determine but it can also create significant savings.

As third and as a last point there is benefits of better customer satisfaction and savings in employee's time. The case company has a customer promise that they have always goods to ship and customers are used to short transit times for their orders. At the moment, this customer promise has not been fulfilled fully which has led to loss of sales. This is of course a situation which any company does not want be in. It creates loss of revenue in terms of lost sales but in worst cases it also leads to loss of customer which is even worse from revenue point of view. In other hand company with efficient, reliable and fast supply chain it is also tool of increase revenue. It can be way separate your company from competitor which leads to increase of revenue.

In current set up the case company logistics organization have a lot more work to do as they would have in optimized scenario. This extra work means 140 containers and 48 LCL shipments needs to be track and traced, processed, unloaded etc. as many times as there are shipments. This was only 50 % from their total shipments which means time savings are even more significant. All these processes take a lot of time and all this time could be directed to more productive work or it can be possible that there is no need for so many persons to handle shipments. Changing to F-incoterm also creates more work because of more responsibilities but overall set up is easier to control and creates less work.

This study has been done for half of the case company total volume. These results most likely would not be totally same for the rest of shipments because those shipments are more fragmented to different origins. Volumes from other origins are not as high as it is from Shanghai which means consolidation benefits do not reach to same level either. Other benefits such as time savings and level of inventory etc. are also applicable in same level for rest of the volume.

There are many factors that advocates to change of incoterm to F-term to get more control for companies´ own supply chains. It is ultimately a strategic decision where all departments should be heard because it affects to all their daily work. It is always big decision to increase your costs but in this kind of cases also savings should be taken into consideration.

6 CONCLUSION

Background for making this research was, that many companies in Finland, are still approaching supply chain decisions based on how things have been done before. This is at the moment, costing them a lot of money in form of exceeded supply chain costs and wasted time in operational work. The author purpose was, to research how would origin consolidation affect to company with a typical shipment profile, from transportation cost point of view. Tangible results could be used in further researches and to prove for companies that savings are possible without any dramatic changes in their supply chain.

The theory part of this research, concentrated to strategy decisions and concept of total transportation costs. Theories supported that with correct transportation decisions there are cost-cutting effects without changing anything in current volumes. When right kind of transportation management decisions are made, it has a positive effect to whole supply chain. Discussion about incoterms and delivery terms showed that these decisions have major effect to transportation costs and most of all control of goods. Strategic decisions which are made together with other departments, typically reduce transportation costs and improve visibility. If strategic decisions are made within function, normally transportation costs are higher and company has less control and visibility for their inventory. The theory about total cost of ownership did not support optimization study or results as the author thought in the beginning of the research. TCO though supported thinking behind purchase decisions which can easily lead to starting point of this study. TCO is also essential for further studies which are made based on the research. Critically thinking, there could have been more theory from the origin consolidation to support benefits of it.

Result from this research shows that companies with same kind of shipping profile can save in total transportation by using origin consolidation. Research shows that savings can be as big as 27 % from current scenario. In the case company, savings would mean also changing of incoterm which would need additional costs for the case company. This research did not study savings in side-costs and purchase price which would possibly overcome these new costs and help to justify changing of purchasing strategy. It is common that companies are buying with F-incoterms and they usually also have similar shipment profile such as in this research. In those cases, changing to origin consolidation is more easy.

Outcomes of this research are repeatable and can be used also for the basis of other companies' shipment profiles no matter of their size. Optimization calculation itself, is quite simple, but most likely it would need supply chain professional to intercept are results possible to implement. Different companies can benefit from this kind of study in many different ways. Firstly, companies who have thought origin consolidation but have not done it yet, can use this model to calculate what kind of benefits there are to achieve. Secondly, forwarding companies could use this research as a sales tool to build up quantified value propositions to their potential customers. The research is not completely ready sales tool but with further research sales tools could be build based on the research.

There are several different ways to do future research based on the research. The author suggests following ideas to extend this research:

- Would company with less shipments save in total transportation costs by consolidating?
- What kind of cost savings can be achieved in side-costs by consolidating shipment flow?
- Would 14 days' consolidation time increase cost savings significantly compared to 7 days' consolidation?
- Developing customer facing sales tools from optimization study.

First two additional researches would strengthen results of this research. If those researches are proven to support this study, forwarding companies would benefit from sales tool, which would help them to build up value propositions to customers.

REFERENCES

Arkieva. 2014. *Multi-echelon inventory optimizer.* Available from: http://www.arkieva.com/wp-content/uploads/2014/05/Multi-Echelon-Inventory-Optimizer-Arkieva-whitepaper.pdf Accessed 29.9.2016

Bidgoli, Hossein. 2010. *The handbook of Technology Management, Supply Chain Management, Marketing and Advertising, and Global Management.* John Willey & Sons. ISBN 047024948X. 931 pages.

Business Encyclopedia. *Total Cost of Ownership TCO Explained. Definitions, meaning and example calculations.* Available from: https://www.business-case-analysis.com/total-cost-of-ownership.html. Accessed: 17.10.2016.

Butta, Khurrum S., Huq, Faizul. 2002. *Suppliers Selection Problem: a Comparison of the Total Cost of Ownership and Analytic Hierarchy Process Approaches.* Available from: http://dx.doi.org/10.1108/13598540210436586. Accessed: 13.10.2016

Cook, Thomas A. 2014. *Mastering the business of global trade; Negotiating Competitive Advantage Contractual Best Practices, Incoterms, and Leveraging Supply Chain Options.* CRC Press. ISBN1466595795. 405 pages.

Daft, Richard. 2007. *Management.* Cengage Learning. ISBN 0324537700. 848 pages. (p.716 – 717)

Damco website. *Origin consolidation management*.
Available from: http://www.damco.com/en/our-services/supply-chain-management/origin-cargo-management/origin-consolidation-management. Accessed 19.9.2016

Davi, Charles. 2013. *How microprocessors and shipping containers have dimished the value of the worker.* Available from: http://qz.com/52831/how-microprocessors-and-shipping-containers-havediminished-the-value-of-the-worker/. Accessed 18.8.2016

Edwards, Goodrich. 2016. *Introduction to Transport Security.* CRC Press. 388 pages.

Ellram, Lisa M. 1993. *A Framework for Total Cost of Ownership.* Available from: http://dx.doi.org/10.1108/09574099310804984. Accessed: 13.10.2016

Ellram, Lisa M. 1995. *Total Cost of Ownership: An Analysis Approach for Purchasing.* Available from: http://dx.doi.org/10.1108/09600039510099928. Accessed: 13.10.2016.

EPA. US Environmental Protection Agency. *Global Greenhouse Gas Emission Data.* Available from: https://www.epa.gov/ghgemissions/global-greenhouse-gas-emissions-data. Accessed: 19.10.2016.

Equipment and Service specifications. 2016. *Container Specification.* Available from: http://www.maerskline.com/en-zw/shipping-services/dry-cargo/equipment-and-services/specifications. Accessed 7.10.2016.

Fleischmann, Nunen, Speranza, Stähly. 2012. *Advances of distribution logistics.* Springer Science & Business Media. ISBN 3642468659. 535 pages.

Gattorna, John. 1998. *Strategic Supply Chain Alignment: Best Practice in Supply Chain Management.* Gower Publishing ltd. ISBN 0566078252. 671 pages.

Grath, Anders. 2016. *The Handbook of International Trade and Finance: The Complete Guide For International Sales, Finance, Shipping and Administration.* Pages 13 – 23. Kogan Page Publisher. ISBN0749475994. 264 pages.

Handfield, Nichols. 2002. *Supply Chain redesign: Transforming Supply Chains Into Integrated Value Systems.* FT Press. ISBN0130603120. 371 pages. (p.225-235)

Happek, Susan. 2005. *Supply Chain Strategy: The importance of aligning your strategies.* A UPS Supply Chain Solutions White Papers. Available from: https://www.ups-scs.com/solutions/white_papers/wp_supply_chain.pdf. Accessed 21.9.2016.

Hines, Tony. 2014. *Supply Chain Strategies.* Routledge. ISBN 1136703969. 376 pages. (p.23-25)

ICC. 2016. *From 1936 to today: The incoterms rules.* Available from: http://www.iccwbo.org/products-and-services/trade-facilitation/incoterms-2010/history-of-the-incoterms-rules/. Accessed 14.9.2016

iContainers. 2016. *How to Choose a Competitive and Safe Incoterm For Your International Sales.* Available from: http://www.icontainers.com/us/2016/06/01/how-to-choose-a-competitive-and-safe-incoterm-for-your-international-sales/. Accessed: 12.10.2016

IMF News. *IMF Cuts Global Growth Forecasts on Brexit, Warns Of Risks to Outlook.* Available from: https://www.imf.org/en/News/Articles/2016/07/18/18/11/NA07192016-IMF-Cuts-Global-Growth-Forecasts-on-Brexit-Warns-of-Risks-to-Outlook. Accessed 17.8.2016.

Incoterms Explained. *The eleven rules in Brief*. 2016. Available from: http://www.incotermsexplained.com/the-incoterms-rules/the-eleven-rules-in-brief/. Accessed 14.9.2016

Investopedia. *Inventory.* 2016. Available from: http://www.investopedia.com/terms/i/inventory.asp Accessed: 29.9.2016.

Kallionpää, Pöllänen, Mäkelä, Liimatainen. 2013. *Suomen meriliikenteen skenaariot 2030*. Available from: http://www.trafi.fi/filebank/a/1360854107/f5c4b79459bcc0a283ababe40bc8b8ba/11409-Trafin_julkaisuja_03-2013_-_Suomen_meriliikenteen_skenaariot_2030.pdf. Accessed 12.9.2016.

Kaye, Simon. 2012. *Using Incoterms to Simplify Global Sourcing.* Available from: http://www.inboundlogistics.com/cms/article/using-incoterms-to-simplify-global-sourcing/. Accessed: 12.10.2016.

Kempf, Keskinocak, Ozsoy. 2011 *Planning production and inventories in the extended enterprise: A state of the art handbook.* Springer Science & Business Media. ISBN1441964851. 650 pages.

