

# Viable Options a Shipper has in Using Different Logistic Solutions

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**KTH Industrial Engineering  
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Master of Science Thesis  
Stockholm, Sweden 2013

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## **Abstract**

The research question explores the viable options a shipper has in using different logistic solutions. An investigation was conducted by first understanding the different provider levels based on their activities and then differentiate the logistic solutions based on attributes that are important for a shipper in their supply chain. These attributes were; organization, information technology (IT), flexibility and transportation quality aspects. Once the investigation was done, it was applied on a case study at a shipper to help answer the research question.

The study confirms previous findings and provides additional evidence that suggests that generally the logistic solutions definition match with the literature. The evidence shows that the third-party logistics providers need to be redefined due to the fact that they are capable of performing other logistic solutions activities within their company groups. Additional evidence from the shippers indicates that two of three that were contacted do not only use one type of logistic solution in their organizations or company groups. These findings suggest several possibilities of action for Shipper A to proceed in undertaking further studies of what the implications are of changing their current setup to another. Also the study confirms that Shipper A with the research question in mind has a viable possibility to insource to a second-party logistics provider from their current third-party logistics provider setup in certain flows. Other viable possibility is to outsource the third-party logistics provider's activities to a fourth-party logistics provider.

Based on confirmations the results have shown, all PLs are viable to use in all the flows except the African customers that are not able to use any form of second-party logistics providers.

*Key Words:* LSP, 2PL, 3PL, 4PL, Shipper, insource, outsource.

## **Preface**

Our time in Shipper A's organization was immensely educational and rewarding. We learnt the complexity an organization of Shipper A's size has and the challenges they face. It was not only academically developing but we also had a great time because of the marvelous people that work in Shipper A.

We would like to give a big thanks to our supervisor in Shipper A for giving us the opportunity to conduct this study with them and the people in their organization for helping us. We would also like to give thanks to others outside of Shipper A for contributing with their knowledge and information into the thesis.

## ***Glossary of terms***

2PL	<p><i>Second-Party Logistics:</i> Carriers that provide transport services over a specific section of a transport chain. It can involve maritime shipping companies, rail operators or trucking companies that are hired to transport cargo from an origin such as a distribution center to a destination.</p>
3PL	<p><i>Third-Party Logistics:</i> (abbreviated 3PL) describes businesses that provide one or many of a variety of logistics-related services. Types of services would include public warehousing, contract warehousing, transportation management, distribution management, freight consolidation. A 3PL provider may take over all receiving, storage, value added, shipping and transportation responsibilities for a client and conduct them in the 3PL's warehouse using the 3PL's equipment and employees, or may manage one or all of these functions in the client's facility using the client's equipment, or any combination of the above. Another term, 4PL is sometimes used to describe businesses that manage a variety of logistics related services for clients by using 3PLs.</p>
4PL	<p><i>Fourth-Party Logistics:</i> A '4PL' or fourth-party logistics provider; a supplier of outsourced supply chain coordination and management services that generally does not own or operate the underlying logistical assets and resources.</p>
ATA	<p>Actual time of arrival</p>
Cross-Docking:	<p>An enterprise that provides services to transfer goods from one piece of transportation equipment to another.</p>
ETA	<p>The Estimated Time of Arrival</p>
DC	<p><i>Distribution Center:</i> A facility that accepts inbound consignments of raw materials, components or finished goods, divides and then recombines them in different ways into outbound shipments. Many DCs also contain specialized handling/storage equipment and IT systems and also serve as warehouses</p>

SC *Supply Chain:* All the elements in the process of supplying a product to a customer. The chain begins with the sourcing of raw materials and ends with the delivery of finished merchandise to the end-user. It embraces vendors, manufacturing facilities, logistics service providers, distribution centers, distributors, wholesalers, other intermediaries, etc.

SCM *Supply Chain Management:* The coordinated management and control of the supply chain, from the acquisition of raw materials from vendors through their transformation into finished goods to the delivery of merchandise to the final customer. It involves information sharing, planning, resource synchronization and performance measurement.

Shipper: The person or company who is usually the supplier or owner of commodities shipped. Also called Consignor.

Source: (Logisuite 2012; CSCMP, 2012)

# Innehållsförteckning

- 1 Introduction.....1
  - 1.1 Background.....1
  - 1.2 Problem Statements.....1
  - 1.3 Research Question .....2
  - 1.4 Shipper A’s Background .....2
  - 1.5 Significance.....3
  - 1.6 Delimitation.....3
  - 1.7 Layout.....4
- 2 Research Method .....5
  - 2.1 The Approach .....5
  - 2.2 Data Gathering .....5
  - 2.3 Selection of Interviewees .....6
  - 2.4 Reliability and Validity .....8
- 3 Literature Review ..... 11
  - 3.1 Supply Chain Management and Logistic Management..... 11
    - 3.1.1 Logistics ..... 13
    - 3.1.2 Sourcing..... 13
  - 3.2 Second-Party Logistics Providers (2PL)..... 15
    - 3.2.1 Sea Transportation ..... 16
    - 3.2.2 Air Transportation ..... 17
    - 3.2.3 Road Transportation..... 17
  - 3.3 Third-Party Logistics Providers (3PL)..... 18
  - 3.4 Fourth-Party Logistics Providers (4PL) and Lead Logistics Providers (LLP) ..... 21
  - 3.5 Summary ..... 22
- 4 Empirical Setup..... 24
  - 4.1 Shipper A ..... 24
    - 4.1.1 Distribution Strategy ..... 24
    - 4.1.2 TM..... 26

4.2	Product Flows .....	27
4.2.1	Spain .....	28
4.2.2	Benin.....	29
4.2.3	Nigeria .....	30
4.2.4	Factory to Distribution Center.....	31
5	Analysis.....	33
5.1	The Provider Level Attributes.....	33
5.1.1	Organization .....	33
5.1.2	IT .....	36
5.1.3	Flexibility.....	39
5.1.4	Quality .....	42
5.2	Shippers .....	44
5.2.1	Organisation .....	44
5.2.2	IT .....	45
5.2.3	Flexibility.....	45
5.2.4	Quality .....	46
6	Discussion and Conclusion .....	48
6.1	The Provider Level Model.....	48
6.2	The Viable Options in the Flows.....	50
6.2.1	The 4PL .....	50
6.2.2	The LSP.....	51
6.2.3	The 2PL.....	53
6.3	Theoretical Contribution .....	54
6.4	Empirical Contribution .....	55
6.5	Conclusions and Further Studies.....	56
6.6	Limitations .....	56
7	References.....	58
7.1	Articles.....	58
7.2	Books .....	60

7.3	E-resources.....	61
8	Appendix.....	63
8.1	Appendix 1 – Provider Level Model .....	63
8.2	Appendix 2 - Questionnaire for Provider Level’s .....	63
8.3	Appendix 3 - Questionnaire for Shippers .....	65
8.4	Appendix 4 - List of Contacts .....	67
8.5	Appendix 5 – Total Volumes and Shipments.....	69

# 1 Introduction

## 1.1 Background

One of the many challenges companies face today is how their supply chain is structured, especially in logistics. Many companies have followed an irresistible trend where non-core activities have been outsourced (Shi & Gregory, 2003) and today it is considered a norm. One forgets that in the past, especially in the 1970s, the trend was to control the logistic operations. It was only in the beginnings of the 1980s and 1990s that firms started to entrust the task management of their logistics operations to Third-Party Logistics Providers (3PL). At the end of the 1990s to the beginnings of the 2000s, a new type emerged, the Fourth-Party Logistics Provider (4PL) (Gattorna, 1998). They are seen as playing the role of mediator between their clients but at the same time as a conventional 3PL and IT service provider (Gattorna, 1998).

As one can see, there are a number of logistic solutions that companies can choose between. Many factors have to be considered in the subject of sourcing and they are not always clear. These factors are regularly based on cost, dependability, reliability, flexibility and other factors, depending on the needs of the shipper procuring. One also forgets that because of historical reasons shippers have made the choices and kept them. Authors such as Tate et al. (2009) and Vitasek & Ledyard (2010) stated that in the service outsourcing literature there have been indications that firms should not only assess the performance in outsourcing in terms of cost reduction. The authors stated that companies should also consider the added benefits of it through improved margins for the outsourcing service provider and also the improvement of service and innovation. What the authors are implying is that companies often do not see beyond costs and should look into the added benefits that logistic services can offer as previously mentioned.

What happens when shippers start looking for other logistic setups? What are the implications of changing it? How will it affect them and what are the consequences? Depending on what kind of change, this could result in insourcing or even outsourcing which might cause them to either lose people with certain skills or gain them. How will factors such as; quality in the transportation and delivery time change and will flexibility increase or decrease depending on the chosen logistic setup? These important factors are vital when one looks beyond costs. Companies must know the differences between logistic setups and the different possibilities each one offers.

## 1.2 Problem Statements

As the background stated, there seems to be a new trend for shippers to overlook their logistic setup to see if there are other possibilities of cost reduction and value adding benefits beyond using third-party logistics solutions (3PL). This is especially seen in shippers that have relied

heavily on 3PLs as their sole logistics partners for many years without making evaluations if they are needed.

Due to the prolonged and leading trend of outsourcing, shippers are looking for alternatives which could cause them to rethink their logistic setup. This could lead them to insource back some parts of the logistics or even outsource more of their activities if it is of benefit. A study of the different types of logistics solutions is needed because the vast majority of logistic research has been solely based on the 3PLs. This does not mean that the 3PLs are not good logistic providers but the implication remains that there are other types of solutions which can be beneficial. Not only looking at the different solutions available but there is a need to categorize them more thoroughly because there are a number of names and the terminology used for them in the logistic field which causes confusion. The research is going to supply managers supporting data of the different logistic solutions available which in turn will be beneficial in the decision making when choosing a logistics provider that fits their needs.

### **1.3 Research Question**

The problem statement explained the need to make further studies in the logistic fields of other alternatives, besides the third-party logistics providers. This study is conducted through a case study at a shipper. Therefore the research question is:

*What are the viable options a shipper has in using different logistic solutions in their flows?*

These logistic solutions are to be called Provider Levels and are abridged to PL's in this thesis. These PL's are: the Second-Party Logistics Providers (2PL) are the transport carriers, the 3PLs are who coordinate the transport carriers and inter alia, and the 4PLs who act as Supply Chain (SC) consultants. How the research question is answered is by first understanding the different provider levels based on their activities and then differentiate the PLs based on attributes that are important for a shipper in their supply chain. These attributes are; organization, Information Technology (IT), flexibility and transportation quality aspects. Once the investigation is completed, they are used on a case study at a shipper to help answer the research question.

### **1.4 Shipper A's Background**

As mentioned in the chapter before, to be able to answer the research question a case study on a shipper is needed. In this case it is Shipper A that is in need to evaluate their distribution strategy. This chapter gives an insight of what kind of company Shipper A is and their situation.

Shipper A is a global company that produces high technology products in almost every country in the world. Not only that, they make tailored solutions depending on their customers' needs. Most of their operations are project based which is a challenge for them. Specifically in their

Supply Chain Management (SCM), which demands an extraordinary amount of flexibility to accomplish this.

Shipper A has updated their distribution strategy and is currently implementing it. This new strategy could have an impact on how the company buys its distribution services. Therefore they are seeking for external analyses as input to upcoming implementation of their revised distribution business model.

In line with the current distribution business model, Shipper A is currently buying services from a third-party logistics provider. Given the new strategy, the Provider Level (PL) needs to be reviewed and updated from the outbound logistics, to ensure an efficient and smart way of delivering goods with high quality, at the right time and to the right price to the customers.

An analysis of Shipper A's current situation is to be done which is grounded on the outbound distribution strategy, by understanding the fundamentals and driving forces within the strategy. The findings from the investigation are to be applied on selected product flows that generally represent the other flows that Shipper A has.

## **1.5 Significance**

There seems to be limited studies in the scientific community of comparing existing logistic solutions where shippers have to choose appropriate logistic solutions or to evaluate their current setups. The main reason is that there have been substantial amounts of studies solely based on 3PL and 4PL. Hopefully the thesis is going to generate enough interest in the scientific community to undertake further studies in the matter that has been explained.

## **1.6 Delimitation**

Delimitations have to be made due to restricted time and to stay on course with what is of relevance to the thesis. This section is detailed so the reader understands the framework of the case study and research question. The flows are to be observed on a macro-level because micro-level investigation means looking into specific routes, which are going to increase the complexity of the study. Besides observing on a macro-level other points of delimitation that are taken into consideration and are the following:

- Shipper A has customers across the globe so delimitations have to be made. Four flows are going to be observed that represent general flows the shipper has. The first flow is when the goods leave from a factory and reach a Distribution Center (DC). Then from the DC to three separate customer flows are to be observed that differ from each other in terms of economic and geographical reasons.
- The flows begin when they leave factory or DC and end when they reach DC and the customers' country border.

- One specific product is not the focus but instead an annual flow of volume is viewed which means that exact paths, in-betweens and consolidation stations are disregarded. Why the volume is looked at and not the weight is because only in special cases will Shipper A consider weight first.
- Financial aspects such as costs are not looked into due to the high variables that affect it.

## 1.7 Layout

The outlay has been explained in this fashion to let the reader understand the essence and structure of the thesis. The remainder of the thesis has been organized with the research method in chapter 2, where the method chosen to conduct the study is explained and what kind of implications it has.

The literature review will begin in Chapter 3. This is to give the foundation needed to answer the research question and it is to be built on sources based on scientific journals, books and e-resources. The literature will consist of Supply Chain Management (SCM), logistics sourcing and different parts that are relevant to the attributes that are investigated. The literature includes the different logistic solutions which are the Second-Party Logistics Providers (2PL), Third-Party Logistics Providers (3PL) and Fourth-Party Logistics Providers (4PL).

Once the theoretical base is concluded the empirical study of Shipper A's current situation is explained in chapter 4. In this chapter the information gathered came from people of senior status in Shipper A, that were relevant to the study of the organization.

The interviews and the literature together provide the basis for the analysis, where the literature is compared to the data collected from the provider levels and the shippers. Finally in the last chapter of discussion and analysis, which is based on the analysis and empirical setup, is where the results of the investigations are revealed.

## 2 Research Method

The introduction provided the layout the research question, delimitations and framework that the thesis is going to have. To be able to complete the thesis with a scientific approach, a research method has to be selected.

This chapter goes into the methods used to help gather the information that is going to help with the investigation and answer the research question. It starts with the research method selected under the subchapter on the approach. With the explanation of the approach selected, the different research methods are explained and followed by a detailed description of how the interviews were conducted. The chapter also contains why certain interviewees were contacted. Finally at the end of this chapter there is a section on reliability and validity to illustrate to the reader, the level of credibility this thesis has.

### 2.1 The Approach

The research method that was selected for this thesis was a qualitative method. The study required an approach that is going to give an understanding of what activities the firms have and understand the sought after attributes. The qualitative research method has the aim of describing, analyzing and understanding an individual/group or a phenomenon. This is done through seeking answers to questions about “what”, “how” or “why” of a phenomenon rather than “how many” or “how much”. This means that the answers that will be given are influenced by both feelings and experience of the interviewee and their standpoint (Green & Thorogood, 2004; Holloway & Biley, 2011).

The qualitative research method has its drawbacks. This method is time consuming when analyzing the collected data. The data is also subjective and very difficult to generalize and compare it systematically (BUC, 2013; SFIT, 2013). Misunderstandings could also occur when the respondents use different terminology from the authors, since the terms are fragmented in the logistics when it comes to the PL. The authors tried to minimize this by giving a simplified description of the terminology to the respondents before starting an interview, so that both were on the “same page” when the interviews were conducted.

### 2.2 Data Gathering

Now that the qualitative method is the established choice of method, the data gathering chapter gives the reader the procedures the interviews had. The authors used literature to have a proper interview procedure, this being how they were conducted and how the questionnaires were formed.

The book by Gillham (2008) gave the foundation on how to conduct interviews and how to form questionnaires. The questionnaires were formed with the research question in mind i.e. this can be seen in how the questions are categorized. The questionnaires can be seen in

Appendix 2 and 3. Ethics played a crucial role in the interviews because the authors did not want to scare the respondents with unethical interview procedures. This was important because it made sure that the respondents felt safe when being interviewed and that the procedure was done professionally. This would ultimately generate more accurate answers from the respondents. Before each interview was conducted the authors would ask and inform the following questions to them:

- I) *The authors introduced themselves and explained what the thesis was about.*
- II) *If it was acceptable to tape the conversation.*
- III) *If they wished to be anonymous.*
- IV) *If they wished that the company to be anonymous.*
- V) *If they wished that the recording and transcript of the data to be destroyed after being used for thesis.*

The detailed introduction was done so that the respondents would know who the authors were, their purpose and the framework for the interviews. Also this gave the authors recorded data with the permission of the respondents. This in turn enabled the authors to access the data later, which ultimately gives an accurate understanding of it. The procedure of informing the respondents showed the seriousness of the interview and that the data is to be treated with the outmost respect to them and their company.

The interview process started off with contacting the PLs and other shippers mostly by email. If email did not work then contact was made by phone and an interview date was established. The interviews lasted on average between one to two hours and were recorded by a digital voice recorder.

### **2.3 Selection of Interviewees**

Having explained the data gathering chapter and its interview process content, the next step is to explain why the firms and people were contacted to be part of the thesis.

First step was to understand Shipper A's current situation, strategies and what their goals in the future are. The most important contact was the Manager Logistics Provider Developer (MLPD) who in turn was our supervisor of the case study. The MLPD provided us with some of the 3PL contacts but also important contacts within the Shipper A's organization. They are seen below in the table of data of contacts in Shipper A:

Title	Information pursued
Head of Distribution Logistics	Provided information on current situation and current problems.
Head Strategic Logistics	Provided a description of the current strategy and future goals.
Strategic Distribution Manager	Provided the knowledge of Shipper A's current situation in their distribution setup and what future goals exist.
Strategic Sourcing Manager	Knowledgeable in sourcing strategies and contacts in the flight carrier industry
Regional Distribution Manager I	Provided information and behavior on two customer flows
Regional Distribution Manager II	Provided information and behavior on one customer flow
Operational Efficiency	Is part of the TM project and provided us with the goals and expectations.
Distribution Manager	Provided information of the goods flow from factory to distribution center.

