Logistics and Transport Management

Master Thesis No 2000:34

The Swedish Air Freight Industry

A complete description of the airfreight industry with specific relevance to Sweden and recommendation supporting a process that will assist the re-engineering of the traditional air cargo segment of the industry

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ISSN 1403-851X
Printed by Novum Grafiska

ACKNOWLEDGEMENTS

Writing this report could have never been accomplished without the support of the industry. A number of individuals currently active in the industry have provided us with invaluable input. These individuals made helpful comments and/or provided material for this report including: Magnus Blinge, Chalmers, Lars-Gunnar Comén, Euroavia, Christer Holst, Arlanda Airport, Magnus Rehnström, AstraZeneca, Lars Keding, Cargo Center, Niclas Johansson, Cargo Center, Jörgen Samsjö, DHL, Tommy Larsson, Lufthansa Cargo, Ulla Leijon, SAS Cargo, Gunnar Melin, SAS Cargo Terminal, Björn Lennartz, Landvetter Airport, Ann Jacobson, Landvetter Airport, Patrick Backman, ASG, Ulf Strömbäck, SAS Cargo, Björn Pålsson, Wilson, Ingrid Hjalmarsson, Sturup Airport, Johan Carlén, VOLVO Transport, Björn Ragnebrink, Skavsta Airport, Rolf Ringborg, SCAA and Wilhelm Jansson, SCAA.

Further, we wish to thank Göteborg's Handelhögskolan for providing us with the education resources. Also, we want to thank the Professors that participated in the Masters program, for sharing their knowledge with us.

Finally, we would like to express our gratitude to our thesis advisor, Professor Arne Jensen, for his assistance and valuable suggestions.

We are indeed grateful to all of you.

REMARKS

When reviewing this report, the reader should bare in mind some of the challenges the authors had to face throughout the duration of the project. The reader should understand that the project was constructed based upon the (6 months) experience both authors have had in the air cargo industry, along with information provided by the industry's participants.

Also, the reader should consider the constant presence of a language barrier, since most of the communication between the student partners was done in

English, a language that is not native to either of them. The same barrier was present during the execution of the interviews with various representatives from the industry. Further, the project was constructed by two individuals that come from different nations and cultural backgrounds.

Moreover, readers should be aware that the research was executed under significant time pressure, and that it was conducted according to the available resources (i.e. budget, work areas, access to equipment etc.). Time pressures were the result of an external factor influencing the project's time management, as interview meetings had to be arranged according to the heavy schedules of respondents.

To remedy the time-related problem the authors first formulated the main research problem together and then divided the task in two in order to meet the time obligations toward this project. In this way both authors were able to work in parallel toward their common goal. Niclas Anderson contributed Parts 1 and 3 of the Thesis (Chapters 1,2,3,11,12). Niclas has further contributed to the project by managing the project budget and by arranging interview meetings with the selected respondents. Efstathios Efstathiou contributed Parts 2 and 4 of the Thesis (Chapters 4,5,6,7,8,9,10,13,14,15). Both authors feel that the outcome of the project may have been superior, if they had the opportunity to work through each phase of the project together.

Efstathios Efstathiou Niclas Anderson

ABSTRACT

This study offers a complete description of the airfreight industry with specific relevance to Sweden. The study was done to satisfy the conditions, the way these were specified by its sponsors, Swedish Institute for Communication Analysis (SIKA) and the Swedish Civil Aviation Authority (SCAA). Further, the completion of the study fulfills the requirements of the Gothenburg Graduate Business School for the Masters Program of Logistics and Transport Management.

An introduction to the two main topics investigated in the work along with the methodological framework is presented in Part 1. The findings of the research on the first topic, titled Air Cargo Industry: structure and behavior (found in Part 2), elucidates the structure and behavior of the Swedish Air Cargo Transport Industry. Work in the second topic, labeled as Cost Structure (found in Part 3), identifies the cost structure of the industry and explains the complexities entailed in the task of defining these costs.

The study proceeds in Part 4 with the classification of sub-problems that contribute to the lack of information exchange, among the participants of what is defined as the traditional air cargo transport flow. Such classification leads to the identification of current activities executed by these industry participants that result to inefficiencies in the system. The study concludes with a recommendation supporting a process that will assist the re-engineering of the traditional air cargo segment of the industry.

Key words: **Airfreight Industry, Airfreight Cost Structure, Airfreight Bottleneck, Airfreight Industry Re-engineering**

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Part One

Thesis outlook

Part one contains an introductive chapter followed by a methodological discussion. The objective is to describe the project in general terms including research problem, purpose and delimitations of the thesis. The second chapter aims at describing the methods that were selected to accomplish the task. Further, the second chapter displays the strategy utilized by the authors to approach the problems.

Contents:

1. INTRODUCTION

1.1 Aviation History and Development

There is not much written about the earliest period in the airfreight history but since the first recorded movement of air cargo in India 1911[1], air transport industry has developed enormously, especially during the 20th century. It is generally considered that the development started after World War I with use of air for mail transportation. In the 1920s most airlines started operating by carrying mail. These operations were subsidized by the government, which supported a fast development of the air industry.
During that time passenger transportation was actually viewed as a by-product of the mail business. Although, soon after that, the passenger industry began to evolve on its own in selected markets.

The air industry developed rapidly in all the industrialized western countries. The real starting point for airfreight as a real alternative to other transport modes, was after World War II (WWII). There were two main factors that influenced the industry's development, one internal and one external. The internal driver was the technical development of airplanes and other related products during the WWII. Radar equipment and the jet plane are just two examples.

The external driver was the consequence of the war, since it exemplified the need for the transports of all kinds of goods. The demand was so large, that even shipments that were normally moved by sea were transported by air. The demand surge introduced new categories of aviation activities such as the charted flights, ad-hoc, and dedicated cargo flights.

The year 1960, was the year the next important step for the industry took place. During that year, a lot of new aircraft types were developed, resulting in more cost efficient operations and thus, lower rates to the market.

[1] Wood, D

During the last few decades, airfreight transport has grown with approximately 12-15 % yearly[2]. Today, passenger revenues are the most important source of income for the airlines but airfreight income is continuously moving in closer to the "first room", as an important business that generates profits.

1.2 The air industry from an International perspective

The world airline system carries 1.5 billion scheduled passengers a year - and more than 26 million tonnes of freight. The air transport industry provides at least 24 million jobs for the world's workforce and USD 1, 250 billion in gross output.[3]

Air transport activity is expected to double over the next ten to twelve years. More than a third of the value of the world's manufactured exports is transported by air. The airlines have also created markets - such as those for perishable products from tropical countries, which could not exist without air transport.

World	5,70%
North America	4,30%
Europe-North America	4,40%
Asia-North America	13,40%
North America-Latin America	-2,80%
Europe- Asia	5,60%
Intra-Asia	13%

TABLE 3-1 Air Freight Growths by Major Markets[4]

The profit squeeze within the passenger industry has turned the attention toward the cargo market's lower hold revenue opportunities. Industry yields for both cargo and passenger services have steadily declined since 1970. Such declines reflect airline productivity gains, technical improvements, and firming of yields during the first half of 2000.[5]

[2] Lumsden, K
[3] IATA Web Site
[4] Ibid
[5] Boeing Web Site

The international express market has continued to grow at an extraordinary pace. Growth for this segment of the industry is estimated to have averaged nearly 24% per year since 1992 (as measured in tonne-kilometres). Such growth is comparable with the one in the Unites States' domestic market during the 1980s. Further, the new services offered by the express companies, raised the expectations of the industry. For instance, today it is a must to provide the buyers with high standard services simply to avoid running the risk of losing market shares to competitors. The international express industry is expected to grow at an average of 13 % through 2019, gaining market share from today's 9,2% to 31%. The average shipment size has grown from 2.7 kg in 1992 to 4.5 kg in 1999.

1.3 Thesis Background

The Air Cargo Market has experienced an explosive growth during the past two decades. According to figures provided by Boeing, the aircraft manufacturer, air cargo services represent thirteen percent of the total of airline industry revenues (1998 figures). This market is the fastest growing segment of the industry, with an average annual growth rate of 6.4% for a twenty year forecasted period, resulting in the world air cargo traffic to more than triple in the duration of this period.

The key factor that influenced the market and provided the thrust that generated the growth is globalization of trade. The globalization's major catalyst has been air cargo services, as former obstacles to trade such as distance and time are now limited, and new trade routes and traffic flows are established. The challenge for every nation in the world is to manage to adjust to the changes emerging in the way they do business, as well as to adapt to the impact fuelled by globalization.

Competition has become fiercer, resulting in the stimulation of actors toward becoming more innovative. Competition has also caused the current shift away from set tariff pricing toward price differentiation based on value. Finally, competition is responsible for the increase of value offered to clients,

and for the ability of smaller firms to effectively compete in the world market, through the penetration of new markets formerly non-accessible to them.

The structure of distribution changed dramatically resulting to the dependence of most industries upon air cargo services. Delivery value of products has become time-measured and the capability of after-sale service has become a powerful marketing tool.

Airports have become even more critical for the economic activities of a nation as they provide the grounds for domestics industries to effectively compete. In order to exploit their pivotal position to the fullest, airports strive to offer optimum services to their shippers and assist their residents (forwarders, agents etc.) in their efforts to increase their capacity and rate of productivity.

1.4 Project principals

This project is sponsored by the SAMGODS-group. The Swedish Institute for Communication Analysis (SIKA) and the Swedish Civil Aviation Authority (SCAA) are two governmental institutes that need information for planning and analysis. They have initiated the project.The principles' demands from the authors were to describe the airfreight industry and identify the different structure components, including actors and costs. These requirements lead to the problem statement.

1.5 Statement of the Problem

When assigned with the requirements of the Thesis, the authors had set up a plan of action with which to work. Literature search was initiated from both partners for the first two months, in order to become familiar with the industry and understand what already is known. During this period the authors enhanced their knowledge about the industry and its behavior in general.

In addition, the authors were continuously looking to identify important information that would lead them to the establishment of the main problem

area to be investigated, along with the research question(s) that would be more appropriate to investigate while striving for a solution. Overall, the aim was to develop a deep understanding of the entire air cargo transport system within which the problem exists, define the problem, and set up a strategy that would lead them toward possibilities of finding solutions to the problem.

Upon completion of this enlightening period, the authors had established the problem they were going to investigate. The main problem was found to exist in the traditional air cargo transport segment of the industry and was identified as follows: *lack of information exchange between participants in the traditional air cargo transport system*. Communication inefficiencies set the obstacles to the endeavor to understand and satisfy the needs of the customers in the market, while at the same time they place a limit to the optimization of existing resources in this transport system.

After instituting the main problem to be the *lack of information exchange between participants in the traditional air cargo transport system*, the authors worked toward the formulation of the research question that would provide an explanation of the problem and possibly lead to its minimization or complete solution.

The research question to be asked throughout the research period is; *what are the sub-problems that contribute to the main problem*? To excavate information relevant to their research question, the authors organized a research strategy (see figure 1-1) to assist them in their research approach, and enable them to satisfy their Thesis purpose(s) below.

1.6 Purpose of the project

The purpose of this project is the following:

A. *To describe the organizational structure of the system (Part2)*. In this segment of the research the market and its nature will be investigated. The operations of several actors such as shippers, Fourth Party Logistics

Providers (4PL) forwarders, airlines, terminal operators, ground handling agents, integrators, and airports, will be evaluated.

Further, there will be an attempt to understand the incentives influencing the transport decisions of the shippers. Throughout this research process, the five market-driven factors that comprise the air cargo product namely price, equipment, schedules, networks and services will be considered. This segment of the project targets the satisfaction of the requirements set by the Swedish Civil Aviation Administration (SCAA).

B. *To analyze the costs, as they currently exist in the system (Part 3)*. There will be a qualitative description of the costs for each actor in the system and the different cost structures of their operations. This cost structure will satisfy the needs of the STAN model (see Appendix 5) in terms of information requirements necessary for its update.

C. *To identify possible bottleneck that affects the output of the airfreight system and to give recommendations on how these could be treated (Part 4)***.** This information will hopefully enable any actor in the Swedish Air Freight market reduce costs and improve customer service.

D. *To establish an information source.* Our description of the market may be useful for other authors that are interested in the subject. It could also serve as a springboard to further research in the topic.

In an attempt to satisfy all the purposes of the study, the authors constructed a research strategy on how to treat the sourcing of information. As it may be viewed in figure 1.1 below, the authors selected the Shipper to initiate mining for cost related information since the shipper is the most 'neutralized' actor when compared to other actors in the system when it comes to cost-related information. Further, the authors selected the Airports to initiate excavation for industry related information as the airports were also found to be the most 'neutralized' actor when compared to other actors in the system when it comes to industry-related information.

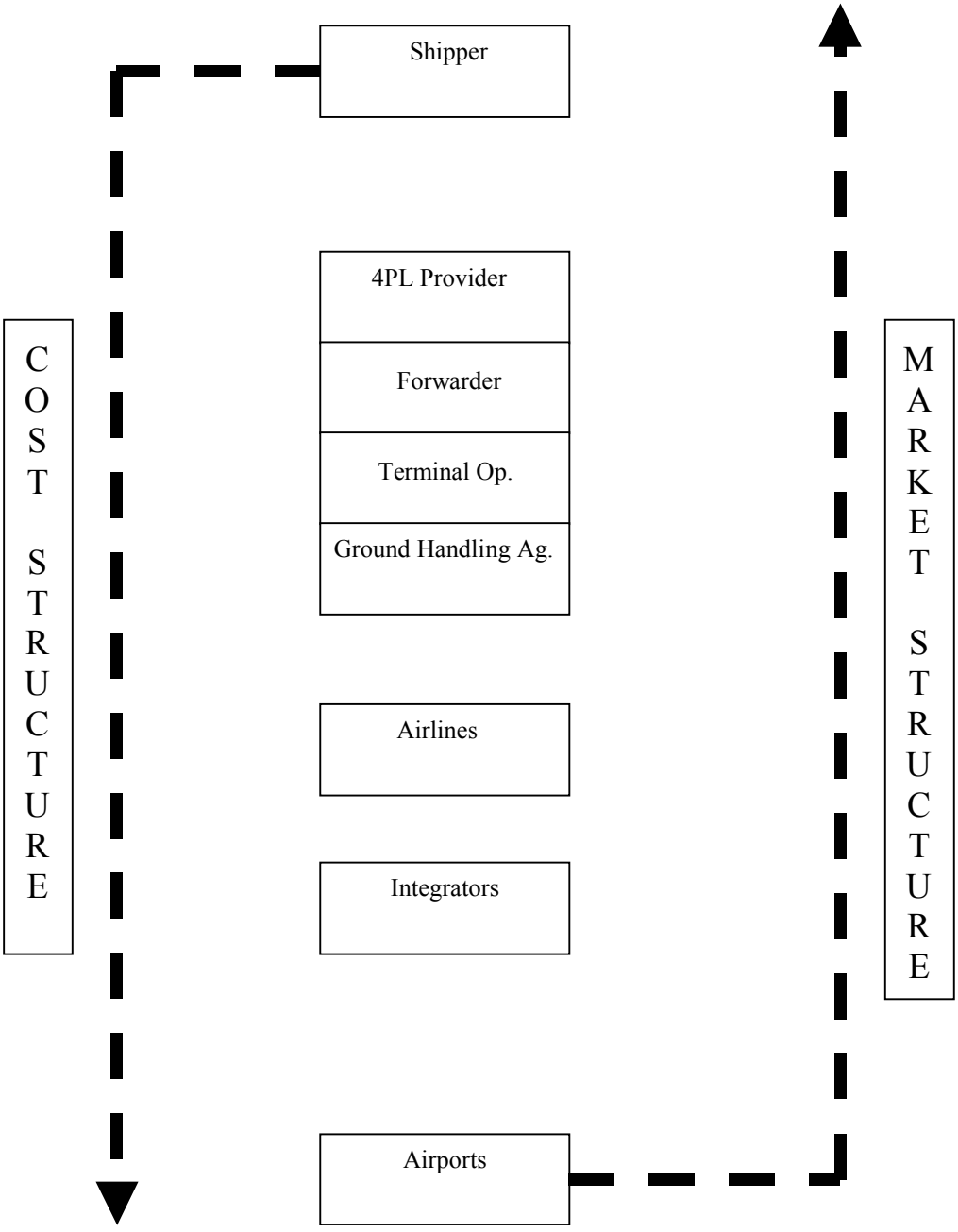

FIGURE 1-1 Research strategy[6]

[6] Researcher's own approach model (Anderson)

1.7 Delimitations

Due to the size of the task some limitations must be established on what will actually be treated in this research project. The research will focus on the Swedish air cargo market only. The nature of the business, forces the consideration of both imports and exports. As far as airports are concerned, Arlanda Airport, Landvetter Airport, Skavsta Airport and Malmö-Sturup Airport will be included in the study.

The authors will consider cargo movement as pax-belly (passenger flights carrying goods on the lower deck), and dedicated cargo freighter operations. Charter and ad-hoc operations will be mentioned but not analysed. The reason they are excluded is because these types of operations are quite rare for the Swedish market, mainly due to the near proximity of the country to major European hubs. Aircraft types to be investigated are Boeing 737-600 and A300-600. The costs that the industry will allow the authors to investigate will be quantified, since the amount of costs actually quantified will be solely based upon the response of the industry in the form of providing these numbers.

2. METHODOLOGY

" If you want to know how people understand their world and their life, why not talk with them?"[7]

2.1 Research Approaches

There are two main principals in scientific work: *positivism* and *hermeneutics*. The basic scientific outlook differs between an explanatory knowledge creating, and an understanding one. However, the borderline between the two approaches is very often diffused. Detailed discussion of the two research approaches is found below:

2.1.1 Positivism

This is a homogeneous thought which denies every fundamental difference between natural and social science. The positivists assume that successful methods in classic nature science, also is applicable in social scientific research[8]. The traditional idea states that the research *can* and *should* neglect ethic and moral questions[9]. The purpose is to find causal relations also for social phenomenon and not acknowledge any problems in considering social contexts in *facts* and *objects.* A positivist believes in absolute knowledge and tries to be as objective as possible. A positivist starts out from theories and hypothesis that could be described in mathematic terms.[10]

2.1.2 Hermeneutics

Hermeneutic means general interpretation and rejection of the nature of scientific ideal. Hermeneutics support that methods used in nature of science are unsuitable in the subject field of social science, and that there are big differences in describing the nature and to understand (interpret) the culture of it[11].

[7] Kvale, S
[8] Arbnor/Bjerke
[9] Holme I/Solvang B
[10] Gummeson E

Hermeneutic is built on personal interpretations to understand the surrounding. Andersson (1979) states, that the process used for creating an understanding, could be similarly treate, from case to case, and be described in "general " terms, as long as we are aware of that it is an individual case. The emphasis on insight and understanding could give a more balanced knowledge, which benefits the hermeneutics compared to the positivism approach.

2.1.3 Research approach used in this project

The two different approaches are more or less suitable dependent on the type of study. An advantage with the positivistic approach is the objectiveness that characterizes the entire research. On the other hand, the idea of one absolute truth could limit the field of application.

The advantage with the hermeneutic approach is the openness and flexibility for the research objects. But the researcher has to be aware that he/she is assuming the risk of becoming too subjective in the description. The airfreight industry comprises of dynamic markets with a number of different actors. Each one has its own rules. These facts along with the researchers' own interpretations make the hermeneutic approach more suitable. Some other reasons are established below:

- The authors believe that the study will not be valid forever, and for any Industry. The study evolves around the study of one Industry, the Swedish Air Freight Industry.

- Throughout the data collection process we had to analyse much of the information and make our own interpretations to understand the industry.

- The purpose has not been to find causal relations.

- The project was initiated with a "white paper" and a lot of enthusiasm; no theories or hypothesis.

[11] Arbnor/Bjerke

2.2 The research design

A research design is simply the framework or plans for a study, used as a guide in collecting and analyzing data. It is the blueprint that is followed in completing the study. There are different types of research designs suitable for specific situations. What determines the research design is the need for information.
Below are the three fundamental objectives classified and explained with a summary found in table 2.1.

2.2.1 Exploratory design

The major emphasis in exploratory research is on discovery of *ideas* and *insights*. The exploratory study is particularly helpful in breaking broad, vague problem statements into smaller, more precise sub problem statements, hopefully in the form of hypothesis. If relatively little is known about the phenomenon, exploratory research is warranted.

Exploratory research may involve reviewing published data, interviewing knowledgeable people, conducting focus groups, or investigating trade literature that discuss similar cases. The most important characteristic of the exploratory research are its flexibility. Since the researchers know little about the problem, they must follow their intuition about possible areas to investigate.

2.2.2 Descriptive design

The descriptive research design study is typically concerned with determining the *frequency* with which something occurs or the relationship between two variables. The descriptive study is typically guided by an initial hypothesis.
In this type of research, data collection is not flexible but rigidly specified, with respect to both the data collection forms and sample design.

2.2.3 Causal design

A causal research design is concerned with *cause–and–effect* relationships. Causal studies typically take the form of experiments.

Design	Uses	Types

Exploratory Research	• Formulate problems more precisely • Develop hypotheses • Establish priorities for research • Eliminate impractical ideas • Clarify concepts	• Literature search • Experience survey • Focus groups • Analysis of selected cases
Descriptive Research	• Describe characteristics of certain groups • Estimate proportion of people in a population who behave in certain way • Make specific predictions	• Longitudinal study • Sample survey
Causal Research	Provide evidence regarding the causal relationship between variables by means of: • Concomitant variation • Time order in which variables occur • Elimination of other possible explanations	• Laboratory experiments • Field experiments

TABLE 2-1 Research design summary table[12]

2.2.4 Research design used in this project

This project utilized the exploratory research design, since very little was known about the problem investigation area. While working with the project the authors developed an understanding of how the market works, who the different actors and flows are. Own thoughts were developed and were used to formulate a hypothesis based on which interview questions were constructed for each respondent.

[12] Churchill, G

2.3 Data collection method

The theory separates data as two different sources, primary and secondary data. Secondary data is information already collected such as statistics, not gathered for the immediate study at hand, but for some other purpose. Primary data, on the other hand are originated for the purpose of the investigation.
There are mainly two different methods for collecting data: qualitative and quantitative method.

2.3.1 Qualitative method

A qualitative research method aims at gaining as much information as possible from a small amount of research units. In other words the objective is to "go deep" into the knowledge bank of the different research units. There are four principal requirements to be fulfilled when using this method[13]:

1 Closeness to the research units. A face-to-face relationship with the object, which will give social interaction that hopefully, will lead to trust.

2 There has to be an accurate and true reflection of the existing conditions. A report using this method describes what is currently happening, according to the researchers objective opinion.

3 The report shall contain pronounced descriptive explanations of what has been done so far.

4 The report should contain direct quotations to have the best result and understanding of the research.

2.3.1.1 Qualitative interviews

The qualitative interview is a unique and very sensitive method to catch experiences and the content of the interviewed person's world. Its purpose is to understand the subject from the eyes of the interviewee. There are few standard rules or methodological conventions for qualitative interview research. This type of interview is sometimes labeled as unstructured or non-

[13] Holme I/Solvang B

standardized interviews. According to Holme/Solvang (1997) a qualitative interview is a drawing of an ordinary conversation. There is no designed questionnaire that guides the interview; it is more a memory list (unstructured interview). The interview person should be able to express thoughts and opinions in a natural manner. The interview could either have an exploratory purpose or could be used for testing hypothesis.

2.3.2 Quantitative method

The quantitative method is according to Holme/Solvang (1997) a broad-based study that treats a great number of investigated units. Each unit contains less information than in the qualitatively method. The study is systematic and the observations are very structured and standardized (e.g. questionnaires), with a focus on the common, the average or the representative. The distance from reality is distinct; the researcher is a spectator observing the reality. There are different techniques for analyzing the information. These mean significant simplifications of the reality.

A main problem with the quantitative method is the strong belief in numbers. It is easy to misjudge the results based on the numbers. It gives you a "black and white" picture, which may not be not be very balanced.

The quantitative method aims at collecting knowledge about a number of research units. This knowledge is then used by the researchers to compare different facts. The chosen theories are expected to provide quantified and generalized conclusions.

2.3.3 Data collection method used in this project

The qualitative method was used to search for the data necessary to complete the study. Data were collected from interviews that were conducted during the months of July-November 2000 resulting in the primary data mined from industry participants. Secondary data have been extracted from various sources and were used along with interview findings. Moreover, other secondary sources were used when it was necessary to do so.

2.3.3.1 Interview source

The purpose of this project's interviews has been principally to understand the airfreight market. Each interview was prepared carefully, since the objective was to collect as much information about the question area as possible.
Steinar Kvale's "Seven Stage model" was used to provide a fairly solid and structured approach to the interview research[14]. The model is a chronological step-by step manual that starts at the originally idea and ends up with the final report. This approach was selected so to provide some structure to an otherwise open and flexible (un-structured) interview study.

2.3.3.2 Literature and journal sources

The continuous changes in the industry are a constant variable. Based on this fact, literature use was limited to the review of former writings on market research strategies. Also, the selection of interviewing as an information search tool renders necessary the study of literature related to successfully performing qualitative research interviewing.

Further, there was an extensive research performed on articles that focus on airfreight transport and its operations. This type of research enabled the authors to develop an overall understanding of the industry through the acquisition of knowledge on up-to-date (up to two years old) information for air cargo operations.

2.3.3.3 Other sources

The size, budget and the nature of the project, does not allow the realization of a market research in the form of a questionnaire sent out to the industry. For this reason, the authors used throughout their study, the findings of a survey of freight forwarders and shippers conducted by IATA during October-November 1999, as part of the IATA Cargo Service Tracker program. Internet sites were also used for information mining when deemed necessary to do so.

[14] Kvale, S

2.4 Treatment of the research

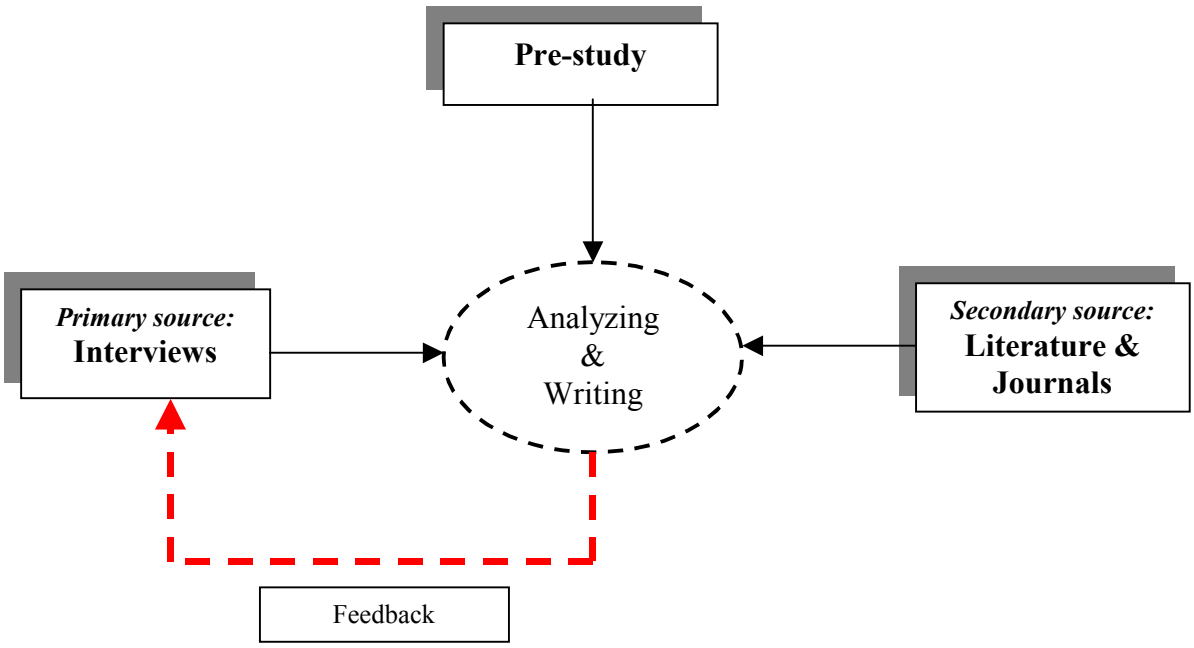

FIGURE 2-1 Research treatment model[15]

2.4.1 Pre-study

Since very little is written about the Swedish airfreight market the authors had to make a pre-study to source information about existing conditions. The first part of the pre-study was performed at Landvetter Airport in Gothenburg. The study provided valuable information about where to start the project, something that could not be done solely by reading literature. The second part of the pre-study was done by interviewing Lars-Gunnar Comén, an industry expert, who gave valuable direction to the authors, along with assistance toward the establishment of market contacts.

2.4.2 Literature search

Literature and journals were continuously reviewed throughout the entire project.

[15] Researcher's own model (Anderson)

The literature has supported the authors with important information about the existing conditions of the airfreight cargo market both on a global and domestic level. The aim here has been is to develop a deep understanding of the entire system within which the problem exists. This understanding has enabled the researchers to become familiar with what is known already.

2.4.3 Interviewing, analyzing and feedback

The issues that were indistinct were passed back to the respondents to minimize any speculations (our interpretation).

2.5 Reliability discussion

A discussion of the reliability is normally built around *relevancy* (is there data that can illustrate the research problem?), *reliability* (are the measurement units affected by circumstances?) and *validity* (do we measure the thing we want to measure?).

The authors believe that our study has high relevance, since the market (and literature) has provided them with information that can illustrate the problem statement. The authors have been neutral and no actor has been "hanged out".

Interviews were used to compliment own findings and observations. The authors have continuously requested feedback, a fact that makes reliability satisfactory.

During the whole interview process the authors tried to think objectively (in every step) in order to achieve high reliability. The researchers have controlled the actual interviews as little as possible without any leading questions to reduce question bias. They were also aware of the fact that some of the answers were perhaps "colored" to meet the interests of the interviewee. This is a reality that was discussed after every meeting to reach a result as reliable as possible.

Validation is built into the research process with continual checks on the credibility, plausibility, and the trustworthiness of the findings[16]. To achieve a high validity the authors related every stage in the project to the problem statement, and to the delimitation. They were critical and tried to relate the findings to the purpose of the study. This relation was essential considering the amount of interviews and the complexity of the subject. “To not lose the concept has been an underlying goal”. The authors believe that this outlook and attitude to the research project has contributed to a high validity of the results.

[16] Glaser, B/Strauss, A

Part Two

AIR CARGO INDUSTRY- STRUCTURE AND BEHAVIOUR

The objective of Part 2 is to make an attempt to explain the interaction between the industry's participants. The interaction is exhibited in the industry interaction model, in Figure 3.1 below. To accomplish such an explanation the subsequent chapters offer a comprehensive description of the air cargo transport industry, while emphasizing on issues such as the position, operational structure, opportunities, constraints, and requirements of each industry participant.

A brief introduction below, demonstrates some information for the reader to consider, before reviewing the rest of the chapters in this section.

Information found in this Part of the Thesis may be of particular interest to SCAA and to authors that have an interest in the subject.