Kourdi, Jeremy. 2008. *Business strategy: A Guide to Taking Your Business Forward.* John Wiley & Sons. ISBN1846681243. 250 pages. (p.109-111)

KPMG Transport Tracker. *Global transport. Market trends and views. Pages 4 – 5.* Available from: https://assets.kpmg.com/content/dam/kpmg/pdf/2016/03/kpmg-transport-racker-v1-2016-web.pdf. Accessed 17.8.2016

Lee, B. Calvin. 2003. *Multi-Echelon Inventory Optimization.* Available from: http://www.e-thematic.org/download/Papers/Multi-Echelon%20Inventory%20Optimization%20-%20Evant%20white%20paper.pdf Accessed: 28.9.2016

Lee, L. Hau. 2004. *The Triple-A Supply Chain.* Harvard Business Review. Available from: https://hbr.org/2004/10/the-triple-a-supply-chain. Accessed 19.9.2016

Levesque, Peter J. 2011 *The shipping point: The rise of China and the future of retails supply chain management.* John Wiley and Sons. ISBN047082624X. 300 pages.

Levinson, Marc. 2016. *The Box: How the shipping container made the world smaller and the world economy bigger.* Princeton University Press. ISBN1400880750. 544 pages.

Li, Ling. 2007. *Supply Chain Management: Concepts, Techniques and Practices Enhancing the Value Through Collaboration.* World Scientific. ISBN 9812700722. 347 pages. (p. 70-85.)

Lilly and Associates. 2016. *How Consolidating Your Cargo At Origin Can Benefit Your Business. Eli Dolgansky.* Available from: http://www.shiplilly.com/blog/consolidating-products-at-origin-benefit-business/. Accessed 12.12.2016

Mangan, Lalwani, Buther. 2008. *Global logistics and Supply Chain Management.* John Wiley & Sons. ISBN0470066342. 392 pages. (p.35-40)

Marine-Business experts. 2016. *Incoterms 2010.* Available from: http://www.marine-business.com/incoterms-2010. Accessed 13.09.2016

McGuire, George. 2015. *Handbook of Humanitarian Health Care Logistics: Designing the Supply Network and Managing the Flows of Information and Health Care Goods in Humanitarian Assistance during Complex Political Emergencies in low-resource settings.* George McGuire. 1450 pages. (p.712)

Meriliitto.2016. *Varustamoelinkeino.* Available from: http://www.meriliitto.fi/?page_id=32. Accessed 12.9.2016

MIQ Logistics website. *Origin consolidation.* Available from: https://www.miq.com/resources/white-papers/origin-consolidation-white-paper/. Accessed 20.9.2016.

Mujis, Daniel. 2004. *Doing Quantitative Research in Education: with SPSS.* SAGE. ISBN1412933013. 240 pages

Mäntyneva, Heinonen, Wrange. 2008. *Markkinointitutkimus.* WSOY Oppimateriaalit Oy. ISBN 9789510284537. 130 pages.

Oskarsson, Aronsson, Ekdahl. 2006. *Modern logistik – Lönsam fysisk distribution och dess förutsättningar.* Liber. ISBN9147086777. 327 pages.

Quayle, Michael. 2005. *Purchasing and Supply Chain Management: Strategies and Realities.* Idea Group Inc. ISBN 1591409012. 360 pages. (p.13-16)

Reuvid, Sherlock. 2011. *International trade: An Essential Guide To The Principles and Practice of Export.* Kogan Page Limited. ISBN 9780749462376. 389 pages. (p. 179-191)

Revise Sociology. 2016. *Quantitative Secondary Sources.* Available from: https://revisesociology.wordpress.com/2011/05/04/4-quantitative-secondary-sources/. Accessed: 19.10.2016.

Ross, Frederic David. 2015. *Distribution Planning and Control: Managing in the era of supply chain.* Springer. ISBN 1489975780. 915 pages. (p. 47-50)

Rushton, Croucher, Baker. 2014 *The handbook of Logistics and Distribution Management: Understanding the Supply Chain.* Kogan Page. 690 pages.

Räty, Asko. 2006. *Incoterms, kauppatavat ja toimituslausekkeet.* Suomen logistiikka yhdistys Ry. ISBN9789519805078. 124 pages.

Scott, Lundgen, Thompson. 2011. *Guide to Supply Chain Management.* Springer Science & Business Media. ISBN 3642176763. 189 pages. (p. 79-82)

Seyoum, Belay. 2009. *Export-Import Theory, Practices and Procedure.* Taylor & Francis. ISBN 0789034190. 677 pages. (p.158- 175)

Shah, Janat. 2009. *Supply Chain Management: Text and Cases.* Pearson Education India. ISBN8131715175. 446 pages. (p.102-104)

Shanghai Shipping Exchange. 2016. *China Containerized Freight Index.* Available from: http://en.sse.net.cn/indices/ccfinew.jsp. Accessed 17.8.2016.

Shipwire. *Incoterms: 3 Things you Should Know for International Shipping.* Available from: https://www.shipwire.com/w/blog/incoterms-3-things-you-should-know/. Accessed 12.10.2016.

SkillsYouNeed. *Quantitative and Qualitative Research Methods.* 2016. Available from: http://www.skillsyouneed.com/learn/quantitative-and-qualitative.html. Accessed: 21.10.2016

Skjott-Larsen, Tage. 2007. *Managing the Global Supply Chain.* Copenhagen Business School Press DK. ISBN8763001713. 459 pages. (p.325-335)

Snapp, Shaun. 2009. *Multi-echelon planning explained.* Available from: http://www.scmfocus.com/inventoryoptimizationmultiechelon/2009/11/multiechelon-inventory-optimization-defined/. Accessed: 29.9.2016

Sople, Vinod V. 2012. *Supply Chain Management: Text and Cases.* Pearson Education India. ISBN81317690995. 527 pages.

Supply Chain Digest 1. *Global Supply Chain News: Better times ahead for container shipping industry, Says Maersk line CEO, And this he means it.*

Available from: http://www.scdigest.com/ontarget/16-05-10-1.php?cid=10674. Accessed 17.8.2016

Supply Chain Digest 2. Supply Chain News: *Growth of Global Container Fleet to be Lowest in Decades - but will Still Well Exceed Volume Growth, Continuing to Give Shippers the Edge.* Available from: http://www.scdigest.com/ontarget/16-01-25-1.php?cid=10182. Accessed 12.12.2016

The Economist. *Profits Overboard.* 2016.
Available from: http://www.economist.com/news/business/21706556-shipping-business-crisis-industry-leader-not-exempt-profits-overboard?zid=302&ah=601e2c69a87aadc0cc0ca4f3fbc1d354. Accessed 14.9.2016

The Economist 2. 2016. *The humble Hero.* Available from: http://www.economist.com/news/finance-and-economics/21578041-containers-have-been-more-important-globalisation-freer-trade-humble. Accessed 18.8.2016

The Supply Chain Digest. 2008. *Focus on Inventory Optimization.* Available from: http://www.scdigest.com/assets/reps/SCDLetter_InvOpt_Final.pdf Accessed 29.9.2016

UK Essays. 2013. *The Importance of Incoterms For International Sales Contracts.* Available from: http://www.lawteacher.net/free-law-essays/international-law/importance-incoterms-international-sales-contracts-international-law-essay.php. Accessed: 12.10.2016

Universal cargo. 2016. *Container Loading Guidelines.* Available from: http://cdn2.hubspot.net/hub/57382/docs/container+loading+guidelines.pdf?t=1460660141773 Accessed: 29.9.2016

Walsh, Wellman. 2011. *Decentralized supply chain formation: A Market Protocol and Competitive Equilibrium Analysis.* Available from: https://www.jair.org/media/1213/live-1213-2219-jair.pdf Accessed: 29.9.2016