Once the internal knowledge of the Shipper A was gained, the focus was redirected to finding firms that offer logistic solutions. Although the focus was on firms that offer logistic solutions, a few shippers were contacted as well to get an insight in their logistic setup. This was to gain insight on how others differ from Shipper A's setup. The goal was to contact at least two of each type of the different logistic solutions available. Likewise at least two shippers are to be contacted. A criterion that had to be fulfilled was that the respondents operate in an international context e.g. crossing countries or even transporting goods to other continents. This is because Shipper A works internationally and it was important to have that in mind when interviewing. Why it was of relevance, was because conducting transportation within a country is different from international transportation. Not only had the interviewees work internationally but they also had to be big players in their respective fields, which meant that they are mature in their business and have well developed processes.

Air freight carriers such as *Lufthansa Cargo* and *Air France-KLM Cargo* were contacted to understand how they operate. These two are the two biggest in their field and operate worldwide. Sea freight carriers like *Maersk* and *CMA CGM* were contacted to give an insight in their business and how they conduct it. Maersk is the biggest in the world and CMA CGM is the third biggest. One forwarder named *Combitrans* was contacted to see how they operate. Two trucking firms *AB Fluckinger Transport* and *Ahréns åkeri* were contacted to understand the trucking business. These trucking companies were contacted because they operate

internationally (mainly in the European continent) and have a large fleet of vehicles and many trailers (hundred plus units of vehicles and/or trailers).

3PLs were contacted to supply an insight in their business and these companies are *DHL*, *Panalpina* and *DB Schenker*. These three are the three largest in the world and operate internationally. 4PLs also were contacted to understand how they differ from the 3PLs and understand how they operate; these were *UnitedLog* and *Schenker Dedicated Services*. The 4PLs are large and operate globally.

Finally firms that contract logistics solutions called shippers were contacted; *Tetra Pak* because they use all the different types of logistic solutions available, *Skanska Maskin* because they do not have the knowledge how the market will behave when in need of hiring construction machines from them. Also a shipper shifted using 3PL in one of its business units in the company group was contacted, they wished to be anonymous. From now on they will be referred to as *Shipper Z* in the thesis. A list of names and titles of the interviewees of the PLs and shippers can be found in appendix 3.

How the work process of the chapter Research Method went about can be seen in the figure below:



Figure 2.2 - Research method work process

## 2.4 Reliability and Validity

To ensure high reliability and validity of the data gathering, several steps were taken, which are explained in this chapter. This begins by explaining what the terms are and how the reliability and validity were increased.

Reliability is the level to which experimentation, testing, or any measuring procedure produces the same outcome on repeated trials. Without the agreement of independent observers able to repeat research procedures, or the ability to use research tools and procedures that produce dependable measurements, scholars would be incapable to adequately draw conclusions, formulate theories, or make statements about the generalizability of their research. In addition to its important role in research, reliability is critical for many parts of our lives, including manufacturing, medicine and sports (Colorado State University, 2012).

Reliability of the interview schedules is a central problem in method books. These books emphasizes that the each of the respondents understands the questions in the same way and

that their answers can be coded without the possibility of uncertainty. This is achieved through several methods but the following are the most relevant (Silverman, 2006):

- Thorough pre-testing of interview schedules
- Thorough training of interviewers
- Inter-rater reliability checks on the coding of answers to open-ended questions

The above was done to increase the reliability in our thesis. The pre-testing was done between the authors and people in Shipper A. This gave the authors the training of conducting interviews which were of great use when interviewing PLs and other shippers. Also since there were two authors doing the interviews, the inter-rater reliability checks on the coding of the answer increased simply because there were two authors of the thesis checking and decoding the data acquired through the interviews.

Internal validity: Communicative validity. The investigator's ability to communicate the investigative process affecting the validity of knowledge. The communicative validity may consist of:

- Description of the data collection. How data collection was implemented must be carefully described. If the data collection has been carried out over a longer period of time, it can sometimes add credibility because experience from the first part of the data collection time to improve data collection towards the end.
- Description of the selection. The cases / examples / persons selected must be described in detail.
- Description of the analysis process. A detailed description of what happened during the analysis. What did they do and what decisions were taken? What turns directly to the material in-depth analysis and what gives interpretations in different ways? (Thunma & Wiedersheim-Paul,2003)

All of the above was done which increased the credibility of the validity of this thesis. The data and the selection were thoroughly described and motivated. Also since the sampling for each type of PL was greater than one, the authors gained experience in the field. The experienced gained fulfilled the last criterion in the internal validity which increased the credibility of the data collected.

The authors did the above and asked the questions that are seen in the questionnaires in appendix 2 and 3, more follow-through questions complemented the questionnaire. Higher quality answers were attained by doing so. This would seem to put the reliability and validity in question because it is a qualitative study with open and semi open questions. The validity was increased when comparing with at least two sources of each type.

There were parts of the study where reliability and validity could be questioned, especially in the questions where different interpretation could occur. The word flexibility is interpreted differently depending on the environment people operate in. This was conducted by first asking the respondents what flexibility was for them and then compare to the other sources. The questions involving tailored solutions had also the risk of different interpretations and this was led the same way as the questions regarding flexibility. One drawback could be not having observed the processes physically. This would have given the research another dimension of affirmation to the given answers.

The focus has not been on the shippers but on the logistic solutions that are viable for a shipper to use in its flows. If more shippers would have been included, this would have given an idea on how the PLs are being used in different scenarios and how the attributes being studied reflect and differentiate between shippers and the PLs. Greater number of PLs would have increased the reliability and validity of the research.

## 3 Literature Review

Having explained the scientific approach to the thesis the next section is the theoretical base that was used on this thesis which is going to facilitate the reader to promptly immerse into the subject. It starts by explaining and defining basic supply chain management, sourcing and relevant theory for the sought after attributes. The theories of different provider levels are also included. This is significant to understanding the bigger picture when looking into Shipper A's flows and the application of different PLs in them. A summarization of the literature is also done to give the reader an overview.

### 3.1 Supply Chain Management and Logistic Management

Before going into the definition of the different provider levels, a broader understanding of the whole supply chain is needed and of the important aspects in it. The chapter starts off by defining what Supply Chain Management (SCM) is and attributes that are correlated to the supply chain. An understanding of these topics is essential before moving on to the provider level and what activities they perform in the supply chain.

Supply Chain Management based on the Council of Supply Chain Management Professionals (CSCMP, 2012) is defined as:

*“Supply chain management encompasses the planning and management of all activities involved in sourcing and procurement, conversion and all logistics management activities.”*

In other words, the supply chain management consists of the management of all parties that are involved in fulfilling a customer demand. This includes the manufacturer, the supplier, the transporters, warehouses, retailers and the customers (Chopra & Meindl, 2010), as seen in figure 3.1.

CSCMP (2012) and Ha et al. (2010) emphasize the importance of coordination and collaboration with all parties in the SC for gaining competitive advantage. Ha et al. (2010) mentions that trust is key element in collaboration and collaboration has an influence on the logistic efficiency. Trust is referred to the emotional and personality dimensions, which is usually gained through long-term relationship. It is also important to have an inter-personal relationship rather than inter-organizational with the parties, since trust is an emotive paradigm (Mouzas et al., 2007).

Information technology has long been known as an important aspect in SCM (Wang & Yuen, 2010). All companies have some sort of IT system to help them coordinate their information flow between the parties in the SC. The information that is shared through the SC has evolved over the years, from sending mail to using advanced IT solutions (Nyman, 2012).

But studies show that advanced IT solutions have no direct effect on operational performance in the supply chain (Li et al., 2008; Devaraj et al., 2009). Although it has been shown that these

IT systems do improve the efficiency of information flow and coordination of material flow (Tilanus, 1997). Suppliers often develop heterogeneous information systems to operate their logistic activities. These systems have distinct structures, data definitions and data processing that make the information sharing difficult between LSP's and their partners. (Wang & Yuen, 2010).

Another important aspect in SCM is the delivery precision. The delivery precision is the accuracy in the delivery, i.e. the delivery accordance with what is promised. This is measured in terms of actual delivery date compared to the delivery date which was agreed upon. The delivery is often determined either by a specific date, specific time or even in a time interval (Stadtler and Kilger, 2008; Pettersson, 2011).

Transparency, information sharing, also has a positive effect on the flexibility and the speed to adjust to customer changing demands (Swafford et al., 2008; Wadhwa et al., 2010). Flexibility can have different meanings in the SC, Sabri and Beamon (1999) define two different definitions of flexibility in SCM. The first one is *volume flexibility*, this is the ability to increase or decrease production in line with customer demand. The second is *delivery flexibility*, the ability to change both delivered quantity and delivery date. According to Swafford et al. (2008), IT integration has a direct impact on a companies' ability to react to unforeseen events, such as customers changing demands. A good IT integration has a positive effect on a companies' ability to be flexible, since the IT integration will increase the reaction time between all the parties in the supply chain.

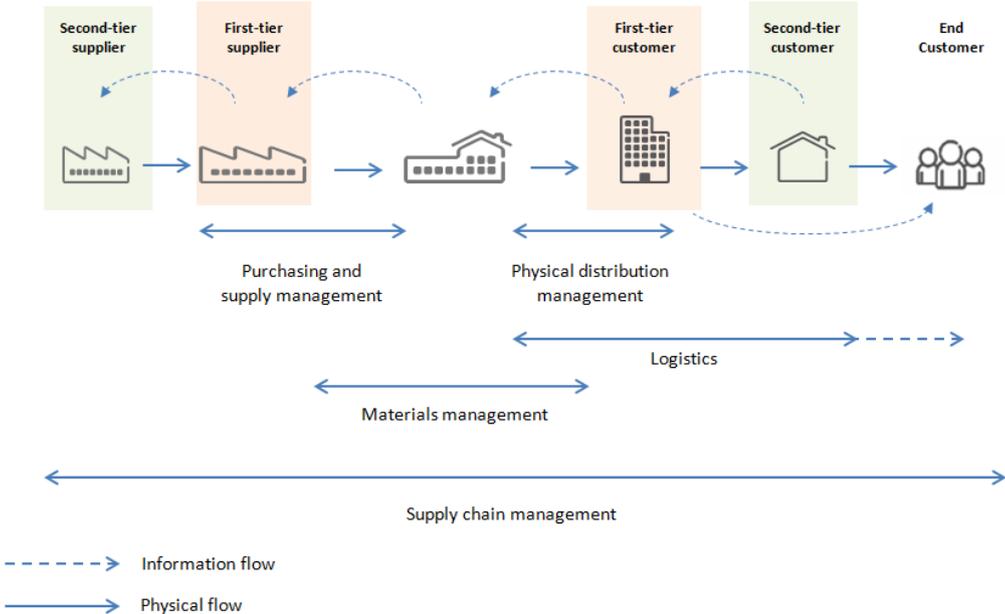


Figure 3.1 - Supply Chain Management (Chopra & Meindl, 2010)

### 3.1.1 Logistics

One part of the SCM is the logistics, which is defined as the activities that have to do with obtaining the right product or service at the quantity, in the right condition, at the right place at the right time, to the right customer, at the right price (Shapiro & Heskett, 1985). There are two types of logistics, which are called internal and external.

Internal logistics, is the flow through a series of manufacturing operations. The internal logistic is all about getting a faster and more efficient output without increasing buffers between machines or the manufacturing costs. The solutions often revolve around increasing capacity, especially in bottlenecks.

External logistics is the flow between companies and the end users, including inventory and transportation. Even external logistics working towards a faster and efficient flow will usually not focus on physical bottlenecks, but instead administrative bottlenecks. The solution usually revolves around increased multidisciplinary holistic approach (Lindh, 2003).

As seen in figure 3.1 the logistic management is only one part of the whole SCM. If you break the SCM into different parts you will find that logistics is one of them. Logistics can be described as the distribution management of a product from a company to its buyer. To be more accurate you can state that logistics is the planning, implementing and control of the flow, storage of the goods, services and related information between point A and point B for the product. In these activities like inbound and outbound transportation, fleet management, warehousing, material handling, logistics network design, inventory management, supply/demand planning and management of third party logistics service providers are included. (CSCMP,2012)

### 3.1.2 Sourcing

Another important element in SCM is sourcing. Meaning that the performance of various activities in a supply chain, that previously conducted in-house are now transferred and performed by another company (outsourced). The activities can be storage, production of a product, transportation and even managing of the supply chain.

A definition of sourcing by Axelsson and Wynstra (2002) is:

*“The decision and subsequent transfer process by which activities that constitute a function, that earlier have been carried out within the company, are instead purchased from an external supplier.”*

When a company decides to outsource activities there are certain aspects that need to be taken into consideration. These are what are the advantages and disadvantages of doing it in-house or outsource. Slack, Chambers and Johnston (2007) stated that different sourcing strategies will affect the operation performance objective of a company. They categorize these

objectives as: *Quality, Speed, Dependability, Flexibility and Cost*. Below a comparison will be made between conducting an operation in-house and outsourcing.

The effects of having an operation in-house according to Slack, Chambers and Johnston (2007) are:

- **Quality:** It's easier to trace the origin of a quality problem. This allows faster improvements but can also make people comfortable and not so responsive.
- **Speed:** Operation such as material and information can be synchronized for a faster flow. But internal customer may get under prioritized.
- **Dependability:** An easier communication will improve the dependability and better forecast. But like before internal customer will be under prioritized.
- **Flexibility:** An in-house activity helps to alert the requirement changes of a market. But the respond may be limited.
- **Cost:** With an in-house operation you save up the margin that a supplier would take to make a profit from the operation. But with low volumes it will not be cost effective.

According to Lindh (2003) an in-house activity will also give you greater control over the processes. An important aspect if the confidentiality of technology is important. You will also have a better visibility and control of the processes in an internal flow chain. The downside of an in-house activity is that it usually requires investment in, capacity. The volume must be high enough to provide sufficient economies of scale.

The effects of outsourcing according to Slack, Chambers and Johnston (2007) are:

- **Quality:** Suppliers usually have specialized knowledge and more experience. But the communication of quality problems is more difficult.
- **Speed:** The speed respond can be built into the contract where the pressure will encourage a good performance. But there could be significant transport/delivery delays.
- **Dependability:** Late delivery penalties in the contract can increase the performance. The organization barrier will have a negative effect on the communication.
- **Flexibility:** The suppliers usually have a wider capacity and have a greater ability to respond to changes. They may have to balance the conflict needs of different customers.
- **Cost:** Suppliers achieve economies of scale, through focusing on specific operations and they are motivated to reduce their own cost because it directly impacts on their own profit. But it will increase the transaction costs.

Another advantage by outsourcing is that when the demand varies significantly, the capacity utilization will also vary. To let the suppliers take the impact of the reduced demand could mean an economic advantage. By outsourcing different activities the company can then concentrate on their core business. A typical phenomenon is that many companies outsource parts of their logistic, transportation and warehousing activities to be able to focus on their core businesses.

Outsourcing an activity to the wrong supplier could have a negative effect on the quality and delivery precision for the company. Another effect of outsourcing is that a company will lose some control of the SC and get dependent of the suppliers capacity (Lindh, 2003).

In SCM there are different provider levels that a company can source their activities to depending on their needs. The level depends on the amount of outsourced activities to these provider levels. They are known as the 2PLs, 3PLs and 4PLs which will be explained in the next chapters to come.

### 3.2 Second-Party Logistics Providers (2PL)

As previously mentioned outsourcing means that an activity is no longer performed within the company but transferred to an outside party. In this case 2PL are companies that own transport vehicles and transport goods for a customer.

The 2PLs have limited theory in their definition since their only common denominator is the transport of goods from point A and to point B. Their definition is the following (CSCMP, 2012):

*“Second Party Logistics (2PL): A 2PL is a transport firm that provides a basic service of one kind, such as road transport, without any integration to other parts of the supply chain, such as warehousing.”*

Their division is based on what kind of transportation they use to carry out the transport services. These are air, sea and land which encompass truck, rail, sea carriers and air carriers. These are later divided into different types of cargo from small packages to containers. In the book by Oskarsson et. al. (2006) they stated that the business of transportation is changing rapidly, from traditionally having worked with very high levels of fullness in their cargos without customer focus to a customer focused business where the customer is the driving force. They give a list of actors in the transporting market which exist out of tradition:

- Transportation brokers, arranges the right contact with transporting firms or forwarders.
- The freight forwarder, which provides contact with involved haulers and transport planning.
- Haulage company, which accounts for the rental of the vehicle.
- The vehicle owner, who owns the vehicle.
- The driver, who drives a vehicle.

Although authors Oskarsson et al. (2006) overly divides as seen above, most transport companies usually have more than two of the above in their operations. The authors describe

the whole transportation business as being fragmented, meaning that shippers must have several transportation companies to fill in their transportation demand.

Each transportation mode has its advantages and disadvantages, this is easily shown in figure 3.2 (Jonsson, 2008).