Contents:

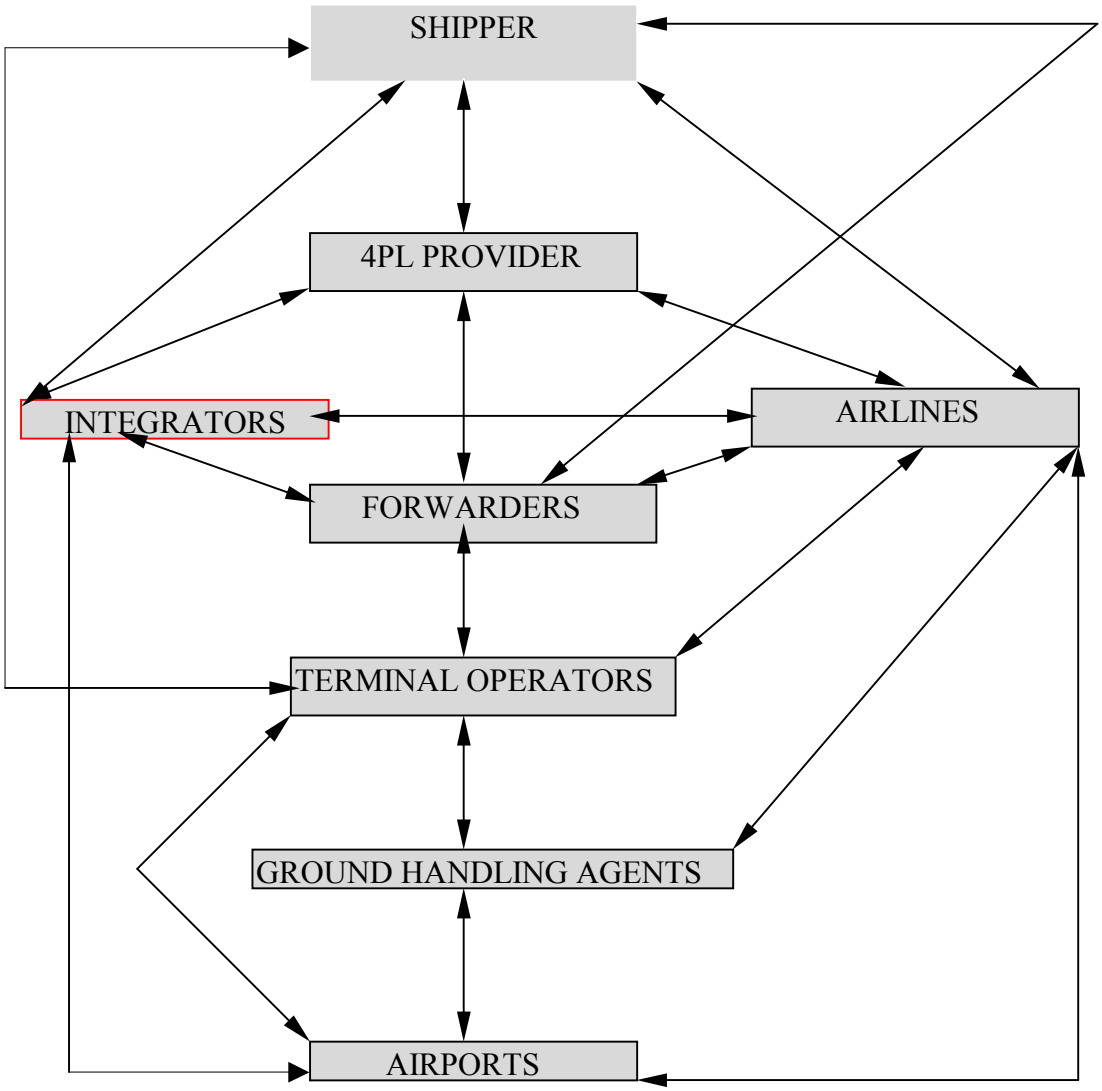

FIGURE 3-1: Industry interaction model[17]

INTERACTION: ⟷
(BUSINESS RELATIONSHIPS)

[17] Researcher's own model (Efstathiou)

3 INDUSTRY OVERVIEW

3.1 National and International organizations

International air transport is one of the most dynamic and fast-changing industries in the world. The air industry has always been highly regulated due to several factors. One of these factors is the safety issue. Bi and multilateral agreements between countries have formed a framework for how air movement can be achieved. There are a number of different organizations that play a decisive role in coordinating efforts for operations, administration and technical routines. Some of these important organizations are mentioned below.

3.1.1 IATA- International Air Transport Association

IATA is the trade association of the world's international airline industry. Originally founded in 1919, it now groups together nearly 270 airlines, including the world's largest. These airlines fly over 95 percent of all international scheduled air traffic.
In a fast-changing airline world, where privatizations, alliances and increased competition are global realities, airlines still need to cooperate, in an attempt to offer a seamless product of the highest possible standard, to the world's air passengers and cargo shippers. Much of that cooperation is expressed through IATA, whose mission is to "represent and serve the airline industry".

Continual efforts through IATA ensure that people, freight and mail can move around the vast global airline network as easily as if they were on a single airline in a single country - and that Members' aircraft can operate safely, securely, efficiently and economically –under clearly defined and understood rules. IATA is the collective voice of the world's fastest growing transport sector - which, in turn, is part of the world's largest industry - travel and tourism.

For the general public, IATA simplifies the travel and shipping process. By helping to control airline costs, IATA contributes to cheaper tickets and shipping costs. IATA allows **airlines** to operate more efficiently. It offers joint

ways - beyond the resources of any single company - to exploit opportunities, reduce costs and solve problems.

For **third partie**s, IATA is a collective link between themselves and the airlines. Passenger and cargo agents are able to make representations to the industry through IATA and derive the benefit of neutrally applied agency service standards and levels of professional skill. Equipment manufacturers and third-party service providers are able to join in the airline meetings, which define the way air transport goes about its business.[18]

3.1.2 ICAO- International Civil Aviation Organization

The organization was founded in 1944. Its headquarters are located in Montreal, Canada. The main purpose is to develop the technology and principles of the international aviation. They also aim at supporting the planning and development of international air transportation. ICAO work in close cooperation with IATA when it comes to the standardization of navigation aids, traffic control issues, ground communication between airports, the creation of international air maps and in the analysis of air traffic and accidents statistics.[19]

3.1.3 FIATA-International Federation of Freight Forwarders Associations

FIATA is a non-governmental organization that today represents approximately 40,000 forwarding firms. FIATA is the largest non-governmental organization in the field of transportation. Its influence is worldwide.

FIATA's main objectives are[20]:

1 to unite the freight forwarding industry world-wide

2 to represent, promote and protect the interests of the industry by participating as advisors or experts in meetings of international bodies dealing with transportation

[18] IATA Web Site
[19] ICAO Web Site
[20] FIATA Web Site

3 to familiarize trade and industry and the public at large with the services rendered by freight forwarders through the dissemination of information, distribution of publications, etc.

4 to improve the quality of services rendered by freight forwarders by developing and promoting uniform forwarding documents, standard trading conditions, etc.

5 to assist with vocational training for freight forwarders, liability insurance problems, tools for electronic commerce, including electronic data interchange (EDI) and barcode.

3.1.4 SCAA - Swedish Civil Aviation Administration

SCAA is a state owned organization responsible for the civil aviation administration in Sweden. They shall *ensure a macro-economically and sustainable transport supply for individuals and the business community throughout the country and provide economically efficient operations and develop state owned air navigation services, airports and related activities*[21]. Some of their main tasks include safety issues such as regulations, analysis, and provision of advice to the industry. SCAA works toward the development and the improvement of civil aviation. In parallel to this work SCAA is responsible for the protection of the environment against pollution from civil aviation. 20 airports are currently operated by the SCAA. In total there are 4 243 SCAA employees all over Sweden.

3.2 Developments influencing the air cargo markets

Electronic commerce is the most rapidly changing, misunderstood, and potentially of significant influence to the air cargo industry today. The relentless advance of Internet capabilities and market penetration, quickly eclipse even the most recent predictions. Potential consequences for commercial air cargo, range from stimulation of time-sensitive traffic to increasing pressure on yields and diversion of documents to digital media. Given the unprecedented increase of Internet transactions, estimates of seven-fold growth in the business-to-business (B2B) and three-fold growth in the

[21] LFV Web Site

much smaller business-to-consumer (B2C) market by 2003 are not surprising. The time and cost advantages that B2B e-commerce brings to order processing and logistics planning will increase emphasis on time-definite delivery. However, B2B e-commerce is not expected to fundamentally change the way businesses actually move their goods.

At about a third the size of the B2B segment, B2C involves commodity and higher value consumer goods. Internet consumers expect rapid delivery but are sensitive to price, which favors surface-based transport. Thus, time-definite service, cost efficiency, and greater integration of customer and transport systems remain priorities in both e-commerce segments. Estimating e-commerce impact on shipping patterns and, specifically, air cargo traffic is a major challenge for analysts. The current concentration of transactions within contiguous continents has, so far, favored ground transport. As intercontinental transactions become more common, it is reasonable to expect that both e-commerce segments will contribute to air cargo growth in excess of general economic expansion.

Because air cargo 's primary advantage over surface transport is speed, the industry can be expected to embrace any technology that enhances that advantage. The value of e-commerce to the industry may therefore emerge as comprehensive B2B exchanges might provide the means to integrate marketing, manufacturing, and logistics.

Document transmission stands out among the many uncertainties that beset forecasting Internet effects on air cargo traffic. Some observers estimate that as much as 30% of the document business may eventually, be siphoned off by the Internet. UPS, USPS, and TNT are among the numerous carriers who currently handle significant paper document traffic. Several obstacles must be overcome before the full potential of Internet transmission can be realized. These obstacles include security and barriers to entry for new competitors, as well as a number of dependability factors beyond the control of electronic service providers. Until these issues are resolved, it is unlikely that the Internet will divert significant document volumes in the short term.

3.3 Characteristics of the market

The airfreight market has a different structure of operations when compared to the passenger segment. The most important are as follows[22]:

3.3.1 Directional imbalances

The imbalances at some destinations are sometimes significant and create a big problem for the airlines. The flows of goods are not evenly distributed and this affects the load factor in terms of lower efficiency. Low unit efficiency is a contributing factor that makes some routes unprofitable. On the contrary, passenger operations do not experience this constraint so often since most people leaving by plane also return by plane.

3.3.2 Heterogenous vs homogenous markets

When viewing the passenger segment, one notices that it is relatively homogenous with needs that do not differ so much. The freight market's needs on the other hand, could vary in terms of size, service, weight etc.

3.3.3 Network structure

In comparison to the passenger routes, the all-cargo network is very little developed. The airfreight market is therefore highly dependent on the selected freight capacity for scheduled passenger flights.

3.3.4 Day and night transport

Passengers prefer to travel during daylight and therefore most of the departures are scheduled during daytime. Freight buyers on the other hand are interested to move cargo with night transports.

3.4 Frequent air cargo flyers

Normally there are time sensitive goods types that are transported by air. Four main characteristics can be found among these[23]:

[22] Comén, L-G (1988)
[23] Lumsden, K

3.4.1 Perishable goods

Several types of goods can easily lose value. Examples are fruit, vegetables and flowers. Also, some types of chemical substances may be time sensitive. Transport time (lead time) is therefore essential and this is something that the air transport can fulfill, especially over longer transport legs.

3.4.2 Goods with news value

Goods risking being out of date could be newspapers and fashion clothes. Another moved-by-air-candidate on the rise, is different types of computer equipment and peripherals.

3.4.3 Products with special demands

After-market services have created a new and lucrative market for the air industry. Companies now offer the customers a total service packages with service and support to be available after the sale of a product.

3.4.4 High value products

The competitive time advantage is even bigger for products with a high value per weight unit. Reducing the capital costs and minimizing the risk of pilferage are important quality related factors discussed when high value products are in question.

4 SHIPPER

4.1 Shipper's logistics activities of operations

To effectively describe the logic of operations utilized in several industries, it is imperative to first identify the logistics processes implemented by these organizations.

Business Logistics is a comprehensive concept covering both physical distribution and physical supply. These activities are separated into key and supporting activities for both procurement (inbound) and distribution (outbound) flows as it viewed in below (Figure 4.1). When these flows are correctly coordinated, a firm may achieve better equipment utilization and therefore generate substantial savings. Moreover, by having a single, responsible logistics function, reduction of costs is possible since one department coordinates all of the logistics-related activities.

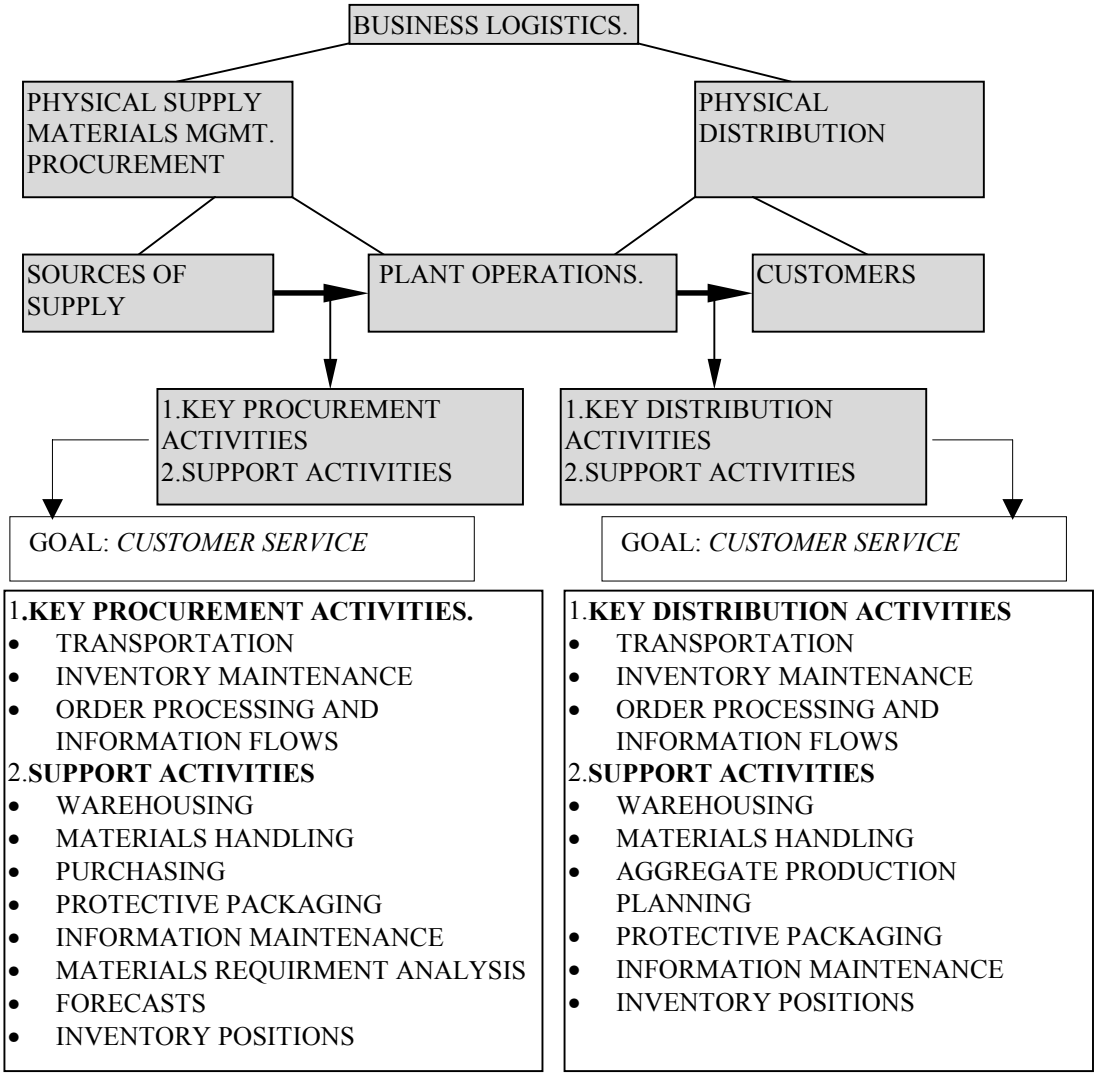

FIGURE 4-1 Business Logistics Concept[24]

Detailed description of all the activities presented in figure 4-1 is available in Appendix 4.

4.2 Logic of Operations

When one observes the air cargo market's forecasted growth figures found in the Boeing Report 2000, one realizes that the air cargo segment is the fastest growing segment of the industry, with an annual forecasted growth rate of 7% for the next 20 years. This growth rate is the result of some significant changes in the logic of operations of the cargo generators (shippers). Below are some of

these new processes, implemented by competitive companies throughout a wide range of industries.

4.2.1 Shorter Product Cycles

Consumers have become more sophisticated and more demanding in their purchase of goods and services. This shift has placed a strong pressure on the research and development departments of companies to produce new and improved products and services continuously, in order to satisfy the demands of different markets.

The outcome of this whole issue was that companies learned how to manage to create a new product much quicker. Speed in new product development is gained through the establishment of a basis providing a commonality of components used in all products manufactured by a company. By maintaining a standard design for these products a company need only produce a few new components to satisfy the improved functions of a given product. In this way the product design process is simplified and the whole process's time is reduced, as only a small number of new components must be tested for performance (same product basis).

Further, cost reduction schemes and the elimination of non-value-adding processes, has led to the amplification of the manufacturing processes in many industries. In turn, these improvements in production have led to the reduction of a product's life cycle as is viewed in figure 4.2.
Consequently, companies are now pressured by time to get their new product to the market in time, so it generates enough sales to cover its development cost and provide for a sizeable profit.

The solution to the constraints of time is found in the inclusion of freight transport by air, justifying the increased cost of transport by the increased sales the product may generate by getting to the market faster. Moreover, air transport ensures that the product will get to the market in the appropriate time. Use of other slower modes of transport are not an option, simply because the

[24] Lecture 1, Jensen, A

product will arrive wherever it is demanded, late. Transport of articles by air safeguards the product from becoming obsolete when arriving at the market place.

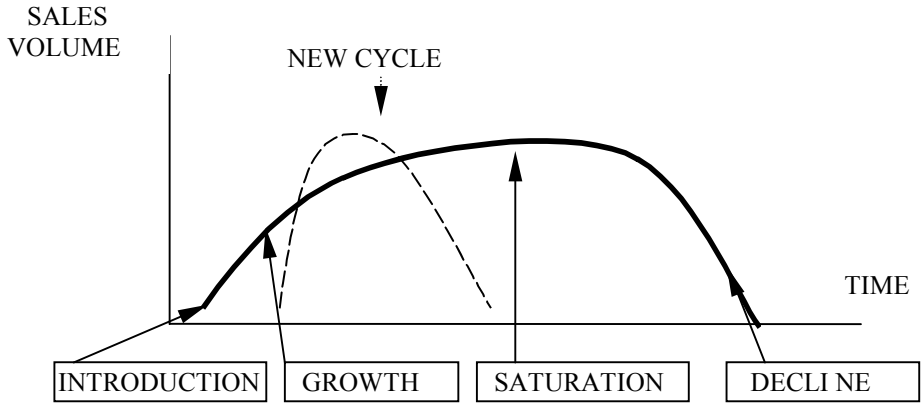

FIGURE 4-2. Product Life Cycle[25]

4.2.2 Just in Time Manufacturing

In recent years, companies in the manufacturing sector have implemented Just In Time (JIT) manufacturing for their production operations in order to achieve cost reductions on the total of their inventory carrying costs. Companies in these industries screened through their supplier base and eliminated the ones that were incapable of operating in the JIT environment. Further, they conditioned the remainder of the suppliers, so as to synchronize their operations and align them to theirs.

These activities led to the establishment of modularization as a standard in many industries. When a manufacturer structures his production processes to host modularization, it means that his suppliers are capable of producing entire modules of what goes in the product and not individual components. Parts arrive JIT at the assembly line as modules, that are directly processes to construct the product. No warehousing and no storing means that these costs are eliminated from the production system and are thus generators of cost reductions.

[25] Lecture 1, Jensen, A

Several companies prefer to sustain the premium in transport costs for the transport of the modules or components by air and ensure that their assembly line will keep on running. One should keep in mind, that the costs assigned to a production line remaining idle are substantial. An example of such costs will help illustrate, "For every minute an automobile assembly line is down, the car manufacturer loses significant amounts of money. Honda Motors Co. for example, loses $24,000 every minute its primary assembly line in Marysville, Ohio, is idle; secondary-line downtime costs is $11,000 a minute."[26]

4.2.3 Globalization of Sourcing and Selling

The procurement process has undergone some important changes. Companies source their raw materials, based on factors other than transport cost. They now source globally and trade off the high transport costs with gains generated by economies of scale achieved at the country of production, lower prices offered by suppliers due to productivity gains, and gains from warehouse and storage centralization.

At the other end of the logistics system, companies are aware that the capability to deliver anywhere in the world translates into higher sales. However, in order to be able to distribute globally, they must be capable to do so with a competitive "landed cost" as this cost defines the extend of the market for a given organization. "The works of Fetter and Losch suggest that the extend of the market area for two competing firms is the point where the landed cost is equal for the products of the two firms. The market area for the seller will be the area where the seller has a landed cost advantage over its competitor because the buyer is assumed to select the seller that offers the lowest price (landed cost)"[27].

Further, many organizations are integrating their marketing and logistics departments, with the aim to improve the distribution capability of the company, generate value for the customer through its implementation, and

[26] Orton, C
[27] Coyle, J., Bardi, E., Novack, R.

effectively communicate that value to the customer through the marketing department.

4.2.4 Postponement and Mass Customization

As stated above, product life cycles have significantly shrank. This actuality has placed a pressure on companies to compress their product development processes. Also, the cost of development had to be treated differently, as companies where running the risk of not having enough time to recover their product development investments along with sizeable profit, again due to shorter product life cycles.

For these reasons most organizations rearrange their production processes and standardize most of the components of their products. Standardization then, enables a company to take advantage of its production capacity fully and realize scale economies through the production of a uniform product in volume. At the same time a firm is capable of providing a variety of products to the market, since it can develop new products faster due to the commonality of its components. Development costs are lower and customer value is higher, since a wider range of products, with improved features, is more widely available.

Standardization is also responsible for the change of strategies regarding distribution and the way demand is treated. In previous years demand was treated with “push” strategies. That is, stock was fed into the system and inventory buffers were built so to anticipate demand at every point in the distribution channel. Several quantities of different inventories were held in every storing location owned by an organization.

Standardization of production though enabled postponement also know as demand “pull” strategy. Postponement in production means that a different range of products, are commonly produced partially and are then kept as Work in Progress Inventory (WIP). When the company receives an order for the product the WIP’s production is completed. Postponement in turn enables customization of the product to the market’s and the customer’s requirements.

For example, a company receives an order for product X for the delivery of 50 units to Italy and 30 units to France. 80 X units are then pulled out of the WIP inventory, 50 are complemented with instructions, packaged and labeled in Italian and 30 units are complemented with instructions, packaged and labeled in French. Clearly through the ability to customize, companies reduce their inventories and become extremely flexible in terms of satisfying the market's demand. These cost reductions more than compensate for the additional transport cost a firm may have to sustain for the use of premium transport often involving airfreight and LTL (Less than Truck Load) road haulage.

Martin Christopher, the author of Marketing Logistics, provides an excellent example concerning postponement, through his description of Benetton's postponement concept "they take the plain undyed yarn and knit a pullover. Garments can then be dyed in small batches when demand is known. The advantages of this are considerable. Firstly, only one color is held in stock- plain undyed, grey- thus dramatically reducing the amount of inventory held in total. Secondly, great flexibility is achieved since the garment can be dyed in any color depending upon local demand"[28]. Figure 4-3 below indicates clearly the effects of postponement.

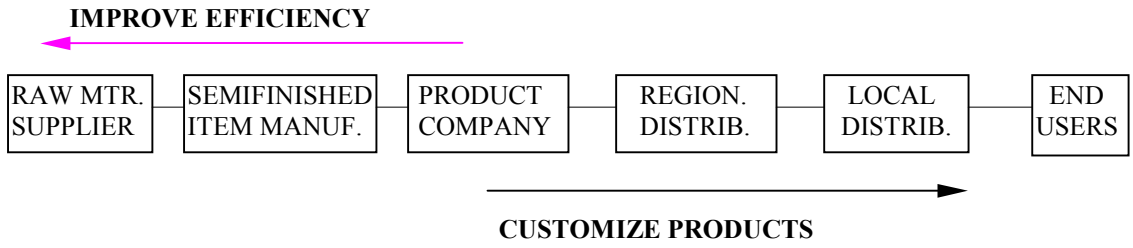

FIGURE 4-3: Postponement and customization[29]

4.2.5 Inventory Management

To understand the real cost of inventory one should consider total inventory carrying cost for the U.S. standing at $332 billion (1999) as an example[30]. The

[28] Christopher, M
[29] Lecture 3, Mattson, S-A
[30] Cooke, J.A

average inventory carrying cost for a given manufacturer is estimated to be in the range of 25% of direct cost of goods sold. Figure 4-4 indicates of what comprises the inventory carrying costs for a company.

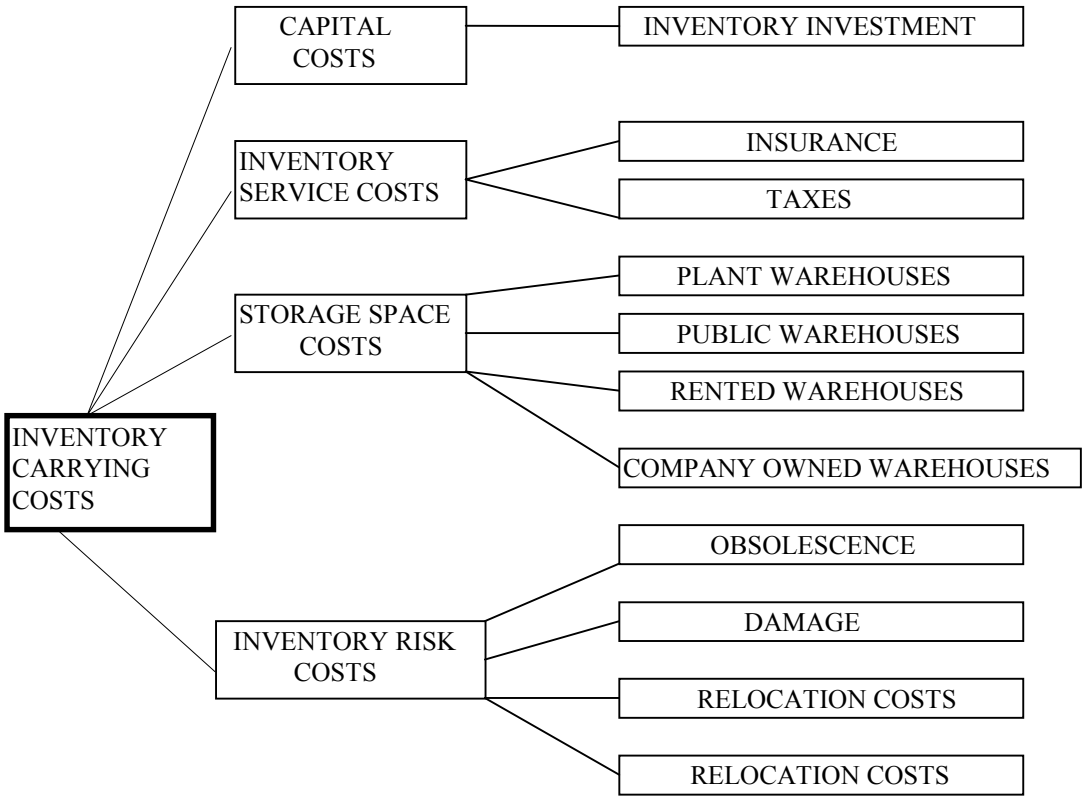

FIGURE 4-4 Normative model of inventory carrying cost methodology[31]

As it is exhibited in figure 4-4, these costs are divided into Capital costs, Inventory Service Costs, Storage space costs, and Inventory risk costs and their importance varies. Inventory management is a major determinant of a supplier's profitability. The supplier's profitability largely depends on how fast a company can turn stock into cash. With more stock-turns, a supplier can generate annually the higher gross margins for the company as inventory-carrying costs are divided into each stock-turn.
A more detailed description of inventory carrying costs is available in Appendix 6.

[31] Lambert, D.M. (1976)

4.3 Position in the system

4.3.1 Service Demand Generator

What is it that the shippers need their suppliers (air transport cargo service providers) to do for them?

1. Reduce their lead time
2. Assist them in the maintenance of a lean supply chain
3. Help them minimize their inventories
4. Help them reduce their procurement and distribution costs
5. Help them focus on their core competence
6. Be so good, that shippers can use them to gain new business in the form of their production superiority and distribution capability when compared to competitors.

The position of the shipper in the airfreight system is that of the actor that generates the demand for the service, and justifies the existence of the air cargo transport industry. No matter what the conditions, when the shipper's output is 0 the demand for air freight transport services will also near 0 with the exception of some consolidated freight from other destinations.

4.3.2 Modal Selection

Based on IATA' s 1999 survey report, over half of the shipper sample (60%), send less than ½ of their output by air while the remainder of the sample (40%) use air transport to send more that ½ of their output. According to these findings the percentage of cargo sent by air, has increased considerably. Based on the same survey, 23% of the shipper sample sends more than 50 shipments per week by air and another 23% uses air transport for 21-50 of their weekly shipments. Finally, half of the shipper sample was found to advance less than 20 shipments per week[32].

The question here is: why choose to ship cargo by air? The answer is found in section 4.2. All company processes have become time sensitive (see Appendix

[32] Hind S., Trounce C., Aulton N.

4). Air transport may cost more but it offers the benefit of reduced lead times, an advantage so greatly appreciated by various industries. Also, transporting by air makes the shipper more flexible to demand fluctuations without the need of excess inventory. Moreover, a shipper is capable of providing a superior service to its client as smaller batches can be delivered to the customer, minimizing their own inventory costs. In addition, quality of service is higher as transport by air can most often provide the reliability most customers depend on, since they operate in a JIT environment. Finally, shippers experience higher levels of security as the transit time of their product is reduced and most of that time is spent in the air.

In order to clearly exhibit the benefits realized by companies that use air transport, the Contracting Manager of Volvo Transport, a Fourth Party Logistics (4PL) provider, was asked to compare the transport of a shipment by two different modes; the illustration evolved around Volvo Transport's importing activity of audio equipment from Japan (1 shipment per day). By having the equipment flown in, VT saves time for its client's production. It takes 6 week to bring these items to Gothenburg by ship. Naturally, transporting by ship is not an optimal solution for the company's clients that operate in a JIT manufacturing environment. Also, the tied up capital vested in the shipment for several weeks more than compensates the higher cost for air transport[33].