APPENDICES

APPENDIX 1

day	month	year	Container 1 Type	Container Number	Container Pieces	Container Typ	Container Volume	Container Weight	Destination Station Name	Number of Packages	Number of TEU	Origin Country Code	Origin Station Code	Port of Loading	Port to Port Transit Days	Shipment Type	Shipper Country	Shipper Name	Shipper Name Line 2	Terms of Delivery	Total Chargeable Weight	Total Number of 20 ft Containers	Total Number of 40 ft Containers	Total Number of Containers	Total Volume	Total Weight	Type of Packages
5	1	15	20'	MAGU2526811	467	20'	22.520	4173.5	GOTHENB	467.00	1.00	CN	NNG	GUANGZHOU	35.00	FCL	CN	LABORSIN		FOB	22 520.00	1.00	0.00	1.00	22.5	4 174	CTN
5	1	15	20'	UACU4026443	1202	20'	26.351	5102.4	GOTHENB	1 202.00	1.00	CN	SHA	SHANGHAI	42.00	FCL	CN	ORIENT IN	SHANGHA	FOB	26 351.00	1.00	0.00	1.00	26.4	5 102	CTN
7	1	15	40HC	GATU8297091	1246	40HC	59.500	10859.0	GOTHENB	1 246.00	2.00	CN	SHA	SHANGHAI	47.00	FCL	CN	SHANGHA	LTD	FOB	59 500.00	0.00	1.00	1.00	59.5	10 859	PKG
8	1	15	40HC	UETU5010600	400	40HC	9.500	1650.0	GOTHENB	400.00		CN	SHA	SHANGHAI	40.00	LCL	CN	ORIENT IN	SHANGHA	FOB	9 500.00	0.00	1.00	1.00	9.5	1 650	CTN
8	1	15	20DC	YMLU3593177	1030	20DC	27.870	5265.0	GOTHENB	1 030.00	1.00	CS	YTN	YANTIAN		FCL		KENNY W(		CPT	27 870.00	1.00	0.00	1.00	27.9	5 265	CTN
8	1	15	20'	HDMU2642552	50	20'	1.770	448.5	GOTHENB	50.00		TH	BKK	SINGAPORE	37.00	LCL	TH	S.T.(THAIL	624/1-4 MC	FOB	1 770.00	1.00	0.00	1.00	1.8	449	CTN
8	1	15	20DC	CPIU0460267	796	20DC	28.030	6500.0	GOTHENB	796.00	1.00	CN	SHA	SHANGHAI		FCL	CN	NANTONG		CPT	28 030.00	1.00	0.00	1.00	28.0	6 500	CTN
8	1	15	20DC	DIXU2153714	837	20DC	27.500	4520.0	GOTHENB	837.00	1.00	CN	SHA	SHANGHAI		FCL	CN	WUXI TAS		CPT	27 500.00	1.00	0.00	1.00	27.5	4 520	CTN
8	1	15	40'	NYKU8392669	2400	40'	53.235	16596.0	GOTHENB	2 400.00	2.00	CS	SZX	YANTIAN	41.00	FCL	CS	RUBBERE	11F DAH S	FOB	53 235.00	0.00	1.00	1.00	53.2	16 596	CTN
9	1	15	40HC	BSIU9230130	150	40HC	3.700	650.0	GOTHENB	150.00		CN	SHA	SHANGHAI	39.00	LCL	CN	ORIENT IN	SHANGHA	FOB	3 700.00	0.00	1.00	1.00	3.7	650	CTN
11	1	15	20'	UACU3947361	418	20'	18.820	3045.7	GOTHENB	418.00	1.00	BD	CGP	CHITTAGONG	44.00	FCL	BD	INDUSTRI/	PLOT NO#	CFR	18 820.00	1.00	0.00	1.00	18.8	3 046	CTN
12	1	15	20DC	ARDU2028888	890	20DC	27.000	5548.0	GOTHENB	890.00	1.00	CN	SHA	SHANGHAI		FCL	CN	NANYANG		CPT	27 000.00	1.00	0.00	1.00	27.0	5 548	CTN
13	1	15	40HC	PONU8239023	380	40HC	7.940	1934.0	GOTHENB	380.00		CS	SZX	YANTIAN	30.00	LCL	CS	RUBBERE	11F DAH S	FOB	7 940.00	0.00	1.00	1.00	7.9	1 934	CTN
13	1	15	20'	MRKU8047477	450	20'	12.060	2490.5	GOTHENB	450.00	1.00	ID	MES	BELAWAN, SUMATRA	32.00	FCL	ID	MEDISAFE	DESA BUN	FOB	12 060.00	1.00	0.00	1.00	12.1	2 491	CAS
14	1	15	20DC	TCLU2861789	959	20DC	27.903	5588.0	GOTHENB	959.00	1.00	CN	SHA	SHANGHAI		FCL	CN	SHANGHA		CPT	27 903.00	1.00	0.00	1.00	27.9	5 588	CTN
14	1	15	20DC	CPIU0462260	699	20DC	27.800	4169.0	GOTHENB	699.00	1.00	CN	SHA	SHANGHAI		FCL	CN	WUXI TAS		CPT	27 800.00	1.00	0.00	1.00	27.8	4 169	CTN
15	1	15	20DC	ARDU2029478	739	20DC	28.082	7390.0	GOTHENB	739.00	1.00	CN	SHA	SHANGHAI		FCL	CN	KENNY W(		CPT	28 082.00	1.00	0.00	1.00	28.1	7 390	CTN
15	1	15	40'	NYKU8546949	2400	40'	53.235	15901.0	GOTHENB	2 400.00	2.00	CS	SZX	YANTIAN	41.00	FCL	CS	RUBBERE	11F DAH S	FOB	53 235.00	0.00	1.00	1.00	53.2	15 901	CTN
15	1	15	CLD	TTNU9294774; YMLU	107; 107	40HC; CLD	3.739; 3.73	671.4; 671.	GOTHENB	107.00		ID	JKT	JAKARTA, JAVA	35.00	LCL	ID	SEOK HWA	BLOK 3 RT	FOB	3 739.00	0.00	1.00	1.00	3.7	671	CTN
16	1	15	20DC	ARDU2029101	735	20DC	26.890	6386.0	GOTHENB	735.00	1.00	CN	SHA	SHANGHAI		FCL	CN	NANTONG		CPT	26 890.00	1.00	0.00	1.00	26.9	6 386	CTN
16	1	15							GOTHENB	17.00		PK	KHI	KARACHI		LCL		PRIME SA		CPT	2 000.00	0.00	0.00	0.00	2.0	266	CTN
16	1	15	20DC	LCRU2517865	1524	20DC	27.700	4282.0	GOTHENB	1 524.00	1.00	CN	SHA	SHANGHAI		FCL	CN	NANYANG		CPT	27 700.00	1.00	0.00	1.00	27.7	4 282	CTN
19	1	15	40HC	TCNU9564049	2220	40HC	67.240	8625.0	GOTHENB	2 220.00	2.00	CN	SHA	SHANGHAI		FCL	CN	NANTONG		CPT	67 240.00	0.00	1.00	1.00	67.2	8 625	CTN
19	1	15	20'	MRKU9105520	574	20'	13.276	3963.5	GOTHENB	574.00	1.00	MY	PKG	PORT KELANG	38.00	FCL	MY	RUBBERE	LOT 13820	FOB	13 276.00	1.00	0.00	1.00	13.3	3 964	CTN
19	1	15	40'	CRXU4563145	853	40'	31.100	6721.0	GOTHENB	853.00	2.00	CN	SHA	SHANGHAI	52.00	FCL	CN	SHANGHA	LTD	FOB	31 100.00	0.00	1.00	1.00	31.1	6 721	CTN
20	1	15	20DC	MRKU8359048	306	20DC	22.644	3131.0	GOTHENB	306.00	1.00	LK	CMB	COLOMBO		FCL	CMB	INDUSTRI/		CPT	22 644.00	1.00	0.00	1.00	22.6	3 131	CTN
20	1	15							GOTHENB	250.00		PK	KHI	KARACHI		LCL		SEA HAWI		CPT	17 000.00	0.00	0.00	0.00	17.0	2 010	CTN
21	1	15	20DC	DIXU2153606	1011	20DC	29.490	6331.0	GOTHENB	1 011.00	1.00	CN	SHA	SHANGHAI		FCL	CN	SHANGHA		CPT	29 490.00	1.00	0.00	1.00	29.5	6 331	CTN
22	1	15	20'	MSKU5785273	398	20'	12.114	2636.0	GOTHENB	398.00	1.00	MY	PEN	PENANG (GEORGETOW	31.00	FCL	MY	PEARL GL	LOT 22, JL	FOB	12 114.00	1.00	0.00	1.00	12.1	2 636	CTN
22	1	15	20DC	LCRU2517910	822	20DC	22.600	6526.0	GOTHENB	822.00	1.00	CN	SHA	SHANGHAI		FCL	CN	NANTONG		CPT	22 600.00	1.00	0.00	1.00	22.6	6 526	CTN
23	1	15	40HC	MRKU3374311	203	40HC	13.139	2146.0	GOTHENB	203.00		CN	NNG	GUANGZHOU		LCL	CN	LABORSIN		FOB	13 139.00	0.00	1.00	1.00	13.1	2 146	CTN
23	1	15							GOTHENB	195.00		LK	CMB	COLOMBO		LCL	CMB	DIPPED PI		CPT	9 450.00	0.00	0.00	0.00	9.5	1 599	CTN
28	1	15	40NR	TCLU1301115	48	40NR	1.850	163.1	GOTHENB	48.00		KR	PUS	BUSAN	39.00	LCL	KR	ANSELL K(	352-65, JA	FOB	1 850.00	0.00	1.00	1.00	1.9	163	CTN
29	1	15	40NR	SZLU9819553	176	40NR	10.530	1178.5	GOTHENB	176.00		CN	FOC	XIAMEN		LCL	CN	FUZHIOU I	R409 M F (	FOB	10 530.00	0.00	1.00	1.00	10.5	1 179	CTN
29	1	15	20DC	MRKU9686868	351	20DC	18.329	3132.0	GOTHENB	351.00	1.00	LK	CMB	COLOMBO		FCL	CMB	INDUSTRI/		CPT	18 329.00	1.00	0.00	1.00	18.3	3 132	CTN
29	1	15	20DC	APZU3715671	950	20DC	28.980	3735.0	GOTHENB	950.00	1.00	CN	SHA	SHANGHAI		FCL	CN	NANTONG		CPT	28 980.00	1.00	0.00	1.00	29.0	3 735	CTN
29	1	15	40DC	HLXU5078765	747	40DC	50.500	6418.0	GOTHENB	747.00	2.00	CN	SHA	SHANGHAI		FCL	CN	XIN ZHU		CPT	50 500.00	0.00	1.00	1.00	50.5	6 418	CTN
30	1	15	20DC	LCRU2517994	1021	20DC	29.580	5850.0	GOTHENB	1 021.00	1.00	CN	SHA	SHANGHAI		FCL	CN	NANYANG		CPT	29 580.00	1.00	0.00	1.00	29.6	5 850	CTN
30	1	15	20DC	TEMU5610090	782	20DC	28.100	7038.0	GOTHENB	782.00	1.00	CN	SHA	SHANGHAI		FCL	CN	KENNY W(		CPT	28 100.00	1.00	0.00	1.00	28.1	7 038	CTN
4	2	15	20DC	CCLU3531430	457	20DC	30.300	7994.0	GOTHENB	457.00	1.00	HK	HKG	HONG KONG		FCL		FUK SING		CPT	30 300.00	1.00	0.00	1.00	30.3	7 994	CTN
5	2	15	20'	MSKU5785273	359	20'	12.570	3936.8	GOTHENB	359.00	1.00	MY	PEN	PENANG (GEORGETOW	31.00	FCL	MY	NASTAH IN	PLOT 393,	FOB	12 570.00	1.00	0.00	1.00	12.6	3 937	CTN
5	2	15	20'	DFSU6248528; TRHU	50; 50	40HC; 20'	1.832; 1.83	448.5; 448.	GOTHENB	50.00		TH	BKK	SINGAPORE	44.00	LCL	TH	S.T. (THAIL	624/1-4 MC	FOB	1 832.00	0.00	1.00	1.00	1.8	449	CTN
5	2	15	40DC	CSLU5168155	3202	40DC	56.400	8729.0	GOTHENB	3 202.00	2.00	CN	SHA	SHANGHAI		FCL	CN	NANYANG		CPT	56 400.00	0.00	1.00	1.00	56.4	8 729	CTN
9	2	15	40HC	KKFU7782825	2185	40HC	66.370	8669.0	GOTHENB	2 185.00	2.00	CN	SHA	SHANGHAI		FCL	CN	NANTONG		CPT	66 370.00	0.00	1.00	1.00	66.4	8 669	CTN
10	2	15	20DC	ARDU2028698	472	20DC	19.500	5108.0	GOTHENB	472.00	1.00	CN	SHA	SHANGHAI		FCL	CN	NANTONG		CPT	19 500.00	1.00	0.00	1.00	19.5	5 108	CTN
10	2	15	20DC	TGHU3591687	1429	20DC	28.925	5901.0	GOTHENB	1 429.00	1.00	CN	SHA	SHANGHAI		FCL	CN	SHANGHA		CPT	28 925.00	1.00	0.00	1.00	28.9	5 901	CTN
11	2	15	40DC	HLXU4400666	881	40DC	58.000	7237.0	GOTHENB	881.00	2.00	CN	SHA	SHANGHAI		FCL	CN	XIN ZHU		CPT	58 000.00	0.00	1.00	1.00	58.0	7 237	CTN
11	2	15	20DC	BMOU2857627	769	20DC	28.880	7229.0	GOTHENB	769.00	1.00	CN	SHA	SHANGHAI		FCL	CN	KENNY W(		CPT	28 880.00	1.00	0.00	1.00	28.9	7 229	CTN
12	2	15							GOTHENB	183.00		CN	SHA	SHANGHAI		LCL	CN	WUXI TAS		CPT	8 900.00	0.00	0.00	0.00	8.9	1 661	CTN
12	2	15							GOTHENB	1.00		CN	NNG	GUANGZHOU		LCL	CN	LABORSIN		FOB	1 000.00	0.00	0.00	0.00	1.0	1	CTN
12	2	15	20DC	CPIU0460204	612	20DC	27.208	6607.0	GOTHENB	612.00	1.00	CN	SHA	SHANGHAI		FCL	CN	NANTONG		CPT	27 208.00	1.00	0.00	1.00	27.2	6 607	CTN
12	2	15	40HC	MRKU3374311	203	40HC	13.139	2146.0	GOTHENB	203.00		CS	CAN	YANTIAN	29.00	LCL	CN	LABORSIN		CIF	13 139.00	0.00	1.00	1.00	13.1	2 146	CTN
12	2	15	20DC	CPSU1638055	625	20DC	20.000	4310.0	GOTHENB	625.00	1.00	PK	KHI	KARACHI		FCL		BELTEXC(		CPT	20 000.00	1.00	0.00	1.00	20.0	4 310	CTN
12	2	15	40'	PONU1789368	3000	40'	58.344	18283.0	GOTHENB	3 000.00	2.00	CS	SZX	YANTIAN	51.00	FCL	CN	RUBBERE	11F DAH S	FOB	58 344.00	0.00	1.00	1.00	58.3	18 283	CTN
12	2	15	20'	KKTU7146406	1010	20'	25.000	7837.5	GOTHENB	1 010.00	1.00	TH	BKK	BANGKOK	33.00	FCL	TH	SAFE GLO	126 MOO 1	FOB	25 000.00	1.00	0.00	1.00	25.0	7 838	CTN
13	2	15	20DC	BBCU2212486	1118	20DC	20.000	5863.0	GOTHENB	1 118.00	1.00	CN	SHA	SHANGHAI		FCL	CN	SHANGHA		CPT	20 000.00	1.00	0.00	1.00	20.0	5 863	CTN
15	2	15	20'	HLXU3493197	1016	20'	20.000	6012.4	GOTHENB	1 016.00	1.00	PK	KHI	KARACHI		FCL		BELTEXC(			20 000.00	1.00	0.00	1.00	20.0	6 012	CTN
16	2	15	20'	LTGU1130377	1300	20'	25.283	7484.0	GOTHENB	1 300.00	1.00	CS	SZX	YANTIAN	51.00	FCL	CS	RUBBERE	11F DAH S	FOB	25 283.00	1.00	0.00	1.00	25.3	7 484	CTN
17	2	15							GOTHENB	265.00		CN	SHA	SHANGHAI		LCL	CN	NANTONG		CPT	13 000.00	0.00	0.00	0.00	13.0	2 942	CTN