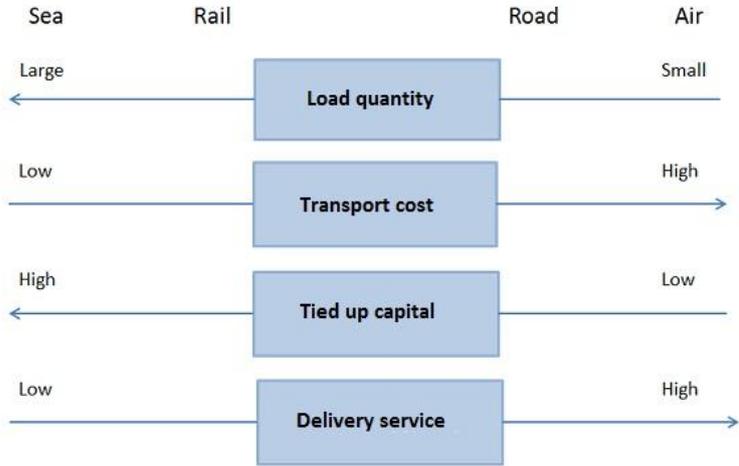


Figure 3.2 - The difference between each transport mode (Jonsson, 2008)

### 3.2.1 Sea Transportation

The 2PLs that use ships to transport goods are the sea carriers. They are normally the slowest of the available transport types, it is in almost all cases the lowest operating cost per ton-kilometer (i.e. the quantity of goods in tons multiplied by the distance in transported kilometers). Transportation is done between ports and if possible directly to ports that are owned by suppliers’ and customers’ plants. Inland waterway transport is also common in certain regions in Asia where roads and rail are lacking (Jonsson, 2008). Sea transportation operates in an oligopoly because of the large initial investment which usually limits the number of carriers (Bloomberg et al., 2002).

One of the greatest advantages of sea transport is the capacity of loading large amounts of goods and also in the flexibility of transport routes given by the sea. The largest competitive advantages for sea transport are with shipping low-value bulk loads over long distances where sea routes exist. Another shipping sector is the container shipping which mostly transports medium-value goods (Jonsson, 2008).

There are two main types of for-hire carriers that make up deep sea transport. The first type called Liners that have fixed times and fixed routes when to sail. Liners are time fixed which means that they sail even though they aren’t filled to capacity. The second called tramps only sail when they have reached capacity. Tramps normally offer a lower rate because their asset utilization rate is higher than the liner’s. When service dates and times aren’t issues tramps are ideal, otherwise liners are better suited (Bloomberg et al., 2002).

Ships have evolved for specific types of goods and transport routes. Container ships make sure that high utilization of the ship's capacity is used since the containers can be stacked on top of the ship as a puzzle for maximum space usage. Although container ships are good, not all ports are equipped with cranes that can handle this type of cargo. Container ships are most often used as trans-ocean transporters. Then there are the RoRo vessels (roll-on-roll-off) which are usually built on the principle of loading onto rolling units for ease of loading and unloading. All types of rolling load carriers, such as trucks, trailers, cassettes and railway wagons can be loaded onto this type of vessel. Lastly you have bulk ships which are designed for transporting solid, dry goods such as ore, coal, cement and liquid bulk loads such as oil as well. Combined varieties of vessels of the above mentioned also exist (Jonsson, 2008).

### 3.2.2 Air Transportation

The 2PLs that work with air transportation have two types of air freight, one is a specialized freight aircraft and the other is in the cargo hold of passenger aircrafts commonly known as belly freights. The airlines are seen as the fastest transportation option available for anyone interested in using air transportation. This is their biggest strength as Jonsson (2008) stated *"the very short transport time over large geographical distances is the greatest advantage of air transport"*. Due to the very high cost per ton kilometer it is generally used for goods of high value and/or low weight, time sensitive goods, emergency sendings, and packages/posts of long distances. There has been an increase in demand for air freight because the customers are after fast and safe transportation. Their main competition besides other air freighters is container ships between continents. One disadvantage is their inability to provide direct transport to and from suppliers 'and/or customers' plants (Jonsson, 2008). Another strong point Bloomberg et al. (2002) stated is that the airlines or air freighters are reasonably reliable even though when delays are caused by the weather, it is still faster than the second fastest transportation mode which is motor carriers. Additional disadvantage stated in Bloomberg et al (2002) book *"The significant start-up costs associated with an airline limit the number of competitors, creating an oligopolistic market structure, with only a few large carriers."*

### 3.2.3 Road Transportation

The 2PLs that work on roads are the trucking companies which are commonly used for short but also for long distances. It is one of the few modes of transportation that offers accessibility to all suppliers' and customers' on the same continent. Other types of transportation usually ship goods between terminals and there are few alternatives who can offer the same accessibility as trucks can (Jonsson, 2008). Road transportation market structure is of a monopolistic competition in nature. The number of competitors is higher than any other type of transport, this is because of the low entry cost into the market (Bloomberg et al., 2002).

One of its relative advantages is greatest in transportation in widely scattered markets. Virtually any type of goods can be transported to almost anywhere by road. It is nearly always possible

to fit a transportation route for individual batches as long as there is a sensible road and size. What is of little significance is the goods value, weight and transport distance. This means that truck transportation is more flexible than other kinds of transportations. Trucks usually compete with air transport for small volumes and high-value goods and against railways for large volumes and low-value goods (Jonsson, 2008).

Its drawbacks are it has economic disadvantages in comparison to rail and sea transportation when it is of very low-value goods, and the delivery times of air transport for high-value goods. The environmental consequence from exhaust emissions, road safety, noise and traffic congestions can be a competitive disadvantage compared to other types of transport (Jonsson, 2008; Bloomberg et al., 2002). Factors to take into account are: they are not well suited to handle extremely bulky and heavy goods, because trailers are not properly constructed to transport such significant weight efficiently, even though a permit is gained to do so (Bloomberg et al., 2002)

### **3.3 Third-Party Logistics Providers (3PL)**

If a company does not want to have direct contact and manage the 2PLs then one of the options available is to outsource these activities to a 3PL. From the literature, their definitions and the amount of activities they are able to perform, are explained from different sources.

There are a number of names for third-party logistics and classifications since they cannot be fitted to a single definition. This problem is seen in many science journals and supply chain management books because throughout the history of 3PLs they have changed and evolved which has made it hard defining them and categorizing them into set of parameters. Quite often they seem to intertwine with each other but are more like different shades of the same color.

The first terms that showed up was the forwarders/ freight forwarders work as a transport architects. They are specialized in arranging logistics services on behalf of the shipper. These services include the transportation, storage, insurance, custom clearance and terminal services (Jonsson, 2008; Burkovskis, 2008). Forwarders do not always own their own assets, their role in the “logistic world” is more as a coordinator (Burkovskis, 2008)

Starting with the third-party logistics the Hertz (2003) definition is one of the simpler and broader definitions of a 3PL, she uses the acronym TPL (the third-party logistics) and defines them as the following:

*“A TPL provider is an external provider who manages, controls and delivers logistics activities on behalf of a shipper.”*

Her view of the activities in her definition can either be all or parts of the logistics activities. She also states that the minimum requirements are the management and execution of warehousing and transportation. She further tries to fit them in a matrix with two axes; general ability of problem solving and ability of customer adaption as shown in figure 3.3. In the left matrix she has divided it into four parts of different logistic firms: the *integrators* who integrates and uses all kinds of transportation in their global network; *standard transport firms* move goods with their transportation crafts; *traditional house brokers* which exist due to shippers; and finally Hertz definition of TLP fit in the top right corner of the matrix where she further divides them into four parts viewed on the right matrix in figure 3.3.

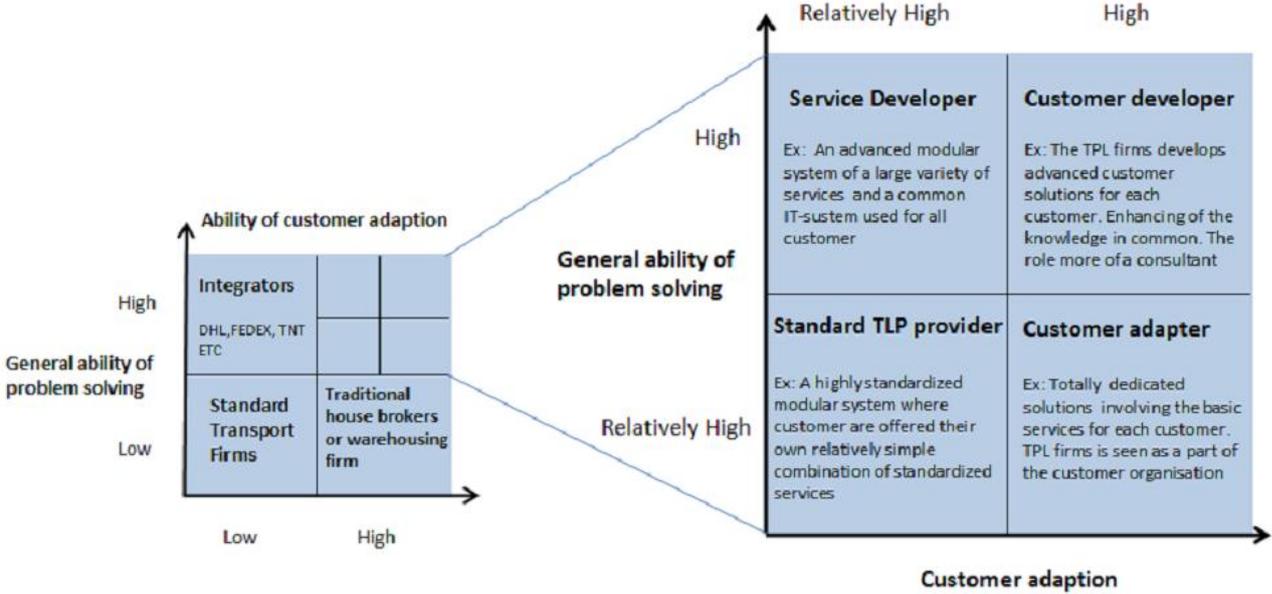


Figure 3.3 - TLP Matrixes by Hertz (Hertz, 2003)

First one, bottom left, is the *standard TPL provider* which is seen as supplying the standard services of a TPL such as warehousing, distribution, pick and pack and etc. These services are offered as value adding business besides their core activities.

Top left corner, the *service developer*, offers advanced value-adding services. These services could be differentiated depending on the customer, specific tailored packaging, cross-docking, track and trace, special security systems. Advanced service packages will involve several sets of further standardized activities which lead to modules. These modules could be combined, depending on the customer demand. An advanced IT system helps the development and the focus would more towards the economy of scale and scope.

Bottom right, *customer adapter*, is described as a TPL that is mainly takes over customers' existing activities and improving the productivity while not focusing on the improvement of services. The customer adapter may take control of customers' logistic activities, including warehousing, which means that they rely on few, but very close customers.

Final box, top right, is the *customer developer* which she describes as “*the most advanced and difficult form.*” They involve high integration with its customers which many times lead them to taking over the whole logistics operations. Their focus lies in design of supply chain which involves the know-how, the methods and the knowledge development. Customer developers’ customer base is limited and their work with each customer is extensive in nature.

Although Hertz (2003) tried to fit these logistic firms into a matrix, the author implies in the journals conclusion that all the others are moving into the TLP box on the top right corner. This is due to the fact that by taking on more advanced activities, will lead to a greater integration with the customer and this fits more into the TLP box definitions.

Stefansson (2006) like Hertz (2003) tries to divide them into his own terms. In his article he gives a definition of what a 3PL is: “*The role of third-party service providers varies according to the level of outsourcing, from only transportation services to complete integrated-logistics value added services and global management of the customers’ logistical setup.*” (Coope, 1994; Sink et al., 1996; Lieb et al., 1998; Lieb and Randall, 1999; Delfmann et al., 2002; Lieb and Kendrick, 2003; Langley et al., 2004; Lieb and Bentz, 2004; Stefansson, 2006). The author later categorizes the third-party service providers in to three categories depending how much a company outsources their activity. These categories are *carriers, logistics service provider and logistics service intermediaries*:

*Carriers* have the most straightforward services compared to the other ones. The services that they provide are: inbound and outbound transportation, door- to- door transportation, transportation administration, transport scheduling, document handling etc.

*Logistics service provider (LSP)* provides diverse services in addition to the transportation services which do not need to be carried out by their own fleet. This service includes warehousing, cross-docking, consolidation services and other value-add services like: export/import clearance, payment services, inventory management etc. This means that a LSP can give both physical and administrative services. This gives the customer the opportunity to outsource all the distributional activities to the LSP’s.

*Logistics service intermediaries (LSI)* do not physically handle the goods themselves but administrate the different logistics activities. This has for many years been the function of forwarders, well-established service providers, that shippers have used to find the right carriers or LSPs to carry out a specific set of logistics services. ” (Sheffi, 1990; Cooper, 1994; Sink et al., 1996; Stefansson, 2006) This means that the LSI designs , administrate and implement the logistic setup. Some of the services that they carry out are, design individual logistic setup,

implement logistic setup, forward services, tendering and contracting LSPs and carriers etc. The author Stefansson (2006) simplifies the categorization through an image seen in figure 3.4

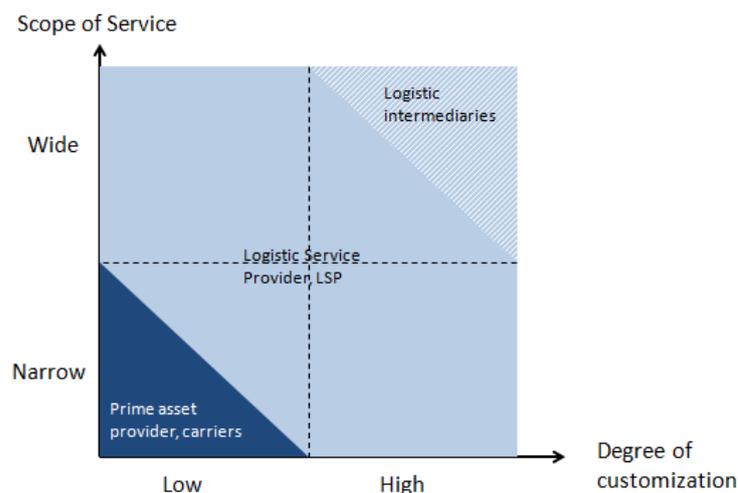


Figure 3.4 - Categorization of LSP's (Stefansson, 2006)

Like Stefansson (2006), Jonsson (2008) uses the term LSP to encompass similar types of logistics. In the term LSP the author Jonsson (2008) includes the fourth-party logistic providers. The author describes the LSP as the following:

*“Logistics service providers (LSP) are companies normally without their own transportation resources. Their role is to arrange and execute transport by planning and subcontracting necessary transportation resources. They carry out other more stationary activities along the transport chain, such as storage and terminal activities. Depending on the extent of their responsibilities, we can distinguish between forwarders, third-party logistics providers (3PL) and fourth-party logistics providers (4PL).”*

### 3.4 Fourth-Party Logistics Providers (4PL) and Lead Logistics Providers (LLP)

The next outsourcing step for a company that has a 3PL is 4PLs. Here the term LLP is also introduced because there are authors who group them together with the 4PL, while others define the 4PL as an own entity. In this chapter, these differences and similarities are explained using different sources, to give the reader an overview of the 4PL and LLP literature.

Beginning with the authors who define the 4PL as an own entity. The authors Win (2008) and Langley et al. (2005) describe the 4PL as an independent, non-asset based, supply chain integrator. The 4PLs expertise lies in their knowledge of the SCM and their strengths in their advanced technology capability. Their role is to implement and manage a value creating business solution for the customer (Win, 2008; Langley et al., 2005). These activities include operational, tactical and strategic activities (Büyüközkan et al., 2009; Magill, 2000; Langley et al., 2005). That means that the focus of logistic efficiency is no longer on a local level, but more

in the whole supply chain with the 4PL (Büyüközkan et al., 2009; Fulconis, 2007). Other service attributes they have are; consultative skills, project management and provider coordination (Langley et al., 2005)

The sources other than the 4PLs that define the Lead Logistics Provider as an own entity are Gattorna et al. (2004) and CSCMP (2012) stated that the lead logistics providers are a “higher” level of a third-party logistics. Their role is to act as a single point of contact for the shippers and manager, of a network of third-party logistics companies, including other subcontractors.

Authors Schary and Skøtt-Larsen (2001) illustrated both of them together only because they can perform the same activities. The authors Schary and Skøtt-Larsen (2001) still separates the 4PL and LLP as different entities since they stated that the LLP work as a mediator for the shipper and provides logistic services through asset-based third party provider. How the authors showed that they can perform the same tasks is with an image seen in figure 3.4, where the LLP and 4PL perform the same activities in the bottom half and their contacts are on the upper half.

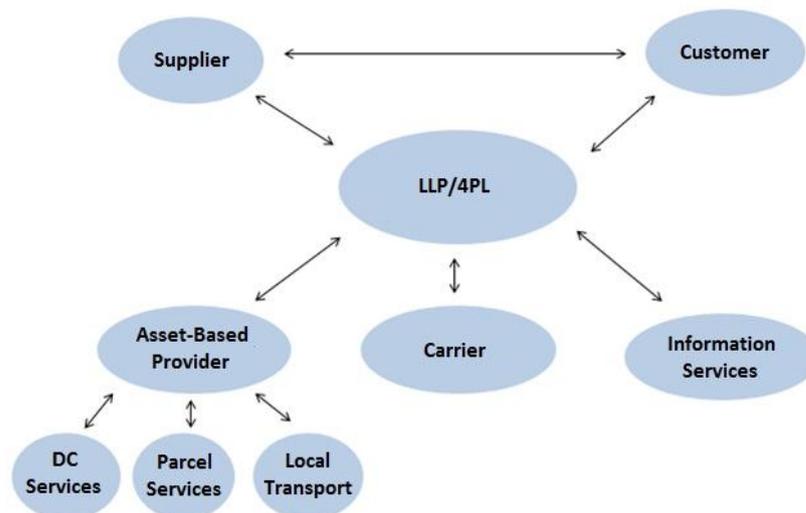


Figure 3.5 - Modified figure from Schary & Skøtt-Larsen (2001)

### 3.5 Summary

Here, a summary of all the literature from the previous section is presented, to give the reader an overview of it.

Supply chain management consists of the planning and management of all activities that are involved in fulfilling a customers’ demand. It is important to have a close relationship with all the parties in the SC for gaining competitive advantage. To be able to have a close and long-term relationship between the different parties, transparency and trust is a key element to accomplish this.