[33] Carlén, J

4.3.3 Service Provider Selection (Product Flow Model)

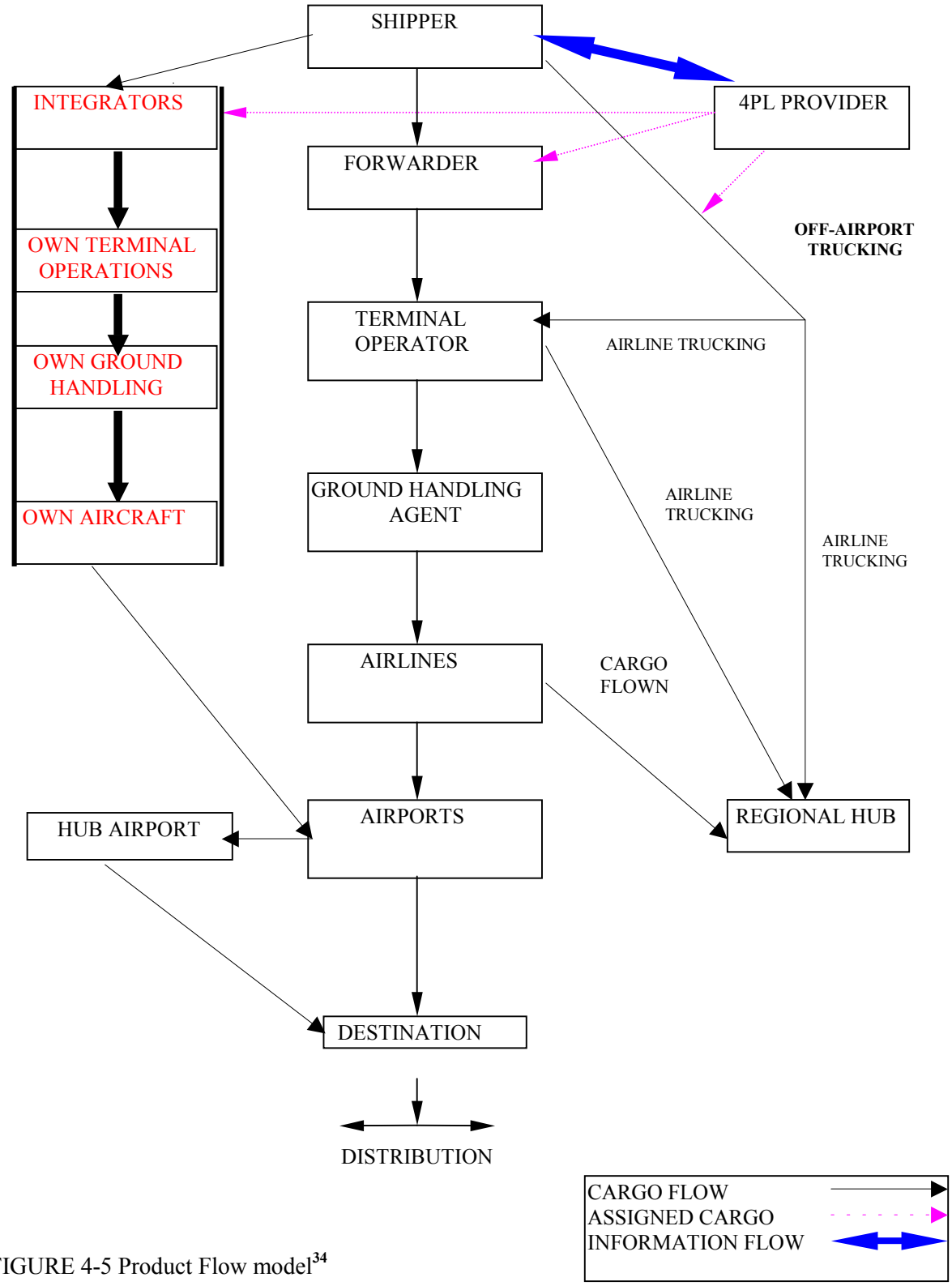

FIGURE 4-5 Product Flow model[34]

[34] Researcher's own model (Efstathiou)

As may be observed in figure 4-5, a shipper has a choice to transport his output through four different flows. A general introduction of these flows is presented below, followed by a more thorough explanation found in the individual chapters dedicated to each actor.

1. The cargo may be transported through the traditional air cargo transport chain: the forwarder picks up the cargo consolidates it and moves it as such to the airport terminal. At the airport terminal the cargo is unloaded at the terminal operator's premises. The terminal operator prepares the shipment for export and moves it to the ground handling agent's premises. Ground handling agents then, move the cargo out to the tarmac where it is loaded on the aircraft. The aircraft then transports the cargo to its destination. Once unloaded at the destination terminal and after the import process (de-consolidation, customs clearance) is complete, a local forwarding agent picks up the cargo and delivers it to the consignee.

2. The cargo is assigned to an integrator who is responsible for the pick up. The integrator owns all the fixed facilities (airport terminals, handling facilities, trucks) necessary for the transport. Ownership of all the facilities enables better control on the processes (i.e. handling). The same process as in the traditional air cargo chain is implemented in this flow as well. The difference is, that at the destination point, a load is delivered by the integrator rather than by a forwarding agent (door-to-door service). Also, integrators manage to reduce the lead times even further through the speed of processes at the nodes of the transport chain, due to the complete control they exercise over these operations.

3. The cargo is assigned directly to the airlines. Airlines are responsible for the pickup of the cargo its transportation to an airport of their choice (Off-airport trucking, see airline chapter 7.1.) and its processing through the airport terminals. At the destination the airline arranges for the import process activities and may maintain its own truck fleet used to complete the distribution at the consignee's premises.

4. A fourth party logistics provider (4PL) is responsible for the transport of the cargo. The 4PL, being familiar with the requirements of the specific task assigns the transport accordingly, to an integrator, a forwarder or directly to an airline. The 4PL provider maintains an established channel of communication with the shipper, so to be able to select the appropriate solution for its client's needs. No actual cargo flows through the 4PL provider, since these do not own such facilities or equipment. Again, it must be stated that the 4PL provider on behalf of the shipper assigns the cargo.

4.3.4 Service provider selection criteria

In their selection of a flow through which the product will be distributed, shippers use a number of criteria to determine whom to employ. Two of the key criteria identified by the shipper sample in the IATA survey as the most important for their carrier selection were Best Price and Reliability[35].

4.3.4.1 Best Price (40% of respondents)

Shippers consider their cost of distribution, as it places a limit on their market area (landed cost) as it is explained in section 4.2.1.2. A shipper will base the justification of the cost on the value he perceives he will receive for the money he pays for the transport service.

4.3.4.2 Reliability (33% of respondents)

New procurement systems such as standardization, modularization, and customization, new production systems such as JIT manufacturing, new distribution systems such as JIT delivery, Quick Response (QR), and new demand treatment strategies such as postponement, render the issue of reliable transport service to be one of the most important carrier selection criteria.

As is explained in section 4.2, shippers are heavily concerned with the reliability of their carriers, as distribution efficiency is a "do or die" for

[35] Hind S., Trounce C., Aulton N.

companies nowadays. Shippers willingly pay the premium air transport price, in order to reduce uncertainty and maintain a lean distribution flow.

However, certainty and speed exist only if the actors involved perform accordingly. Internal processes of companies are optimized in comparison to previous years, however the trade-off for the optimization is the sustenance of fragile, third-party-dependent distribution systems.

4.3.4.3 Speed (11% of respondents)

Shippers consider the speed of delivery, as "time is money". The money is expresses in the form of tied up capital and inventory carrying costs in the procurement and distribution chain, obsolete product and lost sales that may be the result of late arrivals in the marketplace, and quality related costs assigned to customer service levels.

4.3.4.4 Capability

Another factor that may be viewed as an important criterion used for carrier selection, is Capability. The shipper will select the carrier that has the capability (equipment) to handle and deliver the shipment. A specific example of a carrier's ability is the capability to transport a shipment of any weight or volume. According to IATA's 1999 survey, over half or 51% of the shipper sample is sending freight weighing 0-45kg. The remainder of the sample brakes down as follows:

46-100kg	19%
101-500kg	18%
> 500kg	13%

Naturally, the forwarder or carrier that will be favored the most by the shipper is the one with the capability to perform any transport the shipper requests

them to. Capability is one of the primary reasons why shippers outsource their transport activities to third parties. It is less costly for the shipper to source the activity externally, than to maintain its own range of equipment, capable of transporting any volume type or weight of freight.

4.3.4.5 Security

Security of the cargo is also an important criterion for shippers, as their reputation depends heavily on it. Shippers expect their shipments to arrive at their destination without any incidents of theft, pilferage, tampering, and damage taking place.

Currently, 50% of the shippers interviewed in IATA's 1999 survey, claim damaged, delayed or lost shipments. 27% of the shippers make 1-5 claims annually, for which they are compensated for most. These finding were found to be 5% higher than the previous year indicating an overall decrease on the reliability of the industry.

4.3.4.6 Fewer service suppliers

Shippers have now realized that it is more beneficial for them to satisfy their transportation needs through the employment of fewer service suppliers. By doing so shippers simplify the administrative activities entailed in the purchase of the service. Naturally, through such simplification, shippers also reduce their costs for these activities, since the ordering and payment processes are more efficiently performed. Moreover, by having fewer suppliers, shippers can establish long-term relationships with them and take advantage of the 'experience curve' generated by the specialization of the service provider in transporting their cargo.

Long-term relationships and communication of shipper requirements are often discussed in a negotiation process called Three-Party-Talks (TPT). These meetings are called Three-Party-Talks because they include the airlines and the forwarders with whom the shipper is planning to do business with. During these talks a number of issues are discussed. The meetings focus mainly on the levels of service the supplier requires for the transport of his goods, cost

discussions in the form of setting prices in the contracts through the process of negotiation, and on certain marketing plans of the shippers. For example, "if Ericsson is aware that it will need to uplift 4,000 tons of products to Singapore during the period of one year it will then make a long-term contract with an airline in order to satisfy the distribution requirements of the product[36]".

4.4 Trends

4.4.1 E-commerce

By now everybody is aware of the reality of the Internet. The Internet's background and its overall use as a business tool will not be expressed here, as it is not the objective of this report to do so. What the reader should consider here is that the introduction of the Internet has had an impact on the world of transport business; particularly influencing the way companies view their future in business. Suddenly there is a large new market desperate for creative transport solutions. This market is divided into business-to-business and business-to-consumer segments.

The prosperity of Internet based companies depends to a large extends on their ability to deliver product successfully. Distribution of goods to customers fell short of expectations so far, resulting in the impairment of customer loyalty due to the loss of trust. Customer loyalty is crucial for Internet based companies, as it is quite difficult to attract and retain repeated customers on the Internet. Further, the impersonal nature of the Internet as a tool, makes loyalty a key factor in the success of companies doing business on the net. The number of site visits is not how a company's value is determined anymore. Investors are starting to consider the number of retained and repeated customers (both businesses and individuals) when they assign value to these companies.

Taking all this into consideration, internet companies are in the search of transport service providers that can deliver their goods to the customer virtually error free, so to enhance the trust of the consumer on their site's "brand name". Transport service providers competing in the business-to-

[36] Comén, L-G (2000)

consumer segment of the market have to operate in a Less-Than-Truckload (LTL) environment, as shipments to individual customers are usually small. Further, these shipments most often must be distributed using airfreight and premium-LTL transport services. In the business-to-business segment, shipments are small as well, since the companies searching for service providers are usually small-to-medium size. The remaining segment of the market, which is also the largest, comprises of companies that produce high volume of product. These companies most often satisfy their transport needs through the establishment of contracts with transport service providers, since they can secure attractive rates based on their volume.

4.4.2 Time-Based Competition

Martin Christopher, the author of Marketing Logistics, successfully severs time-based competition into three dimensions:

"*Time to market*: How long does it take the business to recognize a market opportunity and to translate this into a product or service and to bring it to the market?[37]"

The main concern here is the company's ability to respond quickly to the market opportunity when it arises. This capability is largely dependant on the logistics concept (as described in section 4.1) employed by the organization.

Companies also formulate multi-departmental teams that work together on design of the product from the moment of its conception. This approach enables parallel processing and multi-tasking which results in time to market reductions.

"*Time to serve:* How long does it take to capture a customer's order and to deliver or install the product to the customer's satisfaction?[38]"

In order to improve their performance in the execution of the order cycle, companies have been implementing Business Process Reengineering (BPR) aiming at the elimination of non-value-adding activities that may exist as part of their order processing. An example of a non-value activity that is rather

[37] Christopher, M.
[38] Ibid

common in many organizations is the storage of finished inventories in warehousing facilities. A solution that eliminates this activity will generate value for the company and ultimately to its suppliers and clients.

Also, companies must now be capable of providing reliable delivery, as the JIT environment in which many organizations operate in, offers no time for errors. Delays or errors in the order are simply not tolerated, for they can be catastrophic for the customer that operates without safety stocks.

"*Time to react:* How long does it take to adjust the output of the business in response to volatile demand? Can the 'tap' be turned on or off quickly?[39]"
Suppliers of goods have made tremendous efforts to comply with their customer's (i.e. retailers) requirements. In this retailer example, exchange of the commitment for improvement and the conformity of suppliers, retailers extend their valuable knowledge of the market to their suppliers enabling them to become even more responsive to the market's needs and be more flexible to face demand uncertainty, hence improve their ability to react through enhanced visibility.

4.4.3 Increase of Time Sensitive High-Value High-Tech Products

As is explained in section 4.4.2, importance of time has increased to a point where it is critical to manage time effectively in order to stay competitive. Time then, has a direct impact on products in a sense that more and more of output becomes time dependent for its commercial success. Most often these types of products are of high-value or are high-tech products. The current nature of competition calls for premium transportation of these items in order to provide the high quality of service expected by everyone that purchase such items. Premium transportation enables sufficient reduction in lead times. Such lead-time reductions are highly appreciated by the consignees of cargo since they realize several benefits because of effective time management. Examples of 'frequent cargo flyers' are mobile phones, automotive spare parts, and pharmaceuticals.

[39] Christopher, M.

4.4.4 Supply Chain Management

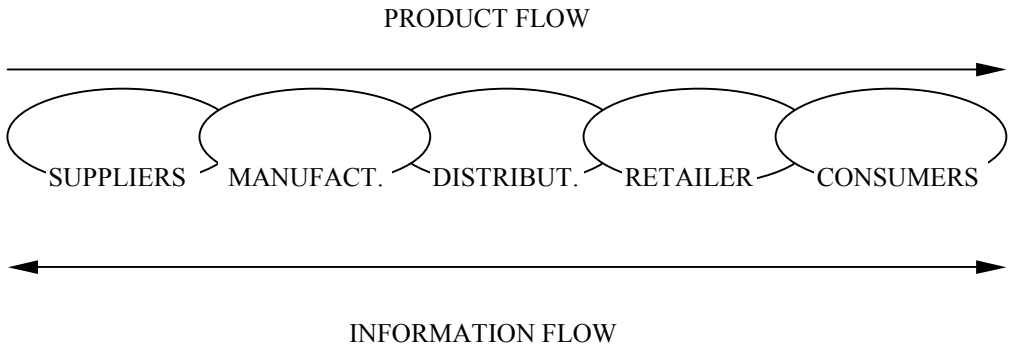

FIGURE 4-6 Supply chain Integration[40]

4.4.4.1 How it works

The concept of supply chain management has completely changed the way organizations view their logistics activities. The goal in the supply chain is to improve the overall value generated by the channel, and avoid sub-optimization of parts of the system. In a supply chain, the processes discharged by the channel participants are integrated, as it may be viewed in figure 4.6 above. Integration is achieved through the sharing of information between companies at all levels of the value chain, thus establishing seamless operations in the system. The value of such activities is found in a study done by Andersen Consulting, Stanford University, and Northwestern University, "compressed supply chain programs could provide an incremental value of more than $500 million for a typical distributor and assembler in the PC industry".

However, prerequisites to information sharing are the establishment of trust and commitment displayed by all the participants in a marketing channel. Assuming that these prerequisites do exist, companies in this channel will develop a competitive advantage based on their capability to be more responsive to the market's needs and at a lower cost than their competitors. Responsiveness is gained for example, from the direct transmission of Point Of Sale data (POS). Suppliers receiving POS information can interpret the consumer's needs through the observation of their purchasing patterns.

[40] Christopher, M.

Another form of information sharing is through the involvement of all the members in the product development process. When the supplier of the components has a chair on the product development table, proposals for more appropriate use of components will be readily available. In the past, proposals for specific product components were made during the negotiation process between supplier/buyer. By then, it was either too late to make the change, or the product had to go back to the development department for the necessary changes.

Similarly, if the carrier is involved in the early stages of product development, then appropriate suggestions about the products physical qualities and its packaging can be furnished.

Also, supply chains maintain cost clarity between every participant in the channel. For example, if the raw material supplier provides its customer with its cost structure, then the manufacturer will be able to look for possible changes that can help reduce the cost of the raw materials by assisting his supplier in reducing his own costs. A manufacturer can also extend its requirements early in the process, which is a major advantage for the raw materials supplier. In this way, the costs for the buyer decrease, and the supplier's margin remains the same.

4.4.4.2 Reduction of forecast errors (Forester Effect)

In a traditional chain, companies use forecasting to anticipate demand requirements. When sales forecasts are established, then the appropriate inventory is assigned to all the locations the company owns a warehouse. Inventory buffers are created at each point of the distribution flow resulting in excess inventory in the system. Also, these inventories make it difficult for the up-stream companies to understand and estimate demand. This impact on industry dynamics is caused by what is known as the "Forester Effect". Inventory levels are used independently hence, only using cost and demand structures.

Consider a 2% forecasted demand increase for product Z at a retailer's location. As demand forecasts move upstream in the value chain they increase, as they consider the forecasts of each level and their respective inventory buffer needs. The result is, as it is clearly visible in figure 4.7 below, that demand is overestimated to be 30-40% for Product Z when in fact it's market demand is forecasted to only grow by2%.

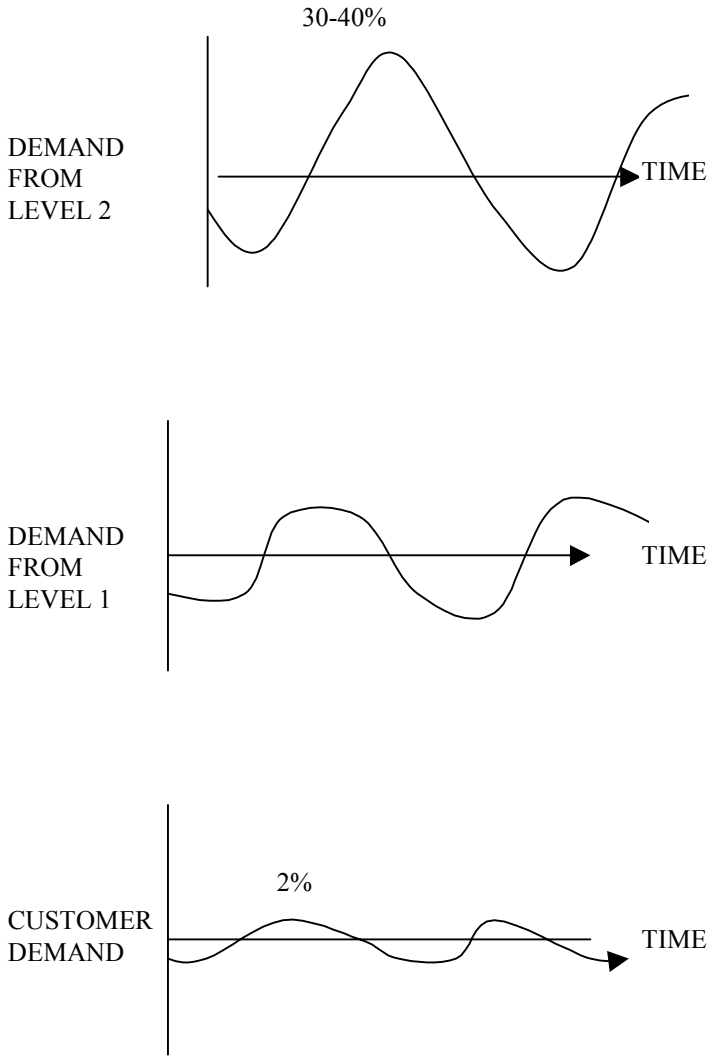

FIGURE 4-7: Forrester Effect[41]

Therefore, a supplier can understand the pattern of market demand and eliminate its uncertainty from the system.

[41] Lecture 2, Jensen A

5 4PL PROVIDERS

5.1 Position in the system

Fourth Party Logistics Providers (4PL) are the newest entrants in the transport industry. These companies represent the natural evolution of the Third Party Logistics (3PL) service providers. Their background lies in the forwarder segment, as most of these new service providers are extracted from forwarding companies. What is the difference if any, between 4PL and 3PL then?

3PL providers are companies that not only can furnish their customers with the transportation of their raw materials and the distribution of their finished inventories to the market, but they can also offer the option to clients to outsource all their other logistics operations. Operations of this kind are for example warehousing and storage services, inventory management, packaging and labeling, order processing and billing, and order cycle management. Examples of 3PL's that currently exist in the market are TNT, DHL, UPS, and FedEx (see Integrators, chapter 9).

4PL providers have created their own traffic system as non-asset based integrators. 4PL's are the companies that employ the 3PL providers and other forwarding agents and carriers on behalf of the industry, to perform the activities described above. 3PL's and other agents (service suppliers) provide the services needed by the 4PL's since these companies do not own any fixed assets in the form of facilities and vehicles, essential for the provision of transport and logistics services. It is imperative to understand that the 4PL's sell a pure service product, that of knowledge. Their goal is to select the most appropriate structure for the logistics and transport processes of their client; The quotation of a 4PL provider's management position, is used to emphasize this segment's core service further "Even though we to a various extent purchase transport and logistics operations including management and development from external providers, we still remain fully responsible to our customers. This also means that we actively manage and supervise what we deliver".

Further, 4PL's aim at establishing long-term relationships with their service providers, as they prefer the stability of such relationships. Stability enables innovation and development in service. This type of thinking contradicts the norm of the past, which was to move with the cheaper solution whenever such a solution was readily available. Such practices resulted in mistrust between the different parties, lower service levels by suppliers who slashed service to meet the lower rates, and unwillingness to invest in facilities and equipment to generate development due to the instability (sunk cost risk) caused by cost-based thinking. More information on 4PL providers are provided below.

5.1.1 Knowledge Provider

4PL providers justify their existence through their expertise in the provision of logistics knowledge. 4PL's may be found as internal subsidiaries servicing the needs of the mother organization as well as the needs of other subsidiaries, or found as an independent company, in the market competing for business. The 4PL provider's core competence is to use its knowledge in logistics and transport to provide its clients with optimal solutions that can yield competitive advantages for them. At the same time the successful management of these services by the 4PL provider, enables the organization that employs them to focus on their own core competency and become more competitive through continuous evaluation and improvement of other processes such as Marketing, and Research and Development (R&D). Figure 5-1 below, shows the core competence (knowledge) of the 4PL provider, which in turn enables him to offer services to the industry.

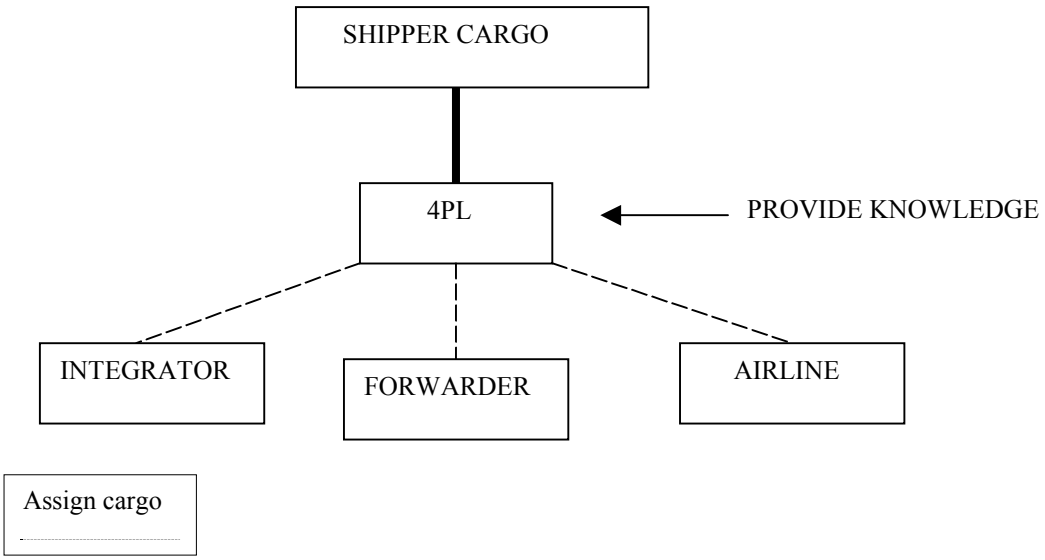

FIGURE 5-1 Key role of the 4PL provider[42]

5.1.1.1 Internal

An example of an in-house 4PL provider is that of Volvo Transport (VT) that provides logistics and transport services to all the companies of the 'Volvo World'. In-house 4PL's have a mission that targets the improvement of the logistical competence of the entire group as well as the enhancement of the overall product value offered by the company they belong to. Volvo Transport's mission statement is sighted below to illustrate the point further:

- "We develop, market and manage transport and logistics systems with such performance that the competitiveness of the Volvo brand companies is strengthened.
- We focus on the Order-to-Delivery process, covering packaging material, material supply and distribution of finished products.
- We share the core values of Volvo: Quality, Safety and Environmental Care.
- We promote the interests in transport and logistics matters of the Volvo Group in relation to authorities and organizations"[43].

[42] Researcher´'s own model (Efstathiou)
[43] Volvo Transport Presentation Material

Companies like VT may operate some in-house logistics activities. For example, VT operates its own cross-docking terminals for handling goods in some parts of the world, to ensure the quality of handling. Further, in some of these terminals they perform several value-adding activities such as packaging, warehousing, kitting, pre-assembly and sequencing.

The decision of the Volvo Group to use its own 4PL provider was based on the following logic:

The nature of Volvo Transport, which is to primarily service its internal customers, empowered the company to develop an expertise in the automotive industry and its respective supply chain. Expertise and familiarity with operations, enables the logistics group to offer its clients customized solutions. This expertise becomes more visible when one considers that Ford Corporation upon the purchase of the car division did the benchmark with Volvo Cars on their logistics competence and decided they should keep VT as a 4PL provider.

In addition to the competence, the entire Volvo group benefits from exploiting economies of scale realized by the operations of VT. Scale economies are generated from combined volumes when contracting with suppliers of service. Scale encourages lower cost and better performance in terms of quality of service.

Moreover, the service provider (VT) is currently located near most of its customers around the world and is targeting presence proximal to everyone, in an effort to better cater to their needs for integrated logistics solutions. Finally, since VT is part of the Volvo Group, vital information is shared freely between VT and its customers. The relationship is solid and based on mutual trust, understanding and the motivation to achieve a set of overarching goals as a group.

5.1.1.2 External

An example of an independent company operating, as a 4PL provider is that of the subsidiary of the freight forwarder ASG. The subsidiary is called ASG Logistics AB.
ASG owns 15% of the Nordic market with customers like ABB AB and NOKIA AB. It mainly ships its cargo with SAS, Lufthansa, Finn Air, Singapore Airlines, Air France, and British Airways. However, it intends to reduce the amount of air carriers it buys services from in order to simplify some of its own processes such as ordering and payment.

ASG generates a lot of business for both imports and exports resulting in favorable rates for its clients, as the service provider can negotiate better because of its capability to arrange back-haul cargo for the airlines.

The independent company's goal is to compete freely in the market, with the sole purpose of generating revenue and naturally turning profits through the provision of such services. Moreover, because ASG Logistics has a number of different clients it has developed an expertise in a variety of industries in which its clients belong to.

The company's customers are separated into Industry segments and Buying patterns;
Industry segments designates the division of the client base according to the industry they operate in. ASG provides a lot of service to the automotive industry, as it has established a strong working relationship with the companies in the industry. Buying patterns refers to the solutions clients request based on their perception of the air cargo service.

A further customer separation extracted from the Buying patterns, is that of Traditional buyer types and New buyer types; Traditional buyer types (shippers) mainly consider the price for the service when they make their service provider selection, for they still view their work as that of moving cargo and not buying a service that helps their company compete. New buyer types are customers that want solutions to their logistics costs, which

approximately account for 20% of the total. These buyer types often prefer to outsource their logistics activities and focus on their organization's core competence whatever that may be[44].

5.1.2 Assignment of Air Freight Services

As stated above 4PL's assume the responsibility for all logistic processes of the client. These companies assign their staff the task of studying every logistics process-taking place in their customer's business. Examples of such processes are those of procurement, production, ordering, and distribution. These employees evaluate the existing structure of operations. They then develop recommendations for their client to consider, based on their findings. The outcome of this evaluation process will determine the transportation solution the company will utilize for its freight movement requirements. Based on these requirements, the 4PL provider assigns the cargo to different actors in the transportation system with the goal to fulfill all the requirements set by the logistical structure of the client.

5.1.2.1 Product Flow Selection Scenario

Astra-Zeneca and its pharmaceutical products will be used here for exhibition purposes, in an attempt to illustrate how a 4PL provider determines which flow to use when shipping its client's products. Assume that a 4PL provider was responsible for the transportation and distribution of a container (labeled X) of Astra-Zeneca's products to a given destination (Y).

In order to make the best selection, the 4PL should be familiar with the other operations taking place within this organization. To be more specific, the service provider should be aware of the marketing activities of the company so it can establish the lead-time requirements. The 4PL should also be accustomed to the production system used for the manufacturing of the products. Moreover, the 4PL must be aware of all the physical characteristics of the product in question, so that its handling requirements may be carefully

[44] Backman, P

defined. Finally the 4PL must know of the destination and the consignee of the product.

Considering that all this information is conceived, the 4PL will use them to evaluate the existing transport flows in order to make a final selection. To make the final selection the service provider will consider all available distribution flows offered by different actors in the system and select the one flow that best suits the needs of its client.

The company's pharmaceutical products have temperature limitations and have a high degree of safety requirements, as tampering is absolutely forbidden with such products. A tampering incident may cause catastrophic consequences to the company since its brand name in the market will be damaged. Astra-Zeneca maintains a rather conservative production system since its products are produced in big batches. The company's lead time is not such a big issue, as the products are contrived only after the reception of orders. There is a need for fast transport though, since Astra-Zeneca does not want to keep its products in an uncontrollable environment for a long time. Finally, Astra-Zeneca prefers as little handling as possible of its cargo, to ensure that the right temperature is maintained in its containers, in order to safeguard the level of product quality the company is committed to offering its clients[45].

In this case then, the 4PL would select to ship through the traditional cargo flow. Integrators cannot be used, as their core competence is focused on shipments of <50-70 kg and container (X) weighs more than that. Moreover, integrators have restrictions in the type of cargo they accept. Usually they refuse to take cargo that has several special handling requirements. The reason why this is done is because the integrators do not want to put at risk of delay (due to customs clearance) the remainder of the cargo they will be flying on the same aircraft during that particular transport.

With the integrators eliminated as on option, the 4PL has two options left, the use of airlines only or the use of a traditional forwarder. However, airlines are

[45] Rehnström, M

not so attractive as the forwarders are in this case, since special physical product characteristics are involved here.

On the contrary, to have a forwarder involved in the process may be a more appropriate solution because the forwarder owns the appropriate equipment (specialized) to provide the temperature requirements this type of product needs. The forwarder will then move the cargo to the airport's terminal operator for the export process to be initiated. When the preparation is complete container (X) would then be handed over to the ground handling agents who would move the cargo out on the tarmac for final loading on the carrier of the 4PL provider's choice. The most appropriate carrier for this type of transport (assuming rates and destinations are attractive) is SAS, because of its ability to offer a non-stop service, which implies the least handling for the cargo. Cargo handling minimization is extremely important for Astra-Zeneca.

Forwarders, integrators, as well as airlines may be capable of providing transport solutions by truck, but these are not desirable in this case, as the security of the cargo is jeopardized, by having the cargo in transit for a longer time.

5.2 Existing market conditions

5.2.1 Competitive Position

4PL providers are in an attractive position in the market. The primary reason of this favorable condition is that they are positioned to the industries' eyes, as consultants providing knowledge for logistics and transport services. Whether 4PL's are in-house or external, they appear to be gaining popularity for the following reasons:

Shipper appears to trust 4PL's more than they trust other service providers. The reason for this increased trust comes from the fact that 4PL's will offer their clients the best possible solutions (most optimal) without having any external factors influence their decision in any way. External factors are stated

here in the context of economic or strategic interests, influencing the decision by the service provider concerning the flow of goods.

Some examples of such interests causing external influence:

A. A shipper may be offered a solution by an airline that may be based on the interests of the airline, in the form of the airline's obligation to send the cargo through a particular route simply because it is forced to do so because of its alliance partner's routing. Such activities add no value to the product and result in the increase of the handling of the cargo. Also, the airline may truck (feed) the cargo to one of its hubs to exploit economies, ensuing in increased exposure and handling of the cargo.

B. A shipper may be not be offered the most optimal solution by an integrator because the integrator is locked in its own system and has to consider the utilization of its resources (fixed assets) along with the interests of its clients.

C. A shipper may be offered a solution by a forwarder based on the fact there is very cheap capacity available on an ad-hoc system that the forwarder could make use of resulting in the increase of handling simply to exploit that lower rate.