APPENDIX 2

	day	Week	month	year	Container Typ	Container Volume	Container Weight	Destination Station Name	Number of Packages	Number of TEU	Origin Station Code	Port of Loading	Port to Port Transit Days	Shipment Type	Shipper Country	Terms of Delivery	Total Chargeable Weight	Total number of LCL shipements	Total Number of 20 ft Containers	Total Number of 40 ft Containers	Total Number of 40 ft HC Containers	Total Number of Containers	Total Volume	Total Weight	Type of Packages
2014	18	12	3	14	20'	28.700	5925.0	GOTHENBURG	728.00	1.00	SHA	SHANGHAI	50.00	FCL	CN	FOB	28 700.00	0.00	1.00	0.00	0.00	1.00	28.7	5 925	CTN
2014	20	12	3	14				GOTHENBURG	152.00		SHA	SHANGHAI		LCL	CN	CPT	10 155.00	1.00	0.00	0.00	0.00	0.00	7.9	10 155	CTN
2014	25	13	3	14	20'	28.700	5925.0	GOTHENBURG	728.00	1.00	SHA	SHANGHAI	50.00	FCL	CN	FOB	28 700.00	0.00	1.00	0.00	0.00	1.00	28.7	5 925	CTN
2014	26	13	3	14	20'	30.180	5846.6	GOTHENBURG	1 036.00	1.00	SHA	SHANGHAI		FCL	CN	CIF	30 180.00	0.00	1.00	0.00	0.00	1.00	30.2	5 847	CTN
2014	31	14	3	14	40'; 20'	52.700; 30.000	5632.5; 5632.5	GOTHENBURG	2 650.00	3.00	SHA	SHANGHAI		FCL	CN	CPT	82 700.00	0.00	1.00	1.00	0.00	2.00	82.7	11 265	CTN
2014	31	14	3	14				GOTHENBURG	301.00		SHA	SHANGHAI		LCL	CN	CIF	10 760.00	1.00	0.00	0.00	0.00	0.00	10.8	1 919	PCS
2014	1	14	4	14	20DC	27.600	7125.0	GOTHENBURG	750.00	1.00	SHA	SHANGHAI		FCL	CMB	CPT	27 600.00	0.00	1.00	0.00	0.00	1.00	27.6	7 125	CTN
2014	3	14	4	14	20DC	28.100	6820.0	GOTHENBURG	660.00	1.00	SHA	SHANGHAI		FCL	CMB	CPT	28 100.00	0.00	1.00	0.00	0.00	1.00	28.1	6 820	PCK
2014	4	14	4	14				GOTHENBURG	198.00		SHA	SHANGHAI		LCL	CMB		6 780.00	1.00	0.00	0.00	0.00	0.00	6.8	1 050	PCS
2014	8	15	4	14	40'	36.100	6440.0	GOTHENBURG	634.00	2.00	SHA	SHANGHAI	51.00	FCL	CMB	FOB	36 100.00	0.00	0.00	1.00	0.00	1.00	36.1	6 440	CTN
2014	9	15	4	14	40'	51.772	8949.8	GOTHENBURG	2 084.00	2.00	SHA	SHANGHAI	40.00	FCL	CMB	FOB	51 772.00	0.00	0.00	1.00	0.00	1.00	51.8	8 950	CTN
2014	9	15	4	14				GOTHENBURG	785.00		SHA	SHANGHAI		LCL	CMB	CPT	15 550.00	1.00	0.00	0.00	0.00	0.00	15.6	2 293	CTN
2014	11	15	4	14	20DC	13.504	2183.0	GOTHENBURG	650.00		SHA	SHANGHAI		FCL	PK	CPT	13 504.00	0.00	1.00	0.00	0.00	1.00	13.5	2 183	CTN
2014	11	15	4	14				GOTHENBURG	438.00		SHA	SHANGHAI		LCL	PK	CPT	15 940.00	1.00	0.00	0.00	0.00	0.00	15.9	2 763	CTN
2014	17	16	4	14	20'	22.889	3798.9	GOTHENBURG	647.00	1.00	SHA	SHANGHAI	39.00	FCL	CN	FOB	22 889.00	0.00	1.00	0.00	0.00	1.00	22.9	3 799	CTN
2014	21	17	4	14	40HC	59.676	11091.0	GOTHENBURG	2 530.00	2.00	SHA	SHANGHAI	39.00	FCL	CN	FOB	59 676.00	0.00	0.00	0.00	1.00	1.00	59.7	11 091	CTN
2014	22	17	4	14	20DC	28.130	6513.0	GOTHENBURG	655.00	1.00	SHA	SHANGHAI		FCL	CN	CPT	28 130.00	0.00	1.00	0.00	0.00	1.00	28.1	6 513	CTN
2014	25	17	4	14	20'	28.903	5950.9	GOTHENBURG	1 306.00	1.00	SHA	SHANGHAI		FCL	CN	CFR	28 903.00	0.00	1.00	0.00	0.00	1.00	28.9	5 951	PCS
2014	25	17	4	14	20'	25.000	10133.0	GOTHENBURG	1 390.00	1.00	BKK	SHANGHAI	46.00	FCL	TH	FOB	25 000.00	0.00	1.00	0.00	0.00	1.00	25.0	10 133	CTN
2014	28	18	4	14	20'	27.700	7707.0	GOTHENBURG	866.00	1.00	SHA	SHANGHAI		FCL	CN	CFR	27 700.00	0.00	1.00	0.00	0.00	1.00	27.7	7 707	PCS
2014	29	18	4	14				GOTHENBURG	555.00		SHA	SHANGHAI		LCL	CN	CPT	16 950.00	1.00	0.00	0.00	0.00	0.00	17.0	4 370	CTN
2014	4	18	5	14				GOTHENBURG	292.00		SHA	SHANGHAI		LCL	CN	CPT	11 040.00	1.00	0.00	0.00	0.00	0.00	11.0	1 691	CTN
2014	4	18	5	14	20'	28.000	5527.0	GOTHENBURG	996.00	1.00	SHA	SHANGHAI	43.00	FCL	CN	FOB	28 000.00	0.00	1.00	0.00	0.00	1.00	28.0	5 527	CTN
2014	5	19	5	14				GOTHENBURG	310.00		SHA	SHANGHAI		LCL	CN	CPT	10 750.00	1.00	0.00	0.00	0.00	0.00	10.8	2 000	CTN
2014	6	19	5	14				GOTHENBURG	318.00		SHA	SHANGHAI		LCL	CN	CPT	8 800.00	1.00	0.00	0.00	0.00	0.00	8.8	1 169	CTN
2014	7	19	5	14	20'	27.600	5549.0	GOTHENBURG	953.00	1.00	SHA	SHANGHAI	39.00	FCL	CN	FOB	27 600.00	0.00	1.00	0.00	0.00	1.00	27.6	5 549	CTN
2014	10	19	5	14	40HC	63.700	8070.0	GOTHENBURG	2 110.00	2.00	SHA	SHANGHAI		FCL	CN	CPT	63 700.00	0.00	0.00	0.00	1.00	1.00	63.7	8 070	CTN
2014	10	19	5	14				GOTHENBURG	233.00		SHA	SHANGHAI		LCL	CN	CPT	8 750.00	1.00	0.00	0.00	0.00	0.00	8.8	1 143	CTN
2014	13	20	5	14	20DC	29.780	5249.0	GOTHENBURG	1 402.00	1.00	SHA	SHANGHAI		FCL	CN	CPT	29 780.00	0.00	1.00	0.00	0.00	1.00	29.8	5 249	CTN
2014	14	20	5	14	40HC	55.247	8188.0	GOTHENBURG	1 388.00	2.00	SHA	SHANGHAI	33.00	FCL	CN	FOB	55 247.00	0.00	0.00	0.00	1.00	1.00	55.2	8 188	CTN
2014	15	20	5	14	20'	22.500	5113.0	GOTHENBURG	480.00	1.00	SHA	SHANGHAI	33.00	FCL	CN	FOB	22 500.00	0.00	1.00	0.00	0.00	1.00	22.5	5 113	CTN
2014	15	20	5	14				GOTHENBURG	633.00		SHA	SHANGHAI		LCL	CN	CIF	12 450.00	1.00	0.00	0.00	0.00	0.00	12.5	2 144	PCS
2014	15	20	5	14	20'	28.000	2455.6	GOTHENBURG	415.00	1.00	SHA	SHANGHAI		FCL	CN	FOB	28 000.00	0.00	1.00	0.00	0.00	1.00	28.0	2 456	PCS
2014	15	20	5	14				GOTHENBURG	320.00		SHA	SHANGHAI		LCL	CN	CPT	11 640.00	1.00	0.00	0.00	0.00	0.00	11.6	2 114	PCS
2014	21	21	5	14	40'	38.800	7084.0	GOTHENBURG	686.00	2.00	SHA	SHANGHAI	38.00	FCL	CN	FOB	38 800.00	0.00	0.00	1.00	0.00	1.00	38.8	7 084	CTN
2014	21	21	5	14				GOTHENBURG	120.00		SHA	SHANGHAI		LCL	CN	CPT	4 700.00	1.00	0.00	0.00	0.00	0.00	4.7	588	CTN
2014	22	21	5	14				GOTHENBURG	321.00		SHA	SHANGHAI		LCL	CN	CPT	11 900.00	1.00	0.00	0.00	0.00	0.00	11.9	2 120	CTN
2014	22	21	5	14	20DC	20.000	2613.0	GOTHENBURG	434.00	1.00	SHA	SHANGHAI		FCL	CN	CPT	20 000.00	0.00	1.00	0.00	0.00	1.00	20.0	2 613	CTN
2014	26	22	5	14				GOTHENBURG	339.00		SHA	SHANGHAI		LCL	CN	CPT	13 000.00	1.00	0.00	0.00	0.00	0.00	13.0	2 403	CTN
2014	28	22	5	14				GOTHENBURG	192.00		SHA	SHANGHAI		LCL	CN	CIF	10 530.00	1.00	0.00	0.00	0.00	0.00	10.5	2 317	PCS
2014	2	23	6	14				GOTHENBURG	250.00		SHA	SHANGHAI		LCL	CN	CFR	8 640.00	1.00	0.00	0.00	0.00	0.00	8.6	1 219	PCS
2014	5	23	6	14	20'	5.100	640.6	GOTHENBURG	121.00	1.00	SHA	SHANGHAI		FCL	CN	CIF	5 100.00	0.00	1.00	0.00	0.00	1.00	5.1	641	PCS
2014	5	23	6	14	40'	7.500	1173.6	GOTHENBURG	408.00		SHA	SHANGHAI		FCL	CN	CFR	7 500.00	0.00	0.00	1.00	0.00	1.00	7.5	1 174	PCS
2014	5	23	6	14				GOTHENBURG	191.00		SHA	SHANGHAI		LCL	CN	CPT	7 250.00	1.00	0.00	0.00	0.00	0.00	7.3	1 254	PCS
2014	11	24	6	14	20DC	29.000	5211.0	GOTHENBURG	1 294.00	1.00	SHA	SHANGHAI		FCL	CN	CPT	29 000.00	0.00	1.00	0.00	0.00	1.00	29.0	5 211	CTN
2014	17	25	6	14	20'	29.870	5118.3	GOTHENBURG	1 367.00	1.00	SHA	SHANGHAI		FCL	CN	CFR	29 870.00	0.00	1.00	0.00	0.00	1.00	29.9	5 118	PCS
2014	20	25	6	14	20DC	28.000	2647.0	GOTHENBURG	464.00	1.00	SHA	SHANGHAI		FCL	CN	CPT	28 000.00	0.00	1.00	0.00	0.00	1.00	28.0	2 647	CTN
2014	26	26	6	14				GOTHENBURG	168.00		SHA	SHANGHAI		LCL	CN	CFR	5 520.00	1.00	0.00	0.00	0.00	0.00	5.5	1 042	PCS
2014	27	26	6	14	40DC	57.000	6199.0	GOTHENBURG	980.00	2.00	SHA	SHANGHAI		FCL	CN	CPT	57 000.00	0.00	0.00	1.00	0.00	1.00	57.0	6 199	CTN
2014	27	26	6	14	40HC	55.667	10355.6	GOTHENBURG	2 037.00	2.00	SHA	SHANGHAI	40.00	FCL	CN	FOB	55 667.00	0.00	0.00	0.00	1.00	1.00	55.7	10 356	CTN
2014	27	26	6	14	20DC	30.190	6012.0	GOTHENBURG	1 154.00	1.00	SHA	SHANGHAI		FCL	CN	CPT	30 190.00	0.00	1.00	0.00	0.00	1.00	30.2	6 012	CTN
2014	30	27	6	14	20'	17.400	3664.0	GOTHENBURG	474.00	1.00	SHA	SHANGHAI	39.00	FCL	CN	FOB	17 400.00	0.00	1.00	0.00	0.00	1.00	17.4	3 664	CTN
2014	30	27	6	14	40HC	62.070	7870.0	GOTHENBURG	2 100.00	2.00	SHA	SHANGHAI		FCL	CN	CPT	62 070.00	0.00	0.00	0.00	1.00	1.00	62.1	7 870	CTN
2014	30	27	6	14	40'	4.426	800.0	GOTHENBURG	200.00		NKG	SHANGHAI	44.00	FCL	CN	FOB	4 426.00	0.00	0.00	1.00	0.00	1.00	4.4	800	CTN
2014	3	27	7	14				GOTHENBURG	150.00		SHA	SHANGHAI		LCL	CN	CFR	13 197.00	1.00	0.00	0.00	0.00	0.00	13.2	2 550	PCS
2014	3	27	7	14				GOTHENBURG	237.00		SHA	SHANGHAI		LCL	CN	CFR	10 881.00	1.00	0.00	0.00	0.00	0.00	10.9	1 692	PCS
2014	3	27	7	14	20'	29.530	5233.0	GOTHENBURG	1 376.00	1.00	SHA	SHANGHAI		FCL	CN		29 530.00	0.00	1.00	0.00	0.00	1.00	29.5	5 233	PCS
2014	3	27	7	14				GOTHENBURG	476.00		SHA	SHANGHAI		LCL	CN	CFR	16 041.00	1.00	0.00	0.00	0.00	0.00	16.0	2 498	PCS
2014	3	27	7	14	20'	28.580	4778.4	GOTHENBURG	928.00	1.00	SHA	SHANGHAI		FCL	CN	CIF	28 580.00	0.00	1.00	0.00	0.00	1.00	28.6	4 778	CTN