Transparency and IT integration has a positive effect on the flexibility and the speed of adjustment. The information sharing is done using different methods, studies shows that an advanced IT system improves the efficiency of the information flow and coordination of material flow, although it does not have an effect on the operation performance in the SC. The delivery precision is the accuracy of the delivery. This is measured through a comparison of the actual delivery date, compared to the delivery date which was agreed upon.

Logistics is one of many activities in the SCM, it is the planning and management of the inbound and outbound transportation. Sourcing means that the performance of various activities that a company used to conduct in-house is now performed by another company.

As the literature review has shown, the 3PLs and 4PLs do not have standard activities and are able to perform a variety of activities, except for the 2PLs that their main activity is the physical transportation of goods. Without over complicating the literature review, a summarization is done:

- 2PLs are the goods transporters and own their assets (transport crafts).
- Forwarders are the bookies that book up which 2PLs are available for their customers.
- The 3PLs are little more complicated and their range of activities is in between the forwarders and up to a 4PLs' activities. When they are a LLP they are a 3PL booker. Some 3PLs have extended business portfolios and have 4PLs activities as a side business from their main business.
- The 4PLs can be considered SCM consultants they can basically perform all of the previously mentioned activities and much more, depending on what the customers' needs are. They can go as far as taking the whole SC of a customer.

In figure 3.6 the authors Büyüközkan et al. (2009) visually summarizes the outsourcing level of the different PLs. The scale starts from the left, where all activities are conducted in-house and then moving to the right as the level of activities being outsourced increases.

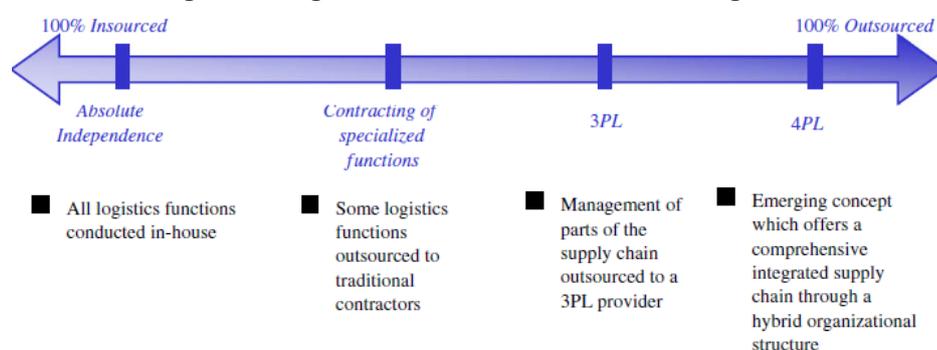


Figure 3.6 - Amount of outsourcing depending on PL (Büyüközkan, 2009)

## 4 Empirical Setup

Having the research question in mind the relevant literature was illustrated which is one step towards solving it. In this chapter the information gathered from the case study of Shipper A, is described.

The chapter empirical setup, is to supply the reader an overview of what kind of company Shipper A is, what its current distribution strategy looks like and the strategy's future goals. The flows of interest are explained with their properties and how they differentiate between each other. A significant part of the strategy, is the project Transportation Management (TM). This project is explained because of its future importance for Shipper A's logistics. This chapter is the foundation of the case study being done at Shipper A. This information, with the analysis, is going to provide the results later shown in the chapter discussion and conclusion.

### 4.1 Shipper A

Explaining the structure of the chapter, the first step was getting a description from the Manager Logistic Provider Developer (MLPD) of the company current situation. The MLPD stated that Shipper A is a global company that has over 100 000 employees within the group. They sell high technology products to their customer in almost every country in the world. Shipper A sells large amounts of products every year and that being stated, an efficient distribution is an important factor for the movement of produced goods.

The MLPD also stated that they sell their products to both internal customers of foreign country affiliates and to external (direct markets) customers. Shipper A does have standardized products that they sell, but have the ability to offer their customers completely tailored goods for them. The customization can be features such as esthetic and functionality, but also how they want it distributed. This becomes a challenge because it increases the difficulty in the distribution and manufacturing.

Today, Shipper A is using several third-party logistics to distribute their products to the customers, which was a reoccurring answer in all the interviews done in the organization.

The purpose of the case study is to use the empirical data of Shipper A, to understand the current distribution model. Important part of the distribution model is the distribution strategy, including the project Transport Management (TM). What is also included is the understanding of the four flows of interest, that will answer the research question.

#### 4.1.1 Distribution Strategy

With having a general description of how Shipper A provides the foundation required to move into explaining the distribution strategy so that the reader can understand its goals.

The distribution strategy that is explained, has begun to be implemented and is under the process of changing the distribution model, explained by the MLPD. The figure head of the distribution strategy is the Strategic Distribution Manager (SDM). The SDM explained that the old strategy used to have a “Central Point” distribution, which meant that they had a central distribution center in Europe, where all the goods were sent from to the customers, as shown on the far left side in figure 4.1. This setup was not optimal according to the SDM due to a couple of reasons. All factories were not located in Europe, as well as the customers. So, for instance, if a factory is located in South America and the customer is in North America. The product would first be sent from South America, to the DC in Europe and then shipped to North America. This method is neither cost nor time effective, as the explanation points out. The goal, illustrated by the strategic distribution manager, of the new strategy, is to change the distribution structure to a “diamond structure”. This evolution is seen going from the “Central Point” from the left, moving towards a diamond shape on the far right, seen in figure 4.1. The idea of the diamond structure is to decentralize the distribution. This means that instead of having one DC, where all goods are transported from, there will be several DC strategically placed around the world. These DC’s will have regional distribution, to shorten the distance and lead-time, both to the customers and from the factories. This makes the distribution cheaper, where the need of using expensive transportation methods such as air carriers, is not going to be necessary to compensate the long lead-time. Not to mention, as the SDM pointed out, that distribution between the DCs is to be available if there is a need to ship between them. This creates the possibility to send products, which are available in another distribution center, closer to a DC in need, than from a factory that is further away.

To make this Distribution structure as efficient as possible, a high visibility is needed. A project that is part of the strategy called TM, is being deployed, to bring this needed visibility in to the SC, this project is explained further in chapter 4.1.2.



*Figure 4.1 - Shipper A’s Distribution Strategy*

The new distribution strategy is to also focus on minimizing unnecessary procedures in the DC stated the SDM. That means that instead of spending time on relabeling, repackaging or waiting for the correct documents, the focus is on value adding activities, such as cross-dock to every product. The reason for this is that for every minute the product is stationary in the warehouse, it becomes tied up capital and is not bringing any value to the company. Besides tying up the capital, the products take up space and raise inventory costs. The new strategy endeavors include cross-docking the shipments. The solution that this new strategy is going to provide, is

that the shipments have the right documentation from the start, so they are easy to track in the supply chain. Also better communication with the supplier, will provide the products the right label and minimize the unnecessary, time wasting, procedures.

Another key element mentioned by the SDM in the new strategy, is that it is going to both reduce the lead-time and yield them a more constant flow. How this is going to be done is to stock “high runners” e.g. product types that are sold more often regionally in the distribution centers. In this way the customer can choose between buying a readily more available product, the high runners, with a shorter lead-time, or buy a completely customized product, that has a longer lead-time.

#### 4.1.2 TM

The strategic distribution manager stated that one of the operational parts in the distribution strategy, is the Transport Management (TM), which is a substantial project Shipper A has deployed. The Operational Efficiency (OE), who is part of this project, stated that the philosophy is to orchestrate the volumes and flow lanes better, with optimization in mind. It’s two main purposes are: to optimize the lanes in the flow and the planning of capacity within them. They are called *management of networks* and *capacity planning*. Why this is needed, is because Shipper A has almost no visibility on which lanes and routes that exist. This knowledge is possessed by their 3PLs, which they exploit. The OE stated that having better visibility will provide knowledge of what flows and routes exists and thus can demand a better price from their 3PLs. Not to mention as the OE pointed out, they have too many existing flows today and want to have fewer flows, where the idea is to have a volume “highway”, instead of these small flows that exist today. The other is the predictability of which goods are in the flows and where they are exactly. This is where the capacity planning comes into the picture, which is going to provide better forecasting to other units such as DC or cross-docking stations. The inventory planning is going to facilitate the right data on the goods from the beginning, so they do not need to be relabeled which they have to do today in certain moments in the supply chain.

The Operational Efficiency stated that today Shipper A pays approximately 30% extra for “flexibility”, because they just tell their 3PLs that X amount of goods will be coming in today or tomorrow, and that it has to be shipped to a destination on a specific date. The OE stated that the factory informs the 3PL one day in advance how much volume has to be mobilized, the DCs are only informed on the same day they receive the volumes, where they have to be transported. Shipper A works in an extremely reactive way, which is why TM has started to be implemented. They want to either lower the flexibility margin, and/or move to buying capacity per week, for example. One problem, that the OE stated with moving to capacity thinking is that it will cause problems further down in their SC, when they reach their factory. The reason is that the factory’s behavior today is to produce as much as possible, because they get paid when an article is finished and they have no inventory for outbound goods. This means that

they want to ship it immediately when the product is finished. Shipper A wants to move to buying fixed capacities per week, e.g. buy 100 m<sup>3</sup> per week instead of just pumping out the volumes that factory were able to create based on the orders sent to them. This way TM has to gradually change the factory's current behavior, to having them modify their production to fit in with the provided capacity margin. This means, that they must try to fill out the capacity provided to them that week. In this way, the flows are to become more stable, which renders a less fluctuating transportation flow.

According to the OE, the TM and other units will be connected to a financial system which will be the core stated the Operational Efficiency. This is where other parts of TM, such as management of network and capacity planning, are docked to this core creating a constellation of units and sub-units that will be connected. The core will control the costs, since the purpose of the units connected to them is function based.

In short, what TM is going to do is enable them to see the flows in terms of when, how much and where the goods are being transported. This visibility will supply them the power and control, to be able to manage and plan their volume flows and networks, much better than before. They will know more in advance when a product will start being produced, and how much time it will take before being ready for shipment. In other words, they will know the lead-times, from factory to distribution center and ultimately from the DC to the customers.

## 4.2 Product Flows

Moving from the chapters of the distribution strategy and TM, now the flows of interest are described. The information gathered from the customers came from the Regional Distribution Managers (RDM I) and (RDM II) and the information from the factory came from the factory's Distribution Manager (DM).

The flows from factory to distribution center and from distribution center to the customers, are explained in this part to supply the reader an idea of the characteristics each flow has. They have been studied from a macro perspective, i.e. exact transportation routes have not been considered. The data from the customers was provided by the MLPD which is volume (m<sup>3</sup>) for a year on a weekly basis because Shipper A in general focuses on volume first within their product range and only afterwards deals with weight. The data from factory to distribution center, was acquired from the regional manager from the factory. Also, the number of shipments that are being sent, is looked at to provide indications between how much is being sent per shipment. A comparison between all the customer volumes, can be seen in appendix 5 to give the reader an idea of their volume sizes. The volumes from factory are not included in appendix 5 because they are about ten times more than the customer volumes, which made it hard to differentiate the customer volumes. Furthermore all flows are both customer and financially driven which are fundamental parts in the flows.

The idea of having these countries, DC and factory, was to create different logistic scenarios, that could provide indications of other typical flows Shipper A has in the world. The flows are shown in figure 4.2 which is seen below.

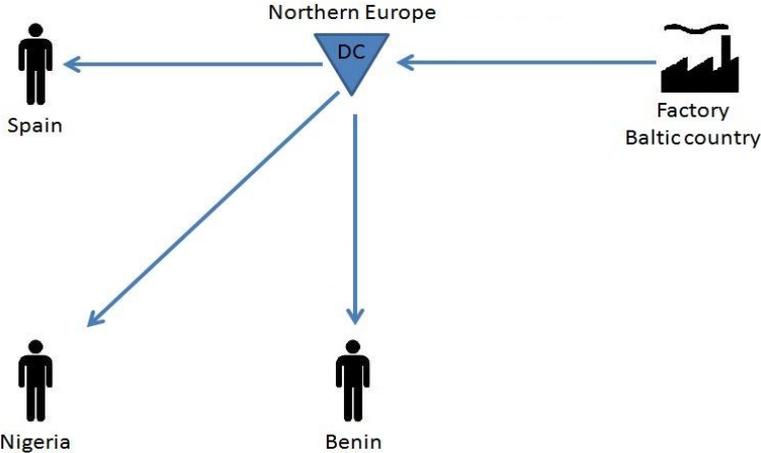


Figure 4.2 - Shipper A's Flows

How they were picked was that one bulk flow was needed, one affiliate country and two external/direct markets customers. The affiliate country and external customers were chosen to see if there was any difference between them. The external customers were both extreme scenarios, where one is a big economy and the other is a small economy. These countries in figure 4.2 were chosen to match the criteria above.

4.2.1 Spain

The first one to be described is the customer in Spain, which is an affiliate within Shipper A. The RDM II explained that this is a customer they have continuous business with where the trucks are the most commonly used method of transportation. Since the transportation is conducted within the European Union, importation licenses are automated and crossing borders through customs is easily done, with very little to no hindrance.

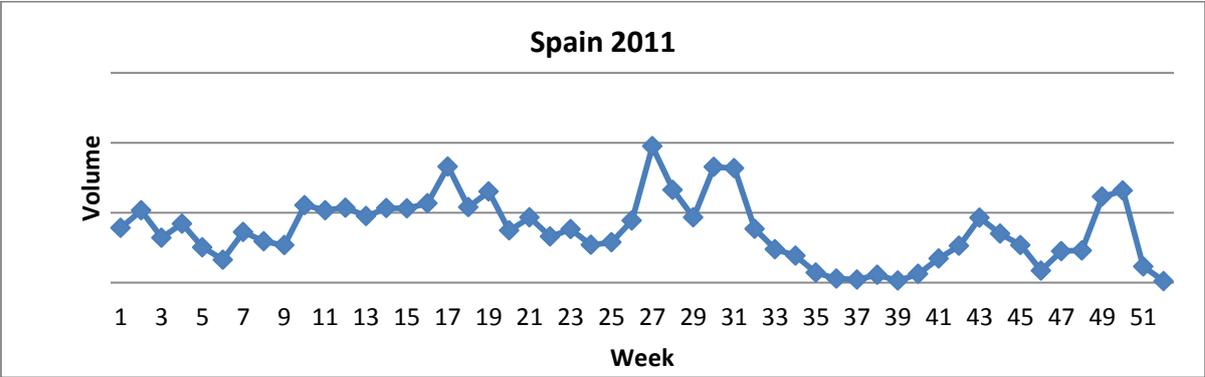


Figure 4.3 - Volume shipped from DC to Spain

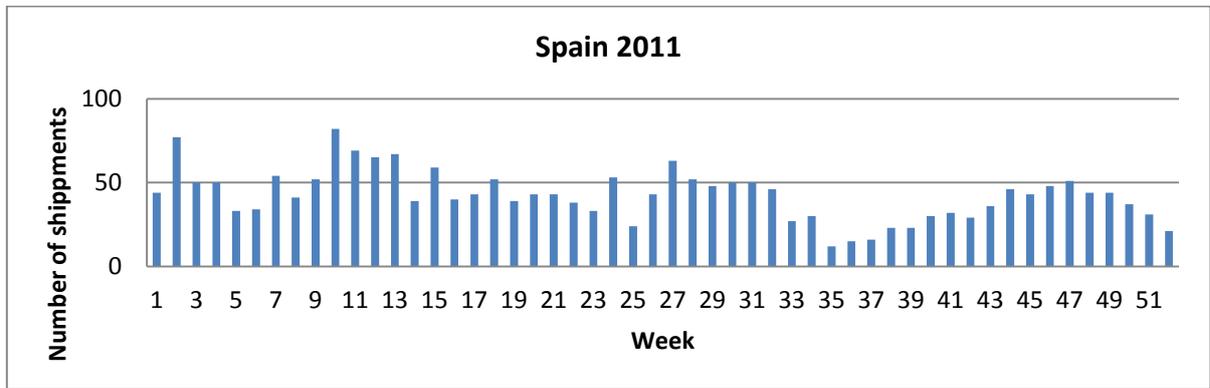


Figure 4.4 - Number of shipments shipped from DC to Spain

When showing both figures 4.3 and 4.4, the RDM II explained that the shipments of goods to Spain encompass complete projects, batches and ad-hoc sendings. Also because it is a customer they have continuous business with they send large amounts of volumes to the customer, by sending many shipments per week. When looking at the figure 4.3, it can be described as being fluctuating, with three strong peaks and one substantial dip.

#### 4.2.2 Benin

The RDM I explained that Benin is a small economy compared to Nigeria, in general terms. Benin as a customer also has an irregular behavior, which means that there is not a continuous business maintained between them and Shipper A. When business occurs between them, the RDM I stated that the contracts formed with the customer, are usually in one year periods and that customer wants complete projects, not batches. The appearance of figure 4.5 was described by the manager as being extremely project driven. The high peaks are where a shipment of complete projects might have been sent. This provides difficulties for them because the experienced gained during the time it was sent is lost, until the next time the customer in Benin inquires for a new projects.