The fact that 4PL's do not own the fixed assets necessary for the provision of logistics and transport services is the primary driver of their flexibility. 4PL providers make their margins based on the quality of the solution they offer their client. Their revenue are not based on who gets the business, since they have no fixed assets whose utilization is influenced by the direction of the flow like is the case of airlines and forwarders and even the case of integrators.

As it has been found throughout the duration of this study the air cargo transport market is in need of knowledge. This market has been neglected by the government, airlines, forwarders, terminal operators, and ground-handling agents for a long time. The only actors in the system that have not ignored the

importance of cargo are the integrators. These conditions resulted in the increased need for knowledge of the air cargo business. 4PL's have identified this need and they have a mission to fulfill it. Smarter solutions are really the only way to optimize air cargo services, as the aircraft may not fly any faster than they do now for a few decades to come!

Unlike some of the other actors in the air cargo system, the 4PL's have provided the market they compete in with a clear description of what their role is supposed to be. This clean indication helps these providers justify their margins and successfully assist their clients in "perceiving" the value they receive when they employ them for their knowledge.

5.3 Service supplier selection criteria

The information regarding the supplier selection criteria is extracted from information provided by Volvo Transport in an attempt to illustrate real-market conditions (similar criteria were set by ASG Logistics).
According to VT then, the most important criteria for supplier selection are that the supplier's flow meets the requirements of the product (based on physical characteristics and distribution strategy). These are as follows:

5.3.1 Total Logistic Cost (Landed Cost)

This criterion is based on the overall mission of logistics found in its definition "The mission of logistics is to get the right goods or services to the right place, at the right time, and in the desired condition, while making the greatest contribution to the firm"[46]. Contribution is stated in the quote in the context of the total logistic cost. The landed cost is extremely important for an organization because the market area for any company is limited to the area where the company's landed cost advantage is lost.

5.3.2 Service Performance

Service performance is of primary importance. Supply chain integration means that many companies are now depending on the performance of their partners

more than ever. Cost may be necessary to consider, but they are fairly limited when compared to costs that emanate from bad service. For instance, "the stoppage of the production line due to the delay of a shipment in today's JIT manufacturing environment costs a company like SAAB AB. 30,000 SEK per minute"[47]. Naturally, transport cost increases may very well be justified if these increases ensure service performance.

5.3.3 Technical and Logistical Innovation

The ability of the service provider to support the shipper in the form of the appropriate equipment is essential. The service provider cannot survive without the equipment that will enable it to offer the capability of facilitating the services its target market needs. Moreover, shippers look for service providers that own the right equipment for the safe transport of their merchandise.

Logistical innovation can only be the result of investment in communication capability.

Cargo carriers that consider their future seriously have made the necessary investment in improving their communication capability. For example, consider a supply chain whose participants are linked by Electronic Data Interchange (EDI) with the exception being the freight forwarders that participate in the channel. These forwarders would be eliminated from the system the moment forwarding companies with EDI capability offer the supply chain a reasonable tender.

5.3.4 Environmental Care

Organizations have come under a lot of pressure from the market when it comes to the environment. This pressure is the result of the sensitivity of the existing sophisticated buyers. Nowadays, customers heavily consider the environmental performance of companies, to the point that their buying decision is influenced by that performance. Organizations are responding to

[46] Lecture 1, Jensen, A
[47] Carlén, J

these demands by continuously investigating the environmental impact of their operations. Companies try to measure that impact by performing investigations such as Life Cycle Assessment (LCA) to evaluate the environmental impact of a product from source-to-sink. Such activities set the requirements for transport service providers to make efforts themselves to reduce the impact of their services to the environment in order to stay competitive for the shipper's business.

5.4 Market Trends

5.4.1 Expansion

Based on their competitive position as analyzed above, 4PL providers have a bright future. This segment will continue to grow and it will gain market share from airlines, forwarders and integrators. The strongest advantage that will be responsible for the fuelling of this expansion is the knowledge of the 4PL providers. The importance of their knowledge service increases, when one considers that this knowledge base covers all flows (airlines direct, traditional forwarder flow, integrator flow) and is the product of knowledge based on the clients operations. This fact means that the 4PL is capable of offering customized integrated solutions to a market starving for knowledge. This segment will gain market share from everyone else because its non-asset based structure appears to be more attractive to the customers needs due to its flexible nature.

6 FORWARDER

6.1 Position in the system

Companies operating in this segment of the system may have the size of global operators, local operators or operators functioning as part of a forwarder's alliance.
Forwarders are responsible for the physical transport of goods and for their documentation. The actual transport may take place through the deployment of a number of different transport modes. Goods may be transported by rail, ship, truck, through inland waterways, by air or through a combination of the above (inter-modal transport).

Wilson, a freight forwarder, in the form of a sea-air service, executes an example of an inter-modal transport activity. The cargo can be moved from Asia to the West Coast of the U.S. or around South-East Asia to Dubai by ship. The cargo is then loaded onto an aircraft for the remainder of the distance. All in one service, clients pay half the cost of airfreight and manage to reduce the sea freight lead-time in half[48].

For the purposes of this study, we will only consider the transport flows that include transport by air in any part of the transport service.

6.1.1 Transport Services

The transport services offered by freight forwarders are primarily airport-to-airport, consummated by door-to-door and express/priority services (i.e. documents, spare parts). Loads may have different weight composition, different physical characteristics and indeed, different handling requirements.

Freight forwarders mainly use their own equipment (i.e. trucks) to perform the physical transport of the service requested by the customer. The pickup from the shipper's warehouse, transport of a shipment and delivery to the destination's airport, warehouse or storage area is one of the freight

[48] Pålsson, B

forwarder's primary responsibilities. To this end forwarders collect the clients' freight during the day and add value to it (if required) at their urban terminal locations. They then forward the load to their airport terminals where after being prepared for the flight, it is moved by the ground handling agent onto the air carriers' aircraft during late afternoon or in the evening. A visual display of the forwarder activities is found in figure 6-1 below:

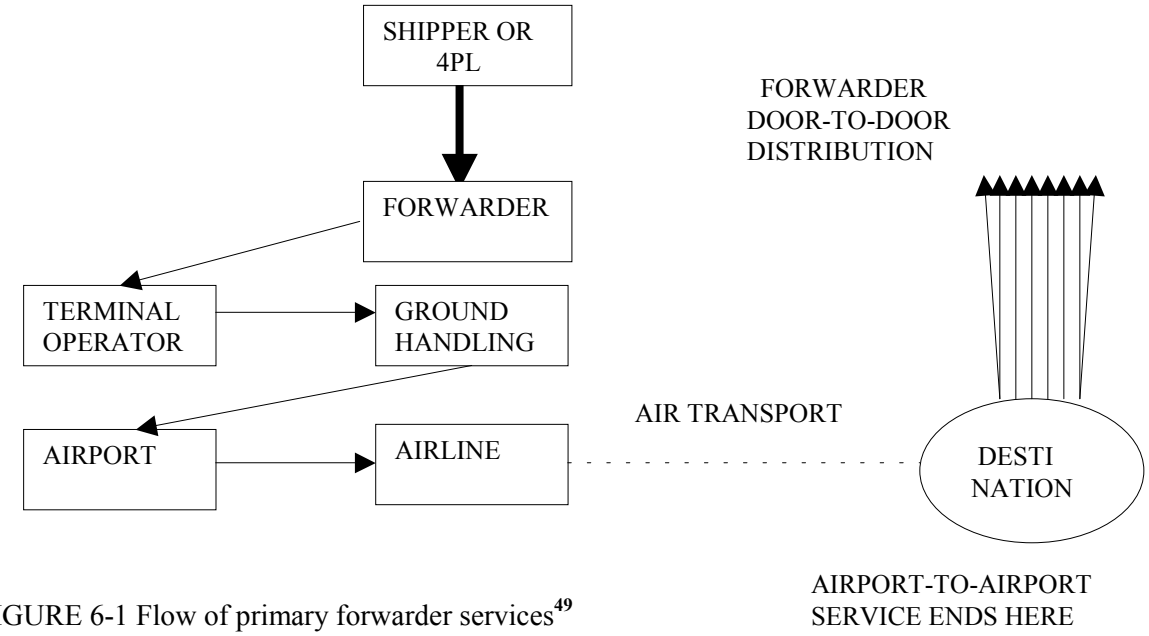

FIGURE 6-1 Flow of primary forwarder services[49]

6.1.2 Consolidation/De-consolidation Services

Other than the physical transport of goods, forwarders provide additional services to shippers. Forwarders add some types of value to the shipments they transport at their own premises, the airport terminals. Terminals provide for the network forwarders need to consolidate and distribute freight.

At the forwarder owned airport terminal, loads from different shippers are sorted with respect to their destination. When sorting is complete, shipments bound to the same destination are consolidated and dispatched to the ground-handling agent to move the loads out to the tarmac and onto the aircraft. Further, at these terminal locations forwarders may situate their order processing and marketing departments that handle sales, invoicing and claims and complaints for airfreight.

Consolidation is one of the key activities fulfilled by freight forwarders. Their profit margin, or markup on the market price is attained through consolidation. Consolidated shipments from several different shippers are given different quotes by carriers for their transport from their point of origin to a specific destination. Had their generators handled these shipments independently, much higher quotes would have been assigned to them for the same transport activity. Hence, there is a direct relation between high volumes of cargo being handled and the high proportion of consolidation activities by a given forwarder. In the 1999 IATA survey report, 56% of the forwarder's sample stated that they consolidate more than one half of the total cargo they handle. This number was found to be consistent to the number unearthed in the 1998 survey[50].

At the destination airport's terminal, arriving consolidated shipments are separated and sorted according to their final destination. This activity may also be done by an
independent terminal operator if required by the forwarder to do so. When shipments are de-consolidated they are reloaded onto trucks for the final leg of the distribution process. Freight forwarders that maintain forwarding agents abroad as well as these types of terminals are capable of offering the customer door-to-door service. Had these facilities not been part of their network, the services offered to customers, would be limited to airport-to-airport for example.

6.1.3 Value-Adding Services

Value-added activities are executed in terminals away from the airport because of capacity restrictions, since such activities require space which is much more costly when this space lies on the airport's ground. Value-Adding Services are one of the most competitive areas in the entire industry at the moment. These services most often take place at the forwarder's terminals (usually away from the airport) and at its warehousing/storage facilities if any.

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[49] Researcher's own model (Efstathiou)
[50] Hind S., Trounce C., Aulton N.

Forwarders, like others in the industry, operate in a very slim profit margin business environment, with total costs often averaging more than 96-97%. Value-Adding services are seen as a very attractive way to increase revenue and enhance the profitability of the company, as costs for the provision of these services are not as high as the costs for transport. Such services are documents handling, de-consolidation, picking and packing, sorting, kitting, customs clearance, order processing, to-door distribution, packaging, labeling, warehousing, storing, and inventory control. Another value-adding service is the installation of the forwarder's IT system at the shipper's facilities, improving in this way their logistical efficiency. Wilson offers such an option.

Value-Adding services are indeed profitable to operate. The main reason that makes the provision of these services a necessity though, is the clear indication by a large percentage of shippers that these services are found to be essential to them. Storage capability for example, is quite important to shippers. According to IATA's 1999 survey report, 40% of the shippers interviewed, identified the need for special handling storage facilities for shipments comprising dangerous goods, high-tech, high-value goods etc[51]. More value-adding services enhance the service offered by transport agents and are desirable by shippers since the outsourcing of these activities assists them in their effort to focus on their core competence.

The cost of providing value-adding services may not be so high but the risk is. Forwarders that do offer value-adding services must carefully align the level of service they provide their customers with, along with their willingness to pay for such higher quality of service. If the shipper is not willing to pay for the additional services then forwarders that offer these services may go out of business, as they will have to sustain the variable costs of idle time, experienced by additional labor, and the sunk costs of unutilized facilities and of handling equipment among other things.

[51] Hind S., Trounce C., Aulton N.

6.2 Existing market conditions

6.2.1 Competitive advantages

6.2.1.1 Flexibility

The biggest advantage that forwarders have to compete with is their flexibility. Unlike the integrators who offer a 'standard product' type of service, forwarders can assume the air transport of virtually any type of cargo, with the exception of a few unique types of cargo. Integrators often place limits on the weight of cargo they accept, as smaller package transport is their core competence. Forwarders on the other hand may easily handle and move such cargo throughout the entire day.

Moreover, forwarders have an advantage over the integrators when it comes to the terms of delivery such as air-to-air, ex-works, door-to-door, door-to-airport etc. A customer may be offered more appropriate solutions by a forwarder than from an integrator in this case. Forwarders advise non-biased solutions to clients, with no influence by any need to utilize capacity throughout the entire transport activity. Integrators though, offer 'standard products' of door-to-door service, since they must capitalize gains from the utilization of resources throughout their entire system to be profitable.

6.2.1.2 Closer to the market

Forwarders are in the position to maintain direct contact with the shippers. They control a large portion of air cargo demand based on the nature of their position as middlemen.. Hence, such strategic positioning renders for high bargaining power.

The forwarder's position is similar to the position of department stores in the retail business. Throughout many decades of presence and performance in this position they have amassed a lot of knowledge about shippers and their needs for transport services. Shippers appreciate such knowledge, a fact found in the

1999 IATA survey, where 63% of the shipper sample acknowledged value forwarder expertise as a key forwarder service[52].

Forwarder expertise for example, is expressed in the form of knowledge about documentation of shipments, customs procedures and clearance and handling of cargo with special transport requirements.

6.2.1.3 Reduce dependability

Forwarders assign the cargo to the carrier that is equipped to best perform a certain transport activity for both the shipper's and the forwarder's interests. This wide range of air carrier selection enables the forwarder to reduce the shipper's dependability on one air carrier for the transportation of his goods to the market.

Shippers that do business directly with airlines must solely depend on that carrier, or must always provide for an alternative solution in case the carrier cannot offer the service for some reason. Reasons for airlines doing just that could be for example the cancellation of a flight's origin or destination (for pax-belly services, lack of passengers and for other services empty back-hauls) and lack of capacity for larger shipments i.e. North America capacity restrictions by many air carriers to only express items.

6.2.1.4 Personal relationships

Freight forwarders continue to do business in a traditional manner. Here, one should consider that traditional does not always mean bad or outdated. In the case of freight forwarders traditional relationships may be a key reason that keeps them in business. Forwarders continue to conduct sales visits and sales calls at their customers' place of business thus maintaining the personal relationship they have always had with them.

[52] Hind S., Trounce C., Aulton N.

It is through this personal relationship that the forwarder can best market its services and retain its clients. The importance of traditional service for the forwarders future is best summarized by the statement of Julian Keeling, president of air cargo wholesaler Consolidated International Inc., "I further believe that "old fashioned" business virtues, including a high level of personal service, loyalty to a customer, attention to detail, delivering what is promised, and single-minded dedication to the task at hand will spell the difference between forwarder success and failure in our current century"[53].

6.2.2 Competitive disadvantages

6.2.2.1 Wide product range/client base

Forwarders do not focus on one product (service) like the integrators do. Instead they offer a wide range of products. The variety of services makes their efforts to accomplish standardization of their operations extremely difficult. In addition, forwarders offer their wide range of services to an even wider range of shippers. These shippers all have different needs and expect the forwarder to satisfy them. Such conditions create challenging conditions for the forwarders to operate in.

6.2.2.2 Lack of capacity control

Forwarders indeed maintain a direct access to the customer and thus have a direct access to demand. Nonetheless, the cargo must still be flown! For this activity, forwarders depend on the airlines. Airlines are the ones who control capacity in the traditional air cargo transport traffic. Therefore, a forwarder may face difficulties in finding capacity to complete a transport obligation when, for example, a shipper appears with 2,000kg while having a forwarder commitment for 1,000kg. When such situations take place, forwarders do not only have to find space for another 1,000kg, but they also have to deal with the common problem of *overbooking* brought about by airlines who want to ensure their capacity on a flight is fully utilized.

[53] Schwartz, B (2000)

Conversely, integrators do not face such problems since they own their own equipment throughout the entire traffic flow. Moreover, most integrators do not ever have to face such complexities because they limit the weight of cargo they accept to transport.

6.2.2.3 Complicated pricing

Forwarders do not control the entire transport chain from within which the cargo will travel through (except for door-to-door services). They only manage a portion of it. When they sell their services, forwarders give rates concerning their services alone. On top of those rates they add the rates of other actors such as those of terminal operators and ground handling agents along with the airline charges. Additionally, they may have to add fuel surcharges as well as supplementary charges for any value-added services that may be required for a shipment.

Such pricing structure complicates the service in the shipper's eyes, who is paying for the service. The shipper does not wish to discuss the different rates along with other information. The shipper wants a total price for getting the product to a specific destination, arriving at the right time and in the desirable condition. After all, not having to care much about how the product gets to its destination is what the shipper really pays for.

6.2.2.4 Air Carrier Selection Criteria

Freight forwarders are the main clients of the airlines, as they are responsible for approximately 90% of the cargo these carriers transport. A large percentage of these forwarders have constructed a set of guidelines that help them evaluate their carrier's performance. These guidelines impact the selection of a carrier to perform the transport of a particular shipment sent by air.

The guidelines set quality standards for the service expectations of forwarders. In general these standards consider the cost of an activity, and the quality of

the service in terms of the shipment arriving on time, at the right place, and in the right condition.

As far as the quality of service standards are concerned, a forwarder will claim some form of compensation upon the failure of the carrier to perform the delivery appropriately. According to some information found in IATA's 1999 survey report, 89% of the freight forwarder sample makes a claim to their service providers for the delay, damage or loss of a particular international shipment. Based on the information by the same survey, the percentage of claims declined this year by 6% in comparison to 1998 figures, indicating an improvement on the reliability of service offered by the airlines.

The same sample identified the following criteria as the most critical on influencing their airline carrier selection[54]:

Best Price	*40% of respondents.*
Reliability of Service	*33% of respondents*
Space availability	*6% of respondents*
Speed	*5% of respondents*

Another important factor considered by forwarders when selecting a carrier is based on the carrier's capability to handle any weight of cargo assigned to them.

According to the IATA 1999 survey findings, 22% of the shipments moved by forwarders weigh between 0-45kg. The remainder of freight transported by the respondent's is divided by weight as follows:

[54] Hind S., Trounce C., Aulton N.

46-100kg	20%
101-300kg	26%
> 300kg	33%

Naturally, the carrier that can transport any of the weight categories illustrated above will be more favored by the forwarder market.

6.3 Market Trends

6.3.1 Mergers

All industries in our times operate under severe competition. In most industries, merger waves resulted in a few large organizations. Shear size however, lost its value as a primary contributor to a competitive advantage, since size is not enough for guaranteed success anymore. In search of other competitive means companies turned their attention toward the improvement of the efficiency of their operations and toward higher customer service extended to sophisticated buyers.

Similarly, the transport industry has been undergoing through such comparable experiences and is working toward the improvement of its efficiency. Airlines joined their operations under the wings of alliances, shippers consolidated their companies and became even larger i.e. Ford-Volvo Cars, GM-SAAB, Astra-Zeneca, etc., and some integrators have become the target, or have already been acquired by large postal companies i.e. Deutsche Post-DHL, Dutch Post-TNT.

Forwarders naturally partake in this trend. Many freight-forwarding companies have realized that it is impossible to stay independent and effectively compete. So they too have started to consolidate or be acquired by other, much larger freight organizations. In doing so, some freight forwarders managed to become part of large logistics systems established around the globe, and in a way

ensure their existence in the highly turbulent and volatile environment of the transport industry.
Examples of such forwarding companies are those of ASG bought by Danzas-AEI that also bought Royal Ned Lloyd's European Inland Transport amongst others and BTL bought by Schenker.

6.3.2 Specialization

Some companies choose to ignore the consolidation trend and head the other way. These forwarders turn toward specialization to assist them in competing with much larger competitors. An example of such a company is Wilson, a Swedish freight forwarder. Wilson used to belong to BTL but chose to withdraw from this agreement when BTLwas bought by Schenker, as the company could not see any value in staying as part of the enlarged group.

Instead, Wilson is working toward implementing its own global network through the establishment of a series of partnerships, and through the planning of a few acquisitions to encourage its own growth. Wilson is a forwarder that is turning into a 4PL service provider. It specializes in offering professional door-to-door service and in "doing business the Scandinavian Way", a quality that makes them attractive to certain companies. The firm supports that efficiency in costs and high service levels are the key abilities that will differentiate its position in the market and enable it to effectively compete for business. Further, the company is working toward an Initial Public Offering (IPO) in the first quarter of 2002. Its current turnover stands at 5 billion SEK and it is targeting to double that figure.

7 AIRLINES

7.1 Position in the system

7.1.1Transport services

Airlines are accountable for the actual lift and air transport of cargo. Transport services by the airlines on the market are divided into two main categories found in figure 7-1:

7.1.1.1 Airport-to-Airport

Airlines offer airport-to-airport services when they move cargo for freight forwarders, whether these are integrators, traditional forwarders, or 4PL operators. Also, they may move cargo in this way when the shipper has its own foreign agent waiting for the shipment at the destination airport. This type of transport services represents roughly 90% of the total cargo amount airlines move.

This system involves the move of the cargo by truck to the *nearest* airport from which the specific airline, or a code-sharing partner, provides scheduled services. Scheduled services are a condition for this type of transport when one considers that not only does the airline have to be able to lift the cargo, but it also has to offer enough frequencies to attract the shipper's business in the first place.

7.1.1.2 Door-to-Door

Door-to-door services are offered by airlines when no forwarders are embroiled in the transport of the goods. Airlines use their own trucks to pickup the merchandize from the shippers' premises and they transport it themselves (by air or by truck) to the airport of their choice for further processing. Specifically for door-to-door services, airlines mainly utilize two different traffic systems in order to consummate the movement of the cargo.

This system is operated while considering the cost structure of the air carrier itself. As one can imagine, it is very expensive to operate aircraft especially when one reflects on the fixed costs involved behind such operations (see air carrier cost structure). High operating costs then, restrict air carriers from providing air transport services from all airports.

Therefore, in order to still earn the business of the shipper and make some sort of profit from locations where the carrier does not actually fly to and from, airlines use trucks to transport (feed) the goods for a portion of the transport leg, to an airport where they have established hub operations.

Trucks may also have to include a stop in the system at a domestic airport. At the airport the trucks drop off/pickup cargo at the terminal operator's terminal facilities and finally move to the regional hub of the carrier where the shipment is loaded onto an aircraft and flown to its final destination. Airlines provide for the equipment (trucks) that perform most of the feeding operations. Sometimes a freight forwarder may sell some space to shippers on these "flights" (trucks), primarily when the air carrier is unable to generate enough cargo at the vicinity of an airport location and fully utilize the entire capacity of the truck.

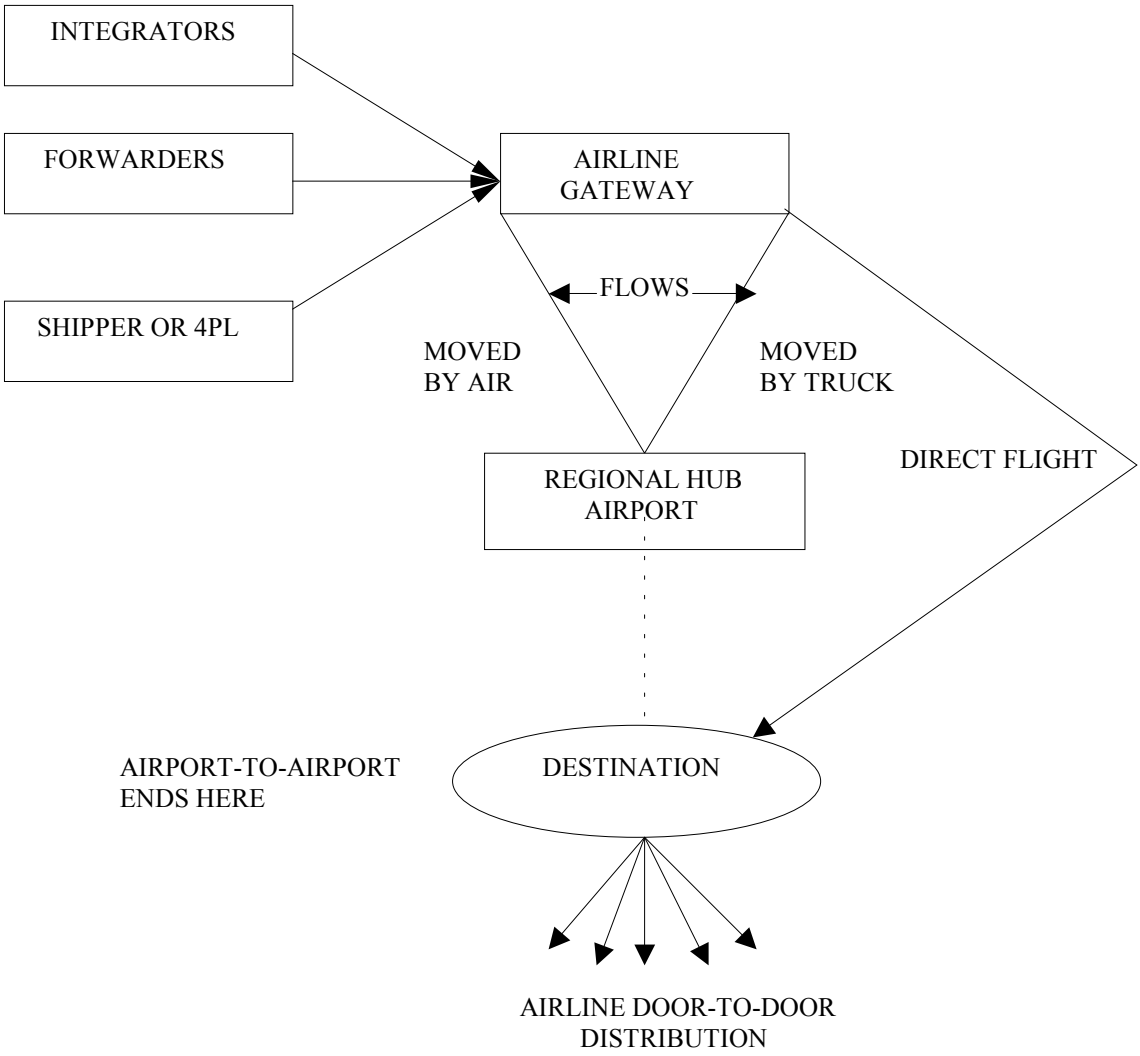

FIGURE 7-1: Flow of airline cargo transport services[55]

7.1.2 Handling Services (Terminal and ground handling operations)

7.1.2.1 Airline owned

Airlines often use computerized systems to furnish ground-support operations. These operations represent a significant percentage of a carrier's costs, and have a large impact on customer satisfaction. The most important element for the efficient execution of these node operations is not the equipment as one may think. People are the most important of elements, as they are also the most controllable variable in the cost (may generate 15-25% of labor costs

reductions)[56]. Therefore, an airline may use systems management software that target the optimization of staff and the overall use of personnel to increase efficiency.

Examples of such systems are Sabre's StaffPlan, StaffRoster, and StaffManager. Better schedules may be constructed with the support of these systems, as variances in workloads are more easily considered. These workload variances are based on aircraft loading expectations.

Further, "Computerized planning allows for injection of changing needs, such as modifying standards, adding or deleting scheduled flights and revising work rules and government guidelines. Time-consuming tasks related to assigning overtime, relief shifts, breaks and vacations and dealing with unexpected absences can be built into the program allowing managers to make decisions more quickly and easily"[57]. Also, companies (alliances) may execute cross-utilization of labor and thus reduce idle time and overtime as well as implement cross training of staff.

Planning may be done as:

- Long range programs for six months or more.
- Shorter-range programs for three months.
- Real-time programs that allow for hour-to-hour adjustments.

Moreover, firms like Sabre (GSEAdvisor) look into the management of Ground Support Equipment (GSE's), dividing their management into forecasting, planning, servicing and inventory control. In this way, companies are able to anticipate changes in government requirements and regulations, life cycles of the equipment, as well as the downtime and repair time of the equipment (spare part inventory needs and warranty information) and equipment scheduling.

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[55] Researcher's own model (Efstathiou)
[56] Taylor, C
[57] Ibid

SBS is a firm that has been developing GroundStar with its partner INFORM of Germany. The system is an integrated resource management system for planning, rostering, and real-time planning of ground handling operations. "The system not only will help employees check their rosters but will let them know what specific tasks they will be doing that day and with what equipment, with whom they will be working and what skills they will need to apply. Air Canada is using Ground Star at Montreal, Toronto and Vancouver. In Europe Copenhagen Air Services is using all three modules for its 600 employees. Some modules are being used at Frankfurt, Munich and Nuremberg airports"[58]. The elements of GroundStar are Plancontrol, StaffControl, and RealTime control.

PlanControl supports long-medium and short-term demand planning of staff and equipment. A number of different scenarios are used for these planning purposes.
StaffControl generates rosters based on shifts, using information about the shift, qualifications, and staff numbers demanded to achieve the best schedule.
ContractControl may be used by airlines and handling agents for contract management activities.

7.1.2.2 Outsourced

A present trend is for airlines to either outsource their ground-support services to a third party for a fixed time period, i.e. Lufthansa being the customer of Cargo-Center at Arlanda airport in Stockholm, through a contract, or to outsource to an alliance partner's facilities at a major alliance hub location. Also, some airlines choose to form subsidiaries with ground handling agents (GHA). An example of such a subsidiary is found in the company modeled by Air France and Servisair Ltd.

Alliances are the major contributing factor influencing the trend for outsourcing the terminal and ground-handling operations. In the past, airlines had to maintain their own handling services or be forced to use the services

[58] Ibid

offered by the national carrier at the destination they were servicing. Nowadays airlines can outsource these activities to an alliance partner that has assumed the investment, on behalf of the alliance at a specific regional hub.

An example of such a situation is found in the investment made by SAS at Copenhagen airport; "Scandinavian Airlines doubles its cargo capacity and expedites deliveries to customers with its new highly automated cargo center at Copenhagen Airport"[59]. The new cargo center, established on December 28, 1998, is 344,000 square feet large. The Unit Loading Device (ULD) warehouse, special ULD handling, and the Euro-pallet warehouse are all situated in the same building. Terminal handling capability stands at 350,000 tons of cargo per annum (formerly 106,000 tons). "SAS now expedites its deliveries, has since improved its lead times, eliminates human errors, guarantees safe handling, and has the ability to have its Star Alliance partners (Lufthansa, Thai Airways, United Airlines, and Air Canada) under one roof. Additionally, all cargo handling is performed on one floor"[60].

Often loads are handled simultaneously as their documents. For this purpose they use an integrated control system (Siemens PL) for the operations inside the terminal, enabling the transfer of information through the network. The system helps select the best routes for transfer, import/export, and palletized or bulk cargo. The air cargo terminal computer then works out a plan in which resources and the flow of materials are optimized.

Nonetheless, airlines have to deal with a problem that is the direct result of outsourcing their Ground Handling Operations (GHOs) to third parties. Airline unions view the outsourcing of ground handling operations as a threat, thus there is a lot of internal resistance toward outsourcing. However, in the case of forming a subsidiary, ensuring employment and most of the benefits for the employees may reduce the resistance.

[59] Randall, S
[60] Ibid

Below are some examples of some conditions regarding outsourcing and unions, set by two U.S. airlines that source their GHOs to other operators.

"American Airlines has a clause in its contract with the Transport Workers Union stating that outsourcing will be based on the number of operations at a particular station. Above a certain number of flights, American does self-handling. Below that number, it outsources"[61].

"Delta airlines states that "under-the-wing" activities are outsourced at a majority of Delta stations, with the major exceptions being about 30 larger airports. Delta handles Delta Connection carriers in a number of cities and has agreements with its code-share partners to handle for each other. Delta ground handlers are not unionized[62]".