APPENDIX 3

Customer Booking Received (Local)	day	month	year	Container Number	Container Pieces	Container Typ	Container Volume	Container Weight	Destination Station Name	Number of Packages	Number of TEU	Origin Country Code	Origin Station Code	Port of Loading	Port to Port Transit Days	Shipment Type	Shipper Country	Shipper Name	Shipper Name Line 2	Terms of Delivery	Total Chargeable Weight	Total Number of 20 ft Containers	Total Number of 40 ft Containers	Total Number of 40 ft HC Containers	Total Number of Containers	Total Volume	Total Weight	Type of Packages
18/03/2014	18	3	14	MOAU0640135	728	20'	28.700	5925.0	GOTHENBURG	728.00	1.00	CN	SHA	SHANGHAI	50.00	FCL	CN	SHANGHAI XINTE LEATHERWARE CO	LTD	FOB	28 700.00	1.00	0.00	0.00	1.00	28.7	5 925	CTN
20/03/2014	20	3	14						GOTHENBURG	152.00		CN	SHA	SHANGHAI		LCL	CN	Shanghai Qianshen		CPT	10 155.00	0.00	0.00	0.00	0.00	7.9	10 155	CTN
25/03/2014	25	3	14	MOAU0640135	728	20'	28.700	5925.0	GOTHENBURG	728.00	1.00	CN	SHA	SHANGHAI	50.00	FCL	CN	SHANGHAI XINTE LEATHERWARE CO	LTD	FOB	28 700.00	1.00	0.00	0.00	1.00	28.7	5 925	CTN
26/03/2014	26	3	14	CTXU3411434	1036	20'	30.180	5846.6	GOTHENBURG	1 036.00	1.00	CN	SHA	SHANGHAI		FCL	CN	NANYANG SHANCHUAN LEATHER PRODUCTS		CIF	30 180.00	1.00	0.00	0.00	1.00	30.2	5 847	CTN
31/03/2014	31	3	14	CCLU4674097; CTXU3410931	1780; 870	40'; 20'	52.700; 30.000	5632.5; 5632.5	GOTHENBURG	2 650.00	3.00	CN	SHA	SHANGHAI		FCL	CN	NANPONG JIADELI		CPT	82 700.00	1.00	1.00	0.00	2.00	82.7	11 265	CTN
31/03/2014	31	3	14						GOTHENBURG	301.00		CN	SHA	SHANGHAI		LCL	CN	SHANGHAI QIANSHEN LEATHER PRODUCTS		CIF	10 760.00	0.00	0.00	0.00	0.00	10.8	1 919	PCS
01/04/2014	1	4	14	TEMU3056267	750	20DC	27.600	7125.0	GOTHENBURG	750.00	1.00	CN	SHA	SHANGHAI		FCL	CMB	KENNY WONG		CPT	27 600.00	1.00	0.00	0.00	1.00	27.6	7 125	CTN
03/04/2014	3	4	14	CSLU1754292	660	20DC	28.100	6820.0	GOTHENBURG	660.00	1.00	CN	SHA	SHANGHAI		FCL	CMB	NANTON HAND PTRECT		CPT	28 100.00	1.00	0.00	0.00	1.00	28.1	6 820	PCK
04/04/2014	4	4	14						GOTHENBURG	198.00		CN	SHA	SHANGHAI		LCL	CMB	SHANGHAI QIANSHEN LEATHER PRODUCTS			6 780.00	0.00	0.00	0.00	0.00	6.8	1 050	PCS
08/04/2014	8	4	14	MOFU5896040	634	40'	36.100	6440.0	GOTHENBURG	634.00	2.00	CN	SHA	SHANGHAI	51.00	FCL	CMB	SHANGHAI XINTE LEATHERWARE CO	LTD	FOB	36 100.00	0.00	1.00	0.00	1.00	36.1	6 440	CTN
09/04/2014	9	4	14	KKFU1301183	2084	40'	51.772	8949.8	GOTHENBURG	2 084.00	2.00	CN	SHA	SHANGHAI	40.00	FCL	CMB	ORIENT INTERNATIONAL HOLDING	SHANGHAI TEXTILES IMP.& EXP.	FOB	51 772.00	0.00	1.00	0.00	1.00	51.8	8 950	CTN
09/04/2014	9	4	14						GOTHENBURG	785.00		CN	SHA	SHANGHAI		LCL	CMB	NANTONG FOREIGN		CPT	15 550.00	0.00	0.00	0.00	0.00	15.6	2 293	CTN
11/04/2014	11	4	14	APZU3561283	650	20DC	13.504	2183.0	GOTHENBURG	650.00		CN	SHA	SHANGHAI		FCL	PK	SHANGHAI QIANSHEN		CPT	13 504.00	1.00	0.00	0.00	1.00	13.5	2 183	CTN
11/04/2014	11	4	14						GOTHENBURG	438.00		CN	SHA	SHANGHAI		LCL	PK	SHANGHAI QIANSHEN		CPT	15 940.00	0.00	0.00	0.00	0.00	15.9	2 763	CTN
17/04/2014	17	4	14	TRHU2473402	647	20'	22.889	3798.9	GOTHENBURG	647.00	1.00	CN	SHA	SHANGHAI	39.00	FCL	CN	ORIENT INTERNATIONAL HOLDING	SHANGHAI TEXTILES IMP.& EXP.	FOB	22 889.00	1.00	0.00	0.00	1.00	22.9	3 799	CTN
21/04/2014	21	4	14	TCLU6244168	2530	40HC	59.676	11091.0	GOTHENBURG	2 530.00	2.00	CN	SHA	SHANGHAI	39.00	FCL	CN	ORIENT INTERNATIONAL HOLDING	SHANGHAI TEXTILES IMP.& EXP.	FOB	59 676.00	0.00	0.00	1.00	1.00	59.7	11 091	CTN
22/04/2014	22	4	14	CSLU1335824	655	20DC	28.130	6513.0	GOTHENBURG	655.00	1.00	CN	SHA	SHANGHAI		FCL	CN	NANTONG HAND PROTECT		CPT	28 130.00	1.00	0.00	0.00	1.00	28.1	6 513	CTN
25/04/2014	25	4	14	FCIU3845790	1306	20'	28.903	5950.9	GOTHENBURG	1 306.00	1.00	CN	SHA	SHANGHAI		FCL	CN	SHANGHAI QIANSHEN LEATHER PRODUCTS		CFR	28 903.00	1.00	0.00	0.00	1.00	28.9	5 951	PCS
25/04/2014	25	4	14	KKTU7726554	1390	20'	25.000	10133.0	GOTHENBURG	1 390.00	1.00	TH	BKK	SHANGHAI	46.00	FCL	TH	SIAM SEMPERMED CORPORATION LTD		FOB	25 000.00	1.00	0.00	0.00	1.00	25.0	10 133	CTN
28/04/2014	28	4	14	TEMU3817073	866	20'	27.700	7707.0	GOTHENBURG	866.00	1.00	CN	SHA	SHANGHAI		FCL	CN	KENNY WONG & CO.		CFR	27 700.00	1.00	0.00	0.00	1.00	27.7	7 707	PCS
29/04/2014	29	4	14						GOTHENBURG	555.00		CN	SHA	SHANGHAI		LCL	CN	NANTONG PREMIER		CPT	16 950.00	0.00	0.00	0.00	0.00	17.0	4 370	CTN
04/05/2014	4	5	14						GOTHENBURG	292.00		CN	SHA	SHANGHAI		LCL	CN	SHANGHAI QIANSHEN		CPT	11 040.00	0.00	0.00	0.00	0.00	11.0	1 691	CTN
04/05/2014	4	5	14	TTNU1675732	996	20'	28.000	5527.0	GOTHENBURG	996.00	1.00	CN	SHA	SHANGHAI	43.00	FCL	CN	SHANGHAI XINTE LEATHERWARE CO	LTD	FOB	28 000.00	1.00	0.00	0.00	1.00	28.0	5 527	CTN
05/05/2014	5	5	14						GOTHENBURG	310.00		CN	SHA	SHANGHAI		LCL	CN	SHANGHAI QIANSHEN LEATHER		CPT	10 750.00	0.00	0.00	0.00	0.00	10.8	2 000	CTN
06/05/2014	6	5	14						GOTHENBURG	318.00		CN	SHA	SHANGHAI		LCL	CN	WUXI TASTE KENMOST		CPT	8 800.00	0.00	0.00	0.00	0.00	8.8	1 169	CTN
07/05/2014	7	5	14	KKTU8045489	953	20'	27.600	5549.0	GOTHENBURG	953.00	1.00	CN	SHA	SHANGHAI	39.00	FCL	CN	SHANGHAI XINTE LEATHERWARE CO	LTD	FOB	27 600.00	1.00	0.00	0.00	1.00	27.6	5 549	CTN
10/05/2014	10	5	14	KKFU7720037	2110	40HC	63.700	8070.0	GOTHENBURG	2 110.00	2.00	CN	SHA	SHANGHAI		FCL	CN	NANTONG JIADELI		CPT	63 700.00	0.00	0.00	1.00	1.00	63.7	8 070	CTN