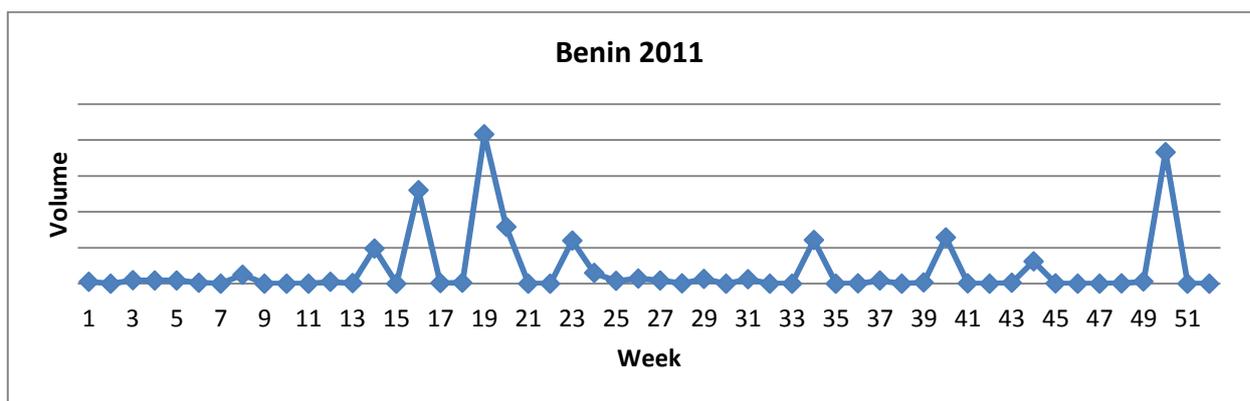


Figure 4.5 - Volume shipped from DC to Benin

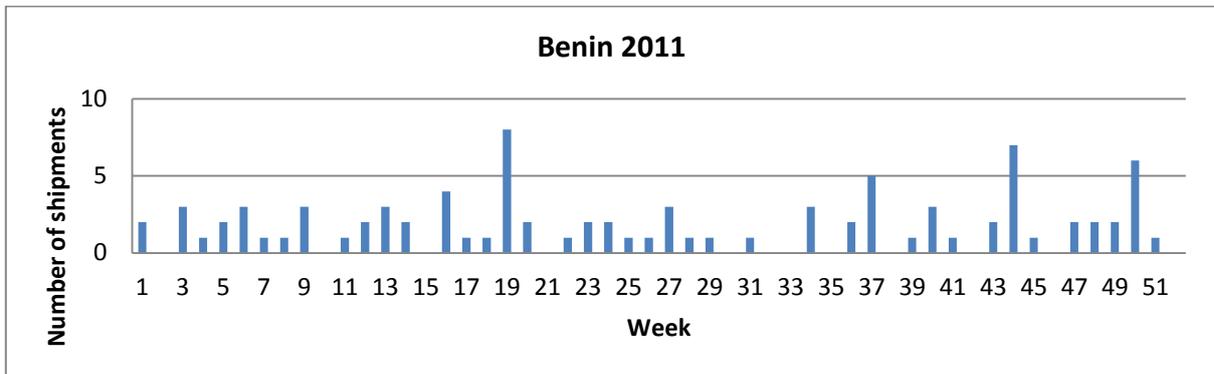


Figure 4.6 - Number of shipments shipped from DC to Benin

Looking at the figures and taking into account the information the RDM I provided for Benin, the figures description is that it has high peaks and between them very little volume. They send very little to Benin, because they do not buy as much as the other two customers, volume-wise. The volumes tell us the economic potential that the country possesses is small, due to the low amounts of volumes being shipped to Benin. Irregular business behavior from Benin makes it particularly hard for Shipper A to have a network/flow to them, since they have to create a new one each time a new business opportunity arises.

### 4.2.3 Nigeria

The last external customer which the RDM I is also responsible for is Nigeria, the manager described them as being a big economy on the African continent. This is a customer that Shipper A has continues business with. This is evidently shown in the figures, due to the large amount of goods being transported to the country. RDM I stated that the shipments to this customer are batch based and one would expect that it would be more similar to Spain's figures, however they are not. There are more aggressive peaks than in Spain's figure and the regional distribution manager responded this is most likely because of the importation licenses and import tariffs. The Nigerians are stricter with importation licenses and have rigid controls, when the shipments reach the country. The importation licenses have to be acquired for every shipment made to the country, to meet the custom compliances, compared to other countries, where one can get a license for fixed period of time. Not to mention as the RDM I explained, the import tariffs make this flow more financially driven, compared to other customers. This is due to the fact that every object sent is charged with an import tariff and so it is better to send large batches which in turns make it cheaper. Since the customer is paying the import tariff and is therefore eager to receive large batches to cut costs. The RDM I implied that this was the most likely reason the figure 4.7 had this particular appearance. The high peaks in the figure, as the regional distribution manager stated could be anything from ten to fifty projects.

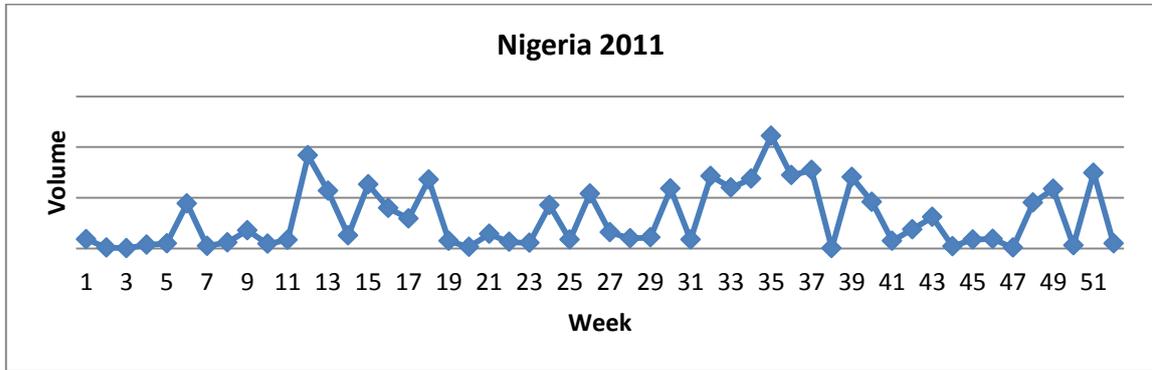


Figure 4.7 - Volumes shipped from DC to Nigeria

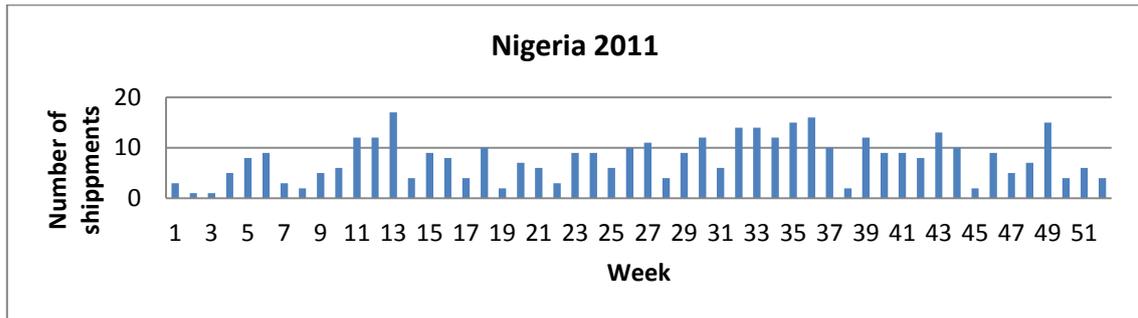


Figure 4.8 - Number of shipments shipped from DC to Nigeria

To summarize, the flow to Nigeria is extremely financially-driven compared to the other flows, because of the customer having to pay the import tariff, this is evidently illustrated in the figures with the aggressive peaks.

#### 4.2.4 Factory to Distribution Center

The last flow observed is the factory located in a Baltic country, where the goods are shipped to a DC in northern Europe. This flow is contracted by a 3PL and one can see that it is a more stable flow compared to the customer flows, when looking at the figure. This is due to the fact that several projects and batches are being sent at the same. In other words as the Distribution Manager stated, this is a bulk flow that is leaving the factory. The DM provided the information that the 3PL working for this flow, knows one day in advance how much has to be transported. The 3PL pick it up with trucks and are later loaded into ferries, for transport to the distribution center.

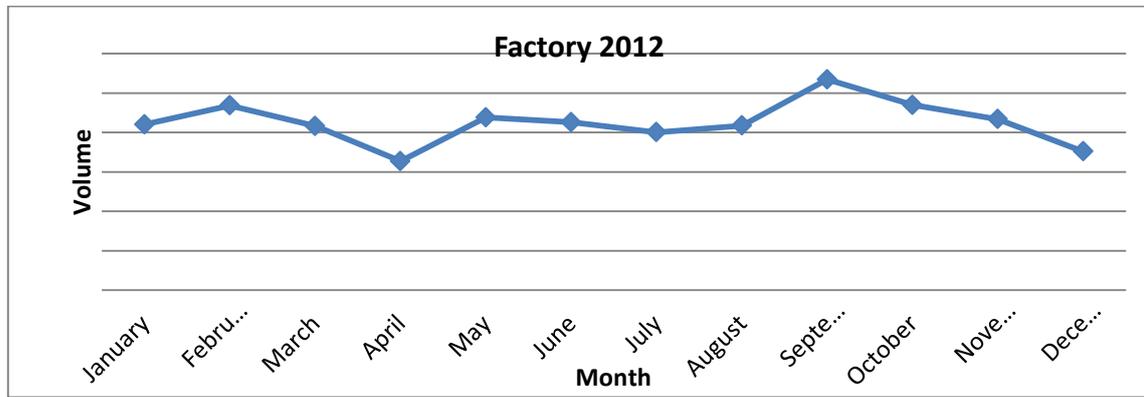


Figure 4.9 - Volumes shipped from factory to DC

To summarize the factory: since this is in the European Union importation licenses and tariffs are not of concern as in the previous flows in Africa. The figure 4.9 show how the flows behave and how much volume on a monthly in an annually basis, is being transported to the DC.

## 5 Analysis

Having presented the empirical data of the strategies, TM and especially the flows, the next step is the chapter Analysis. This is where the data acquired from the PLs and shippers are crossed referenced with the literature.

The structure of this chapter is divided into two parts which are the PLs first and the shippers second. They both contain subchapters which are the attributes of interest for a shipper. Each attribute has different focal points that were part of the questionnaire, this is explained beforehand so that the reader can follow. In the subchapter of *Organization*, the focus was on how the PLs defined their organization and whether their organizations offered either standardized or tailored solutions to customers. In *IT* the sought after information was what kind of IT-system they used, how they connect, how and what methods the PLs use to communicate, what kind of data was needed and their transparency with sharing information outside their organizations. The subchapter *Flexibility* centers around how they define flexibility in their organizations, how they handle unpredictable events and fluctuating flows. Last attribute is *Quality*, where the quality of transportation in delivery precision and their collaboration with other parties was investigated.

### 5.1 The Provider Level Attributes

Starting with the PLs, the subchapters following order of precedence is Organization first, IT, Flexibility and finally Quality.

#### 5.1.1 Organization

The data gathering from the PLs commenced by trying to understand their own image of their organization, compared to the literatures definitions. When given the short introduction of different PLs in the questionnaire, seen in appendix 2, the trucking companies Ahréns åkeri and Fluckinger defined themselves as a 2PL (CSCMP, 2012; Oskarsson et al., 2006). This was also true for the sea transport carriers Maersk and CMA CGM when asked how their organizations defined themselves (CSCMP, 2012; Oskarsson et al., 2006). Since being the transport operators they carry goods from point A to B and usually own or lease their assets. However the air carriers did not fully agree to the simplified definitions in appendix 2. Both air carriers saw themselves as something in-between 2PL and 3PL, because the respondents stated that they use trucking companies that work in their name. This is a value-adding service from their core business, which is air transportation. The trucks that the air carriers offer, can pick up the goods for the customer and drive them to the airport, for air transport. Although, their view of the definition in the appendix did not fully match with the CSCMP (2012) definition because of this extra integration in the SC. It still corresponded to Oskarsson et al. (2006) requirements of being a 2PL. Oskarsson et al. (2006) has a list of activities that a 2PL is able to do, the air carriers fulfill at least two of these where one of the activities is the pickup of customer goods. This

service, as previously mentioned, is beside their core business of air transport, a value-adding service that they offer.

The interview with the forwarder, Combitrans, was consistent with both Jonsson (2008) and Burkovskis (2008) definition of what a forwarder is. The company worked as a transport architect, organizing on the behalf of the shipper or for a 3PL and could have assets. Combitrans specialization was organizing truck transportation for their customers. When asked how they defined themselves the respondent answered they were “second-tier”, since they worked under a third-tier (3PL). It was not clear if Combitrans viewed the trucking companies as a “first-tier” level or not, which is something that needs to be further investigated. Combitrans has assets which are trailers and not vehicles (Burkovskis, 2008).

The 3PLs definition match’s the literature to a certain extent. One thing in common, when pressed, was that their core business was the management and transportation of goods. This corresponded to their core business which is one of their activities that all authors in the literature of the 3PLs mentioned. However, all the 3PL respondents pointed out that they were more than just a 3PL, even though the term is used in their organization, they had more services than the definition, that was given in appendix 2. Their statement about being able to do more matches the Hertz (2003) journal where the author concludes that they are increasing their activities and moving to the top right corner of her figure seen in figure 3.3. The 3PLs comments on having the ability to do more matches also with both Jonsson (2008) and Stefansson (2006) where they stated that it depends on the responsibility given to them. These responsibilities, besides the transportation of goods, can be integrated-logistics value adding services. Schenker and DHL have their own assets where DHL has both trucks and planes, Schenker only has trucks and Panalpina is non-asset based. Jonsson (2008) does not fully match with Schenker and DHL, where the author state that logistic service providers are normally without their own transportation resources. How the Panalpina respondent expressed their business, was that the company is a “travel agency”, where they book transportation and have value-adding business, such as administrative services for custom borders, distribution and warehouse management, these activities match with Jonsson (2008), Hertz (2003) and Stefansson (2006). Schenker and DHL stated similar analogies, which corresponded with those authors previously mentioned.

The two 4PLs UnitedLog and Schenker DS, matched with the two different definitions seen in the literature. The first one being that they offer comprehensive supply chain solutions, manage parts or the whole of the SC, which extends beyond operational activities to include tactical and strategic activities (Büyükköçkan et al., 2009; Fulconis, 2007; Magill, 2000). In other words, the 4PLs are able to do more services beyond what the customer asks for, than only transportation of goods as a 3PLs core business is. This the interviewees repeatedly pointed out their ability of problem solving in the whole SC .The other definition which contained the term

Lead Logistics Providers means that they are a “higher” level of third-party logistics and their role is to manage a network of 3PLs firms for the shipper (Gattorna et al., 2004; CSCMP, 2012). On the other hand one author stated that LLP and 4PL perform the same activity illustrating it in an image, seen in figure 3.5 (Schary & Skøtt-Larsen, 2001). Schenker DS emphasized more on the LLP/4PL concept than UnitedLog. This did not mean that both 4PLs could not work as either an LLP or a 4PL based on the literature because as the other definition stated, they are able to perform many types of activities. UnitedLog stated that their neutrality in the market, with not being asset based, was one of their strengths which matched the Win (2008) and Langley et al. (2005) descriptions of them being non asset based. Schenker DS was also non-asset based and neutral as UnitedLog stated but belonged to the Schenker company group.

When asked if the PL offered standardized or tailored made solutions almost every type of 2PL stated that their companies offered tailored solutions. The trucking companies stated that they are very adaptable to fit the customer needs in context of: delivery time, pick up time, size of the container and even the type of cargo, which was consistent with the literature (Jonsson, 2008). The air freighters Lufthansa and AF KLM respondents, also commented that they offered their customers tailored solutions. They did this in the context where the customer can choose from multiple “product types” such as: fast delivery, dangerous cargo, temperature sensitive cargo and so on. After a customer made a choice of which product type was adequate for them, they make further adjustments if other needs are required. The sea freighters Maersk and CMA CGM offered the customer standardized solutions, such as routes and cargo sizes. These routes are influenced by where the demand to transport goods exists e.g. Maersk gave an example that a lot of goods are transported from Asia to Europe, but much less the other way around. An example that CMA CGM gave was that they would not create a new route just to ship one container to another destination. Only the change in demand of transporting large quantities of goods would either change or create new routes. The sea freighters often referred to and compared this to the passenger flight business, where their organizations cannot conform to few passengers to change routes and/or make these routes more frequent. This kind of response about how the 2PLs offered their customer their services is worth highlighting for further studies since it was not seen in the literature.

The solutions between the 3PLs in offering different services to their customers did not vary greatly. 3PLs like DHL and Schenker have similar system of dividing what kind of customer they have and their importance. Schenker for example divided them into three groups, small, medium and large customer which the respondents referred to as “key accounts”. The size of the customer dictates how standardized or tailored the solution that the 3PL offer. To smaller and medium sized customers, DHL and Schenker offered standardized solutions, where the customer have to fit into their product packages and fixed networks, while the key customers are offered more tailored made solutions. Panalpina works in a similar fashion as the other two, but Panalpina’s respondent claimed that they were the most flexible and customer

oriented in the market because they did not have assets. As in the Hertz (2003) categorization attempt of the TPL (3PL), one can see that the DHL and Schenker abilities do not fit entirely in one of the boxes, the same goes to Panalpina. The 3PL respondent's border-line between many boxes and depending on the customer, can either fit into one or several boxes in the Hertz (2003) model. The 3PL companies' responses about how they divide their customer, the 3PLs problem solving depends on the customers' size. This is worth noting for further studies, since it was not extensive in the literature.

The main difference in this section between the 3PL and the 4PL, is that the 4PL does not categorize the customers in different boxes, but treat all their customers like the 3PLs "key accounts". What is being implied is that the 4PLs give their customers completely tailored solutions. Even the goal between 3PL and 4PL differs. UnitedLog stated that the 3PLs goal is to streamline their own system to give their customer good services while the goal of the 4PL is to focus on the customer needs and work from there. UnitedLog specified this is done by working as a completely independent party to develop tailored solutions around the customers' needs. This is consistent with the definition in the literature of a 4PL, where they are integrated in the customers' organization, Win (2008). A similar parallel can also be made from the literature of 3PLs where both the Stefansson (2006) theory of *LSI* and the Hertz (2003) *Customer developer* theory equals the 4PL's ability of customer adaption and problem solving in the SC.

### 5.1.2 IT

Another important factor in SCM is the information system and how two parties communicate with each other, which is an important factor to take into consideration (Wang & Yuen, 2010).