7.1.3 Value-Adding Services

Airlines provide forwarders and shippers with special handling services as a part of their complete service package. These types of special handling services may be classified as value-adding services, as the quality of the core service offered by the airlines is further enhanced through the provision of such services.

Airlines emulate the forwarders in the provision of these services, as they have realized that value-adding services are the answer to the industry's slim profit margins averaging 2-5%. The core difference between the value-adding services offered by the airlines and those offered by forwarders, is that the airlines offer these types of services further down the transport chain. In a way then, airlines compete with the forwarders for the value-adding services requested by shippers. The competition is of course limited to the flow of cargo that does not involve forwarders in the pickup process.

At the same time though, forwarders are also customers to airlines when it comes to value-adding services. Forwarders are airline customers for value-

[61] Nelms, D W (2000)
[62] Nelms, D W (2000)

adding services for the goods that are picked up and transported to the airport by a forwarder.
Some value-adding services to be sold in this segment of the market, involve warehousing, storage (different rooms), labeling, packaging, barcoding, sorting, kitting, sequencing, and document processing.

An example of a value-adding service is offered by SAS to Volvo's group of companies at Gothenburg's Landvetter airport. SAS offers customer dedicated personnel that deal only with the handling and processing of Volvo documents, resulting in the speeding of the handling process for Volvo's goods[63].

Based on IATA's 1999 survey, 45% of the freight forwarder sample interviewed have need of special handling services for their shipments. This percentage represents a significant increase of 8% compared to the same study's 1998 results. Further, according to the same report, 75% of the forwarder sample appeared to be gratified with the storage services provided by the carriers that service them. This high percentage represents an increase of 16% compared to 1998 figures, indicating a positive response to customer requirements (forwarders) on behalf of the airlines. In addition, 58% of the shipper sample expresses their content for the provision of storage facilities by air carriers[64].

7.2 Airline Types

There are five different types of airlines that currently compete for cargo business. These types are labeled by the industry as pax-belly, combination, dedicated cargo charter, and ad-hoc.

Throughout the entire thesis the focal point will be targeted on the pax-belly operators, dedicated cargo operators and on the combination carriers. The main reason for choosing to consider these types of carriers only, is that the remaining two types of services (charter, ad-hoc) are not so common in the Swedish market. Cargo destined to be flow as charter or ad-hoc is usually

[63] Strömbäck, U
[64] Hind S., Trounce C., Aulton N.

trucked down to major European hubs. Such activities are initiated at Swedish airports when the transport concerns emergency shipments or the physical characteristics of the cargo necessitate its rapid transport.

7.2.1 Charter Operators

Charter flights may turn out in the form of buying the whole capacity of the aircraft, to move a shipment that utilizes the entire capacity or buying the service for emergency shipments of any size i.e. a small package containing a spare part for a plant's machinery and the line is idle.

7.2.2 Ad-hoc Operators

Ad-hoc services are hired when a set of special requirements are involved in the transport. An example is that of extremely large shipments that cannot be handled by a standard freighter aircraft. Generally, aircraft like the Antonof-124, the largest cargo aircraft in the world, are employed for such ad-hoc services, by operators that specialize in the transport of extremely large air cargo shipments i.e. Eastern European Cargo operators.

7.2.3 Pax-belly Operators

A pax-belly airline provides cargo services to the industry by offering for sale the available capacity of the belly of its aircraft, after the passenger-related cargo is loaded i.e. service cargo such as food/beverages, and pax luggage. In this way cargo services are available for the passenger destinations that these airlines call. A pax-belly airline example is that of SAS.

Pax-belly airlines have limitations in the size of cargo they accept as they face capacity restrictions because of the combined services they offer. However, these airlines can provide the industry with air cargo transport flexibility, in the form of frequent flights to destinations. Moreover, in the case of SAS, all flights to the airline's destinations are direct (non-stop) flights. Such service capability offers reduced cargo handling to the industry's shippers that happen to be particularly interested in the minimization of handling on their cargo during transport.

7.2.4 Combination Carriers

Combination carriers are those that offer both dedicated cargo aircraft capacity and pax-belly capacity to the industry. Examples of combination air carriers are those of Lufthansa (largest) and Air France. These carriers own freighter aircraft that enable them to offer the industry the option to ship large shipments by air. In addition, combination carriers possess cargo capacity in all their passenger flights (pax-belly), so they too, can offer the industry with frequent flexible departure schedules. However, combination carriers may offer a pax-belly cargo transport service that involves a lot of cargo handling, as most of these large carriers do not offer direct flights because they utilize hub-and-spoke systems in their networks.

7.2.5 Dedicated Cargo carriers

Full freighter operators are airlines that provide cargo services only. These types of carriers, offer scheduled services for cargo flights. Dedicated cargo carriers do not offer as frequent services as both the pax-belly and the combination carriers do. What they do offer though is, additional capacity to the industry, and a lot of flexibility for cargo with special requirements such as size and physical characteristics. The most important service dedicated carriers have to offer is based on the fact that moving cargo is their core competence. That means that the company focuses on these types of services alone. The result is of course higher service levels and increased reliability on destinations, as routing is ordained based on cargo volumes and does not consider the passenger factor as is often the case in passenger carriers. Examples of such carriers are those of Polar Air and Atlas.

7.3 Existing market conditions

7.3.1 Competitive Position

Consider the U.S as an example, “Since 1977 the growth of cargo shipments has increased 1585% industry-wide. The 1977, 52% airline market share of all U.S cargo shipments has shrunk to 3% today”[65] this entire market share was lost to the integrators.

[65] Anonymous

When it comes to cargo services, airlines currently operate in an extremely competitive environment against some powerful competitors such as UPS, FedEx, and DHL along with some dedicated freighter companies such as Polar Air, Atlas Air and CargoLux. Moreover, they face increasing competition from other modes of transport such as road haulers that offer attractive road based solutions to shippers.

Airlines maintain an advantage over the integrators when it comes to their ability to transport large shipments. Integrators place limits on the weight of the cargo they accept, as the operational efficiency of their system is structured to accommodate small packages. Further, airlines maintain a competitive advantage versus the dedicated cargo carriers because of their flexibility. Airlines provide services to more destinations than these carriers do, they offer more frequencies as they can also utilize their pax-belly capacity for the transport of cargo. Finally, airlines offer competitive pricing against the integrators and dedicated cargo carriers, since their cost is marginal on the capacity of their pax-belly operations.

7.3.2 Development

7.3.2.1 Introduction of time-definite services

The introduction of time-definite services was initiated to enable airlines to level the competition with the integrators, since the integrators already offer such services to the shippers. Such a move by the airlines will help them achieve control over their own operations and focus on their main competence in the air cargo transport business. Time-definite service means cargo delivery is promised, based on a specific time and flight. This type of service is possible because the carrier can ensure that its capacity can meet the demands of any route, at all times. Time-definite services aim at going back to the basics, and offering the airline's customer exactly what he needs. This being to have the product at its destination on time.

Time-definite services do just that; the new service guarantees the performance of the airlines for the main concern of both the forwarder and the shipper. That is to have the product on time, in the right condition, and naturally at the correct location. The 1996 Unisys study by the company's freight program, compared the processes of deferred freight versus time-definite delivery. "The results found that deferred cargo traveling on traditional airlines was handled a whopping 36 times, put into storage 16 times, and held at 8 different locations in the air freight cycle. In contrast, integrators like FedEx, UPS, and Emery had a total of 11 handling processes"[66]. Naturally this comparison shows the gap in service that existed between airlines and integrators prior to the introduction of time-definite services.

7.3.3 Constraints

7.3.3.1 The 'by-product' problem

Pax-belly-type airlines have to first consider the number of passengers wishing to travel to and from a specific destination. The availability of pax will determine the level of service for the freight product, since its competitiveness depends on the amount of pax. For example, high pax demand for flying to and from a destination will increase the frequency by which the airline visits the airport. Higher quality services for cargo transport are then offered to the airline clients in the form of multiple frequencies and increased capacity, qualities that are highly respected in the transport industry.

Consequently, the reduction of customers wishing to fly with an airline to and from a specific destination, will force the airline to drop that destination. By dropping the destination the airline places its clients (forwarder, integrator, 4PL, shipper), in the uncomfortable position of having to look for an alternative solution to move their cargo. Such unavoidable (due to nature of pax-belly airlines) practices dramatically reduce the quality of service of the products offered by airlines.

[66] Schwartz, B (2000)

Pax-belly airlines, still continue to view cargo as a by-product of passenger operations. Only recently they realized that cargo revenue is the income that makes 95% of the passenger flights economically feasible. Therefore, to increase global presence and effectively compete against other carriers in most passenger destinations, sufficient cargo volumes (along with pax volumes of course) must be available at these locations. The capacity available on a pax-belly aircraft is accessible to airlines on marginal cost thus; most income from cargo contributes to the improvement of an airline's operational profitability.

"Unlike passengers, freight is always emigrating. It leaves a point of origin and never comes back"[67]. Because cargo never comes back, carriers face the problem of imbalances, because they need cargo generated at the destination to fill their aircraft capacity and make the operation profitable.

Cargo carriers must consider the utilization of the unit's (aircraft) capacity when they determine the airport locations from which to operate. Cargo is now treated like passengers, in practices such as yield management. Cargo capacity is sold on market price to agents or shippers according to its availability. Limited capacity results in higher-than-tariff rates and large amounts of unutilized capacity often results in lower than-tariff-prices. The exception to market pricing is the capacity allotted to airline clients over long-term contracts.

To establish the rates, airlines must consider the availability of freight for the back-haul at the destination. If there is no cargo generated at the destination, then the empty back-haul costs are added on the rates for the flight into the destination. If these rates are not competitive against other prices offered by competitors, then the airline disconnects the service. For illustration, consider a rise in the Yen. Such a rise would have an impact on the exports of the country (Japan) by reducing their number and thus creating empty back-hauls from Japan to wherever destination. The rates for flights going to Japan would significantly increase in order to cover the costs of operating an empty back-haul.

[67] Larsson, T

A strategy used by airlines to deal with the empty cargo back-haul problem, is to operate an aircraft together with another(s) carrier(s). An illustration of such a practice is found in a tripartite cargo aircraft flying to Japan from Landvetter. Capacity on that flight is allocated to Lufthansa, SAS, and JAL (Japan Airlines).

7.3.3.2 Risk of cannibalization of primary product

So far airlines have enjoyed the advantage of being capable of lifting large shipments of cargo while at the same time offering shippers flexibility through multiple frequencies. Based on this capability airlines have earned approximately 10% of the market share for direct transport of the shipper's output. Airlines assume a great risk of losing their regular customers as they cannot give up capacity to serve them any more since the introduction of time-definite services 'reserves' capacity and thus the airline may be unable to satisfy the emergency needs of key accounts. For example the Lufthansa-SAS group currently offers Express Cargo (20% higher rates) for shipments to North America due to capacity restrictions (empty back-hauls)[68]. Therefore, any long-term customer has to assume these higher rates if he needs to ship his cargo in this way (and does not have a contract on rates).

Also, due to the outsource of handling services to alliance partners, problems appear at the ground handling when sudden events draw staff away from the loading, resulting in the partner's cargo being stranded. Further, as the unions protect handlers, they are not inclined to load the partner's aircraft, as they do not earn anything extra for doing so. Even in cases where handlers are offered some incentives the level of service is not premium.

7.3.3.3 Troubled Airline-Forwarder relationship

This is a fundamental problem in the traditional air cargo system. Airlines and forwarders face several serious problems in their relationship. Both actors

[68] Larsson, T

generate their revenue as a percentage of the total price paid by shippers. Therefore, a lack of trust exits between them. They do not share any information in fear of providing the other with their margins. The lack of information results in several inefficiencies in the traditional airfreight transport chain (see Chapter 13). These inefficiencies make other traffic systems more attractive to shippers.

What "adds salt to the wound" is the practice by airlines to try to approach the customer themselves. Airlines, in so doing, do not mean to offend any other participant (middlemen) in the system. However, they try to keep direct contact with the shippers (cargo generators) because this is the only way to market themselves as carriers.

However, the forwarders do not like these types of practices for several reasons. First, they may be forced to send cargo with a carrier because the shipper asks them to, thus loosing the opportunity to exploit other capacity that may be cheaper. Second, the forwarder is concerned with the direct contact of airlines with shippers since they primarily fear that they will loose their shipper account to the airlines and secondarily, that airlines, by offering the shippers a quote on a route without the forwarder being involved, may give the shipper an idea of what the forwarder's margin is, and thus enable the shipper to gain a bargaining advantage during contract negotiations on rates. Such an advantage may result in lower rates on contracts for the forwarders.

7.3.3.4 Lack of control

Nobody in the airline business offers the same air transport service. Everyone implements their operations in a different way.

Airlines have trouble controlling their operations resulting in lower than the competition service levels. Airlines are not solely the carrier responsible for the successful transportation of a customer's shipment. Other actors such as forwarders, terminal operators, and ground handling agents are involved in the process. The objectionable relationship of forwarders-airlines as described

above, has a direct impact in the loss of control, since it is empowered by the lack of information exchange. Further, lack of control exists because the process of moving the cargo through the traditional airfreight system is not standardized, as is the case in the traffic system operated by the integrators. Alliance partners operate in different ways and are still far from establishing a common platform. Even more, these alliances or individual airlines are unable to set an operational framework with the forwarders, terminal operators, and ground-handling agents, because they are not able to communicate the value of the sizeable investment to these other actors, especially the forwarders. The outcome is that nobody wants to "play hero" and assume the immense costs behind the standardization of the process, and then depend on the other's business in order to recover the investment.

7.3.4 Airlines' Airport Selection Criteria (for some of the SCAA Airports)

All of the criteria identified below are desirable by airlines at all the airports they operate from. However, some of these criteria are assigned to different airports below in relation to each airport's nature in the transport system for exhibition purposes.

7.3.4.1 Stockholm Arlanda

- **Enough goods**
  2/3rd of the incoming cargo is shipped from a 200 km radius from the airport. This number indicates that the airport is situated close to the market (cargo generators).

- **Good infrastructure at the airport**
  By facilitating the efficient operations of cargo, the airport can attract more cargo lines. Thus, the airport authorities are working toward a Marketing Route Development for cargo with a goal to attract new carriers. To that end the authorities consider good infrastructure to be an important variable. The airport is currently working toward the construction of a third runway. Meanwhile the airports existing runway capability can host all aircraft types.

Also, the airport authorities are planning a new cargo area close to the ramp. Further, land is being prepared for the new passenger terminal buildings (6 years to built, cost 10 billion SEK). Nonetheless, SCAA places limits in the amount of money to be invested (Economic limits) so the airport is forced to postpone investments over a longer period. However, the airport's Administration supports that those who should invest in facilities should be the Ground Handling Agents (GHA). Such an example is that of Service-Air; the company agreed on a contract with Copenhagen airport and in this contract the company settled to provide all the facilities for ground handling operations.

Good airport infrastructure also implies good external infrastructure such as forwarders truck lanes etc. Freight forwarders have their offices around the airport to support their truck lines from out of the airport.

- **Pricing**

  This is important. Airport costs comprise 5% of the total costs of the airlines' operating cost. Total cost to operate the aircraft is essential to airline profitability. Trucking a lot of cargo (feeder concept) made it possible to maintain a low cost for the aircraft and still meet the shipper's demands. Therefore, if the costs for airlines to fly from Stockholm are less than to truck the cargo, then Arlanda Airport will attract these new carriers[69].

- **Number of Intercontinental flights**

  Airlines, and especially pax-belly operators, consider the amount of intercontinental flights originating or destined at the airport in question. Let's consider SAS for example; SAS is a 'belly' airline, which means that all its cargo operations are offered in combination to its passenger operations. COP airport provided that flexibility in the form of several different intercontinental destinations, so SAS invested in a new terminal there instead. Therefore, increases in the numbers of

[69] Holst, C

intercontinental flights from Arlanda will make the airport more attractive for cargo operations.

7.3.4.2 Gothenburg Landvetter

- **Throughput efficiency**
  The infrastructure of the airport provides the opportunity to realize efficiencies on the flow of cargo. Terminal capacity is available and is situated near the aircraft parking area, so the moving distance that needs to be covered by the ground handling agents is reduced. The throughput process is done more efficiently, as improved ways of performing the related tasks have assisted in the simplification of the complexities involved in both the preparation for export and the import processes.

- **Freighter Hub**
  If one considers the geographical position of Gothenburg, one will notice that it is situated in 'balanced' distances from the capitals of Oslo, Stockholm and Copenhagen. 80% of this district's capacity is produced at a 500 km radius from Gothenburg's airport. This fact made the airport the logical choice to focus freighter operations, since such operations depend on volumes to be profitable. Volumes are often not filled by one shipper. However, cargo is 'fed' down to the airport by truck and is consolidated for the freighter flight. SAS freighter operations use Gothenburg airport as their hub along with JAL and Lufthansa, as it is much better to consolidate. Gothenburg airport is very efficient, and is also closer to other Scandinavian countries.

  Consequently, agents and/or shippers at Landvetter, have a wider range of freighter options, as the airport at Gothenburg is the freighter hub for the country. Examples of such options are the freight operations to Japan and Hong-Kong.

- **Airport Management**

Airlines expect to face a responsive airport management team at the airports they operate. Through its efforts the airport authorities can assist the airlines calling at the airport, in their effort to become more competitive. Pro-actively responding to the needs of the carriers gives the right signals to the industry. Appropriate investments by the airport authorities ensure the airlines that their business is wanted. Such favorable conditions make airlines more inclined to invest in new facilities and equipment at the airport, since they set forth long-term thinking, and expanding operations. An example is found at Landvetter airport, where SAS is investing in additional workstations in its terminals to further automate its handling process at the airport, as it anticipates an increase in its operations there. The staff at Gothenburg airport is motivated; they manage to offer good organization and lower prices[70].

7.3.4.3 Malmö Sturup

- **Lead times**

  Lead-time has a big influence on the decision of where airlines choose to establish their operations whether those are gateway, or hub operations. Lead time considerations involve the geographical location of the airport, and a mix of time saving. Time saving may be generated while the aircraft is in the air in the form of 'slot time availability' or on the ground through more efficient cargo handling and terminal operations. TNT for example, moved its operations away from Copenhagen airport and onto Sturup because by doing so it reduces its lead times by 1 hour.

[70] Jacobson, A and Lennartz, B

- **Expansion capability**
  An important factor influencing the airport selection of several airlines is the possibility to expand their operations at an airport. These types of investments do not usually take place when a carrier initiates operations at a given airport. These decisions are related to the competitive position of an airline and cannot be determined ahead of time. That is why airlines prefer airports that offer the option for expansion, just in case they need to do so in order to effectively compete against other carriers.

- **Close relationships (dedicated service)**
  Another important factor identified here is the availability of dedicated services. In the case of Sturup airport, close relationships with customers in the form of dedicated services are feasible, because of the limited amount of cargo the airport currently administers. The capacity availability currently stands at 90% permitting the dedication of facilities, personnel and equipment to specific carriers[71].

7.4 Market Trends

7.4.1 Cargo Alliances

Cargo alliances are responsible for many of the market changes that have occurred lately. Cargo alliances are conceived by using the same principles as passenger airline alliances do. The major difference is that these alliances maintain cargo as their core business.

Strategic alliances were the primary solution to the pressures the airline industry experienced a decade after deregulation. These pressures involved increasing capital requirements, product customization resulting in price reductions, and declining overall yields as the space for cost reductions was diminished.

[71] Hjalmarsson, I

The desire of some airlines to create alliances is based on the fact that alliances assist their members in cost reductions and the increase of volume, whether that is passengers or cargo. Further, cargo alliances enable the improvement of schedules and capacity as follows:

- Code-sharing. (share resource units)

- Interline Agreements.

The joint operations above, result in the better service to the customer through the provision of multiple frequency (brand) and non-stop service to more destinations. Multiple frequency, not only improves the branding of a carrier's product, but it also raises the load factor resulting from higher volumes. In addition, more service availability toward the customer causes an increase in productivity, which is the direct outcome of increased efficiency, resulting in lower costs for the carrier.

Moreover, through most alliances participants are able to increase their market share and more effectively exploit the economies of scale that result from the share increase. Enlargement of a carrier's route network through sharing capacity with partners generates economies of scope, and the augmentation of its distribution capability improves the carrier's penetration and presence in different markets.

However, some people in the industry question the benefits from alliances. They claim that the cost of aligning operations (i.e. IT systems) between partners, are much too high and that financial stakes may offer control but do not necessarily generate synergies. Also, the norm toward volume may offer fewer benefits to carriers that are niche players and chose to join an alliance, since their core product would be diluted with that of the larger carriers in the alliance.

7.4.1.1 Cargo Alliance Example

The first air carrier alliance based on cargo operations alone is called New Global Cargo and will have its headquarters in Frankfurt. The project name for the deal is 'Team Up 2000'. The alliance comprises of Lufthansa Cargo, Scandinavian Airlines System (SAS), and Singapore Airlines. Together the partners offer 622 destinations with Lufthansa contributing 450, SAS 100, and Singapore Airlines 72 destinations.

The alliance members will integrate their cargo operations and expect to offer their first product by May 2001. Once the integration of these first three carriers is complete the alliance will extend invitations to the rest of the partners of the Star Alliance (passenger alliance comprising of Lufthansa, SAS, United Airlines, THAI Airways, Varig, and recently Austrian Airlines). The description below will refer to the integration of Lufthansa and SAS only, as information on Singapore Airline's contribution were not retrievable.

Lufthansa-SAS integration is mainly directed toward a sales consolidation at the moment. Legally, Lufthansa-SAS must show separate prices in order to comply with European and U.S antitrust laws. However, at Malmö, Sturup and Gothenburg Landvetter, the airlines have established joint operations as well.

Jointly, they will own 40% of the domestic air cargo market. The co-operation of these carriers through an alliance is quite interesting because due to the combination of their services they will enhance their presence in the pax-belly, combination, dedicated freighter and charter segments of the air cargo industry. SAS offers direct pax-belly services and Lufthansa provides for the dedicated, charter, and combination services.

The blending of the two companies' products will furnish the market with SAS's flexibility of being small and customer oriented, along with Lufthansa's large volume capability (frequency), all under one roof. This cargo alliance may enable better cooperation and provide for an improved structure in the

traditional freight system, as fewer actors and a high airline bargaining power will exist[72].

7.4.2 Mega-mergers

The industry continues to follow the consolidation pattern that has been the norm during the last few years. The new entrants to the consolidation process are major postal firms even though their involvement in operational stipulations is limited by antitrust laws to the extend of partnership programs. According to Schenker AG spokesman, Hans Von Dewall, "With the changes underway in logistics, every alliance is possible between the posts, airlines, freight forwarders, and rail operators".

An example of such conduct is found in the Deutsche Post's acquisition strategy, implemented in the international transportation industry. Deutsche Post will manage a new company called Aerologic GmbH, a joint venture between Lufthansa Cargo and Danzas-AEI. Aerologic GmbH, will administer the stakes (50% voting rights) of these two firms in DHL International. The trend of postal mergers will increase the reliability of the airlines' performance, as there will be more control over the air cargo operations. As a logistics global service provider, Deutsche Post will offer a one-stop-service through the products available in the networks of Danzas-AEI, DHL, and Lufthansa Cargo[73].

Such activity will effectively form an alliance between Deutsche Post, Lufthansa Cargo and Danzas-AEI creating the world's largest freight transport network; according to John Parker, the author of the article Toward the world crown, in Traffic World, "The assets that the alliance can call on are formidable. Lufthansa Cargo has revenue of about $2 billion and DHL about $5.2 billion. Deutsche Post's Danzas-AEI, however, is larger than the two combined. Danzas alone has revenue of about $6 billion and AEI, the largest freight forwarder in the U.S., has around $1.5 billion. In addition, Deutsche Post has acquired and incorporated a half dozen transport and logistics

[72] Leijon, U
[73] Parker, J (2000)

companies into Danzas, including Royal Nedlloyd's European Inland Transport, and Sweden's leading logistics company ASG. In total, Danzas-AEI has revenue of about $10 billion."[74]

[74] Ibid

8 TERMINAL OPERATORS & GROUND HANDLING AGENTS

8.1 Position in the system

Terminal operators and ground handling agents are the intermediaries that assume control for the handling of the cargo shipments when those arrive at the airport. Their goal is to efficiently streamline the goods movement through their facilities. The terminal operator's customers are the freight forwarders that do not own terminal facilities and the airlines. The customers of ground handling agents are the airlines only.

Terminal operators perform their activities in the terminal buildings and ground handling agents are usually situated adjacent to the terminal operators facilities to enable the smoother transfer of cargo between them. In many airports around the world, these intermediaries are situated under one roof.

In some cases the terminal operators administer only the terminal handling for cargo. An example is the CargoCenter terminal, situated at Arlanda airport in Stockholm. On other occasions a terminal operator facilitates both the terminal and the handling operations. Such structure is implemented by SAS cargo handling, at Landvetter airport in Gothenburg.

The operations of both the terminal operators and of ground handling agents are separated in two main processes. These are the import and the export processes. The export process involves the pickup of cargo from the agents/airlines and its preparation for export. The import process evolves around the activities leading to the importation of the cargo and its distribution to different carriers.

8.1.1 Export Process

Terminal operators assume possession of the cargo from the hands of forwarders and airlines. They then move the cargo through their own facilities while preparing it for export (add value). Sometimes forwarders and airlines may deliver loads that are already built into pallets. In this case the terminal

operator just moves the *through pallets* throughout its facilities. Ultimately, the terminal operator delivers all the cargo to the ground handling agents. Ground handling agents move the cargo from their own facilities and onto the tarmac to be loaded on the aircraft. This process may appear to be quite simple to the casual reader. Nonetheless, Terminal operators and Ground handling agents need all the assistance they can get from other actors in the system in order to manage this difficult task.

8.1.2 Import Process

When an aircraft arrives at its destination it is immediately encircled by ground handling agents. Ground handling agents unload the cargo from the aircraft and transfer it from the tarmac to their facilities. From there the cargo is passed on to the terminal operator. The terminal operator will then perform some activities to prepare the cargo for its recipients on the 'land side'.

8.2 Terminal Operations

8.2.1 Goods handling

Freight forwarder and airline trucks arrive at the terminal and drop off the cargo at the terminal facility. These shipments may be consolidated already (different shippers or one shipper with multiple destinations) or they may be the output of a single shipper traveling to a single destination. In the case of consolidated shipments, these are first sorted according to their carrier and their destination. Such information is found on the forwarder's/airline's AirWayBill (AWB) labels. For these services the forwarders/airlines pay an export charge on a per shipment basis. Cost based pricing is used for activities performed inside the terminal, as the margin can be identified.

If the goods both single loads and consolidated shipments are not scheduled to fly during the same day, they are moved to a temporary storage area. Once at the storage area freight is stored according to instructions describing physical characteristics i.e. refrigeration requirements, temperature controlled environment, dust free rooms etc.

8.2.2 Construction of the Unit Load Device (ULD)

Shipments that must board the same flight are consolidated and the construction of the Unit Load Device is done. The terminal operator will establish the Weight and Balance of the ULD and furnish that information to the ground handling agent along with the actual ULD.

8.2.3.Trucking (off-airport activities)

As is described in other chapters, airlines may often move cargo by truck for one portion of the transport service they offer their clients. This transit is called "off-airport activity". Off-airport activities enable the *feeding* of cargo transported from different destinations to a central hub. In this manner airlines manage to keep a lid on their pax-belly and dedicated freighter operational costs, by exploiting their hub-and-spoke systems and achieving a higher utilization rate of their equipment and facilities along with other cost savings.

On such occasions, airline trucks visit the terminal facilities to either drop off cargo that will embark on a flight taking off from that airport, or to pick up *loose cargo* and transport it along with cargo already inside the truck, to another airport's terminal for the ULD to be built.

8.2.4. De-consolidation of Shipments

When the ground-handling agent delivers the ULD to the terminal operator, the operator moves the load to its own facilities to initiate de-consolidation. Upon completion of this task, shipments are assigned to the carriers that will receive them on the 'land side'. Again, if any shipments are not scheduled for pickup within a short time period, they are moved to a storage area (Bonded) where they are stowed accordingly.

8.2.5. Documents handling

When cargo from intercontinental or non-EU origins arrives at the terminal, it must be cleared from the customs before allowed to enter the country. To satisfy these requirements, the terminal operator will register the cargo and check its contents. After the de-consolidation process, as described above, is complete, customs are electronically informed. The forwarder/airline receives a

slip with cargo related documents along with the invoice from the terminal operator.

Forwarders/airlines clear their shipments with the customs. The customs authorities assign a *customs id* for cargo that has been cleared. Forwarder/airline truckers arrive at the terminal and produce their *customs id* to the terminal operator. The terminal operator is connected to the custom's system and through Electronic Data Interchange (EDI) confirms the *customs id* and clears the shipment to be loaded onto a truck and transported out of the terminal facilities.

8.3 Handling Operations

8.3.1 Administrative and maintenance services

Handling agents do not have access to airline information. Instead they perform the following activities in various capacities at an airport; aircraft cleaning, baggage processing, passenger handling and operation of airport lounges, lost and found service and ticket counters. These are some of the services ground handling agents offer for passenger airlines.

Along with these services ground-handling agents offer services that are dedicated to cargo moved by the airlines. Ground handling agents carry out the ramp handling; they load and unload the cargo, and mail. They also provide the aircraft maintenance, and arrange for fresh water, toilet maintenance, and pushback of the aircraft. Further, everything on the apron is classified as ground handling activity.

Ground handling agents are the actors that initiate the import process once an aircraft safely lands at a given destination. Once they unload the cargo, they move it to their facilities. From then they deliver the cargo and its related documents as is, to the terminal operators who assumes responsibility for it from then on.

At the airport, the ground-handling agent receives the ULD from the terminal operator along with the ULD's weight and balance information. The ground-handling agent, with its own equipment then moves the cargo to the tarmac and loads it on the aircraft.

8.4 Value-Adding Services (Terminal Operators)

Value-adding services are, again viewed by terminal operators as a way to increase the currently slim yields in the industry. Additional revenue may be generated through the provision of extra services on top of their core service. Value-adding service capability exists amongst the terminal operators.

However, according to Lars Keding, CEO of Cargo Center at Arlanda airport in Stockholm, "Some airlines may require some new resources in order to establish or expand operations here. The terminal's management will consider the investment necessary to develop that service for the client and measure its contribution to revenue before making a commitment to provide the service to the airline"[75]. Pricing of the service will depend on the product involved i.e. SAS Priority, express, or standard. Investments that would result in the improvement of operations are important to everybody in the system. Although, the question that comes under consideration is the amount that must be paid for gaining these benefits with the subsequent question being which investor is going to pay for it?

8.4.1 Cargo physical characteristics

Some value-adding services are offered along the line of demands set by the physical characteristics of the cargo. An example of such value-added services may be the extra security hired to meet security requirements for live animals waiting to be transported. Extra security is resource consuming thus a rather expensive service.

Dry ice replenishment (maintain temperature specifications) of specific cargo containers may be another value-added service offered by the terminal operators.

[75] Keding, L

8.4.2 De-consolidation

The de-consolidation process is a value-adding service. Once the ULD is broken up the goods are stored and wait for the agent or airline to pick them up. The movement of the cargo toward the 'land side' is done based on the cross-docking system. However, this service may be limited to a number of terminal clients due to the lack of space. Nonetheless, a Third Party Logistics provider could assume such services and offer storage along with packaging and labeling services.

8.4.3 Dedicated personnel and equipment

Sometimes a carrier who happens to be the largest account for the terminal operator, may demand dedicated labor and equipment to expedite its shipment processes. Such an example is found at CargoCenter at Arlanda airport, in Stockholm, where Lufthansa cargo sometimes produces such demands based on its buyer power.