10/05/2014	10	5	14						GOTHENBURG	233.00		CN	SHA	SHANGHAI		LCL	CN	Shanghai Qianshen		CPT	8 750.00	0.00	0.00	0.00	0.00	8.8	1 143	CTN
13/05/2014	13	5	14	UNOU2865812	1402	20DC	29.780	5249.0	GOTHENBURG	1 402.00	1.00	CN	SHA	SHANGHAI		FCL	CN	NANYANG SHANCHUAN		CPT	29 780.00	1.00	0.00	0.00	1.00	29.8	5 249	CTN
14/05/2014	14	5	14	MRKU4791644	1388	40HC	55.247	8188.0	GOTHENBURG	1 388.00	2.00	CN	SHA	SHANGHAI	33.00	FCL	CN	ORIENT INTERNATIONAL HOLDING	SHANGHAI TEXTILES IMP.& EXP.	FOB	55 247.00	0.00	0.00	1.00	1.00	55.2	8 188	CTN
15/05/2014	15	5	14	FFUU2077215	480	20'	22.500	5113.0	GOTHENBURG	480.00	1.00	CN	SHA	SHANGHAI	33.00	FCL	CN	SHANGHAI XINTE LEATHERWARE CO	LTD	FOB	22 500.00	1.00	0.00	0.00	1.00	22.5	5 113	CTN
15/05/2014	15	5	14						GOTHENBURG	633.00		CN	SHA	SHANGHAI		LCL	CN	SHANGHAI QIANSHEN LEATHER PRODUCTS		CIF	12 450.00	0.00	0.00	0.00	0.00	12.5	2 144	PCS
15/05/2014	15	5	14	TEMU2419687	415	20'	28.000	2455.6	GOTHENBURG	415.00	1.00	CN	SHA	SHANGHAI		FCL	CN	XIN ZHU (H.K) CO.,LTD		FOB	28 000.00	1.00	0.00	0.00	1.00	28.0	2 456	PCS
15/05/2014	15	5	14						GOTHENBURG	320.00		CN	SHA	SHANGHAI		LCL	CN	SHANGAHI QIANSHEN		CPT	11 640.00	0.00	0.00	0.00	0.00	11.6	2 114	PCS
21/05/2014	21	5	14	MSKU6730640	686	40'	38.800	7084.0	GOTHENBURG	686.00	2.00	CN	SHA	SHANGHAI	38.00	FCL	CN	SHANGHAI XINTE LEATHERWARE CO	LTD	FOB	38 800.00	0.00	1.00	0.00	1.00	38.8	7 084	CTN
21/05/2014	21	5	14						GOTHENBURG	120.00		CN	SHA	SHANGHAI		LCL	CN	HUI HONG NANTONG		CPT	4 700.00	0.00	0.00	0.00	0.00	4.7	588	CTN
22/05/2014	22	5	14						GOTHENBURG	321.00		CN	SHA	SHANGHAI		LCL	CN	SHANGHAI QIANSHEN		CPT	11 900.00	0.00	0.00	0.00	0.00	11.9	2 120	CTN
22/05/2014	22	5	14	TRHU2017486	434	20DC	20.000	2613.0	GOTHENBURG	434.00	1.00	CN	SHA	SHANGHAI		FCL	CN	XIN ZHU HK LTD		CPT	20 000.00	1.00	0.00	0.00	1.00	20.0	2 613	CTN
26/05/2014	26	5	14						GOTHENBURG	339.00		CN	SHA	SHANGHAI		LCL	CN	NANYANG SHANGHUAN		CPT	13 000.00	0.00	0.00	0.00	0.00	13.0	2 403	CTN
28/05/2014	28	5	14						GOTHENBURG	192.00		CN	SHA	SHANGHAI		LCL	CN	NANTONG HAND PROTECT PRODUCTS CO.		CIF	10 530.00	0.00	0.00	0.00	0.00	10.5	2 317	PCS
02/06/2014	2	6	14						GOTHENBURG	250.00		CN	SHA	SHANGHAI		LCL	CN	SHANGHAI QIANSHEN LEATHER PRODUCTS		CFR	8 640.00	0.00	0.00	0.00	0.00	8.6	1 219	PCS
05/06/2014	5	6	14	UNOU2865788	121	20'	5.100	640.6	GOTHENBURG	121.00	1.00	CN	SHA	SHANGHAI		FCL	CN	XIN ZHU (HK) CO.		CIF	5 100.00	1.00	0.00	0.00	1.00	5.1	641	PCS
05/06/2014	5	6	14	MAGU4860540	408	40'	7.500	1173.6	GOTHENBURG	408.00		CN	SHA	SHANGHAI		FCL	CN	NANYANG SHANCHUAN LEATHER PRODUCTS		CFR	7 500.00	0.00	1.00	0.00	1.00	7.5	1 174	PCS
05/06/2014	5	6	14						GOTHENBURG	191.00		CN	SHA	SHANGHAI		LCL	CN	SHANGHAI QIANSHEN		CPT	7 250.00	0.00	0.00	0.00	0.00	7.3	1 254	PCS
11/06/2014	11	6	14	CSLU1380741	1294	20DC	29.000	5211.0	GOTHENBURG	1 294.00	1.00	CN	SHA	SHANGHAI		FCL	CN	NANYANG SHANCHUAN		CPT	29 000.00	1.00	0.00	0.00	1.00	29.0	5 211	CTN
17/06/2014	17	6	14	CTXU3410870	1367	20'	29.870	5118.3	GOTHENBURG	1 367.00	1.00	CN	SHA	SHANGHAI		FCL	CN	NANYANG SHANCHUAN LEATHER PRODUCTS		CFR	29 870.00	1.00	0.00	0.00	1.00	29.9	5 118	PCS
20/06/2014	20	6	14	YMLU3431155	464	20DC	28.000	2647.0	GOTHENBURG	464.00	1.00	CN	SHA	SHANGHAI		FCL	CN	XIN ZHU		CPT	28 000.00	1.00	0.00	0.00	1.00	28.0	2 647	CTN
26/06/2014	26	6	14						GOTHENBURG	168.00		CN	SHA	SHANGHAI		LCL	CN	SHANGHAI QIANSHEN LEATHER PRODUCTS		CFR	5 520.00	0.00	0.00	0.00	0.00	5.5	1 042	PCS
27/06/2014	27	6	14	DRYU4190128	980	40DC	57.000	6199.0	GOTHENBURG	980.00	2.00	CN	SHA	SHANGHAI		FCL	CN	XIN ZHU		CPT	57 000.00	0.00	1.00	0.00	1.00	57.0	6 199	CTN
27/06/2014	27	6	14	CBHU8212923	2037	40HC	55.667	10355.6	GOTHENBURG	2 037.00	2.00	CN	SHA	SHANGHAI	40.00	FCL	CN	ORIENT INTERNATIONAL HOLDING	SHANGHAI TEXTILES IMP.& EXP.	FOB	55 667.00	0.00	0.00	1.00	1.00	55.7	10 356	CTN
27/06/2014	27	6	14	UNOU2866228	1154	20DC	30.190	6012.0	GOTHENBURG	1 154.00	1.00	CN	SHA	SHANGHAI		FCL	CN	NANYANG SHANCHUAN		CPT	30 190.00	1.00	0.00	0.00	1.00	30.2	6 012	CTN
30/06/2014	30	6	14	UACU3475780	474	20'	17.400	3664.0	GOTHENBURG	474.00	1.00	CN	SHA	SHANGHAI	39.00	FCL	CN	SHANGHAI XINTE LEATHERWARE CO	LTD	FOB	17 400.00	1.00	0.00	0.00	1.00	17.4	3 664	CTN
30/06/2014	30	6	14	SEGU4156686	2100	40HC	62.070	7870.0	GOTHENBURG	2 100.00	2.00	CN	SHA	SHANGHAI		FCL	CN	NANTONG JIADELI		CPT	62 070.00	0.00	0.00	1.00	1.00	62.1	7 870	CTN
30/06/2014	30	6	14	DRYU4198469	200	40'	4.426	800.0	GOTHENBURG	200.00		CN	NKG	SHANGHAI	44.00	FCL	CN	DANYANG APOLLO OPTICS CO LTD		FOB	4 426.00	0.00	1.00	0.00	1.00	4.4	800	CTN
03/07/2014	3	7	14						GOTHENBURG	150.00		CN	SHA	SHANGHAI		LCL	CN	SHANGHAI FORCOM CORPORATION LTD.		CFR	13 197.00	0.00	0.00	0.00	0.00	13.2	2 550	PCS
03/07/2014	3	7	14						GOTHENBURG	237.00		CN	SHA	SHANGHAI		LCL	CN	NANTONG PREMIER SAFETY CO.,LTD.		CFR	10 881.00	0.00	0.00	0.00	0.00	10.9	1 692	PCS
03/07/2014	3	7	14	UNOU2866402	1376	20'	29.530	5233.0	GOTHENBURG	1 376.00	1.00	CN	SHA	SHANGHAI		FCL	CN	NANYANG SHANCHUAN LEATHER PROD			29 530.00	1.00	0.00	0.00	1.00	29.5	5 233	PCS
03/07/2014	3	7	14						GOTHENBURG	476.00		CN	SHA	SHANGHAI		LCL	CN	SHANGHAI QIANSHEN LEATHER PRODUCTS		CFR	16 041.00	0.00	0.00	0.00	0.00	16.0	2 498	PCS
03/07/2014	3	7	14	GLDU3639104	928	20'	28.580	4778.4	GOTHENBURG	928.00	1.00	CN	SHA	SHANGHAI		FCL	CN	SHANGHAI QIANSHEN LEATHER PRODUCTS		CIF	28 580.00	1.00	0.00	0.00	1.00	28.6	4 778	CTN