When the following question was given "*what IT system is used in your company?*" the interviewees answered "*our own*". The PLs did not have any compatibility issues between other parties IT- systems. However, there was a general opinion from the PLs on having too many IT-systems internally. These statements from the respondents correspond to Wang and Yuen (2010), that suppliers often develop a variety of systems to operate their activities. For instance Air France-KLM (AF KLM) answers to the questions related to IT and what systems they had was, "*Many, for example Cargo, Pelican and many other IT-systems*". Lufthansa had a similar response "*we use many of IT systems. We have a humorous picture, a map of how many systems we have. There is a main system in the middle and then about 50-70 systems around it*". The Lufthansa illustration of the different IT systems corresponds to Nyman (2012), where he explains the evolution of information sharing has grown into advanced IT solutions. Nyman (2012) states that to be able to manage parties, some sort of IT system is needed, this is evident in how the interviewees responded that they have an array of systems to cope with many activities in their organizations. The only PL that did not match the rest was the trucking companies Arhéns and Fluckinger, which mostly used email and telephone contact and did not have complex IT-systems. Although all the PLs worked using phone and email, CMA CGM

mentioned that their company wanted to remove phone and email and wanted to move to an interface that could solve this. An interface that would work like the booking of passenger flight tickets on the internet, but instead have the ability to book capacity on ships. Maersk made a similar analogy with buying a book on the website Amazon, which would be more user-friendly for the customer. Both Maersk and CMA CGM visions of a new interface would render positive effects with easy information sharing, that would positively affect their organizations. The sea carrier's interface vision corresponds to the transparency and information sharing, that both Swafford et al (2008) and Wadhwa et al (2010) stated will positively effect is the flexibility, operational abilities within the supply chain functions and the speed to customer changing demand. AF KLM stated that they have an e-booking system which constitutes 12% of all the bookings today and is becoming more readily available. Based on comments, the different PLs do not have standardized IT-system that their companies connect to each other because all of them have their own systems. Li et al. (2008) and Devaraj et al. (2009) indicate that advanced IT solutions have no direct effect on operational performance in the SC and could be an explanation of not having more standardized IT systems.

The data collected regarding the requested data, the trucking companies Ahréns åkeri and Fluckinger requested volume, weight, destination, delivery date and time. The information their customers wanted varied but could be fuel consumption, eco reports which includes Co emission data, Place of Delivery (POD), time and who has received the goods. The sea carrier's request of data was type of goods, departure, arrival and weight. They mostly sell whole containers, when parts of a container are sold, it is mostly 3PL or 4PL that buy it. The data Maersk customers requested from them are confirmation of the booking, what ship, arrival and an arrival notice when the goods are ready to be retrieved. CMA CGM asked for similar information to its competitor but they used an e-commerce system named INTRA, which many sea carriers use for booking capacity. Through this system they get the right info from the start and do not have to translate it to their own systems. What stuck out was that sea carriers were especially keen on weight because their companies sell whole containers and their containers have a weight limit, which was of concern if the goods are heavy but of little volume. The air carriers wanted weight, volume, timings and destinations. Over and above these specifications, Lufthansa wanted more information which had to be put into their system such as number of packages, type of goods and how the packages were packed. The air carrier's customers wanted price, what flights were available and when aircrafts landed. This kind of response is worth highlighting for further studies since it was not extensive in the literature, even though the data they requested was similar.

The forwarder Combitrans and the 3PLs Schenker, Panalpina and DHL want basically the same information as the 2PL since they contract them. The 3PL have sophisticated systems where they communicate to their many customers and suppliers (Nyman, 2012). The procedure Panalpina uses is the following: they get an order via a system called EDI, they plan and book,

then send a preface of the order to the customer. This preface contains data such as carrier, ETA and anything else of concern in the order. Other information such as deviations are only report when they occur. Finally the *Proof of Delivery (POD)* arrives and is sent to the customer through e-tools. Almost no paperwork is involved with Panalpina and this work method is similar to the DHL and Schenker systems. The amount of information depends on the size of the customer as Schenker pointed out. The bigger the customer is, the more information they want and this ultimately means they are more involved. A common criterion the 3PLs wanted from their customers was good forecasts so they could plan the management and booking of transportation and correct “master data”. This master data contains specific information such as weight, volume and so forth. The response about customer size and the amount of information requested, is worth investigating for further studies because the literature does not mention that their ability to be flexible with the customer depends on their size.

The interviews pointed out that the 4PLs UnitedLog and Schenker DS needed more and/or different kind of data and this was consistent with the literature, based on their activities on the supply chain being both tactical and strategic (Magill, 2000; Büyûkôzkan et al., 2009). The reason is because the 4PLs have the ability to work anywhere in the SC, depending on what the customer wanted from them. Schenker DS stated that their need of more information was greater since when a customer goes to a 3PL, the 3PL looks into his network and comes back with an offer of what is possible in his system and network. The 4PL on the other hand as both Schenker DS and UnitedLog attested, tact the customers need into account and try to come up with solution that is customer based. This requires a greater need of information from the customer, that is more of strategic nature than tactical (Magill, 2008). The only time the 4PLs wanted the same information as the other 3PLs is if they worked as an outsourced partner and took care of transporting the customers’ goods.

The amount transparency between the different PLs differs and what is meant with transparency is how much information the PL shares with the customer or supplier. Besides what has been previously mentioned of the exact data each PL needed, other information than this master data shared, was often on a “need to know” basis only. This was especially true with all of the 3PL respondents. But others offered more information as an extra service; this was seen with the truck companies. Their companies could offer GPS tracking so the customer knows exactly where their goods are and if they are on schedule. CMA CGM stated that their company, have been looking into using GPS but that it is not available at the moment. On the other hand Maersk mentioned they have the possibility to offer their customers to track the ship on a day to day basis. Maersk explained that the exact location out in the sea is not what the customer gets but what ports or dockyards it has passed that day. With AF KLM, the GPS was just a thought but nothing that their organization, have been focusing on. The transparency in the air transportation was not overly different from the others, the information that they usually shared is: the flight number, airports and ETA (Estimate Time of Arrival), other

information such as delays would also be shared. A problem that Lufthansa has taking into account is that customers often only know what flight, date and time and do not take into consideration when the goods is available. What Lufthansa meant, is that it takes time to unload and transport the goods to their retrieval location. So the information when it is ready to be retrieved is more of interest than when the aircraft has landed. Lufthansa provided an example of this unloading time: in Frankfurt it takes approximately six hours and in Turkey it can take twelve hours. What the respondent from Lufthansa implied, is that the unloading time varies depending on the airport size and country. This misplaced information can have a negative impact on the planned schedule due to the time span between when the aircraft has landed and when the goods are ready for retrieval. The same information is given by the sea transportation but instead of airports they share ports. The difference is their ETA is based on days and when approaching a port it changes over to hours. The answers regarding their transparency, seem to not fully match with the Swafford et al. (2008) and Wadhwa et al. (2010) definitions that the transparency of information sharing has positive effects on the flexibility and speed to adjust to customer changing demand. This is worth highlighting to further studies because based on the respondents answer, there is some miscommunication occurring between different parties, especially with the sea and air carriers.

The 4PLs have complete transparency with their clients. To be able to work for the customer the 4PLs need to integrate with their clients and work in a close relationship, this statement can be seen in the Büyüközkan et al. (2009) journal, where the 4PL definition matches the interviews view of SC integrators. One thing that both 4PLs pointed out is the need of trust to integrate and cooperate. This was evident from UnitedLog's wish to have better contact by aiming on the top management, where they can provide a better service and increase the interpersonal relationship with their customers (Mouzias et al., 2007). Finally the 4PL underlined using their IT expertise by having services that integrate several units or parts in a SC into a "control tower". This is to increase visibility across the desired area of the SC, the shipper wanted them to control and have one master IT system. This corresponds partially to the theory where they use their own resources to deliver a service or solution, which in this case, is an IT solution.

### 5.1.3 Flexibility

Flexibility is another attribute in SCM, where the significance to have the ability to respond to change and adapt is important.

The response the PLs gave regarding how their company defines flexibility, gave an array of different answers. What was in common with all of them was the incorporation of being flexible to meet the customers' needs. What all the PLs insinuated is that their flexibility has its limitations depending on their specific business. The description Lufthansa provided was one of the better formulated: *"flexibility is within its limitations, within the organization's business*

*limitations. If it does not fit than it is not by the books*". The only PL that was not as constrained as the others was the 4PL, since their organizations are flexible with the task at hand. This means that it all depends on the task given to them and that their flexibility is based on that specific task. They emphasized that their flexibility is their ability to work throughout the whole SC (Büyüközkan et al., 2009) and were not constrained to networks or assets as the other PLs.

When it comes to unpredictable events: volume changes, time changes and other factors, the PLs stated the same thing, *"It happens all the time, every day"* responded the interviewee from Lufthansa. Panalpina mentioned that about 50% of the time that they put in every day goes as planned and the rest is to be flexible because of the unpredictable events. Comparable statements were made by several interviewees, means that regardless of what customer a PL works with, unpredictable events will happen. How the PLs manage their problems depended on their size. How the problems were solved was by working methodically backwards till they found the root problem. This means, that the flexibility on handling unpredictable events for the trucking companies, the 3PL and the 4PL relates to the second Sabri and Beamon (1999) definition of flexibility, which is their ability to change delivery date and quantity in the supply chain. This definition of flexibility in the supply chain, did not match with the sea and air carriers because of their fixed routes and schedules.

The questions regarding handling unpredictable customers that had fluctuating flows, all responded that they could handle it but with conditions. Trucking companies claimed that they did not have any problem with a fluctuating market since they are very flexible. When asked how long in advance they needed to be able to remedy a change, such as time changes or volume changes, the answer was at least a day before if capacity was available. This, the truck respondents explained, was that they work on a daily basis and their planning is done mostly on the day before shipment. However, they mentioned if a change on the same day as the shipment day occurred, it was possible as long as the available capacity existed. This corresponds to Bloomberg et al. (2002) that the truck transportation market is substantial and of its monopolistic structure, so if one customer cannot provide business, they have other customers to fill out their vehicles. Ahréns åkeri also stated that if they ever should face a time where the demand in volume would be too great for them to handle, they would not mind receiving help through a competitor as a token of "goodwill" to the customer. This, the respondent from Ahréns åkeri pointed out, is in extreme cases and depending on how valuable that customer is for them. Both trucking companies, especially Ahréns åkeri, showed a high level of flexibility if based on the second definition Sabri and Beamon (1999) of their ability to change the delivery of quantity and date. The sea carriers are not as flexible when it comes to fixing a change. The difference between the sea carriers and the road transportation is that they have fixed routes and departures. When asked how much time in advanced the sea carriers needed to make a change, they mentioned that it depends on available capacity and also the destination. The sea carriers possibility to make a change is at least ten to fourteen

days before departure date but not guaranteed. The sea carrier respondents mentioned that different destinations have different frequencies of departure. Maersk gave an example of ships going from Asia to Europe where they guaranteed capacity, on to the high frequency this flow has. There are a few of these types of flows in Asia and some in Europe also. This means that as in the literature where Bloomberg (2002) mentions that the sea transportation market is of an oligopoly structure, where there is limitation in number of carriers and because of the ship limitation, they will be mostly used on high demand routes and other destinations. The air carriers are similar to the sea carriers in that they are constrained to fixed points, the airports, yet they also have more frequent routes and destinations because airplanes are faster than sea carriers. Their ability to change something in the booking was between seven to ten days prior to the departure and this as the sea carriers was not guaranteed. The sea carriers were not flexible based on the second definition of flexibility by Sabri and Beamon (1999).

The 3PLs pointed out their flexibility lies in their transport networks and the ability to handle fluctuating flows. Also the experience and knowledge in their networks are vital for their flexibility. Schenker stated that their flexibility depends on the customer size. In other words, the larger the customer, the more flexible their solutions are. This was true with the other 3PLs, even though they did not state it so explicitly. How they managed fluctuating flows depended on trying to have harmony, as Schenker pointed out. What the 3PLs meant is that the carriers that they contract might get tired of events that happen too often, so Schenker stated that they buffer this with their own assets. This was true for DHL to but Panalpina does not own assets and relies on its people and their expertise. Panalpina emphasized on their mindset to solve problems rather than getting stuck on obstacles. Schenker pointed out that its flexibility also depends on the region they are working in. How Schenker described this was by giving an example: in Europe, they could have a network of twenty trucking companies working for them for one destination which made this flow extremely flexible. While in other regions they maybe only have a handful of trustworthy and reliable transport carriers. The 3PLs could handle this also with value adding services such as warehousing and taking control of the distribution. This way they could adapt the customer's flow better to their own network. The 3PLs are considerably flexible in their ability to change the delivery of quantity and date in their network (Sabri & Beamon, 1999). Depending on the region and available suppliers, their flexibility can increase or decrease as previously mentioned.

Lastly, the 4PLs flexibility depends on what task they were given by their customers, this can be in the whole SC, which is consistent with the literature (Fulconis, 2007; Magill, 2000; Win, 2008). So their amount of flexibility is high because they can work with most things in the SC, it all depends on the needs of the customer. Being more specific: if their company were to take care of the outbound logistics of a customer, then their flexibility is greater stated UnitedLog. How UnitedLog explained this, was that they argue that the 3PL will force the customer to use its assets, system and network which will be less beneficial for them. UnitedLog pointed out

that by having a 4PL, their company make the choices which are best for the customer because they do not have a network to manage and optimize that a 3PL is bound to do. Another strength UnitedLog implied is they are flexible enough to choose a provider that can be either from a 2PL, 3PL or both. While a 3PL will most likely not seek another competitor but a 4PL has no a loyalties or networks to manage and is an independent entity in the market. Schenker DS made a comment that corresponds well to the Magill (2000) activity description with being able to operate tactically and strategically. This comment came up when the questions of how Schenker DS handle unpredictable events/ fluctuating flows, they explained that it happens all the time such as economic situations, production changes in planning and machine stops. That the expectation of flexibility from the customers, is to operationally handle these variations. Schenker DS sees it as several levels where flexibility and adaptability are seen on a daily basis and gave two scenarios. One being adapting the system on a tactical level and the other being flexible with the customers and making a tailored solution for them. How Schenker DS defined their flexibility on a strategic level was the following:

*“You can also be flexible on a strategic level i.e. being flexible in the three dimensions of thinking, planning and acting.” (CEO from Schenker DS)*

As Schenker DS previously quotation implies the 4PLs flexibility is not constrained to the tactical level but can also have the ability to operate on a strategic level mentioned in the Magill (2008) definition.

#### 5.1.4 Quality

The last attribute investigated is the quality of delivery and the collaboration between parties.

How the PLs defined delivery precision did not vary much. The 2PLs, especially the trucking companies like Ahréns åkeri, were very specific with that the goods have to arrive on the exact time that they were assigned to deliver. Ahréns åkeri were explicit that if the customer said that the goods have to be at the destination eight o'clock on that date then it is going to be there at the appointed time and day (Stadtler & Kilger, 2008; Pettersson, 2011). The other trucking company Fluckinger, was more eager to meet in the middle with the delivery precision. This way they could ensure that the delivery precision would be good since both would have an understanding that it is reasonable and possible within the boundaries of the operation. Both trucking companies delivery precision was above 90%. How their companies measured delivery precision is between departure and arrival (Stadtler & Kilger, 2008; Pettersson, 2011). The air carriers have similar systems where AF KLM has two parameters they use to measure: *local delivery performance*, which is the delivery precision of the trucks they contract in their name and *flow as planned* which is the aircrafts delivery precision. Lufthansa used one parameter for both truck and plane which was *time of availability*. Their percentage in delivering was both above 90% worldwide, while Lufthansa believed that in the Nordic countries in Europe the

percentage was higher at 94-95%. The sea carriers CMA CGM use the parameters of days and when getting close to a port in hours in their delivery precision. Maersk called delivery precision in their company as on time delivery but they measured in ETA which should not differentiate more than 24 hours *from the time they set*. The Maersk percentage was 90% and the other sea carrier stated that there were too many variables to take into consideration and did not have a number. The 2PLs interest in collaboration with their customer was to have better communication between the two, in order to form long term business relationships which would ultimately influence logistic efficiency (Ha et al., 2010). An understanding of the limitations of their carriers and routes was also voiced.

3PLs stated the same thing as the trucking companies but Panalpina gave a more exact description of their delivery precision. Panalpina call it *on time delivery precision*, where their requested due date is based on the lead-time of each type of transport type. They send an ETA to customer and then they compare the ETA with actual time of arrival (ATA) (Stadtler & Kilger, 2008; Pettersson, 2011). This is one way to measure their delivery precision but they usually do it with ATA and requested due date. All 3PLs provided high values in their delivery precision which was above 95%. All 3PLs stated that if their transporters do not meet the requirements then they change them. Panalpina on the other hand provided interesting information of the delivery precision of their transport operators they hire. Panalpina stated that the air carriers *flow as planned* percentage is 75% worldwide, their requirement on them is that they should reach 80% but it is acceptable if they do not. There was no delivery precision percentage for sea carriers but he gave an example to illustrate: *“the lead-time of the sea carriers is greater, if you have for example 40 days lead-time to a destination and the ship arrives one week later than expected arrival date. This is acceptable in the sea transportation market. This can be daunting for a customer who is used to air transport because they are not familiar with the lead-times of the sea carriers”*. When asked about when they collaborate with the shippers, all 3PL respondents wanted better communication and understanding of each other’s business. This was because the 3PLs stated that often the shipper makes unreasonable requests, this lack of understanding and communication causes friction which does not help with the logistic efficiency or to gain competitive advantage (CSCMP, 2012; Ha et al., 2010). Although the questions did not discuss exactly how the different parties had contact with each other, the common comment between the 3PLs was the need to increase communication. This relates to Mouzas et al. (2007) pointing out the importance of inter-personal relationships over inter-organizational because trust is important.