8.4.4 Logistics services

A cargo-handling firm may offer specialized warehouse management services as well as a distribution facility to attract clients that want to buy logistics operations. An example of these services is described below:

"Strategically situated side by side near the airport's (Frankfurt) two passenger terminals, the Deutsche Post facilities feature advanced conveyor, sorting, handling, and computer technology along with expert handling teams that optimize airmail logistics for Europe's single largest market. FITA is Germany's sole sorting and distribution station for all international airmail and for many years has served as the principal gateway for Germany's domestic hub-and-spoke airmail network"[76].

[76] Hill, L

8.4.5 Other

Other value adding services include expedited handling requested by some carriers and agents, specialized services for shipments that require extra care in handling, special handling equipment provisions, or service on special routes according to freight demand based on one or two clients.

8.5 Operation Support Systems

8.5.1 Information Systems

A principal goal of the terminal operators and ground-handling agents is to differentiate themselves in the market, in terms of the services they offer. These actors look into technology to help them achieve just that. During this search they must consider the investment and evaluate whether potential returns will justify the costs (SkyFreight Systems example). Returns will be generated by the provision of improved service, as value-added service is the only thing the customer will actually be willing to pay for.
Some examples of existing IT systems for ground handling and terminal operations are disclosed below:

A product currently in the market is CargoChorus (by Syntegra). CargoChorus is a modular, inter-operational IT system that combines automated handling with other advances. This system is marketed as "a new generation air cargo IT system to manage performance, operational procedures and information flow during the ground handling process"[77]. Another module of the same system that is due in the future will deal with capacity, yield-management, and accounting. Other future modules of this system will tackle knowledge and customer management issues.

"Two other IT/handling systems are the Electronic Logistical Warehouse Information System (ELWIS) developed by Lufthansa System Division and the Warehouse Automation Terminal Cargo Handling system (WATCH) developed (1998) by Alitalia and Singapore Airlines in conjunction with SITA

[77] Nelms, D W (2000)

and being marketed by SITA"[78]. WATCH offers the same modules as other systems plus an additional service level control module along with a distribution module that further enables differentiation of services. The other can handle bar coding and RF transmission, making the process seamless, eliminating the need to download/upload information.

IT use is what will increase the performance of terminal operators and ground handling agents. As the Cargo 2000 (IT to enhance total cargo movement) initiative did not achieve its objectives, these operators must turn to the development of their own IT systems to achieve the communication levels they need. Terminal operators and ground handling agents find it difficult to develop their own information systems though, due to complexities arising by the lack of standardization. Some choose to implement identical applications used by airports and airlines i.e. cargo handling IT system recently upgraded by American Airlines.

8.5.2 Automation Systems

Automation in terminals is expressed in the form of automatic stacking elevators, vacuum lift for heavy cargo lifting, and automated systems for handling pallets (workstations).

8.6 Constraints (For terminal operators)

8.6.1 Equipment and income relation

Main sources of income are the ground handling agent's fees paid by airlines and terminal fees paid by forwarders. The prices are weight-based and export fees are based on the amount of shipments (volume) while the import fees are based on weight. This nature of services causes the difficulty these operators face. Most of their income is generated from import business but most of their resources are dedicated to export services. This relationship means that when export activities are increasing, terminal revenues are decreasing along with their operating costs increasing!

[78] Ibid

8.6.2 Negative technological effect

Forwarders in the industry pursue different strategies in the way they do business Some forwarders sell capacity at lower rates while others offer higher quality services. The medium-large forwarders usually utilize the latter approach, as they can exploit economies of scale resulting from volume operations.

The technological advancements that have occurred during the recent years made it possible for new small entrants to join the forwarder market. Even though new entrants are essential for competition to thrive, in this industry's case they are viewed as having a negative impact. Such a conviction is based on the fact that smaller participants cause de-stabilization of any efforts to create a standard in the forwarding industry, as they are too many and too small to afford necessary investments. In turn, this condition makes handling of cargo even more difficult, because of order processing and communication difficulties.

8.6.3 Dependency and no control of operations

Terminal operators and ground handling agents do not have control over their operations. Lack of control exists because their operations depend on the reliability of other actors such as the airlines and the forwarders. They also depend on the amount of cargo related information the shipper is willing to provide them with. Further, terminal operators cannot exercise complete control over their own operations even if they want to, because they are dependent on the forwarders' and airlines' business.

Hence, the bargaining power of customers renders impossible for the terminal operators to set any kind of strict deadlines and in this manner establish a form of control over their own operations. Hub airports such as Copenhagen airport can set these restrictions because the bargaining power of the carriers and that of agents is lower at that airport, for they need to be present and operate at that airport.

8.6.4 Cargo delivery delays

Cargo delays for delivery at the terminal are an industry problem. The way the timing is supposed to work is organized as follows: airlines set a deadline to the forwarders (integrators, other airlines) that want to ship cargo on a specific flight. Terminal operators and ground handling agents set their deadline based on the airline's deadline minus one hour. However, delays continue to occur due to several reasons (city traffic, accidents, late pickup, late arrival of documents etc.) resulting in inefficiencies in the operations of terminal operators and ground handling agents.

Delays on delivery of shipments cause the bad utilization of resources for export services and the decrease of the quality of the import services. When a shipment arrives late more equipment has to be dedicated for processing that shipment which may result in the delay of other export loads. Further, such activity may result in the delay of shipments waiting to be imported, since necessary equipment are being used for export activities. Moreover, when considering the resource utilization in this case one should not fail to include the 'idle time' experienced by the export equipment while waiting for the late shipment to arrive.

8.6.5 No information sharing

In the traditional air transport system, loads are moved by different actors to get to their destination since seamless operations are not established in this traffic system. When these shipments 'change hands' there is an exchange of information concerning the shipments' details. Such information exchange does not occur early enough in the process, so as to generate lead-time reduction or even enable the sustenance of the desirable lead time stated in different contracts. Such a practical logistics problem is exhibited below based on real conditions:

8.6.5.1 Practical example of a logistic problem

A specific flight is set to depart at 17:00. The forwarder arrives at the terminal operator's premises at 16:10 or later to make the delivery when the truck should have been there at 16:00. The terminal operator needs 45 minutes to

perform its processes effectively, therefore, in this case, there is no time to get the cargo on the aircraft.

When the situation above was further investigated, the terminal operator communicated this issue to the customer and found that the customer had all the cargo related information ready by 13:00.

The forwarder in this case kept this information until the cargo arrived at the terminal operator's facilities. Had this information been communicated directly from the shipper to the terminal operator, the latter could perform some activities concerning the shipment prior to its arrival. Such visibility would reduce the terminal operator's lead-time and result in the operator's ability to still make the flight even if the forwarder arrives at 16:10 instead of 16:00[79].

8.6.6 Scheduling problems

60-65% of total cargo bound for export, leaves the airports on Friday, the end of the business week. Similarly, most cargo is imported into country during Mondays. The reason why such cargo traffic pattern occurs is because of the traditional order cycle process, used for decades in business. That is, the shipper receives the order from the consignee on Monday, and has the order sent out on Friday, so it would reach the consignee's premises by the following Monday. Other than tradition, no apparent reason appears to be responsible for such order cycle practices.

Nonetheless, these conditions result in scheduling and operational problems for the terminal operators and ground-handling agents. Scheduling problems occur because the terminal operators and ground handling agents may have to maintain a specific amount of labor force, capable of satisfying the demand for the peaks of Friday and Monday. Some of the labor force experiences partial idle time during the remaining five days of the week, resulting in higher costs for these operators. Moreover, operational problems appear in the form of the inefficient utilization of equipment since increased traffic may reduce their

[79] Keding, L

efficient operation (space limitation). Further, equipment idle time occurs based on the same principle concerning labor, as explained above.

8.6.7 Market volatility

Terminal operators and ground handling agents are contemplative of some investments that would enable them to improve their level of service substantially. However, they cannot take the risk of investing without any form of a guarantee of continuous business for a fixed number of years. Such risk cannot be assumed because the air cargo transport industry is extremely volatile, as it is influenced by numerous external factors. Airlines may crowd an airport for a two year period and then relocate to another simply because such a move is dictated by competition. Long-term relationships may exist in this industry, however such long-term relationships are quite difficult to *guarantee*.

Market volatility then, bears the risk of sunk costs for any of the terminal operators investing in additional capacity (labor, facilities, equipment, IT/automation systems etc.). The result is that these operators are reluctant in making substantial investments that would generate further optimization of their processes making them more attractive to airlines and forwarding agents.

8.7 Market trends

8.7.1 Privatization

Privatization resulted in the increase of the number of Ground Handling Agents (GHA's). "Ground handling companies have grown from 50-60 in 1988 to over 400, as a result of the EU directive that forced European airports to give up their ground-handling monopolies".[80] Privatization has provided the spark for competition in this segment of the industry. Increased competition has resulted in the increase of the service levels offered by these operators along with the reduction of prices resulting from lower costs of operation being the outcome of increased productivity.

8.7.2 Outsourcing

In Chapter 7 there was a description of both the internally and externally assigned (outsourced) cargo handling operations of the airlines. The results of privatization affected the ground handling and terminal operation services available in the market and made them more attractive. Further, intensified competition increased efficiency and in some cases surpassed the efficiency of in-house airline operations, thus making outsourcing a viable, logical option.

Moreover, the formulation of passenger and cargo airline alliances has dramatically increased the carriers' bargaining power at all the different airports from where the alliances operate from and enhanced the willingness of terminal operators and ground handling agents to conform to their service requirements. Terminal operators and ground handling agents, now focus on improving their flow control by enhancing their workflow processes and effectively moving the cargo through their terminals.

8.7.3 Paperless Trading

Terminal operators and ground handling agents are working toward the establishment of 'paperless trading'. To that end, they work toward the incorporation of information systems that can make such an objective feasible. Paperless trading will speed the flow of documents through the system, reduce lead times, improve efficiency, increase the quality control in operations, and reduce the percentage of errors in such transactions. For example, at the Cargo Center at Arlanda airport in Stockholm, a new in-house IT system is being constructed to support communication with customers (forwarders, airlines, shippers) and airport authorities[81].

[80] Nelms, DW (2000)
[81] Keding, L

9 INTEGRATORS

9.1 Position in the system

What is it that the integrators do? Why are they called integrators and not forwarders, since they do the same job as them? They are labeled as integrators because they offer other services than just plain consolidated airport-to-airport and some door-to-door transport services like the traditional forwarder does. They mainly operate in the business-to-business markets and they specialize in offering door-to-door transport solutions. Value-adding services function as a complement to these door-to-door transport solutions making them more attractive to potential clients. Overall, the integrators are the service providers responsible for connecting all the markets around the globe.

They also specialize in offering Third Party Logistics services (TPL). Assistance by specialists for Third Party Logistics services, enables an organization in a given industry to integrate its own distribution and procurement processes and thus realize tremendous savings in doing so. The statement of Brian Glancy, a principal at MergeGlobal Inc, that "The express companies are highly efficient flying warehouses"[82] best summarizes the position of the integrators.

Integrators such as FedEx, DHL, UPS, and TNT were the first ones in the air cargo industry to identify the needs of the shipper. They studied the internal processes of shippers and realized the upcoming trends in manufacturing (as stated in Chapter 4). This pro-active approach empowered the integrators in preparing accordingly, to satisfy the needs that would result from these forthcoming trends.

Integrators foresaw the opportunity and invested in their own infrastructure so that they would make possible the provision of domestic/international air express and TPL services. International express air cargo market is forecasted to be 40% of the total by 2017 and currently stands at 6%[83]. The integrators

[82] Tanzer, A
[83] Smith, B

were the first to introduce door-to-door movement of time-dependent items whether those were goods or documents. They were also the first to introduce time-definite deliveries of shipments, much earlier than their competitors. Below a description of their core operations.

9.1.1 Seamless Transport services

Integrators have managed to develop a network that makes possible the seamless flow of goods. This ability is the integrator's greatest advantage, as nobody else in the industry is even close to developing the capability of providing a seamless flow for shipments. Through the provision of seamless operation integrators manage to provide the shippers with substantial reductions in their lead times, a critical service element for most of the industries around the world. Integrators are capable of doing so because they own all the facilities and vehicles (trucks, aircraft) used for the door-to-door transport. Ownership provides these organizations with control of their operations and enables them to offer their clients solutions that are implemented in a "secure" or "closed" system.

When it comes to transport services, the integrators' core competence (specialization) is the door-to-door transport of small packages that weigh around 50 kg or less. Some of the products these companies offer, range from overnight delivery, next-day-by-midday delivery, next-day-by-end of business day, two-day, three-day deliveries etc.

FedEx, TNT and DHL can provide heavy weight services as well, since there is a parallel heavy-weight flow available (forklifts, trucks etc). However, heavy-weight cargo is not their core business. UPS for example, has a maximum limit on the cargo it accepts set at 70 kg. FedEx's statement best describes the integrator's core transport business "The FedEx Express global transportation network provides rapid, reliable, time-definite delivery of documents, packages and freight shipments worldwide"[84].

[84] FedEx Web Site

9.1.1.1 Description of the overnight door-to-door flow

Gateways (the airport locations where production is offered) and Hubs (international sorting centers) comprise the network of the integrators. Cargo moves fast through this network and arrives at its destination Just in Time (JIT), and as promised. Not earlier and not late. Below is a description of the overnight door-to-door service as is done by DHL International, for exhibition purposes. Door-to-door services offered by other integrators retain roughly a similar structure.

Here is the process then: The cargo is picked up at the shipper's location and transported at the airport (Gateway). The shipments are then sorted for departure to different Hubs, and are loaded onto the aircraft for their lift in the air. {Alternative routing is always available, back-up aircraft, back-up transfer locations}. While this process is taking place, real-time tracking of shipments, monitoring of volumes, payloads, and transportation requirements are available to customers.

At some point during the same evening, the goods arrive at the Hub destination. Sorting of shipments is initiated. At this point a value-adding service is executed, in the form of sub-standard and weak packaging strengthening and replacement.

Pilots are briefed about the details of their flight (Evidence of safety measures only 2% of fatal aircraft accidents is shared by all integrators between 1980-1996 compared to for example ad-hoc flights standing at 30% during the same period[85]). Shipments are loaded onto the aircraft and are on their way to their final destination. Hub operations then start to slow down until the next evening. At the final destination (Gateway), the shipments arrive pre-cleared through customs (Electronic signals send information to the customs enabling the clearance of shipments before their arrival at their destination) and immediately depart for the final distribution at the recipient's location[86]. Figure 9-1 below, shows the flow of cargo when transported in the integrator system.

[85] Biederman, D (1999)
[86] Samsjö, J

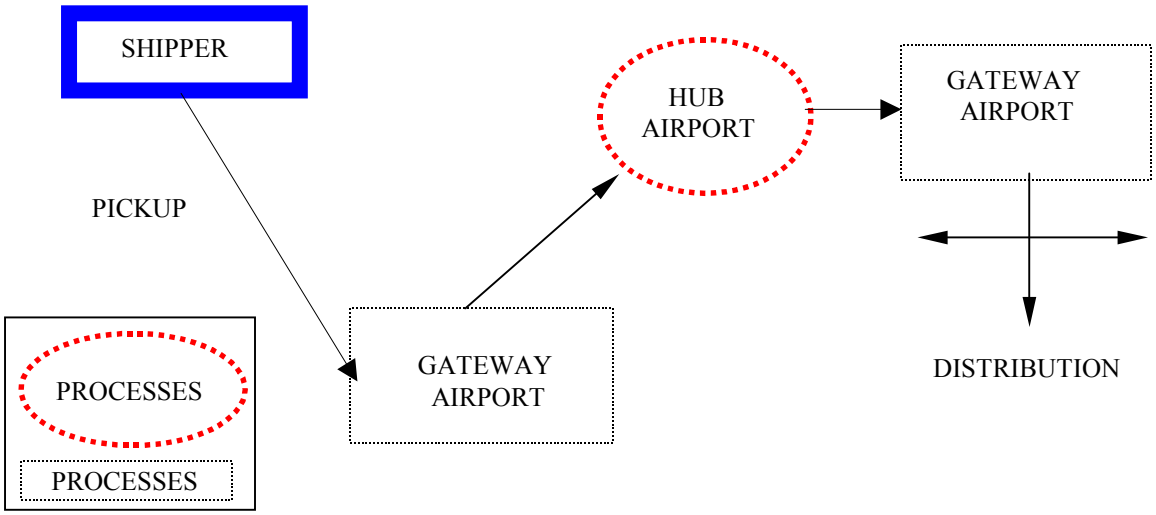

FIGURE 9-1: Integrator cargo flow[87]

9.2 Value-Adding Services

The express companies offer value-adding services to assist customers in more practically managing their transport and distribution activities. A wide range of such services, are available to the market. Integrators are capable of providing competitive pricing for these value-adding services because they maintain cutting edge technology necessary for these types of services. One bill is extended to the customer, including the fees for the 'standard service' plus the fees for any value-added services selected by the shipper.

Plainly stated, a shipper may request any additional service he is willing to pay for, since value-added services complement the 'standard' integrator transport product, that being, door-to-door express service. As is displayed in figure 9-2 below, value-added services may be divided into common and customized assistance services, on offer to satisfy the customer's transport requirements.

[87] Researcher's own model (Efstathiou)

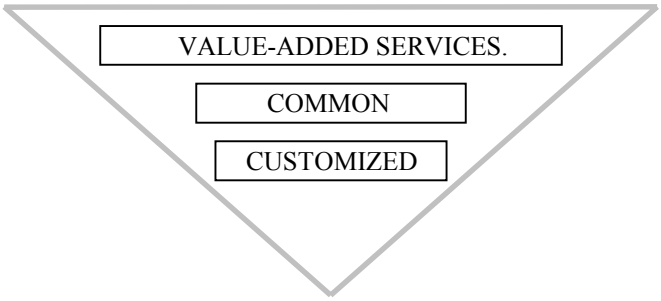

FIGURE 9-2: General categories of value-added services[88]

Some of the general (common) and customized value-adding services the express companies are offering are exhibited below:

9.2.1 Customs brokerage

A value-added service available to the market is customs brokerage, a service that offers assistance to shippers when dealing with customs. Assistance with documents accompanying a shipment, secures that delays at the border are avoided when these shipments arrive at their destination. Such documents are the AirWayBill (AWB), copies of the Commercial Invoice and the certificate of origin.

Further, as stated earlier, express companies offer the service of pre-clearance of shipments. This means that customs authorities receive all the information about the shipment electronically i.e. UPS's Prealert system thus enabling its clearance prior to its arrival at the destination. Moreover, integrators provide their clients with advanced e-commerce programs that can support e-clearance solutions. Shippers are offered with downloadable software that may be integrated with their own systems. With such systems shippers have a direct access to information about their cargo and they also have the opportunity to develop customized solutions to satisfy their needs better.

[88] Researcher's own model (Efstathiou)

9.2.2 Packaging solutions

UPS's packaging solutions is an example of a value-adding service. Companies like UPS own the appropriate packaging equipment and more importantly have extensive knowledge about packaging and its related issues. This knowledge is sold to clients that wish to outsource this activity and ensure the safe and cost-efficient transport of the package[89].

9.2.3 Retail solutions

TNT Logistics offers services such as packing, labelling and tagging, along with services such as product modification (component exchange/upgrade) and product configuration (compose finished product)[90].

9.2.4 Customized solutions

Value-added services, as stated earlier, may be customized for specialized industries that have unique logistics requirements. Computer, automotive, telecommunication, and healthcare are some of the industries with such special requirements. Below are some of the customized value added services DHL offers to some of its customers for illustration purposes:

- *VOR Services Vehicle Off Road.* Satisfying the needs of one of Volvo's high profile program. With this service Volvo aims at getting the part at the location where a car is stranded, by the next day[91].

- *Emergency shipments*/*documents.* DHL gets the shipment transported the fastest way possible from door-to-door. Such services are often used for car solutions and time critical documents such as bank documents. Eight Express Logistics Centers (ELC) based at some of DHL's hub locations, are utilized to get such products anywhere in 24 hours. These ELC's are also used for companies that want to rapidly enter new markets and need quick solutions[92].

[89] UPS Web Site
[90] TNT Web Site
[91] Samsjö, J
[92] Ibid

- *Technical couriers*. This new program extends the services the company offers even further. When DHL delivers a shipment that requires installation, trained drivers have the technical expertise to do it for the customer. This service saves lot of time and money for the customer that may not have the staff or the knowledge to accomplish the installation alone[93].

9.3 Third Party Logistics services

Along with door-to-door transport services of small packages and documents, integrators offer Third Party Logistics (TPL) services on a global/regional scale, to the industries they serve. The integrators' parent organizations maintain logistics subsidiaries that employ their own specialized staff i.e. industrial engineers, software systems integrators and developers, e-commerce experts, facility designers etc. These employees contribute the expert knowledge necessary for the successful provision of TPL services.

An integrator's subsidiary division manages a customer's logistics operations with the objective of helping that customer gain a competitive advantage in the market he competes in. Specialized staff, analyze the customer's procurement and distribution networks and through the optimization of these networks, they manage to help their customers reduce lead times and costs, increase resource utilization, speed products to market and enhance customer service.

TPL services include fabrication or re-engineering of logistic systems, supply chain (distribution strategies) and transportation management, consulting services on logistics operations i.e. return-repair distribution aiming at cost reductions, logistics information systems supporting information sharing, provision of logistics facilities, and e-business logistics support. Examples of such services are exhibited below:

[93] Ibid

9.3.1 DHL's warehousing services

The company offers the service of Strategic Inventory Management (SIM). With the implementation of SIM a client may structure his distribution network to operate with 2-4 hour delivery intervals. Such a system primarily reduces the shipper's inventory carrying costs to a large extend[94].

9.3.2 DHL's repair/return loop programs

DHL assumes the responsibility to pick up any returns of a client's product. This item may be returned to the shipper or may be taken to a DHL repair facility for repair. Once repaired by DHL's own technicians, the item is returned to the end user. The product moves with short lead times in order to enhance the level of service to the shipper's customer[95].

9.3.3 UPS's technology solutions

With this service UPS extends supply chain control and visibility for its clients through the utilization of integrated up-to-date transport technology. Moreover, the company offers assistance to shippers who want to align their e-commerce business strategies with their logistics operations[96].

9.3.4 TNT's Sequencing/in-line JIT

Responding to the modularization of production by several shippers, TNT developed the capability of supporting the preparation of the sequence in which the product modules must arrive at the assembly line. To meet this objective the company owns the facilities necessary for the reception of large volumes of components and for their sortation into smaller lots, sequenced according to the customer's schedules[97].

[94] Samsjö, J
[95] Ibid
[96] UPS Web Site
[97] TNT Web Site

9.3.5 Fulfillment

Order fulfillment, is offered by all the integrators since this service is quite popular amongst dot.coms that do not wish to own any facilities whatsoever. Such companies do not have the time to invest in fixed facilities and equipment. Further, it may not be economic for them to do so. Instead, they outsource these processes entirely to express companies that already have the most advanced infrastructure to satisfy the special distribution needs of e-business. By outsourcing, dot.coms save time and investment money and have the opportunity to develop a competitive advantage on the net, by successfully delivering the goods to the customer.

9.3.6 Why outsource?

TPL services are a very attractive alternative to many industries, because by outsourcing the complex operations often associated with logistics, they have the opportunity to focus on their core competencies. Integrators use their technology infrastructure along with their transportation capability to offer reliable logistics solutions for the customer's time-critical processes.

Further, TPL services are popular because their cost is reasonable. Competitive pricing exists because the integrators are capable of offering extremely efficient TPL services. Efficient operations along with the utilization of economies of scale in their facilities, enables them to offer attractive pricing and thus generate high volumes for such activities.

Moreover, integrators offer complete logistics solutions for companies that wish to outsource all their logistic operations both internal and external. An example of such a solution is found in the example below:

9.3.6.1 Complete Third Party Logistics services example (FedEx)

FedEx is exploiting information technology while targeting the rearrangement of the distribution and procurement channels of its customers. Top-of-the-line IT systems are used to more effectively manage sourcing, inventory

warehousing and distribution activities. Such services are performed virtually error free.

Being a customer driven organization, FedEx has identified the need of the market for TPL services and has invested heavily so as to increase its capability. As a result of its pro-active response, the company is one of the proud participants of the Dell, a computer manufacturer, "miracle supply chain". In this system Dell is paid by the market for its products, before it needs to pay its own suppliers for inventory already sold.

Another FedEx example of a TPL success story is Vishay Corp., "By outsourcing logistics to the FedEx Corp. Vishay slashed its cycle time from 12 days to 2 days. Also, it saved on overhead by consolidating four warehouses in Europe and the U.S into the one FedEx warehouse in Subic"[98] .

9.4 Market conditions

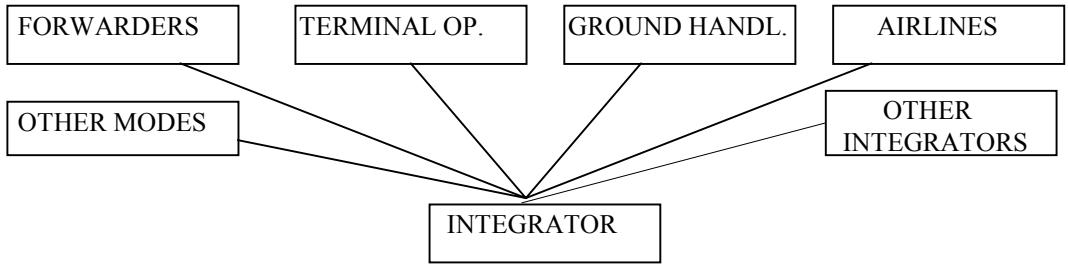

FIGURE 9-4 Integrator's competitors[99]

As it is exhibited in figure 9-4 above, integrators (directly and indirectly) compete with every participant in the air cargo transport industry. They compete with forwarders for the consolidation and transportation process for small packages, with terminal operators and ground handling agents, and for the handling processes, and with airlines for the air transport for both airport - to-airport and door-to-door movement. Moreover, they compete with one another for the express market share of air cargo business. Competition in the

[98] Unknown
[99] Researcher's own model (Efstathiou)

case of terminal operators and ground handling agents, does not imply that the integrators aim at gaining a share of the business from these actors. This is not the case because integrators do not specialize in providing handling services for anybody else's cargo. Competition is stressed here in the form of performing these activities in a competitive manner to ensure the economic viability of controlling their own handling as it is done more efficiently than through the traditional channel.

9.4.1 Competitive advantage

9.4.1.1 Pro-active

Currently integrators are in a favorable position when compared to traditional forwarders and airlines as they have managed to develop an extremely reliable network. The integrators have gained a large portion of the market from their competitors because they are pro-active in the treatment of their client's needs. The needs of the customer (stated in Chapter 4) evolve around short lead times, reliability, speed, capability, visibility etc. When one reviews the description and illustrations of the transport, Third Party Logistics (TPL) and value added services described above, one can clearly notice that most of these customer requirements are met by the secured systems offered by the integrators.

9.4.1.2 Creative marketing

Through creative and aggressive marketing the integrators have managed to take a large market share from traditional forwarders and airlines. Their marketing efforts were successful in establishing a standard product offering. Product consistency has been a very big issue for the integrators as their entire network systems are built to support that consistency. Efficiency of operations gave them control over transit time and allowed them to become the leaders in time-sensitive package transport. Had they had to transport different kinds of goods on a permanent basis, like the traditional forwarders do, they would have a difficulty meeting some deadlines for over-night deliveries.

9.4.1.3 Technological leadership

Integrators continuously upgrade their technological capability. Technologies are investigated and incorporated by the integrators at a high cost because these are expected to provide valuable assistance to the product mix they offer. These technologies support the integrators in their offering of enhanced visibility to their customers. Such capability is valuable in today's competitive distribution environment in which most of the industries and their participants must operate.

Visibility in a supply chain allows its participants to be extremely responsive to the needs of the markets they compete in. Enhanced visibility makes it possible for channel members to read the demand better, reduce uncertainty and arrange all their other processes accordingly, resulting in massive savings i.e. reduce forecast error, increased sales (getting the *right* product to the market) and higher profitability margins (the *right* product is sold at prices that permit higher margins). Such advantages grant a high price tag on services that can infuse visibility in a supply chain and thus justify the high costs related to the service. Moreover, the actual "perception of the value" generated by such services by the different industries, increases their willingness to pay for such services that in turn motivates service providers like the integrators to further invest in innovation and technological advancement in the air cargo market.

9.4.1.4 Communicate value of service

Finally, the shipper's **overall perception** of receiving quality service, justifies the higher rates and is by far the biggest achievement (and advantage) of the integrated express companies.

9.4.2 Competitive Constraints

9.4.2.1 Locked in their own system

As it is stated above, integrators maintain the most efficient production systems because they focus on a single standard product (small packages). Systems are built to facilitate the flow of that standard product achieving

higher productivity levels that translate to lower costs. Roughly 90% of the integrators infrastructure is built to provide cost minimization through efficiency, mainly for small packages.

However, this structure places a limit on the range of transport solutions an integrator can offer. In other words, the ownership of all the fixed facilities and equipment necessary for the operation of the express flow makes them inflexible. For instance, when a client wants to move heavy hazardous cargo with an integrator he must pay a transport charge that is placed at a higher tariff rate to the one that would be paid if a traditional forwarder had been directly assigned the same activity. The reason is that the integrator will have to forward the shipment with an airline, which adds a significant cost to the transport activity.

9.4.2.2 Unable to differentiate services

Intense competition between the integrators has resulted in a rather important problem. The problem is that it is starting to become very difficult to differentiate their services from each other and compete on grounds of competence. More importantly it is becoming increasingly difficult for a shipper to find any difference in the range and quality of services offered by any of the major integrators, namely UPS, FedEx, TNT, and DHL. These four companies are in a 'league of their own'. They all offer the same range of products, they roughly call on the same destinations, maintain equal technological level of competence, they offer services to the same industry segment, and they pretty much go about offering that service in the same manner while utilizing similar system structure. Why is this a problem? Differentiation is desirable by the incumbents of a specific industry because it may be used as a means for competition. When competitors cannot differentiate their product range and market those differences to the client they have to resolve in other measures to gain market share form each other. Usually, the only way to effectively compete for business under these conditions is though "price wars". Here's a price war example, "Airborne played a price-leader strategy very well in the mid 1990's, taking significant share from FedEx, especially in large national accounts. This forced FedEx

into price reductions, which compressed margins on premium next-day air service. The price competition spread to second-day service, with all other three major competitors offering deep discounts to very large shippers. By the mid-90's the express air segment, a premium service was showing many of the characteristics of a commodity market"[100].

Competition based on rate reduction may benefit the customer in the short-term (reduction of transport costs) however, it will hurt the industry, since profit margins will be squeezed and innovation may come to a halt. Such stagnation will hurt the customer in the long-run, as further technological advancements will not be realized due to reduced profitability of the service providers. In order to fight these conditions all these integrated companies are moving toward multi-modal operations (see section 9.6 Trends) in order to differentiate their position further.

9.5 Airport Selection Criteria

9.5.1 Limited restrictions

The integrators will choose to base their operations at an airport that offers its services with limited restrictions. Restrictions imposed at an airport may evolve around issues such as limited slot times due to availability restrictions, and night flight restrictions due to noise regulations. Slot time availability restrictions usually occur at large airport cargo/pax hubs, where high frequencies result in limited slot times in the air.

Night flight restrictions are another issue that may refrain an integrated company from basing its operations at a particular airport. The airport would appear unattractive because most of the cargo is flown in the nights. Therefore, an integrator would have a difficulty meeting its next-day-delivery obligations since it would be impossible to land an aircraft at the airport during the night. Express operations are usually executed during the late night and early morning hours, which means that an airport without such restrictions becomes a better candidate for the integrator's business.