APPENDIX 4

Origin Country Code	Port of Loading	Data Antal av Number of TEU	Summa av Total Volume
BD	CHITTAGONG	1	18.8
CN	FUZHOU	2	18.0
	GUANGZHOU	8	223.2
	NINGBO	2	70.2
	SHANGHAI	164	4678.8
	TIANJIN	11	616.0
	TIANJINXINGANG	1	25.0
	XIAMEN	2	23.8
	YANTAI	1	26.6
CS	HONG KONG	1	2.3
	HUANGPU	1	45.5
	SHENZHEN	2	11.3
	YANTIAN	40	1230.3
HK	HONG KONG	7	200.2
ID	BELAWAN, SUMATRA	2	55.3
	JAKARTA, JAVA	4	47.4
	SINGAPORE	4	30.8
KR	BUSAN	17	316.3
LK	COLOMBO	13	256.9
MY	PENANG (GEORGETOW	2	24.7
	PORT KELANG	10	195.8
	PORTKELANG	1	27.9
PK	KARACHI	21	263.0
	MUHAMMAD BIN QASI	8	200.0
TH	BANGKOK	2	50.0
	LAEM CHABANG	15	461.6
	LAEM CHABANG,**	1	31.2
	LAEMCHABANG	1	31.2
	SINGAPORE	3	12.0
	SONGKHLA	5	129.5
TW	KAOHSIUNG	1	11.6
VN	HO CHI MINH CITY	3	30.5
Grand Total		**356**	**9365.6**

APPENDIX 5

FREIGHT	Ocean Freight	20'	40'	40 HC		LCL / CBM	CFS Fee / CBM (Origin cost)
SHANGHAI	GOTHENBURG	710.00	1 070.00	1 170.00		47.33	10.00

DESTINATION CHARGES		20'	40'	40 HC		LCL / CBM	LCL / Per Shipment
		920.00	920.00	920.00		26.00	120.00

TOTAL CHARGES PER SHIPMENT		20'	40'	40 HC		LCL / CBM	LCL / Per Shipment
		1 630.00	1 990.00	2 090.00		83.33	120.00

Breakpoint between LCL and 20' (1630-120) / 83.33 = 18.12 CBMs Less 18 CBM = LCL

Destination Calculations Used

Based on sample rates

Per FCL container					
Trucking	SEK	3 824.00			
FSC	SEK	811.00			
Handling	SEK	500.00			
THC	SEK	1 350.00			
Wharfage	SEK	285.00			
ISPS	SEK	190.00			
Toll	SEK	40.00			
Carrier Chg	SEK	650.00			
CHB	SEK	350.00	Rate of exchang	Total	
Total	SEK	8 000.00	0.115	USD	920

Per LCL							
Charges Per CBM					Charges per shipment		
Handling	SEK	50					
THC	SEK	155					
					ISPS	SEK	20
					Fort	SEK	350
					Handling	SEK	400
					Co-loader	SEK	275
Lever	SEK	20					
FSC		21 %	SEK	4.20			
Per CBM			Per Shipment				
SEK 229			SEK	1 045			
USD 26			USD	120			