As the others, the 4PLs delivery precision depends on the customers and this is correlated on the set boundaries that were put on before. These can vary since they might have customer that do not mind that the goods arrive at any hour of the delivery date, while others want it to arrive on a fixed time. As previously mentioned, their delivery percentages also depended on the customer UnitedLog gave a few examples: UnitedLog’s standard is that when it is 95% then

it is acceptable, but if the customer goes up to 98% then it becomes quite expensive. On the other hand they have customers that crave a 99, 4% delivery precision margin, due to the delicate goods they transport for them, such as chemicals. How the 4PLs collaborated with contracting transport was they try to support them while making demands which are the same ones of the customer. If the firms the 4PL have contracted misconduct the transportation and do not meet with the minimum requirements, the only option they have is to replace the firms with others that can either 2PLs or 3PLs. When asked how they collaborated with the customer UnitedLog stated they tried to do it as in the literature: their philosophy is to work in the whole SC, with the goal of full transparency, which is consistent with the literature review (Fulconis, 2007; Büyüközkan et al., 2009; Langley et al., 2005).

## 5.2 Shippers

The same order of precedence applies to the shippers as the PLs, these are Organization first, IT, Flexibility and finally Quality.

With the Analysis of the attributes for the PLs done, next step is the few shippers contacted provided an insight into their logistic setups.

### 5.2.1 Organisation

The organization for the shippers was based on how their customer demand behaved and what kind of logistic setup their organizations had.

When given the question how the shipper's customer demand behaved, Tetra Pak and Skanska Maskin had the same answer, which was seasonal based. However Shipper Z stated that they have all types of customers which are constant, fluctuating and seasonal. Their explanation was that they have several business units in their company group and each unit has a different type of customer.

The questions regarding what type of logistic setup the shippers used Tetra Pak stated when it comes to sea and air transportation, they negotiate the prices with the carriers and then use the 3PLs to book the transportation for them. However when it comes to trucking companies Tetra Pak goes directly to a 3PL. Their explanation was that they have factories all around the world and trucking companies usually have one to ten trucks at their disposal. This means that they have to have a gigantic network of trucking companies, in order to be able to handle their distribution worldwide.

Tetra Pak use the 4PL as a mediator which they call a "control tower", to connect with all the 3PLs. This kind of setup is consistent with the Lead Logistics Provider activities of managing 3PLs (Schary & Skøtt-Larsen, 2001; CSCMP, 2012). They did not specify in what regions or routes they used this kind of setup. Tetra Pak pointed out that they have different logistic solutions

depending on where the factories and the customers are, “*there is not one way*” as they pointed out.

Shipper Z has different logistic setup within their group. They mainly use 3PLs throughout the group but in one business unit they have a similar setup to Tetra Pak. There Shipper Z, like Tetra Pak, negotiates the prices with the 2PL, then uses the 3PL to book the transportation. They also mentioned that they use a 4PL in their business group, but did not specify how.

Skanska Maskin use only 2PL in the form of trucks in their logistic setup, since most of their customers are regional. Within Skanska Group they used to have a lot of transport with 3PLs but ceased when there was reorganization in their group structure. Now they have hubs that exist where they have business and these hubs contract local transportation. In rare cases when they need to transport internationally they then solicit a 3PLs services.

### 5.2.2 IT

Here the questions were based on what IT solutions they have and how they connect to their PLs.

When asked what kind of IT system they used, Skanska Maskin responded that they have their own IT system, but this system was not connected to their transport suppliers. The information that is shared between them and the 2PL mostly occurs through e-mail or telephone.

As mentioned earlier, Tetra Pak uses 4PLs IT solution to connect with all their suppliers in certain regions. The IT systems “tower control” function is to be a single node where all the PLs are connected, to reduce the trouble of having to be in contact with several suppliers (Tilanus, 1997).

Shipper Z has approximately three hundred different IT systems in their group (Wang & Yuen, 2010). Although they have so many different IT systems, they have no problem with the compatibility of connecting with their PLs systems. How the information is shared varies depending on the business unit and can be through an IT system, an excel file or even orally.

The data that is requested was the same between the different shippers and they are:

- Movement data - origin, destination and delivery and pick up time
- Shipments data - volume, weight and type of goods
- Special requirements- which they did not specify

### 5.2.3 Flexibility

Flexibility, being the ability to respond to change and adapt, is important for the shippers which is illustrated below:

The Tetra Pak and Skanska Maskin definitions of flexibility were similar: *“be able to adapt to the customers’ needs in the best possible way”*. Shipper Z defined it as *“... flexibility, is the flexibility of the supply chain. If our customers require something from us today that we deliver today, if it had to be yesterday we deliver it yesterday, the fastest response to our customer”*.

When it comes to unpredictable events all the shippers answered the same thing, it happens all the time. Skanska Maskin mentioned that when it comes to these deviations, such as delivery, their organization have an IT system where they report to. Skanska Maskin also contract larger trucking companies since they have a greater capability to be flexible because of having more assets available to them in an ad-hoc scenario.

Tetra Pak and Shipper Z considered that the PLs that they use are flexible. Shipper Z did point out that the tolerance on delays varies within the company group’s different business units.

#### 5.2.4 Quality

Here, the data of the shipper’s quality of the delivery precision and collaboration of their suppliers are shown.

When asked how the shipper defined delivery precision they all mentioned almost the same thing: to deliver on the time that has been promised. They also have the same measurement, where they compare the ETA with ATA (Stadtler & Kilger, 2008; Pettersson, 2011).

Shipper Z stated that their measurement in delivery precision was not fully implemented. The reason for that was the lack of tool capability which has resulted from having too many IT systems. Although they did not exactly specify how they measured it or where in the SC. Shipper Z only supplied an overall rate, that was 98%. Shipper Z only has regular supply meetings where issues are discussed when they have Key Performance Indicator agreements (KPI) with them. KPI is used on four main areas which are revenue improvement, cost reduction, Process cycle-time improvement, increased customer satisfaction (Pnmssoft, 2013).

Tetra Pak did not give any numbers on their delivery precision, just that it varies depending the transportation method and location. Tetra Pak gave an example on how the delivery precision could vary depending on the different transportation methods. In the sea transportation the lead-time is usually in weeks and if a delay would occur it would extend it by days. Lead-time in air freight is usually given in hours or day and a delay would extend it in hours. The trucking companies’ lead-time is usually given in days (depending on the distance) and a delay would extend it in days. Tetra Pak shares statistics with their suppliers monthly, to give them feedback and solve problems.

Skanska Maskin claimed that their delivery precision was very close to 100%, the reason is that they measure only when deviations occur such as if wrong product is delivered to the customer. Their company currently is contracting two major trucking companies, but is changing to only have one. This is because Skanska wants to have a close and long relationship with the supplier, this they hope will increase the quality in their deliveries and a fair price.

## 6 Discussion and Conclusion

The final chapter is where all the parts of the thesis are compiled. A summary of the whole thesis begins with the research question:

The research question is what are the viable options a shipper has in using different logistic solutions? To answer the question, first an investigation was conducted with understanding the different provider levels based on their activities and then on differentiating the PLs based on attributes that are important for a shipper in their supply chain. These attributes were: organization, information technology (IT), flexibility and transportation quality aspects. Once the investigation was done, it was applied on a case study at a shipper to help answer the research question. The study fits with previous findings and contributes additional evidence that suggests, that generally, the PLs definitions match the literature to a certain degree, but evidence also shows that the 3PLs need to be redefined because they are capable of performing other PLs activities within their company groups. Additional evidence from the shippers indicates that two of three that were contacted, do not use only one type of PL in their organizations or groups. These findings suggest several possibilities of action for Shipper A to proceed, in undertaking further studies of what the implications are of changing their current PL setup to another. Also the study confirms that Shipper A, with the research question in mind, has viable possibilities to insource to a 2PL from their current 3PL setup, in certain flows. This means that the activities of managing and coordinating are insourced from the 3PLs to the shipper. Another viable possibility is to outsource the 3PLs activity to a 4PL, so they can have a network of both 3PL and 2PL. Based on confirmations, the results show, all PLs are viable to use in all the flows except the African customers, that are not able to use any form of 2PLs.

### 6.1 The Provider Level Model

With the summary of the thesis provided, now the results of the investigations are shown starting with the differences between the PLs based on their activities.

A model was created to understand the different PLs and their activities. The model is built by separating the PLs, based on their most common activities. The model, seen in appendix 1, encompasses the 2PL with 3PL and 4PL. It is named the Provider Level Model (PL-Model) and is heavily based on Jonsson (2008) and Gattorna (2004), due to the fact that they cover the different types of PLs in a simple way without overly complicating them. The authors Stefansson (2006) and Büyüközkan et al. (2009) have also been used because the former has a simple coverage of activities they are able to perform in his journal and the latter has a scale of how much activities are outsourced, which was integrated in the model. The previous covered literature with the contribution of the interviews are the basis for the PL-Model. A description of the model's content in its sections is explained starting with the First-Party Logistics (1PL):

- First-Party Logistics (1PL): The first level in the PL- Model is where all the activities that are related to SC are conducted in-house by the shipper. This means that the shipper owns assets that can be trucks, airplanes and ships. It also takes care of and manage all of it other SC, such as activities warehousing, distribution. This setup, the shipper has full control of its own SC and is able to utilize its own assets as they see fit.
- 2PL: In this setup the shipper outsources the activity of transporting its goods to the transport operators. These operators can be, trucking companies, air carriers like Lufthansa and sea carriers like Maersk. The services that they can provide are, inbound and outbound transportation, door- to- door transportation, transportation administration, transport scheduling, document handling etc. Some of these carriers do have other value add services such as storage
- Forwarder: Works as a transport architect, where they manage multiple carriers on behalf of a shipper or for another PL like a 3PL or 4PL. This means that the Shipper outsources the booking activities which forwarder then manages with a network of carriers. The activities that they can manage are storage, insurance and custom clearance. They are usually non-asset based and an example of a forwarder with assets is Combitrans which has trailers and manages a network of trucking companies.
- 3PL: Most 3PL have a wider range of activities than forwarder and are usually global companies such as DHL, Schenker and Panalpina. Their core business is the same of a forwarder but they are able to take care of more activities like export/import clearance, inventory management, warehousing, cross- docking ,planning and subcontracting necessary transportation resources. The shipper can outsource all of its inbound and outbound activities to a 3PL. They can be asset based like DHL that has planes and trucks, Schenker has trucks but Panalpina is non-asset based. The 3PLs strength lies in their big network of carriers.
- LLP: Their role as a PL is to work as a mediator for the shipper and provides logistic services through asset-based third party providers, these providers can be both 3PL and 2PL. The activities that they offer are as the same as the 3PL but with one distinction, their network not only includes 2PLs. An example of a LLP is DHL, which has this function in their group.
- 4PL: They are SC experts where they work as an integrator that assembles and manages parts of or all of the SC. The activities that they are able to manage are operational activities just like 3PL's and also include activities that are strategic and tactical. This means that the shipper is able to outsource all the activities that are related with SCM to 4PL. The 4PLs focus is to optimize and manage the SC and give a value creating business solution to the shipper.

When it came to the 3PL, forwarder and LLP the authors found a common denominator in their core business, they all book and manage transportation. The term most widely used in the literature to group them together was the term LSP. However, some authors like Jonsson (2008) also included the 4PL's into the term LSP. But through the interviews together with the

literature, the term LSP was chosen to group in forwarders, 3PL and LLP because as previously stated, their core business is the booking and managing of transport. What differs between them is the amount of activities they are able to take on and this is shown in the PL-Model. This grouping of the forwarder, 3PL and LLP into the selected umbrella term LSP, can be seen in the model in appendix 1. The term LSP will be used from now onwards.

The authors recommend Shipper A to use this model because within Shipper A they use different names in the different divisions. This way everyone understands each other by using the same terminology within the whole organization.

## **6.2 The Viable Options in the Flows**

The other part of the investigation was to differentiate the PLs based on attributes which were: organization, IT, flexibility and transportation quality aspects. With the help of the PL-Model that provides what activities they usually perform and the investigation based on the attributes, helps answering the research question. This knowledge is applied in this chapter through Shipper A and concludes which viable options they have in their flows. How the chapter is structured is the following: a type of PL begins with a summary of their attributes of relevance to the flows. Using this knowledge it is applied first to current flow situation and afterwards to a second scenario, when TM is implemented.

### **6.2.1 The 4PL**

The first PL to be explained and applied to the flows is the 4PL because Shipper A has the possibility to use them in their current scenario and in the TM scenario.

Their strengths are that they are a neutral party in the PL world and have completely tailored solutions for the customer depending on their needs. This makes them highly service oriented, they are problem solvers and like to integrate with the customers. A 4PL can work as a SCM consultant, where they can give both tactical and strategic advice in the whole or parts of the SC. Another service they are able to perform besides consultation activities is that the customer can outsource the whole or parts of its SC. What this means is that they are able to have a network that can both include the 3PL, the 2PL or both. The difference between a 4PL and a 3PL is that the 3PLs offer most customers existing solutions in their network. On the other hand, as the analysis pointed out, a 4PL works for the shippers benefit. Their flexibility is based on the task given to them and their ability to work on the whole supply chain. They also use their IT expertise to try to handle and integrate (Swafford et al., 2008; Langley et al., 2009) the information flow and coordination between different units (Tilanus, 1997). This is to counter problems in communication quality in the supply chain (Slack, Chambers & Johnston, 2007). A valid example of this IT ability is from Tetra Pak's case where they use a 4PL to handle the information flow through them as a "tower control". This point or tower where everything connects can have several functions depending on the setup. This ultimately increases visibility

for the customer across the supply chain and the information sharing is better because of this. The 4PLs are non-asset based and do not have a network to manage, unless the customer wants them to work as an outsourced partner. Based on what is previously mentioned on 4PL, their flexibility on taking on different tasks results in that they are not dependant on how a customer flow behaves. Neither their IT (Li et al., 2008; Devaraj et al., 2009) nor quality of the delivery precision will affect their operational ability on the flows on a macro level.

With today's current setup the possibility to use a 4PL is possible in all the flows. This is because they are not dependant on what the flow looks like. Since they have the ability to do anything on the SC, it is only a matter of what the customer needs are. This is also true when TM is incorporated even though Shipper A has visibility in the flows. This visibility being that they know the lead-times and how much is going to be transported in the flows.

There are two ways how the 4PLs specifically can be used in all of the flows in both scenarios. The first one as consultants based on Shipper A's needs and the second one to outsource from the 3PLs. The shipper can outsource more parts of the supply chain than just the distribution (outbound), depending on their needs (Chopra & Meindl, 2010). By outsourcing, Shipper A's benefit is that they have a partner that works in the interest of the customer with a fully tailored solution. As previously mentioned their network can include both 3PLs and 2PLs, they can contract either one or both of them. This means that the 4PL is going to choose which ones are the most adequate, depending on the characteristics and behavior of each flow. In this case, if a 4PL takes control of the flows, which is outsourced from the 3PL, Lindh (2003) states that when demand varies significantly, the capacity utilization will vary. Furthermore the author states that this lets the suppliers take the impact of the reduced demand and could mean an economic advantage. There are disadvantages in such as loss of control of the SC: dependency of the supplier, negative effects on quality and delivery precision, if the supplier is bad. Switching over to a 4PL setup would mean that the human resources that were responsible with the 3PLs can be used in other parts of Shipper A's organization.

### **6.2.2 The LSP**

Finishing with the 4PL, the next PL to be applied in the flows and two scenarios is the LSP. The term LSP, encompassing forwarders, 3PLs and LLPs was previously explained in the chapter 6.1 and the provider level model can be seen in appendix 1.

Their strengths are that they have networks of transporters which allow them to have many customers to fill out the capacities, they buy and use the network to be flexible based on time and quantity (Sabri & Beamon, 1999). What differs between the forwarder, 3PL and LLP is the amount of activities besides booking and managing of transportation they are able to do. The two who can be asset based are the forwarders and the 3PL but not the Lead Logistics Provider. How they are flexible is by adjusting different customer's goods into their networks and filling it

out. They have the potential of managing parts of the SC and can take customer's inbound and outbound supplies. The LSP, besides transporting goods have other value-adding businesses such as warehousing and documentation, which can be seen in the PL-Model in appendix 1. The activities shown in appendix 1 demonstrate the most common activities that each LSP usually perform: as previously mentioned, their network of suppliers enables them to be flexible, which allows them handle both constant and fluctuating flows. Their primary earnings are managing the transportation, they can make greater earnings when optimizing their network flows and having the other value-adding services previously mentioned. The information shared is usually on a need to know basis and increasing the transparency costs extra. The outsourcing theory of Lindh (2003) and Slack, Chambers and Johnston (2007) also apply here as for the 4PLs which is that the advantages are that the supplier can take the impact of when the demand varies significantly and in this case in the fluctuating flows of Shipper A. The outsourced partners flex is based on their wider capacity and have a greater ability to respond to changes (Slack, Chambers & Johnston, 2007). The disadvantages can be negative effects on quality and delivery precision if the wrong LSP is chosen. Also the loss of control of the SC and dependency is transferred to the supplier (Lindh, 2003).

In the current scenario, it is possible in all flows to use a LSP because they can handle both the bulk flow of the factory to DC and fluctuating flows of the customers. Shipper A uses this today but their LSPs take approximately 30 percent extra to handle the shippers fluctuating flows, due to the lack of forecast.

With the TM scenario, Shipper A has the visibility that they lacked previously and have the ability to plan their capacity better. This is because they know their products lead-times and how much volume needs to be shipped to their end destinations. In the case of factory to distribution center, the Shipper today knows one day in advance how much volume has to be shipped but with TM in place, they know the products production lead-times. What this means is that they can notify their LSP more than one day before how much volume has to be transported to the DC. The implication is that the LSP's extra cost for flex should be lowered because Shipper A can tell them more than one day before and about how much is going to be transported. The distribution center before TM would not know how much is coming in and what destination the volumes had until they arrived. With TM operational, the DC is going to have the information, about what the lead time is from the factory to them, the volumes and their end destinations provided beforehand. The implications are the same as for the customer flows because the extra flexibility buffer they are charged for must be lowered. Due to the fact that the LSPs can plan their resources better because of the increased visibility in the flows that Shipper A now has.