[100] McGinnis F W

9.5.2 Based on strategic decisions

Integrators maintain a very expensive infrastructure on the ground, which translated into high fixed costs. In order to pay for the cost of their infrastructure integrators have to constantly search for new clients. New clients generate additional revenue, some of which may turn into profits. These companies own what is called in the industry as "integrator radar". Integrators use this radar to discover new opportunities, in the form of new shippers. When an integrator identifies a new industry springing up, it may base an aircraft at the nearest airport to service that industry. Opportunities arising form a new industry may not materialize immediately because the new industry, since they may not have enough volume to fill the integrator's unit (unit). The integrator does not mind operating an aircraft with low utilization because they expect the volume of the cargo shipped by their new client to increase. Even, if the volume does not increase, the integrator may decide to operate that unit from the airport simply to safeguard that account from being acquired from another integrator who is also has its "integrator radar" searching[101].

9.5.3 TPL and value-adding services opportunities

An airport may be selected because it offers the opportunity for establishing facilities there to support Third Party Logistics (TPL) and value-adding services. An integrator may set up operations at a small airport located near a large mail-order company that wishes to outsource its services. A small airport may be a good location for such operations, since it is capable of re-engineering its processes and altering the structure of its facilities, so as to offer dedicated services to the large integrator account. Former military airports are just as attractive for such purposes since they offer similar provisions.

9.5.4 Reduced lead times

Express companies are running their operations on very tight schedules. Further, the key driver for the quality of their product is speed. Hence, an

[101] Ragnebrink, B

airport that offers both the internal/external infrastructure that can generate lead-time reductions is an attractive location for an integrator to establish services there.

9.6 Market Trends

9.6.1 Expansion toward multi-modal services

To battle the 'commoditization' of their product integrators are shifting toward multi-modalism. By developing the capability to provide multi-modal services, some integrators will be able to differentiate themselves from others. Multi-modal capability will further enable these companies from refraining from 'price wars', in order to gain new business. Ted Scherck, President of Colography, say's of the integrators success "today's customer is buying transit time, not a transportation service. As a result, air cargo carriers have shed their original identities. They are evolving into multi-modal enterprises focusing on time-definite services"[102].

Integrators will continue to offer the same standard product; only they will utilize other modes to execute the actual transport activity.

The primary mode to be used as an alternative is road haulage. Road based solutions are a strong competitor of the express airfreight services on smaller distances. Trucks can effectively compete on lead times with aircraft. By primarily focusing on road-based solutions to differentiate themselves from each other, integrators will also manage to introduce competition to road-based service providers.

9.6.2 New Technologies

Some of the newest technologies, which appear in the air transport industry are being utilized by the integrators. These companies have developed a lot of muscle that they use to invest in these new technologies to ensure that their

[102] Anonymus

extremely expensive networks are up-graded and are competitive at all times. An example of a new technology created for air cargo use is cited below:

9.6.2.1 Radio Frequency Identification technology (RFID)

Motorola has created a new technology to be used for tracking air cargo transport. The technology is called Radio Frequency Identification technology (RFID). RFID technology is "a tag containing a silicon chip and an antenna (one inch-five feet), a device to read the tag, called a "reader" or "interrogator," and a server with a database to store the information". The entire technology is based on radio frequency and the information carried by the tag can be found in the database. The silicon chip (Bistatix silicon) can hold more data than the barcode (896 bits organized as 32 bit "words" of information, equivalent to 112 ASCII characters). "Rogers described two different kinds of RFID tags, active and passive. The type of tag determines how information is gathered by the interrogator. The passive tag acts as a mirror-all it returns is an identification," said Rogers. The interrogator transmits data usually to a server were they can be stored/accessed by the users. Tags can be read by the interrogator in a "drive-by manner", as they are read via "time division multiple access" each tag responds to the reader at a specific time. The reader is capable of reading between 500 and 1,000 tags within 300 to 1000-foot radius. The reader is capable of gathering information from 1,000 tags in 15 seconds. This technology offers more details in the logistics chain, for its information may be read easier and faster. Information compiled concern who the sender is, the item's destination, the quantity, stock item, the location, date, and time. RF tags can be modified in transit and can hold the information even if ripped and torn. Moreover, they are almost impossible to replicate. Tracking speeds up the payment process, as it can be done as soon as one receives proof of delivery (POD).

The main concern with this technology is that the price a service provider has to pay for more information, speedier retrieval of that information, better visibility, lower labor costs and reduced risk for theft is quite high because the infrastructure for readers has to be installed everywhere the technology is used. The high infrastructure costs assigned to the technology make it attractive

primarily to alliances building their networks. Costs for the technology may be divided amongst the members of an alliance.

Today, an extensive use of barcode technology exists, and is used for shipment tracing. The barcode technology is cheap and easy to use. FedEx was supposed to launch an RFID project in June 1999, for high value shipments. The project's goal is to establish these RF tags (Unisys) in the express business[103].

[103] Hickey, K

10 AIRPORTS

10.1 Position in the system

10.1.1 Economic growth providers

Airports in the 21st century make a significant contribution to the international competitive success of the industries of a nation. Airports have far more impact on regional economies than most people suspect. According to Hugh Doyle, Director of Unisys' freight program "A region without an effective air freight infrastructure will be competitively constrained in a rapidly evolving global marketplace. Well-planned airports and related infrastructure are not a luxury; they are fundamental to the economic success of any region"[104].

As it may be viewed below in figure 10-1, an airport's runway is a key infrastructure investment that is responsible for the fueling of economic growth for an urban area. When a runway is built, the adjacent city will be positively influenced, by becoming more attractive to future residents. Also, the area becomes more appealing to industries that may want to be situated near infrastructure that can support air transport solutions. When an industry establishes operations in a region, additional service companies locate operations in the region to support the industry's needs in various types of services. The formulation of a business web to support an industry, positively affects a city because it attracts new residents that choose to move there and work.

Consequently, the growth of the city's population provides an attractive retail market. Retailers invest in the region and offer their goods and services to the city's growing population. Moreover, new companies emerge with the sole purpose of supporting the operations of retailers.

With such an attractive environment, regions often become the target for further infrastructure investments by a nation's government. Additional

[104] Schwartz, B (2000)

infrastructure investments make a region even more tempting to interested investors, resulting in further growth and prosperity for the region.

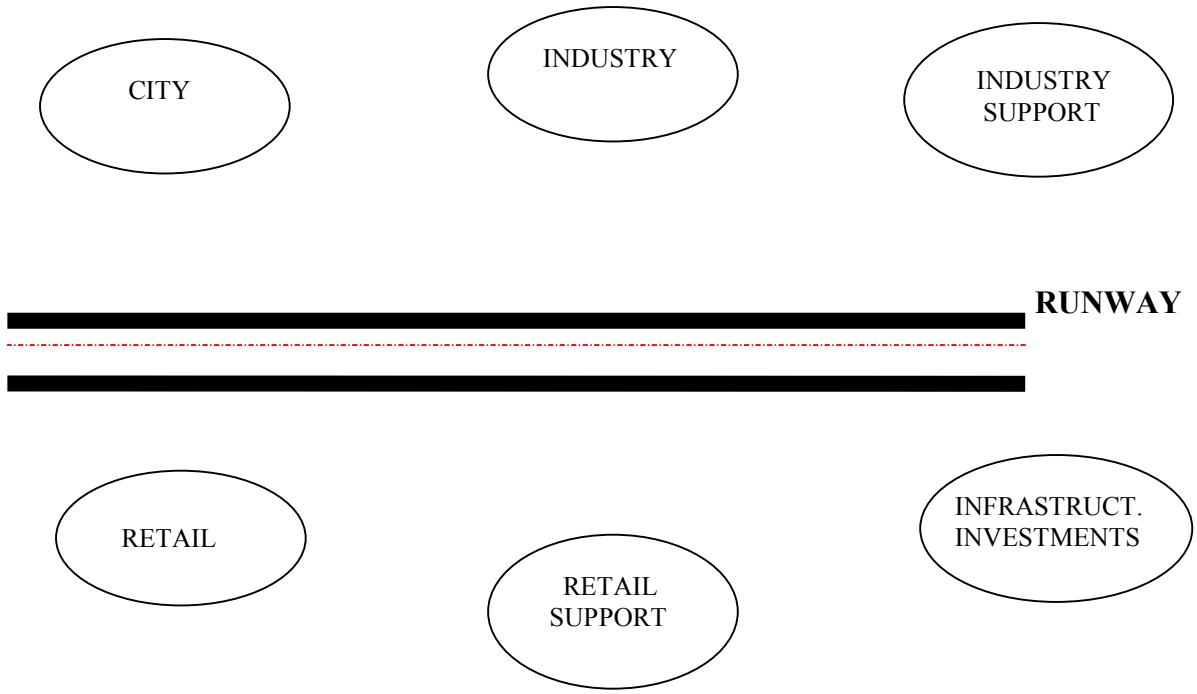

FIGURE 10-1: Runway Impact[105]

10.1.2 Infrastructure Providers

Airports are identified as the infrastructure providers for the entire industry. In Sweden, the Swedish Civil Aviation Administration (SCAA) owns most of the airports operating today. SCAA is the central authority representing the government in the form of managing the airport's infrastructure requirements in coordination with the local authorities of each airport. More information about SCAA, is found in Chapter 3.

The government assumes the substantial fixed costs associated with air transport, in the form of investing in the infrastructure of all the airports in the country. Had governments not provided, from the very beginning, the infrastructure required for aircraft to fly, aviation capabilities would have been greatly underutilized even to our date. The reason being, that nobody would (could) assume the investment risk of providing all that is necessary for an

[105] Researcher's own model (Efstathiou)

airport to function and even further provide for what is needed to remain competitive.

As the government is providing the lump investments, users of airports pay for the usage of the infrastructure in the form of landing and navigation charges along with other charges. Every time a carrier lands one of its aircraft at an airport's airfield, it must pay a variable amount of charges to partially cover the cost for the usage of the infrastructure (refer to airport charges). These fees may not be adequate in covering the entire cost of the investment, as the government has to assume the additional responsibility of maintaining the proper condition of the infrastructure (variable cost). Aviation infrastructure maintenance is of particular importance since it is essential for the safe guidance and landing of aircraft.

The remainder of the costs for the infrastructure, are covered by government subsidies. These government expenses are reasonably justified, since the provision of the infrastructure offers the public the benefits of using it when they need to. Such options generate a positive effect on the quality of life of the country's citizens. A value is assigned to this positive effect, in order to equalize the accounting books concerning infrastructure investments. Added to this value of service is the sum of revenues absorbed from the airports in the form of taxes collected by citizens that use an airport.

10.1.3 Constant Development

Globalization of trade and substantial technological advancements had an extensive impact on the importance of infrastructure projects and in the way they should be planned and evaluated. Infrastructure investments must be viewed in a different perspective. For global air transport trade to flourish key airports involved in the air transport chain must have the appropriate structure and the right technologically advanced systems to enable them to offer up-to-date services and compete for business (both cargo/pax) with other domestic airports as well as with those situated in other countries.

SCAA airports then, must **ensure** the investments in additional space and new, larger facilities so that they can provide for the appropriate capacity to meet the increased demand for air transport services fuelled by globalization of trade. The different participants in the air cargo industry will simply neglect any airport that does not succeed in attracting such investment.

Such action must be taken because airports are the most critical participants in the entire system. Their importance is clearly detected when one considers that the competitive position, market success, and ultimately, profitability of all the actors in the domestic industry relates to the conditions existing at the country's airports and the level of the quality of service provided by these airports.

Here, the discussion of investments is done in the context of the airports ensuring that these improvements are made. It does not necessarily mean that airport authorities should be the ones to bare the investments. Other industry participants can just as well invest in airport facilities such as cargo terminals, equipment, warehousing/storage areas, and IT systems. The role of the government owned airports i.e. SCAA, in terms of investment, is usually limited to the investment in new runways or runway extensions and their maintenance, as well as the construction of new passenger terminals. Additionally, governments provide for the 'external' infrastructure which is an essential contributor to an airport's attractiveness.

Naturally, these technological and physical facility improvements cost a lot of money to both the government of a country and to industry participants that choose to invest. Some actors in the industry, and some governments, decide on assuming investments and staying competitive in this industry, while some simply do not, for they cannot justify the economic cost for these improvements or even further cannot afford it at all.

10.1.4 Co-ordination Services

Airports also function as the coordinators of all the activities that take place at a government owned airport. To successfully coordinate airport operations,

SCAA airports use information systems that support their efforts in this highly demanding task. Some information systems currently used by SCAA airports are the Flight Information Display System (FIDS), an Operational Data Base (OADB) called SAFIR, SMHI, a system that provides weather information for resource planning, and Path Planner, used for simulation of a/c planning[106].

Airport authorities are constantly trying to improve their resident's (forwarder, ground handling agents, terminal operators, airlines) service levels in order to support them in their effort to retain their existing customers as well as attract new ones.

Airports meet with all the intermediaries that operate at an airport and listens to their suggestions on how the airport could assist them in improving their own processes whatever those may be. Improved processes make the actors more attractive to airlines that happen to be the airport's clients. Improved processes then make an airport more competitive.

Hence, what airports should consider, is the investments needed on their behalf to render their residents become more efficient and effective in their operations. Such improvements would better the economic performance of these actors and probably reduce their costs of operations through increased productivity, reduced labor costs through better scheduling capability, and through better equipment utilization.

In turn, reduced costs would enable these airport residents to offer more competitive rates (charges) for their services to airlines. Lower prices would definitely attract many airlines at an airport, as they operate in a very tight profit margin industry. Furthermore, since there are set standards for the industry, airlines both cargo and passenger, forwarders, integrators, and shippers in the system are aware of their needs, and they will generally move their operations to the airport that will satisfy those needs at the right price.

[106] Jacobson, A

10.1.5 Competing for business

The Swedish Civil Aviation Administration (SCAA) is also acting as a competitor in the airfreight market. Through Novia (a joint venture with a Danish group), SCAA is competing for cargo handling business along with other cargo handling companies and terminal operators, at locations such as Arlanda airport, in Stockholm. SCAA is also providing ground-handling services at Sturup airport, in Malmö.

However, the market has expressed a sour sentiment toward such activities, as it does not have a clear understanding of the position of SCAA. In other words, they often are unsure of SCAA's role and whether that is a role of an authority or that of a commercial player competing for business such as building cargo terminals, running shops at the airport locations, or competing for handling business i.e. Novia. Many airlines and actors in the air cargo industry express the preference of SCAA not assuming multiple roles, even though they are aware that the authority is involved in such commercial activities, in an attempt to increase its revenue and exploit any opportunities it deems interesting.

10.2 Competition

10.2.1 Skavsta

Currently, there is only one privately owned and commercially operating airport in Sweden. The airport is called Skavsta and is situated at Nyköping, a city in the Stockholm area. It is part of TBI group, a global airport owner and developer, currently involved in 35 other airports around the world. The parent company is providing the investment funds for the future expansion of the airport.

Skavsta offers both passenger and cargo services. Its capacity is currently standing at 1.2 million passengers and 35-40,000 tons for cargo. The airport owns all the land and the facilities located at the airport, a condition that allows it to easily expand its capacity. According to the airport's Managing Director, "If asked to, the airport is capable of developing the facilities to

handle the entire 200,000 tons of cargo exported from Sweden on one year's notice"[107].

Skavsta has identified a niche in the Swedish air cargo market and has directed its efforts toward the domination of that niche. Specifically, the airport is aiming at becoming the cargo airport of the Scandinavian region handling both dedicated freighters and cargo charter flights. It currently holds 85% of the market share for charter flights[108].

Moreover, it aims at becoming a trucking hub and specializing in off-airport activities for feeder trucks to other airports. The airport is not aiming to compete in the passenger segment. It has positioned itself as a cargo airport, capable of managing pure industrial cargo handling.

The airport is investing in the upgrading of its runway in the form of an extension, development of its terminal building, expansion of its business park and the improvement of its retail and catering facilities. Skavsta wants to be a part of a 'virtual cargo community' and work with its cargo competence together with Arlanda's pax-belly competence to achieve a better overall performance of the air cargo services in the region.

10.2.1.1 Competitive position

Skavsta appears to be competitive for the niche of the market it operates in for the following reasons:

- Skavsta offers competitive prices when compared to SCAA airports. The airport owns all the fixed facilities which have been depreciated already, meaning that on a per square meter basis, it is cheaper. Based on this fact, Skavsta offers 30% cheaper landing and handling fees.

[107] Ragnebrink, B
[108] Ibid

- The airport is located away from congested highways around the Stockholm area. The airport claims that it is able to reduce lead times and feeder costs for forwarders and airlines because of its location. Currently, 40% of the cargo handled at Arlanda airport is trucked while 60% is flown. Skavsta is interested in handling that 40% and supports that lead times for its clients will be reduced. Reduction will be the result of trucks not having to drive through Stockholm and experience road congestion in the city's streets. Further, Skavsta is positioned in an area where many industries are situated in. 65% of the Swedish cargo destined for export is produced within an hour's driving distance from the airport's location[109].

- The airport is privately owned and as such it is more responsive, and free from bureaucracy. When using the airport's services clients receive single billing, as the airport owns all the facilities and service providers. Moreover, it is more keen on assuming business risks in order to pro-actively respond to the market's needs, as they have control over the investment environment. When investment requirements are set by a future client, the airport authorities will treat the cost in a different manner than state owned airports would. Skavsta's investment risk will be assigned to a number of different variables, since the investment will have an impact on most of the facilities that are all owned by the airport.

- Skavsta offers slot times without any limitations to potential customers since it does not experience any congestion. Further, it is capable of providing efficient handling as it controls all the processes that take place at the airport, enabling integration. The statement of the airport's Director, suffices the weight they assign on their cargo handling capability "Competent cargo handling reduces lead time. An airport is nothing without the right handling company since the handling company is the product. The runway is of secondary importance"[110].

[109] Ragnebrink, B
[110] Ibid

- Skavsta has the capability of providing inter-modal services to its clients and thus, offering a number of options to future clients. The deepest harbor in the country is located fifty minutes away, the railway passes 2 km away from the airport and the E4 state highway system is right next to its facilities. The airport is hoping for a government approval of an extension of the railway to its premises. Railway access will improve the marketability of the airport's cargo services since the railway ends at the dock of the harbor, thus enabling complete inter-modal access.

Even thought the airport is attractive, it mainly serves Ryanair for passenger connections and charter cargo flights at the moment. Also, it furnishes pallet construction for Finnair.

The airport must attract forwarders and airlines in order to achieve the necessary volume. However, it is not so easy to do just that. According to the airport's Director, there is a paradox involved when it comes to attracting new accounts "airlines will come to an airport when there is cargo and cargo will come at that airport when airlines are there". Moreover, he states "Volume feeds volume. In other words volumes are a facilitator to get more volume"[111].

Moreover, the airport does not offer many passenger connections. Thus, it does not provide the option for pax-belly cargo transport to regional and intercontinental destinations.

Finally, the airport has to battle the traditional relationships that have deep routes at competing airports. These personal relationships found amongst different actors, have created a feeling of comfort in the way business is done. Such conditions are very difficult to let go. Also, airlines and forwarders are influenced by the psychological need of being situated right next to the largest airports in the country.

[111] Ibid

10.2.2 Other airports

Below, are some examples of airports located in other countries around the world. These airports have understood the industry's needs, made appropriate investments, and managed to become global competitors.

10.2.2.1 Frankfurt

Germany's Frankfurt Airport, is the main European Hub for the partners in Star Alliance. During 1999 Frankfurt Airport also known as FRA handled 1.43 million metric tons of cargo and is the busiest cargo gateway for the entire continent. From FRA, shippers can move cargo to 65 destinations in 40 countries, by using the freighter services offered by 15 airlines stationed at the airport. Moreover, additional capacity is available to shippers and forwarders, in the bellies of passenger aircraft travelling to 290 destinations in 109 countries.

The airport's CargoCity is divided in two areas of operations, CargoCity North and CargoCity South. The South operations zone is linked to existing railway and highway infrastructure.

According to the author of Cargo Gateway Frankfurt, Air Transport World, 53% of the total cargo tonnage handled at the airport was transported in belly holds an increase of 4.9% to 1998 figures. Its weekly cargo capacity is 10,400 metric tons and three quarters of its capacity is transported in wide-bodied aircraft.

The existing bottleneck for the airport appears to be the lack of space. Expansion plans are under way to be completed by 2010 in order to remedy the constraints currently imposed by the lack of space. The airport is using its own Cargo Information System to deal with the complexities of its two CargoCities[112].

[112] Hill, L

10.2.2.2 Sharjah International Airport UAE (SHJ)

This airport was selected as an example, in order to emphasize on the fact that when a government makes the appropriate investments, it sends signals out to the market expressing its concerns about the needs of the airlines. In turn, airlines are responsive to these moves made by airports. Airlines often select to base their operations at airports that have proved their interest for their business through the sizeable investments in improvements of the airports services.

The airport's capacity is set to increase by 30% through an investment of $30 million. This investment will be divided into more cargo terminals (15,000 sq. m.), cargo equipment, warehouse areas, and runway expansion in the form of its extension (3,760-4060 meters) costing $4.9 million.
Sharjah International Airport is ranked 29th in the world for cargo, with 1998 numbers for cargo movement standing at 534,849 metric tones. For both air and sea cargo operations it ranks number 2 in the world.

SHJ has managed to attract the largest carriers that operate in its region such as UPS, Lufthansa, and FedEx. For example, in May 1993, Lufthansa made SHJ its Middle Eastern hub, to feed cargo from Frankfurt to the Middle East and from India back to Frankfurt. Also, Lufthansa meets with its Star Alliance and New Global Cargo partner Singapore Airlines at SHJ and exchanges loads that fly to Singapore and Frankfurt respectively. Lufthansa also shares space with its partner SAS on the flights between Gothenburg-Macau via SHJ. Lufthansa handled 93,000 tones of cargo during 1998 at this airport.

SHJ is an efficient airport that made the appropriate investments at the right time. Very little bureaucracy is involved in the movement of cargo and the airport runs 24 hours a day. SHJ offers the lowest handling charges in the Middle East, and is the only airport in the region that allows own handling by airlines. It also offers one of the biggest International Free Zones (SAIFZone) in the region (10 million sq. m.), hosting 320 companies. The total cost for the Free Zone facilities stands around $800 million[113].

[113] Nelms, D W (2000)

10.3 Market Trends

10.3.1 Privatization

Some people in the air cargo business feel that privatized airports understand the needs of cargo better than government owned airports do. They support that private ownership will eliminate bureaucracy resulting in more efficient operations. Also, they feel that a private enterprise is more pro-active in its dealings with clients and is more willing to assume risks with the objective of realizing some benefits, in the form of market share and revenue increases resulting in higher profits.

On the contrary, some others fear that privatization of airports would increase their costs of operations, because private enterprise would aim at maximizing its profits at their expense. An example is the Air Transport Association (ATA), a trade group representing the interests of cargo carriers, fearing such result from privatization.

10..3.1.1 Partial airport privatization for cargo operations

The first form of privatization deals with the partial privatization of an airport's facilities. Partial privatization means that all the cargo related facilities supporting cargo operations are owned by private enterprise but are situated on government owned land. According to Monty Gettys, President of Montgomery Consulting Group in Maitland, Fla. "Air cargo operations at a majority of airports are already quite heavily invested in by the private sector. The air cargo carriers pay for most of the facilities. It's just that the land they are on happens to be at an airport"[114].

Land is managed by the airport authorities, which represent the government's interests. In addition the government may own the passenger terminals and all that is included in these terminals. Such conditions exist in Sweden. SCAA owns the land of all its airports as well as the passenger terminals. Cargo

[114] Biederman, D (1999)

terminals are owned by private entities that operate these facilities and assume any investments necessary to improve their competitive position.

What may occur at airports that are partially privatized, with regards to expansion/improvement investments, is for the airport authorities to provide (or construct) the facilities, and for private enterprise to invest the equipment (Information/automation systems, handling equipment, etc.) necessary for the successful operation of these facilities. Some additional facility investments are those that can support fully automated storage and retrieval systems. These systems assist the movement and the tracking of goods throughout the airport.

10.3.1.2 Full airport privatization

The second form of privatization involves the long-term lease or full purchase of an airport by a private enterprise. An example of a complete purchase of an airport in Sweden is that of Skavsta. Skavsta used to be owned by the government until it was bought by TBI. TBI now owns the land at Skavsta, the runways, the passenger and cargo terminals, as well as all the other facilities that comprise an airport (re-fuelling stations, parking areas, fire and rescue service etc.). The only presence of the government at a privately owned airport is expressed in the presence of customs officials and immigration officers.

Privatization has been taking place in several other countries around the world. In most cases the assumption by the private enterprise of a government role, that of airport ownership, is made possible because the government has already provided the colossal investments needed for the construction of an airport. Enterprises purchase these airports from governments and turn them into competitive development projects.

An example of such an organization is the U.K. based BAA plc., formerly a government owned authority and now the world's largest airport company with a market capitalization of $8 billion. The company owns 7 airports in the U.K and more in other countries. Others in Europe are Vienna Airport plc. Copenhagen Airports Ltd. and Aeroporti di Roma.

More examples of full privatization activities in other countries include the following:

Canada initiated its airport privatization program in 1994 and the objective was to have it completed by March, 2000. The government aviation agency is expected to realize savings of over $1.5 billion from privatization.

Further, “All of New Zealand’s 10 airports are operating as private enterprises; Auckland International Airport Ltd. is the first non European airport operating company to be listed on a stock exchange. And in 1997 the Australian Federal Airports Commission sold 50-year leases for three of the country’s busiest airports to private operators, realizing close to $2.5 billion. By June 1998, 14 more Australian airports were in private hands”[115].

10.3.2 Long-term management

Companies also undertake the task of airport management from the government’s hands. A case in point is BAA plc., which in 1995, agreed on a 10-year management project with Indianapolis Airport, located on the East Coast of the United States. The contract gives BAA 35% of cost savings and increased revenues. During 1998, the airport had handled over 560,000 tons of cargo traffic. The airport is a sorting hub for UPS, and FedEx’s second-largest sorting hub. “By the end of 1996 BAA generated a $3 million increase in nonaviation income, including a $1.3 million jump in parking revenue and a $291,433 increase in rent from concessionaires. A new 12,888square-foot retail complex attracted 11 national specialty shops that all adhere to BAA's "street pricing" policy of no price increases on items sold at the airport. Foreign Trade Zone revenue was increased by 54 percent. Coupled with productivity and purchasing gains, a total of $7 million in cost savings - from $21 million in 1994 to $14 million - was passed on to airlines in the form of a 65 percent reduction in landing fees, an 8
percent drop in terminal rental fees and an 8.2 percent drop in apron rental fees. At the same time landing fees were kept at 25 cents per 1,000 pounds, by

far the lowest of any major airport in the country. There were some unexpected costs. Management training expenses were higher than anticipated and the airport's net income dropped as depreciation on the FedEx sorting center and a United Airlines maintenance center caused an increase of $10 million in operating expenses. Nevertheless, BAA met its contract obligations for increased revenue and cost reductions and was awarded $1 million in compensation by the IAA board. BAA is expected to save the IAA $25.6 million over the life of the contract"[116].

[115] Biederman, D (1999)
[116] Biederman, D (1999)

Part Three

Air Cargo Costs

Part Three will treat costs associated with moving goods in an airfreight system. The first chapter gives a theoretical foundation that will be helpful when the identified costs are discussed in the following chapter. The costs are described for each actor in the system. To identify and organize costs in airfreight is a complex and difficult task. Some of the most significant problems are related to the great number of actors and to the extensive variation of different products. Also, the dynamical nature of airfreight makes it a complex and demanding task. The objective with the section is principally to organize the most common cost to meet SIKA's requirements. But it could also be a compliment to the market description that explains the other side of the airfreight market and aims to provide a more complete picture of the industry.

This part of the Thesis is of particular interest to SIKA and to authors interested in the subject.

Contents:

11 THEORETICAL COST DESCRIPTION

The focus in this section is directed toward the economics and pricing issues related to the provision of transportation services. The aim is to provide theoretical foundations that will be helpful, when cost are discussed (see Chapter 12) for each of the actor in the system. To begin with, a general description of the different factors influencing the costs will be presented, in order to give an understanding of the complexity and the difficulties of price settings.

11.1 Economic Factors

To be able to describe costs in the transportation industry one must develop an understanding of what is influencing the different costs. Some of the factors do not have a direct impact on the transport rates, but each factor is considered when developing them. Each of these factors is discussed below.

11.1.1 Distance

Distance is a major influence on transportation costs, since it directly contributes to variable costs, such as labor, fuel, and maintenance. The figure below shows the general relationship between costs and distance. First it can be viewed in figure X below, that the costs do not appear at the beginning of the transport leg, since there are fixed costs associated with the shipment. The fixed costs will be discussed in the cost structure section.

Second, the cost curve increases at a decreasing level as a function of distance. This characteristic is known as the *tapering principle*[117]. It results from the fact that longer movements tend to have a higher percentage of intercity rather than urban miles. Intercity miles are less expensive since more distance is covered with the same fuel and labor expense as a result of higher speed, but also because of the lack of frequent stops along with limited additional loading and unloading costs.

[117] Bowersox, D/ Closs, D

11.1.2 Volume

Volume is a product-related cost and has a direct impact on handling activities such as loading and unloading, type of transport unit that will be used, and how the transport is planned and consolidated. Like many other logistics activities, transportation achieves economy through large-scale operations. This means that transport cost per unit of weight decreases as load volume increases. This fact occurs because the variable costs of pickup and delivery as well as administrative costs can be spread over additional volume.

11.1.3 Density

Density refers to a product's weight-to-volume ratio. Product density contributes to the cost of the service, since transport cost is usually quoted in term of dollars per unit of weight, such as amount, per ton or amount of hundredweight.

11.1.4 Stowability

The stowability factor refers to product dimensions and how they affect the unit's space utilization. Odd sizes and shapes, as well as excessive weight or length, do not stow well and typically waste space. Standard shapes are much easier to stow than odd-shaped items.

11.1.5 Handling

This factor is related to how easy or difficult it is to handle the product. Handling requirements depend on the physical characteristics of the cargo. Special handling equipment may be required for loading or unloading activities.

11.1.6 Liability

Liability includes six product characteristics that preliminary affect risk of damage and the resulting incidence of claims. Specific product considerations are susceptibility to damage, property damage to freight, perishability, susceptibility to theft, susceptibility for any damage. Shippers can reduce their risk, and ultimately the transport cost (easier handling), by providing for improved protective packaging or by reducing susceptibility to loss or damage.

11.1.7 Market Factors

Finally, market factors such as lane volume and balance, influence transportation cost. A transport lane refers to movements between origin and destination points. Since transport units must return to their origin, either they must find a load to bring back or the unit is returned empty (deadhead). When deadhead occurs, labour, fuel, and maintenance costs must be charged for the front-haul move. The ideal situation is balanced flows were volume equals in both directions, even though this is rarely the case. For example, demand imbalances in manufacturing and consumption locations.

11.2 Cost Structures

There are two general approaches to find different cost structures and to analyse them. In the first approach, there is a classification and grouping of costs that are either directly assignable to a particular product or service or those that are not. These two types of groups are named separable and common costs respectively. Usually, common costs are further grouped in joint common and non-joint common costs. In the second basic approach, costs are divided into those that do not change with the volume or output of the business in the short term, and those that do. The reference here involves fixed and variable costs.

Because two different approaches exist for studying costs, it is possible that certain costs can be classified as common costs on one hand, and variable in the other, or as common costs in one approach and as fixed in the other. Hence, there are different combinations with different results, but in the end it always depends on what one is interested in investigating.

Therefore, the only cost that is directly traceable or separable is the variable costs. For example, fuel expenses are generally regarded as variable costs. Below is a description of the different cost terms discussed[118].

[118] Bowersox, D/ Closs, D

11.2.1 Variable costs

Variable costs are those that change in a predictable, direct manner in relation to some level of activity during a time period. They are directly related to the rate of output. Variable costs can be avoided only by not operating the transport unit. Aside from exceptional circumstances, transport rates must at least cover variable costs. The variable category includes direct carrier costs associated with the movement of each load. Typical variable cost components are labor, fuel, and maintenance. It is not possible for any carrier to charge below its variable costs and expect to remain in business in the long-term.