APPENDIX 6

Year & Week	LCL shipments	20' Containers	40' Containers	40' HC Containers	LCL Volume	Total Volume	Total Weight	Origin Cost	Freight Cost	Destination Cost	Current cost of shipment
14	**45**	**72**	**24**	**13**	**486.52**	**3980.23**	**741235.50**	**4865.21**	**115038.66**	**118329.55**	**238233.42**
12	1	1	0	0	7.93	36.63	16080.00	79.30	1085.35	1246.18	**2410.83**
13	0	2	0	0	0.00	58.88	11771.60	0.00	1420.00	1840.00	**3260.00**
14	2	3	1	0	17.54	155.94	28178.30	175.40	4030.23	4376.04	**8581.67**
15	2	1	2	0	31.49	132.87	22628.80	314.90	4340.53	3818.74	**8474.17**
16	0	1	0	0	0.00	22.89	3798.90	0.00	710.00	920.00	**1630.00**
17	0	3	0	1	0.00	141.71	33687.90	0.00	3300.00	3680.00	**6980.00**
18	2	2	0	0	27.99	83.69	19295.00	279.90	2744.86	2807.74	**5832.50**
19	3	1	0	1	28.30	119.60	17931.00	283.00	3219.53	2935.80	**6438.33**
20	2	3	0	1	24.09	159.62	25263.10	240.90	4440.26	4546.34	**9227.50**
21	2	1	1	0	16.60	75.40	12405.00	166.00	2565.73	2511.60	**5243.33**
22	2	0	0	0	23.53	23.53	4720.40	235.30	1113.75	851.78	**2200.83**
23	2	1	1	0	15.89	28.49	4287.30	158.90	2532.13	2493.14	**5184.17**
24	0	1	0	0	0.00	29.00	5211.00	0.00	710.00	920.00	**1630.00**
25	0	2	0	0	0.00	57.87	7765.30	0.00	1420.00	1840.00	**3260.00**
26	1	1	1	1	5.52	148.38	23608.70	55.20	3211.28	3023.52	**6290.00**
27	3	4	2	1	40.12	254.16	41309.90	401.19	8048.97	7843.09	**16293.25**
28	2	2	0	1	26.17	96.38	18863.60	261.65	3828.48	3680.29	**7770.42**
29	2	4	1	1	11.85	177.39	36690.60	118.50	5640.90	6068.10	**11827.50**
30	0	4	1	0	0.00	104.20	23142.00	0.00	3910.00	4600.00	**8510.00**
32	1	3	0	0	2.62	82.37	16471.00	26.20	2254.01	2948.12	**5228.33**
33	0	0	1	0	0.00	35.50	7588.00	0.00	1070.00	920.00	**1990.00**
34	1	1	1	0	10.88	73.88	13279.00	108.81	2295.03	2242.91	**4646.75**
35	2	1	2	2	38.88	302.79	53368.00	388.75	7030.08	5850.75	**13269.58**
36	3	2	1	1	33.26	187.28	32019.40	332.62	5234.40	4904.81	**10471.83**
38	4	2	0	0	46.34	102.04	19855.80	463.40	3613.43	3524.84	**7601.67**
39	0	2	0	0	0.00	58.00	10485.00	0.00	1420.00	1840.00	**3260.00**
40	1	0	0	0	4.95	4.95	790.00	49.49	234.25	248.67	**532.42**
41	1	4	3	1	7.90	280.21	51057.80	79.00	7593.93	7685.40	**15358.33**
42	1	1	1	0	9.18	75.86	15794.90	91.80	2214.52	2198.68	**4505.00**
43	2	3	0	1	15.40	97.01	21999.00	154.00	4028.93	4320.40	**8503.33**
44	1	4	1	0	11.63	138.94	26582.00	116.30	4460.49	5022.38	**9599.17**
45	2	2	1	0	28.47	126.79	22028.00	284.70	3837.58	3740.22	**7862.50**
46	0	2	1	1	0.00	194.05	34655.00	0.00	3660.00	3680.00	**7340.00**
48	0	4	0	0	0.00	98.64	18812.60	0.00	2840.00	3680.00	**6520.00**
49	0	4	2	0	0.00	215.32	39811.60	0.00	4980.00	5520.00	**10500.00**
15	**3**	**22**	**4**	**5**	**53.46**	**1032.17**	**193650.40**	**315.60**	**27243.84**	**29700.56**	**57260.00**
1	1	0	0	0	11.33	11.33	2714.00	113.30	536.29	414.58	**1064.17**
2	0	3	0	3	0.00	154.58	29281.40	0.00	5640.00	5520.00	**11160.00**
3	0	6	0	0	0.00	165.38	33363.00	0.00	4260.00	5520.00	**9780.00**
4	0	2	1	1	0.00	150.43	28203.00	0.00	3660.00	3680.00	**7340.00**
5	0	3	1	0	0.00	137.16	23041.00	0.00	3200.00	3680.00	**6880.00**
6	0	0	1	0	0.00	56.40	8729.00	0.00	1070.00	920.00	**1990.00**
7	1	5	1	1	11.33	257.78	48275.00	113.30	6326.29	6854.58	**13294.17**
8	1	0	0	0	8.90	13.00	2942.00	89.00	421.27	351.40	**861.67**
9	0	3	0	0	0.00	86.11	17102.00	0.00	2130.00	2760.00	**4890.00**
Grand Total	**48**	**94**	**28**	**18**	**539.98**	**5012.40**	**934885.90**	**5180.81**	**142282.50**	**148030.11**	**295493.42**

APPENDIX 7

Year & Week	LCL shipment	20' Contain	40' Containers	40' HC C	LCL Volume	Total CBMs	Total Weight All shipments	Origin Costs	Freight Costs	Destination Costs	Current cost of shipme	Optimized cost	Cost saving	Remarks
14	**12**	**12**	**11**	**40**	**107.54**	**3980.23**	**741235.50**	**37140.74**	**72180.23**	**62196.04**	**238233.42**	**171517.01**	**-66716.41**	
12	1	1	0	0	7.93	36.63	16080.00	366.30	1085.35	1246.18	2410.83	2697.83	287.00	CFS
13	0	0	1	0	0.00	58.88	11771.60	588.80	1070.00	920.00	3260.00	2578.80	-681.20	CFS
14	1	0	0	2	15.94	155.94	28178.30	1559.40	3094.49	2374.44	8581.67	7028.33	-1553.33	CFS
15	0	0	1	0	0.00	132.87	22628.80	0.00	1070.00	920.00	8474.17	1990.00	-6484.17	CY
16	0	1	0	0	0.00	22.89	3798.90	0.00	710.00	920.00	1630.00	1630.00	0.00	CY
17	0	0	0	2	0.00	141.71	33687.90	1417.09	2340.00	1840.00	6980.00	5597.09	-1382.91	CFS. Assumption that rest 1.71 CBMs with to container or to next week sailing
18	1	0	0	1	13.69	83.69	19295.00	836.90	1817.99	1395.94	5832.50	4050.83	-1781.67	CFS
19	0	0	2	0	0.00	119.60	17931.00	1196.00	2140.00	1840.00	6438.33	5176.00	-1262.33	CFS
20	1	0	0	2	19.62	159.62	25263.10	1596.17	3268.68	2470.12	9227.50	7334.97	-1892.53	CFS
21	1	0	0	1	5.40	75.40	12405.00	754.00	1425.60	1180.40	5243.33	3360.00	-1883.33	CFS
22	0	1	0	0	0.00	23.53	4720.40	0.00	710.00	920.00	2200.83	1630.00	-570.83	CY
23	0	1	0	0	0.00	28.49	4287.30	284.90	710.00	920.00	5184.17	1914.90	-3269.27	CFS
24	0	1	0	0	0.00	29.00	5211.00	0.00	710.00	920.00	1630.00	1630.00	0.00	CY
25	0	0	1	0	0.00	57.87	7765.30	0.00	1070.00	920.00	3260.00	1990.00	-1270.00	CY
26	1	0	0	2	8.38	148.38	23608.70	1483.77	2736.65	2177.88	6290.00	6398.30	108.30	CFS
27	0	0	1	3	0.00	254.16	41309.90	2541.55	4580.00	3680.00	16293.25	10801.55	-5491.70	CFS
28	0	1	0	1	0.00	96.38	18863.60	963.75	1880.00	1840.00	7770.42	4683.75	-3086.67	CFS
29	0	1	0	2	0.00	177.39	36690.60	1773.86	3050.00	2760.00	11827.50	7583.86	-4243.64	CFS
30	1	1	0	1	4.20	104.20	23142.00	1041.98	2078.80	2069.20	8510.00	5189.98	-3320.02	CFS
32	1	0	0	1	12.37	82.37	16471.00	823.70	1755.51	1361.62	5228.33	3940.83	-1287.50	CFS
33	0	0	1	0	0.00	35.50	7588.00	355.00	1070.00	920.00	1990.00	2345.00	355.00	CFS
34	1	0	0	1	3.88	73.88	13279.00	738.81	1353.70	1140.91	4646.75	3233.42	-1413.33	CFS
35	0	1	0	3	0.00	302.79	53368.00	3027.85	4220.00	3680.00	13269.58	10927.85	-2341.73	CFS
36	0	0	1	2	0.00	187.28	32019.40	1872.75	3410.00	2760.00	10471.83	8042.75	-2429.08	CFS
38	0	1	0	1	0.00	102.04	19855.80	1020.35	1880.00	1840.00	7601.67	4740.35	-2861.32	CFS
39	0	0	1	0	0.00	58.00	10485.00	580.00	1070.00	920.00	3260.00	2570.00	-690.00	CFS
40	1	0	0	0	4.95	4.95	790.00	49.49	234.25	248.67	532.42	532.42	0.00	CFS
41	0	0	0	4	0.00	280.21	51057.80	2802.11	4680.00	3680.00	15358.33	11162.11	-4196.22	CFS. Assumption that rest 0.21 CBMs with to container or to next week sailing
42	1	0	0	1	5.86	75.86	15794.90	758.57	1447.23	1192.28	4505.00	3398.08	-1106.92	CFS
43	0	1	0	1	0.00	97.01	21999.00	970.14	1880.00	1840.00	8503.33	4690.14	-3813.19	CFS
44	0	0	0	2	0.00	138.94	26582.00	1389.42	2340.00	1840.00	9599.17	5569.42	-4029.75	CFS
45	0	0	1	1	0.00	126.79	22028.00	1267.94	2240.00	1840.00	7862.50	5347.94	-2514.56	CFS
46	0	0	1	2	0.00	194.05	34655.00	1940.47	3410.00	2760.00	7340.00	8110.47	770.47	CFS
48	0	1	0	1	0.00	98.64	18812.60	986.44	1880.00	1840.00	6520.00	4706.44	-1813.56	CFS
49	1	0	0	3	5.32	215.32	39811.60	2153.23	3761.96	3018.40	10500.00	8933.58	-1566.42	CFS
15	**5**	**1**	**2**	**12**	**61.35**	**1032.17**	**193650.40**	**9757.71**	**19794.04**	**15995.18**	**57260.00**	**45546.93**	**-11713.07**	
1	1	0	0	0	11.33	11.33	2714.00	113.30	536.29	414.58	1064.17	1064.17	0.00	CFS
2	1	0	0	2	14.58	154.58	29281.40	1545.81	3030.17	2339.11	11160.00	6915.08	-4244.92	CFS
3	0	1	0	2	0.00	165.38	33363.00	1653.75	3050.00	2760.00	9780.00	7463.75	-2316.25	CFS
4	1	0	0	2	10.43	150.43	28203.00	1504.30	2833.69	2231.18	7340.00	6569.17	-770.83	CFS
5	0	0	0	2	0.00	137.16	23041.00	1371.60	2340.00	1840.00	6880.00	5551.60	-1328.40	CFS
6	0	0	1	0	0.00	56.40	8729.00	0.00	1070.00	920.00	1990.00	1990.00	0.00	CY
7	0	0	1	3	0.00	257.78	48275.00	2577.83	4580.00	3680.00	13294.17	10837.83	-2456.34	CFS
8	1	0	0	0	8.90	13.00	2942.00	130.00	421.27	351.40	861.67	902.67	41.00	CFS
9	1	0	0	1	16.11	86.11	17102.00	861.12	1932.63	1458.91	4890.00	4252.67	-637.33	CFS
Grand Total	**17**	**13**	**13**	**52**	**168.89**	**5012.40**	**934885.90**	**46898.45**	**91974.27**	**78191.22**	**295493.42**	**217063.94**	**-78429.48**	