### 6.2.3 The 2PL

The last PL after the LSP is the 2PLs, where the different modes of transport are taken into consideration for each flow and scenario.

What is in common with the 2PLs, especially the sea and air carriers, is that they prefer stable flows where the customer has good forecasts. This is because they have fixed routes and departure schedules, the only difference between flight and sea is that the air carriers have more departures. The sea carrier's threshold of changing any kind of booking such as volume spans between ten to fourteen days. For the air carriers it is between seven to ten days. This was not the case with the trucking companies where they stated that they plan their business one day before transportation. What was in common with the 2PLs was that their threshold of change depends if the capacity needed was available and that they could not guarantee it. The quality of their transportation was certainly high but one of the LSP Panalpina provided realistic numbers based on their experience of their delivery precisions where the air carriers were around 70% flow as planned and for the sea carriers it was acceptable to be late a whole week if the transportation time was 40 days. Tetra Pak's breakdown of the 2PLs transportation lead-times gave good indications which were the following: sea carriers usually in weeks and if delayed extended in days, air carriers in hours or day with delays extended in hours and for the trucking companies in days depending on distance with delays extended into days. In the literature the advantage of insourcing is that it will give you a greater control over the processes in terms of visibility in the internal flow chain (Lindh, 2003). The disadvantages are that it usually requires investment in capacity and usually the volumes must be high enough to provide sufficient economies of scale (Slack, Chambers & Johnston, 2007).

In the current scenario, almost all of the customer flows from distribution center are not viable to use with 2PLs. This is because the DC does not know when the goods arrive, the amount and only knows its destination and volumes on the same day it arrives. Based on the lack of visibility in the flows, the ability for the sea and air carriers to make changes before departure is not possible with the fluctuating flows. Since the flows have steep volume changes on a weekly basis, the air and sea carriers cannot guarantee available capacity at least a week before departure. The only flows possible to use a 2PL are factory to DC and DC to Spain and the type of transportation is trucks. The factory informs one day in advance how much volume needs to be transported to the DC. Based on the interviews from the trucking companies, they are able to make changes one day beforehand if available capacity exists, since they plan their transportation one day in advance. This fact makes it possible to use them but the implications are that Shipper A might need to manage several truck companies to handle the factory flow, in terms of flexibility in volume changes every week. To take into consideration why to use trucks, is that the LSP that Shipper A contract today uses trucks to transport the volumes from the factory. For the shipper to operationalize using the trucking companies, it has to acquire the skills and resources either within its own organization or from outside to manage them. The

possibility to use trucks to handle factory to DC is also true for DC to Spain. The only difference is that the volumes are most likely not able to be shipped on the same day it arrives to the distribution center, due to the trucking companies need at least one day, if available capacity exists. This means that the goods will be staying in the DC until capacity to transport them is found.

In the TM scenario the sea and air carriers are still not a viable choice to use in all the flows because they still need more time when major changes of volume occur. This is evident in fluctuating flows, which was previously explained in the current scenario, of the flows changing every week. Also to take into consideration is that TM will most likely not change customer behavior with the added visibility. On the other hand, there are good possibilities to use trucking companies on factory to DC flow and from DC to Spain flow because of the visibility gained from TM. This means, shipper A is going to have more than one day to book capacity to transport from the factory and the DC is going to have information of the lead-times the goods have with destination to Spain. Besides knowing the lead-times there is the geographical advantage of the factory and the customer Spain due to the fact that the most used type of transportation of goods on the European continent is trucks. Even in the TM scenario the shipper has to contract a supplier base of several trucking companies and manage them from their organization to be able to use a 2PL.

What can be operationalized specifically on the factory flow is that seven of twelve months have almost the same amounts of volume in its figure. What this means is that the shipper can book a fixed amount of capacity based on the average of the seven months and contract other trucking companies when the volumes deviate from the average volumes. This way they have a fixed capacity which is supplemented with flexibility during volume changes. From DC to Spain a truck hub can be created where the supplier base is informed of the amounts of volumes are coming into the distribution center that is en route to Spain. This way the supplier base can offer prices to transport the incoming volumes to the distribution center.

### **6.3 Theoretical Contribution**

Finishing with the possibilities in the flow, the next step is to bullet what the thesis has contributed to the scientific community.

- Studies covered did not consider how the 3PLs categorize their customers based on size and that the size is correlated with the ability of increasing the level of flexibility of offering solutions that deviate from the standard solutions. Other parts in the literature that was lacking was the type of the data requested between the different PLs. Finally all of the PLs voiced a need to understand each other's businesses and wanted to increase communication between them and the customers.

- The studies of the third-party logistics did not match entirely with the respondents in data gathering. The authors in the literature over categorized their abilities into boxes and tried to put different types of PL under a common name such as LSP which could include the 4PLs as well. The studies conclude that two of three 3PL's can perform all activities on the supply chain within their company groups. They already have units in their company groups that work as a 4PL and own assets, such as trucks and aircraft, that correspond to the second-provider level.
- There are not many studies that have compared 2PL with the 3PL and 4PL. In this aspect the PL-Model contributes a simplified model that encompasses the most widely used activities of the different PLs. Not only that, the usage of different terms for the LSP has been confusing both in the literature and when gathering the data which the model also simplifies.

#### 6.4 Empirical Contribution

With the theoretical contribution explained, the empirical contribution for Shipper A is bulleted below.

- The authors propose Shipper A to incorporate the PL-Model in their organization, due to the fact, that within the organization different names are used for their logistics providers. The model also provides the differences the LSP have, seen in the model, which is illustrated by their most common activities they perform. By using the model and using its terminology, the possibility of misunderstanding is eliminated.
- Most of the PLs are possible in all flows both in the current scenario and TM scenario as shown in figure 6.2 below. The difference is that there are going to be benefits when TM is implemented with the increased visibility that is needed. Shipper A is going to be able to lower the extra flexibility they are paying for because they can plan ahead and inform their LSPs earlier about the amount of volumes needed to be sent. The TM scenario showed substantial possibility to use a 2PL such as trucks going from factory to distribution center and from distribution center to the customer in Spain. Why this is so is because of two factors, which are that the most used form of transporting goods in Europe is trucks and that TM is going to give them time to be able to work with the truck companies.

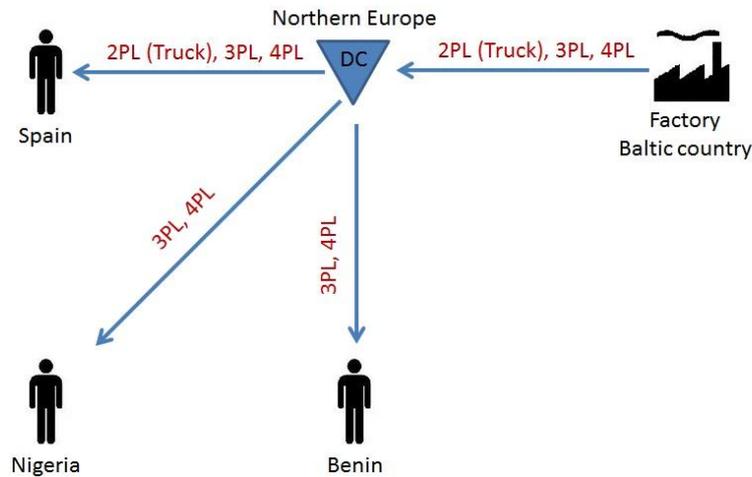


Figure 6.2 – Flow possibilities in both scenarios

## 6.5 Conclusions and Further Studies

Having finished bulleting the empirical contribution, the final part of the thesis is the conclusions and further studies.

The evidence shows that other shippers besides Shipper A uses multiple provider levels, according to the needs their flows have. This indicates that there is not always one solution for everything. The evidence from the data gathering and the application of it on the flows suggest that there are viable choices besides using an LSP on all the flows.

This research has raised subject on many questions in need of further investigation. For Shipper A to make this study complete they need to verify if the PLs that are viable on the flows are also viable in the context of costs that was excluded from this thesis. A point for the scientific community is to make further studies in redefining the large LSP because they already have the ability to perform all activities in the PL-Model, within their company groups. They have their own assets as the 2PL and they already have business units that perform LLP and/or 4PL activities within their groups. The authors propose that a new name for them to be utilized: Logistic Center Providers (LCP), they can offer all of the activities previously mentioned in the PL-model. The name implies that they are logistic centers, where a customer can choose activities in the PL-model depending on what the customer seeks.

## 6.6 Limitations

Due to the time constrains, three sources of weakness were discovered in this study when completed. The first weakness being the number of samples interviewed because even though the total sample size is large, only two of each were interviewed, with the exception of: the 3PLs, being three. The other one is that only one forwarder was contacted, this was due to the

authors were not able to acquire another source. Finally the last weakness is not contacting a Lead Logistics Provider (LLP) because lack of time.

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# 8 Appendix

## 8.1 Appendix 1 – Provider Level Model

Type		Activities	
First-Party Logistics (1PL)		<ul style="list-style-type: none"> <li>All logistics functions are conducted in-house</li> </ul>	<p>100% Insourced</p> <p>100% Outsourced</p>
Second-Party Logistic (2PL)		<ul style="list-style-type: none"> <li>Inbound &amp; outbound transportation</li> <li>Transport operators</li> </ul>	
Logistic Service Provider (LSP)	Forwarder	<ul style="list-style-type: none"> <li>Transport managers</li> <li>Manage multiple carriers</li> <li>May have assets</li> <li>Bring value-add services like, storage and terminal services.</li> </ul>	
	Third-Party Logistic (3PL)	<ul style="list-style-type: none"> <li>Tendering and contracting carriers</li> <li>Forwarding services</li> <li>Asset owner and/or buyer</li> <li>Distribution and warehousing services</li> <li>Manages part of the supply chain</li> </ul>	
	Lead Logistic Provider (LLP)	<ul style="list-style-type: none"> <li>Manages a network of 3PLs</li> <li>Broad logistic expertise</li> <li>Non-asset based</li> <li>Mediator for the shipper</li> </ul>	
Fourth-Party Logistic (4PL)		<ul style="list-style-type: none"> <li>Supply chain planner and optimizer</li> <li>Both tactical and strategic activities</li> <li>Manage whole or parts of the supply chain</li> </ul>	

## 8.2 Appendix 2 - Questionnaire for Provider Level's

### Introduction

The main purpose with the thesis work is to make thorough analysis of the service provider levels (2PL, 3PL & 4PL) and see how the characteristics fit to typical transportation flows. As a part of our thesis work we are of course very interested in having you in our research to understand your business and the value add you bring to the Ericsson organization.

A questionnaire has been made to gather information of company properties in a defined set of parameters.

Here is a simplified theory so we are on the same page when the interview is conducted.

## **Provider level**

Transport flow is the flow between the organizations, namely the movement of products between plants. Transport in this flow usually occurs either by truck, boat, plane or train. You can manage this flow either internal or buy the service (outsource) from a different company. This is divided into four levels, first-party level (1PL), second-party level (2PL), third-party level and fourth-level party (4PL).

Traditional Logistics Services (2 PL)

- ◆ Second-party logistics provider is an asset-based carrier, which actually owns the means of transportation

3rd Party Logistics

- ◆ A 3PL-provider is an outsourcing partner who handles a large part of the material flow. Accordingly, they take over tasks such as transport, handling and storage processes and value-added services (e.g. assembly).

4th Party Logistics

- ◆ Logistic service provider who offer the design, control and management of supply chains or networks for industry and commerce.
- ◆ 4th Party Logistics have predominantly integrative and informing tasks.

## **Questionnaire (Global perspective)**

### **Intro**

- What position and responsibilities do you have?
- What is your company's Core Business?
- How would you describe your company's logistic services? (#PL)
- Why did you define yourselves as #PL? ( Properties)
- Does your company own its own assets? (vehicles)
- If yes, what kind?
- What is your company's strengths
- What is your company's weaknesses

### **Organisation**

- What kinds of skills are needed for a successful collaboration between your company and your client? ( human skills e.g. right knowledge)
- From the Ovl chart, what is needed of responsibility to correspond to your companies business? (#PL)
- Does your company offer complete tailored solution or do you give your clients standardize solutions?

### **IT-system**

- What IT system is used?
- What kinds of specifications do you requested from your clients? (Data, communications, etc.)

- What kinds of specifications are requested from your suppliers? (Data, communications, etc.)
- How far does your company share information in your supply chain? (upstream & downstream)
- How does your company share this information? (Compatible IT systems, Microsoft Office files, hand written documents etc.)

#### **Flexibility**

- How does your company define flexibility?
- How often do unpredictable events occur from your clients? ( Custom/sales order, goods(volume, weight), time and other changes)
- How does your company handle unpredicted events? ( Custom/sales order, goods(volume, weight), time and other changes)
- What are the consequences of the unpredicted events?(two months, weeks, days ahead)
- How much time in advance does your company need to remedy changes? (Custom/sales order, goods(volume, weight), time and other changes)
- How does your company handle fluctuating flows ( orders frequency & volume)

#### **Quality**

- How does your company define delivery precision?
- How is your company's current delivery precision? (in percent)
- How do you measure the delivery precision? (Variables, How far in the chain)
- What delivery precision is expected from your suppliers?
- How does your company improve it's delivery precision?
- Does your company collaborate with suppliers to improve their delivery precision or do you demand them to have a certain percentage?
- If yes to collaboration, how is this done? (Transparency, knowledge sharing, etc.)

### **8.3 Appendix 3 - Questionnaire for Shippers**

#### **Introduction**

The main purpose with the thesis work is to make thorough analysis of the service provider levels (2PL, 3PL & 4PL) and see how their characteristics are.

As a part of our thesis work we are of course very interested in having you in our research to understand your business and to see how supplier's value adds your business.

A questionnaire has been made to gather information of company properties in a defined set of parameters.

Here is a simplified theory so we are on the same page when the interview is conducted.

#### **Provider level**

Transport flow is the flow between the organizations, namely the movement of products between plants. Transport in this flow usually occurs either by truck, boat, plane or train. You can manage this flow either internal or buy the service (outsource) from a different company. This is divided into four levels, first-party level (1PL), second-party level (2PL), third-party level and fourth-level party (4PL).

Traditional Logistics Services (2 PL)

- ◆ Second-party logistics provider is an asset-based carrier, which actually owns the means of transportation

3rd Party Logistics

- ◆ A 3PL-provider is an outsourcing partner who handles a large part of the material flow. Accordingly, they take over tasks such as transport, handling and storage processes and value-added services (e.g. assembly).

4th Party Logistics

- ◆ Logistic service provider who offer the design, control and management of supply chains or networks for industry and commerce.
- ◆ 4th Party Logistics have predominantly integrative and informing tasks.

## Questionnaire (Global perspective)

### Intro

- What position and responsibilities do you have?
- What is your company's Core Business?
- How does your product demand behave? ( constant, fluctuating, seasonal, regional)
- What kind of logistic services does your company use? (2PL, 3PL, 4PL)
- What criteria's have been fulfilled in your company's choice of logistics provider? (2PL, 3PL, 4PL)

### Organisation

- What kinds of skills are needed for a successful collaboration between your company and your logistic supplier? ( human skills e.g. right knowledge)
- From the Ovl chart, what placement of the parts in the figure would correspond to your company's current sourcing strategy?
- Your current logistics solution, is it a completely tailored solution or a does your logistic supplier have a standardize form that fits with your needs?

### IT-system

- What IT system is used?
- What kinds of specifications do you requested from your logistic suppliers? (Data, communications, etc.)
- What kinds of specifications are requested from your logistic suppliers? (Data, communications, etc.)
- How far does your company share information in your supply chain?

- How does your company share this information? (Compatible IT systems, Microsoft Office files, hand written documents etc.)

### Flexibility

- How does your company (you) define flexibility?
- How often do unpredictable events occur? ( Custom/sales order, goods(volume, weight), time and other changes)
- How do your suppliers handle unpredicted events? ( Custom/sales order, goods(volume, weight), time and other changes)
- What are the consequences of the unpredicted events?(two months, weeks, days ahead)
- How much time in advance do your suppliers need to remedy changes? (Custom/sales order, goods(volume, weight), time and other changes)

### Quality

- How does your company define delivery precision?
- How is your company's current delivery precision? (in percent)
- How do you measure the delivery precision? (Variables, How far in the chain)
- What delivery precision is expected from your suppliers?
- How does your company improve delivery precision?
- Does your company collaborates with suppliers to improve their delivery precision or do you demand them to have a certain percentage?
- If yes to collaboration, how is this done? (Transparency, knowledge sharing, etc.)

## 8.4 Appendix 4 - List of Contacts

Name	Title	Company
<b>4PL</b>		
Magnus Strand	CEO	Schenker Dedicated Service
Sven-Erik Andersson	Senior Adviser	United Log
<b>3PL</b>		
Andreas Johansson	Key Account Manager	DHL
Per Zellman	Global Key Account Manager	Panalpina
Martin Avrin	Regional Key Account Manager	Schenker
<b>Forwarders</b>		
Nils-Arne Eriksson	Site Manager	Combi-trans (Bring)
Adam Gunnarsson	CEO	Kales
<b>2PL</b>		
<b>Air</b>		
Mårten Pettersson	Manager Handling & Operations	Lufthansa
Noud Duyzings	Director Of Nordic Cargo Division	KLM ARF

**Ocean**

Björn Jedvert	Key Client Manager	Maersk
Roy Haiward	Logistics & Operations Manager	CMA CGM

**Land**

Pär Svensson	Regional Manager	AB Fluckinger Transport
Cliff Bergman	Transport Manager	Ahréns Åkeri

**Shippers**

Anonymous	Commodity Manager For Standard Sea Freight	Shipper Z
Peter Beijar	Operations Manager	Skanska Maskin
Kenneth Andersson	Project Manager	Tetra pak
Björn Lindahl	Logistics Manager	Tetra pak

### 8.5 Appendix 5 - Total Volumes and Shipments