11.2.2 Fixed Costs

Fixed costs are those costs that must be covered even if the company is closed down (during holidays or in the event of a strike). For transport firms, fixed components include terminal facilities, information systems, vehicles, and aircraft. In the short term, expenses associated with fixed assets must be covered by contributions above variable costs on a per shipment basis. In the long term, fixed cost burden can be reduced somewhat through the sale of fixed assets.

11.2.3 Joint Costs

"This is a type of common costs where products are produced in fixed proportions, and the costs incurred to produce one product necessarily entails the production of another"[119]. Joint costs have a significant impact on transport charges because carrier quotations must include implied joint cost based on considerations regarding appropriate back-haul charges against the original shipper.

11.2.4 Common Costs

This category includes carrier costs that are incurred on behalf of all shippers or segment of shippers. Common costs, such as terminal or management expenses, are characterized as overhead. These are often allocated to a shipper according to a level of activity like the number of shipments handled.

[119] Coyle J, Bardi E, Novack R

The significance of joint and common transportation costs makes it difficult to maintain rates that are both profitable and competitive over time. That is why prices must be continuously monitored.

11.3 Direct and indirect costs

Certain costs can be associated with a specific department, process, or product and are therefore called direct costs. A cost that cannot be easily identified with a specific product is called indirect cost. When relating the definition to the movement of goods, then direct costs are related to the movement of the goods while indirect costs are associated with making the movement possible. The borderline between indirect and direct costs is sometimes difficult to specify. Most of the variation in the costs depends on the direct costs. Below are examples of each cost category in a transport movement[120].

11.3.1 Direct costs

- The actual transport
- Loading
- Reloading
- Unloading

11.3.2 Indirect costs

- Packaging
- Warehousing
- Damages on the goods
- Insurance
- Administration

[120] Lumsden, K

11.4 Costs at Links and Nodes

It is possible to divide the costs further and classify them where they occur. All transport activities can be described as a network structure, built up by nodes and links. Nodes represent terminal activity, storage or other similar operations. Links, on the other hand, represent the actual movement of goods. The different costs could be defined for both the links and the nodes. The costs at the links are dependent on distance, but also on the time it takes to ship the goods. Labor costs are an example of time dependent costs while fuel costs are dependent on the distance. Time dependent costs are especially important for handling operations since waiting time may be experienced at the nodes. Below are examples on how the costs could be calculated:

- Time dependent costs (i.e. wages) x Time
- Distance dependent costs (i.e. fuel) x Distance
- Costs per shipment in handling x Number of shipments
- Costs per ton or volume shipped x Weight or volume

The relationship between node and link costs is of great importance when it comes to air transport's competitive advantage when compared to other transport modes. As a general rule, modes with low node costs and high link costs are more competitive at short transport legs.

11.5 Pricing Strategies

There are a number of factors influencing price. The most important could be grouped in external and internal factors. The external factors are the demand factor, the competition on the market, changes in the market, laws and regulations and technologies. The internal factors are the transport cost, profitability goals and finally factor concerned with the structure of the expansion goals for the business.

When setting rates for the market, carriers can adopt one or a combination of two strategies[121]:

11.5.1 Cost-of Service Strategy

This strategy is used when a carrier establishes a rate based on the cost of providing the service plus his profit marginal. It is a strategy used for low-valued goods, and/or in highly competitive markets.

11.5.2 Value-of-Service Strategy

Value-of-service is an alternative strategy by which a carrier charges a rate based on value of service perceived by the shipper, rather than on the actual cost of providing the service. The demand for transport services is inelastic, enabling the carrier to utilize this pricing strategy. To illustrate, high valued products can usually bear higher prices because transportation cost is a small portion of the article's final selling price.

11.5.3 Combination strategy

Carriers could also establish a combination of the two strategies using a level between the minimum of cost of service and the maximum of the value of service.

11.6 Rate making methods

There are two different ways for setting prices. The first one is through negotiation or agreements. The negotiation between the carrier and the shipper will result in an agreement on a specific transport or a number of transport arrangements during a specific time period. Tariff's are used when there are many similar movements and where it is possible to set common rates. The tariff contains the maximum price for a specified service. Tariffs are further divided in public and internal tariffs. However, in the post-deregulation era internal tariffs prevailed as these may stimulate competition. IATA has created an international air-cargo tariff for freight between airports that is called TACT, the air cargo tariff. It contains the rates, rules and regulations for air

[121] Coyle J, Bardi E, Novack R

cargo transportation. Rates depend on distance, weight, volume and shipment size.

11.7 Transport quality

Quality has become a very important factor for a company's competitive strength. It does not matter which industry, quality is important. Quality does not only refer to a product. Customers demand quality of service as well. There are several definitions of quality, and one of them is: *all the attributes for a product or services that gives the ability to satisfy spoken or unspoken needs*[122]. Transport quality can be defined according to dimensions related to the actual transport[123]:

- **Frequency:** The number of departure per time unit
- **Transport time:** Time from A to B
- **Regularity:** Ability to maintain the promised or scheduled timetable for departures and arrivals
- **Comfort:** Protection for goods and passenger against unsuitable conditions such as impact, vibration, damp, noise, high/low temperature etc.
- **Security:** The protection of goods and passengers against accidents and theft.
- **Controllability:** The possibility of following the transport process with regards to deviations from schedule and communication deviation to external parties.
- **Flexibility:** The ability to adapt the transport system to changes, such as time, load carriers, packaging and handling.

The requirements on these service components vary among shippers. It could be anything from special pick up times to specific equipment and communication services. Whatever services the customers asks for it should be important for the service provider (if this service is economically viable). The

[122] Swedish Terminology Standard

transport time affects the level of inventory held and costs related of holding the inventory. But it also affects the capital cost of having goods in a "pipeline". Someone has to pay for the products during the transport. If that time is reduced, the financial cost is reduced. Long transit time also means greater potential costs in case of a stock out.

The *regularity* of a transport service also affects the inventory level. If the service is reliable, both the shipper and the receiver can optimize the inventory levels and minimize inventory costs. This has become one of the main arguments for selling a transport product today, since no one wants to maintain high inventory levels or stock outs. *Security* is especially important when the goods are either of high value or dangerous for some reason. Damaged or lost goods means the loss of the actual product, an increase risk of stock outs along with the risk of lost sales. The *flexibility* and the capability of a carrier to meet different service requirement is a strong sales argument and a powerful marketing tool in the battle for customers[124].

[123] Jensen, A (1987)
[124] Coyle J, Bardi E, Novack R

12 IDENTIFICATION OF COSTS IN THE INDUSTRY

12.1 Complexities and difficulties with cost identification

During the research period, and according to the response of the industry so far, some limitations were extracted. These were imposed upon the authors when it comes to the task of analyzing the costs. Below are the primary factors that limit the complete analysis of every cost involved in the system.

12.1.1 Cost Related Limitations

12.1.1.1 Nature of the Services

The pricing strategy employed by almost everyone in the industry is that of value-based pricing. This means that these service providers make their money based on the maximum spread between the costs and the service's selling price. The spread is adjusted and based on what they can earn for each transport activity according to the buyers willingness to pay.

Therefore, the pricing structure makes the provision of information on most of the costs each actor has to sustain extremely difficult, as the revenue of each actor involved in the industry depends on the numbers we are asking for.

12.1.1.2 Fixed Costs

These costs cannot be quantitatively treated for each actor in the system for the following reasons: To begin with, companies in the business are reluctant to share this type of information due to their sensitivity and the costs' overall impact on their revenue, as explained above. Also, the complete measurement and consideration of the fixed costs for each actor in the system, is a huge task that cannot possibly be effectively treated throughout the duration of this project. A third issue is that fixed costs have been "accepted" which has led to there being a lack of knowledge. Some of the actors do not have a complete picture of the allocated costs.

12.1.1.3 Joint costs and common costs

Several of the identified costs are joint costs or common costs (overhead). Take the airfreight operations as an illustrating example: The aircraft may have full capacity in one direction but on the way back it is empty. Nevertheless, someone has to pay for the back-haul making this particular service possible. Finding the true costs for a product is therefore both time consuming and complicated. The same conditions apply to common costs. Costs for management or administration are difficult to allocate to a specific product. An ABC-analysis could be applied but still the result could be very uncertain.

12.1.1.4 Quality related costs

Its receiver bases the evaluation of the quality of a given service upon the perception of the value of that service. Hence, if a client receives a high level of service and does not perceive the value to be so at all, then the value of that service is 0.
Because of this condition, it is hard to correctly estimate the value (costs for actors) of the quality of service.

12.1.2 Price Related Limitations

12.1.2.1 Market volatility

The air cargo market is extremely volatile. As is the case in other volatile markets, negotiations and contracts are most often agreed upon on a daily basis. Conditions in these contracts are based on a number of market factors such as: available capacity in the market on that day, nature of the article (stowability, density), point of origin and destination, handling requirements, time requirements, provision of value-adding services, competitive conditions amongst carriers, shipper's WTP etc. According to the findings throughout the research, tariffs are hardly ever used. The only period tariffs prices are offered for a service, is when there is a backlog of orders resulting in the lack of capacity. The market factors introduced above make it impossible to quantify the market price on a specific day as the price for a transport service continuously changes.

12.2 The Airlines

Airfreight is a positive contribution when the goods are transported as pax-belly. It comes as additional revenue for comparatively small incremental costs. The cargo divisions usually operate as separate profit centers and the rates that the cargo division has to pay the passenger division for using "space" is mutually agreed. This business construction enables the cargo division to budget the revenue it has to make to meet the costs.

A high proportion of variable costs exemplify the airline industry. This high degree of variable costs is explained to a large extent by the fact that the airlines do not have to provide their own right-of-way. Infrastructure is provided for them to a large extent, and airlines pay various fees based upon usage.

The costs for flying operations have increased from 1982 to 2000 but total operating costs have decreased at same time. Cost savings were mainly realized from the decrease in maintenance costs, general services and administrative expenses and depreciation. Increased competition has forced the airlines to cut costs where it is possible. Much effort has been made to decrease the labour costs since the airline's labor costs are quite intensive compared to other transport modes. Airlines have to cover several of different costs. Below is a qualitatively description of them:

12.2.1 Fuel (variable cost)

Fuel cost is a variable cost that increases with distance, weight and speed. The only way to eliminate it is to avoid operating the aircraft. Escalating fuel costs have caused problems for the airlines in recent years, and has led to higher prices for the transport buyer. The fuel cost has a major impact on the total operating cost and is hard to manage since mainly external factors (world market prices and currency) influence the prices.

As a consequence, fuel-efficient planes have been developed to internally control and reduce the fuel costs. In the short run, carriers are substituting

smaller planes on low-density (low demand) routes and eliminating service completely on other routes. Below is an example of fuel costs for two different aircrafts; one Pax-belly (B737-600) and one Freighter (A300):

A300	B737-600
622 SEK/mil	235 SEK/mil

(1 mil= 10 km)

TABLE 12-1 Fuel costs in SEK[125]

12.2.2 Labor (semi-fixed)

Labor costs are quite intensive for the airlines. Operating an aircraft requires a number of different professions and some of them are specialized, a fact that results in an expensive work force. Below some of the different skills are listed:

- Pilots
- Co pilots
- Navigators
- Mechanics
- Ground crew
- Other personnel and management

The nature of the labor cost is a bit more complicated than that of the fuel cost. Labor cost is related to time. The more working hours, the higher the labor cost. So in this logic, labor cost is a variable cost that changes with the output/volume. But on the other hand, airlines employ staff for long-term contracts, similar to an asset that will be fixed independent on output rate. From this point of view, labor cost is a fixed cost. So, maybe the best way of describing the labor costs is as a semi-fixed cost.

[125] Fuel costs are calculated on Shell's price list 2000

12.2.3 Equipment (fixed cost)

There are a number of different aircraft operating today, from small commuter planes to large wide-bodies. Cost varies a lot depending on which aircraft is used. Larger aircraft are more costly to operate per hour than smaller ones, but the costs per ton/km are lower for larger planes (economies of scale).

Buying aircraft is a huge investment that will increase the cost for a long time. It is a fixed cost that normally will occur as depreciation, insurance and taxes. The costs could be allocated to a specific airplane.

12.2.4 Maintenance (variable cost)

The maintenance activities are in direct relation to the usage of the aircraft. The more you operate an airplane the more you have to maintain and service them. Maintenance is a variable cost, therefore such a cost could be direct allocated to a specific airplane in terms of maintenance hour, spare parts etc.

12.2.5 Landing charges (variable cost)

This is a variable cost occurring when the aircraft uses an airport. The structure of these costs will be described in section 12.4. Emission data and Noise data are specified in Appendix 1. In the table below are the different charges for two specific airplanes. These costs are however only relevant for state owned airports.

Landing costs	A300	B737-600
Landing charge	10 044	3401
Emission	1004	170
Noise	342	122
TNC	1725	1079
Total:	**13 116**	**4772**

TABLE 12-2 Landing costs in SEK for two different aircrafts[126]

[126] SCAA Tariff Regulations (2000)

12.2.6 En-route fees (variable cost)

This cost is in direct relation to the distance and is a variable cost. This cost is also discussed in section 12.4. Below are calculated costs (according to the formula in section 12.4.5) for two specific aircraft.

A300	B737-600
80 SEK/mil	60 SEK/mil

(1 mil=10 km)

TABLE 12-4 En-route fees in SEK

12.2.7 Other costs (fixed cost)

Overhead costs are fixed costs that normally are costs for administration, sales, promotion and other supporting activities. These costs could be specifies and allocated to different activities and drivers through an ABC analysis.

Below are the operating costs for pax-belly aircraft based on an average for the IATA airline members.

OPERATING COST PER ATK (Available Ton Km) BY ITEM 1999
IATA INTERNATIONAL SCHEDULED SERVICES

	US cents per ATK	Percent change over 1998	Percent of total costs
Cockpit Crew	2,7	-3,6	7
Fuel and oil	5,9	20,4	15,4
Flight Equipment Insurance, Depreciation and Rentals	4,7	-6	12,3
Maintenance and Overhaul	3,7	-5,1	9,7
Landing Charges	2	-4,8	5,2
En-Route Charges	1,8	0	4,7
Station and Ground Costs	4,4	-6,4	11,5
Cabin Crew and Passenger Service	5	-5,7	13,1
Ticketing, Sales and Promotion	6	-6,2	15,7
General and Administrative	2,1	-4,5	5,4
Total	38,3	-2,19	100

Sources: IATA Quarterly Financial Survey, other IATA surveys and IATA estimates
Note: Data based on IATA Membership as of 31 December of relevant year

TABLE 12-5 Operating cost IATA International scheduled services[127]

12.2.8 Pricing

Airlines normally use the value-of-service strategy when setting prices. Frequent flyer goods, are usually goods of high value. Demand for transport services of such goods is therefore inelastic. However, some routes experience harder competition when compared to others, leading to more or less cost based pricing. Cargo pricing is dependent mainly on weight. Some of the shipments that have a very low density can be assessed an over dimensional charge. Other factors affecting the price include completeness of services and special services.

[127] IATA Web Site

12.3 Forwarders and 4PLs

If direct airlines are the wholesalers of space, forwarder are the retailers. They are indirect air carriers. Forwarders function as consolidators of smaller shipments tendered to the airlines in volume lots under the forwarders name as shippers. The differences between the volume or contract rate offered by the airline to the forwarder and the forwarders own tariff rate to the shipper is the forwarders gross yield on the shipment. From that must come all the forwarders handling, administrative, and sales costs. During recent years forwarders have invested in IT facilities to be able to compete successfully against the integrators. According to Björn Pålsson at Wilson, staff and IT solutions are the main costs. The IT systems are a fixed cost. The labor costs are, as for the airlines, best described as semi-fixed costs. A traditional forwarder owns the trucks and the terminals but in the air industry now days they are changing direction and becoming 4PL operators, meaning that the fixed costs for trucks and terminals has turned to be mainly costs for IT-systems and staff.

The forwarder has tariff-based prices, but if the shipper is a frequent user or have large volumes the price is negotiated. Below is an extract from the tariff valid from *2000-01-01*. The example illustrates what 1 ton costs if the pick-up/deliver area is within Gothenburg.

	Export	*Import*
	SEK/ton	SEK/ton
Picking up*	597	597
Terminal costs	479	1208
Handling costs	340	340
AwbFree	95	0
Total:	1511	2145

TABLE 12-6 Wilson price list 2000

12.4 Airports

An airport has money invested in the infrastructure that incorporates runways, buildings, terminals and information systems. Operating an airport also

requires a lot of employees with different skills. Most of the costs are in nature fixed. The main revenue comes from what the carriers pay for the use of the airport through landing charges, rent and lease payments for offices and other facilities, emissions charges, noise charges, terminal navigation charges, passenger charges, security charges and air navigation charges. This will to a certain extent cover the costs the airport has to provide the infrastructure. The state owned airports differs from the only private owned airport in Sweden, Skavsta Airport. A state owned airport can "only" sell the infrastructure while Skavsta can market and control the entire concept that includes runway's, buildings, restaurants, terminals, ground handling etc. According to Björn Ragnebrink, all kind of services can be purchased from one supplier - "Skavsta offers one-stop-shopping"[128].

At Skavsta the personnel account for approximately 50 % of the total costs running the airport. They are viewed as semi-fixed costs. All in all, the fixed costs are about 80-90 % of the total costs at Skavsta airport.

Direct revenues for Skavsta comes from ground handling fees, landing charges and terminal fees. They don't have TNC, Emission and noise charges due to fewer rules initiated by the government. Another big difference is that all the costs are offered as one single price (one package) to the customer (airline or forwarder). The different charges for state owned airports are described below (see Appendix 2):

12.4.1 Landing charge

Landing charges shall be paid for each landing and are based on the maximum take-off weight (MTOW). There are different charges for different airports[129]:

Airport	Weight MTOW	Landing Charge (SEK) Fixed charge +	Charge per tonne	Minimum Charge
Stockholm-Arlanda	0-25 tonnes		28	350
	Over 25 tonnes	700	73 over 25 tonnes	
Göteborg- Landvetter	0-25 tonnes		28	250
	Over 25 tonnes	700	63 over 25 tonnes	
Malmö-Sturup	0-25 tonnes		28	250
	Over 25 tonnes	700	61 over 25 tonnes	

TABLE 12-7Calculation criteria's for landing at SCAA Airports

[128] Ragnebrink, B
[129] SCAA Tariff Regulations (2000)

12.4.2 Emission charge

There is a surcharge added to the landing charges. This is related to the aircrafts certified emission data (based on what type of engine the aircraft is equipped with). The surcharge is calculated only for aircrafts exceeding 9 tonnes. Depending on the emission charge class the charge could vary between 0-30 percent (see Appendix 2).

12.4.3 Noise charge

The noise charge is calculated according to the aircrafts certificated noise level in accordance with ICAO Annex 16 Volume 1 (this is also depending on the engine type). The noise charge is calculated according to the table below (see Appendix 2).

12.4.4 Terminal navigation charge (TNC)

The TNC is also paid for every landing. The charge is based on the MTOW and is the sane for all airports. It is calculated in accordance to the table below:

Weight MTOW	**TNC (SEK)** Fixed charge + Charge per tonne
9-15 tonnes	35
16-50 tonnes	35 24 over 15 ton
51-100 tonnes	875 17 over 50 ton
Over 100 tonnes	1725

TABLE 12-8 TNC charge criteria's[130]

12.4.5 Air navigation charges

This charge is not related to the actual landing at an airport, instead it is based on the air operation for flights carried out within a Swedish Information Region (FIR) and is calculated according to the formula[131]:

$$Charge = pxdx\sqrt{\frac{W}{50}}$$

[130] SCAA Tariff Regulations (2000)
[131] Ibid

p= service unit rate euro 44.43, besides Eurocontrol will invoice an administrative charge of 0,21 euro per service unit.
d=distance factor
w=weight factor

This fee is paid directly to the SCAA and not to a specific airport.

12.5 Terminal Operators and Ground handling agents

Terminal handling is cost intensive. The costs are mainly dependent on what principles the terminal is built on and how the goods are compounded. Some of the different factors are mentioned below:

- The goods dimensions weight and compound
- The average size of the goods flow
- The variation in time
- The level of mechanization on the terminal
- What kind of extern transport vehicles available

The most important factor is the dimensions, weight and the compound.
Terminals represent a high level of fixed investments. These investments will incur as interest, depreciation, and taxes that will stay fixed independent on the production volume. We have chosen two terminals two illustrate the costs, Cargo Center and SAS Cargo Terminal. Appendix 3 contains some price examples at different cargo terminals in Sweden.

12.5.1 Cargo Center, Arlanda (example1)

The most cost driving activity at Cargo Center are the labor costs. They represent 56 % of total cost. Other cost demanding parts are IT-systems 11% and capital costs for the building 14 % and other expenses 17 %. The labor force is viewed as a semi-fixed costs and together IT-systems and capital costs the share of fixed costs is significant. According to Lars Keding there are no big differences between commodities when it comes to handling issues and the cost is more or less the same. The main difference is when a product needs

special handling requirements and service. Then the cost will be somewhat higher. Lars Keding believes that security will affect the price most in the future. Loading and unloading a truck is about 10 % cheaper than handling an aircraft. This is due to less equipment is needed and that it takes shorter time.

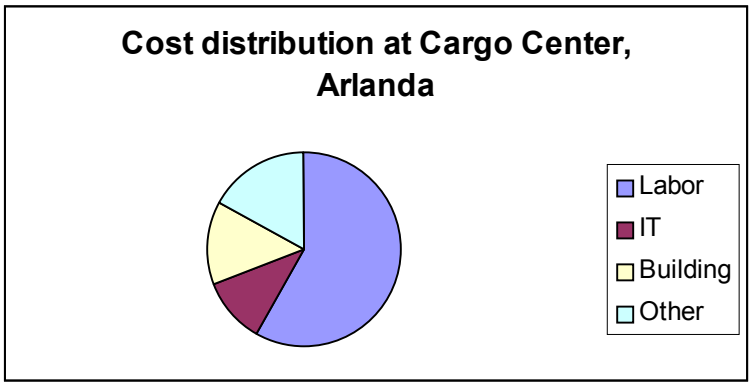

FIGURE 12-1 Diagram of cost distribution at Cargo Center

12.5.2 SAS Cargo Terminal, Arlanda (example 2)

The labor cost is approximately 74 % of total handling cost. Other costs are for IT-systems 3 %, Trucks, 3 %, Rent 10%, External costs 8 % and Capital costs 2 %. The low share of capital costs is due to the old building built in 1968. There are no big differences between commodities; it is the service requirements that affect the price most. Higher security is very resource consuming and therefore also more expensive for the ground agent. According to Gunnar Melin there are no big differences between handling a truck or an aircraft. He believes that the ground handling companies have a small portion of total cost in he airfreight system. When they charge the Airlines they use a ground-handling fee that is negotiated. The forwarder on the other hand pays according to a special price list for forwarder. Export activities require more resources than import due to more documentation. Gunnar Melin means that they only have fixed cost since the labor costs are allocated over a longer period.

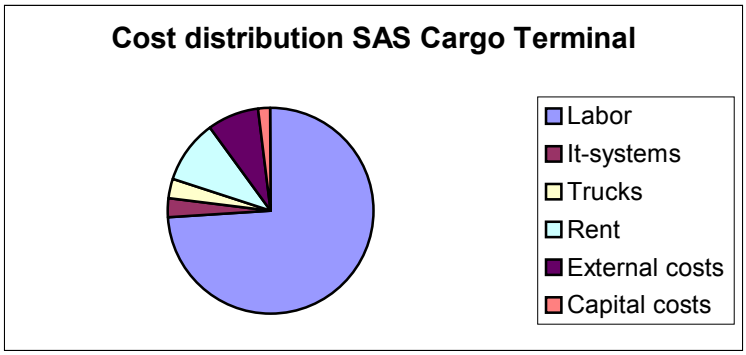

FIGURE 12-2 Cost distribution at SAS Cargo Terminal, Stockholm

12.5.3 Ground Handling

The ground-handling agents are the ones that load and unload the aircrafts. The two main costs are labor and equipment that are fixed costs. According to Gunnar Melin at SAS Cargo Terminal at Arlanda the prices are more or less always based on weight. They are the same unless it is an export or import activity. The market price today is between *700- 1200* SEK/ton[132], but in the end it is always a matter of agreement between the customer and the ground-handling agent.

12.6 Integrators

An integrator has control of the total flow, from picking-up the goods to delivering it. They have same activities as the traditional flow, although it is totally integrated (see chapter 9). An integrator owns all the equipment (terminals, airplane's, trucks, terminals, IT- systems). This means that they have a large amount of capital tied up in fixed assets. The fixed cost will be the same independent on production volume. To cover these costs the Integrator is aiming for large-scale operations. They offer the customers an integrated package that will include every activity necessary for that specific service. Like the forwarder, they have tariffs but if the customer ship large volumes the price is negotiated and a contract is signed. Cost structure was not provided due to policy regulations.

[132] Melin, G

12.7 A practical example

The airfreight system is extremely complex containing a number of different actors that make the flow of goods possible. The market as such has slim margins and the pressure is continuing. The price toward each actor in the system is more or less equal to the costs. The best way of monitoring the costs is to see were they occur and why. The airlines operations are the actual transport or the link in the system. The costs vary depending on which type of aircraft is operated, the distance, the destination and several other market factors. The airlines have to cover costs, for that is both fixed and variable. Fixed costs are the overhead costs like administration, equipment etc. The most distinct variable costs are fuel and oil expenses. Also costs for cockpit crew and cabin crew are significant (see section 12.2). When an aircraft is landing the airlines have to pay different charges to the airport such as landing charges, emission charges, noise charges etc (see section 12.4). When the aircraft has landed the ground-handling agents unload the aircraft and charge the airline. The ground-handling agent has to cover costs for staff and equipment. After the ground handling activity the goods are transported to a terminal for further preparation (consolidation/deconsolidation) before the goods are finally delivered to the destination. The terminal operator has to cover costs for labor, IT-systems, buildings, trucks etc (see the terminal operator section). The price depends on what kind of service the goods needs and is based on SEK/weight.

The last costs that will be added to the total costs are the transport from the airport to the final destination. The price for this has to cover costs for the actual transport work from the airport to the destination, which are fuel, staff, truck and other costs like administration etc.

Part Four

Industry Reengineering

Part 4 focuses on the traditional air cargo flow as defined in the Product flow model in Figure 4-5 in Part 2, section 4.3.3. The main purpose of Chapter 13 is to answer the previously stated research question; *what are the sub-problems that contribute to the main problem*? The main purpose of Chapter 14 is to introduce a recommendation that will assist the re-engineering of the industry, which is deemed necessary for the solution of its problems. Information found in this part of the Thesis may be of particular interest to the industry and to SCAA.

Contents:

13 THE BOTTLENECK

The argument about the existing bottleneck in the system will focus on the traditional air cargo transport chain. This implies that the discussion will evolve around the shippers, forwarders, terminal operators, ground handling agents, airlines and airports.
The integrators and 4PL providers will be excluded as they do not contribute to the bottleneck; integrators maintain their own seamless operations and the 4PL's perform no activities other than assigning cargo to the appropriate carrier and thus will be expressed in the context of the shippers.

"In 1973, it took six days for an air cargo shipment to get from shipper to consignee. By 1996, in spite of outstanding technological improvements in supply chain management, that number had climbed to six days and six hours. The results come from a 27 year old study by the International Air Transport Association (IATA) and a 1996 study by systems provider Unisys"[133].

When reading the statement above one may initially wonder if it is actually true or if it is somebody's idea of a joke. Any questions set forth by the industry to investigate the performance of the system must examine why this is happening.

Throughout the different interviews during the research period, all the individuals interviewed had clearly identified the bottleneck when asked to do so; the bottleneck of the conventional air cargo transport system is located on the ground. Specifically, the effects of the bottleneck may be experienced at the airport terminals, since all the transport 'links' meet on the terminal operator's (node) premises.

[133] Schwartz, B (2000)

The next question that one may ask oneself then, is 'Since everyone is aware of it, how come nobody isn't doing anything about it?' And here is where things start to become a little too complicated. Complexity is based on the number of different reasons that refrain all the actors in the system from taking steps to minimize the impact of the bottleneck on the total performance of the air cargo transport system.

Even though the bottleneck is found to be at the terminal operator's facilities that does not propose that the terminal operators are the only participants to operate inefficiently. On the contrary most of the activities that contribute to the problem occur throughout the system by all the participants. The outcome of all these activities is what causes the bottleneck. Surely there are some processes that can be treated more effectively by the terminal operators. However, these improvements will primarily optimize the individual performance of the terminal operators rather than the performance of the entire system. And for the bottleneck's effect to be minimized, all the actors in the system must consider of "throwing in their two cents" so to speak, to achieve the task at hand.

13.1 Bottleneck Drivers

13.1.1 Problem

As it has been already identified in the introduction of this thesis, the main problem that currently exists in the traditional air cargo transport industry is the lack of information exchange. One of the primary reasons for the existing information gap is the competitive nature of the air cargo industry. The volatility and uncertainty caused by the competitive nature of the business affects the quantity/quality of information shared between different actors. Too little information is communicated, as every actor is concerned with the satisfaction of individual short-term objectives, rather than long-term relationship sustenance.

Consequently, it is quite difficult for industry participants to convey to each other the existing bottleneck in the system and even more difficult to take

action, so as to collectively reduce its impact on operations. This happens simply because each actor refuses to assume responsibility for their contribution to the bottleneck. Industry participants are well aware of the existence of opportunities, but they blame each other for the stagnation currently experienced.

13.1.2 Sub-Problems

The identified sub-problems that cause the main problem are also the contributing factors for some of the existing activities (see section 13.2) industry participants' discharge. These activities are the source for inefficiencies.

The sub-problems are:

A. Lack of trust between the actors in the industry. Competitive pricing strategies like for instance market price are mainly responsible for this sub-problem. Naturally, such pricing conditions set a serious barrier to the sharing of information.

B. The positioning of different industry participants is not clear. The result is that there is a lot of competition for direct communication with the shipper (see Interaction model).

C. Lack of education about the air cargo industry's purpose. Some participants still believe that they only move cargo and not that they provide a service to clients.

D. Cultural barriers and traditional thinking limit the implementation of necessary operational and technological changes that will increase information sharing capability.

E. The treatment of air cargo as a by-product of passenger transport.

F. Unable to standardize operations and IT systems.

G. Market volatility.

H. Logistical problems.

13.2 Contribution to the bottleneck

In the matrix below (table 13.1), the reader can view some activities executed by each actor today. Such activities are responsible for the existence of the bottleneck.

ACTORS	EXISTING ACTIVITIES	SUB-PROBLEM THAT CAUSES THE BEHAVIOR (Section 13.1.2)
FORWARDERS	• Refuse to provide their cargo volume information to terminal operators and airlines	A, D, G
	• Blame airlines when poor service incidents occur	A, C, D
	• Export on Friday/Import on Monday.	F, H
	• Bargain with airlines for lower rates	C, D, G
	• Unwilling to share investment costs for standardization that will enable information exchange between actors	A, D, F, G
	• Do not share information of their cost structure with terminal operators and airlines	A, D
AIRLINES	• Treat forwarders like their sales agents and not like customers	C, D, E
	• Blame forwarders when poor service incidents occur	A, C, D
	• Issuing last minute “low ball” rates	A, E
	• Export on Friday/Import on Monday.	D, F, H

	• Approach some shippers directly	A, B
	• Attempt to eliminate the forwarders from the system	A, B
	• Unwilling to share investment costs for standardization that will enable information exchange between actors.	A, C, D, E, F
	• Production oriented	C, D, E
	• Prioritize passenger operations	C, D, E
	• Overbooking to ensure high capacity utilization of units	A
	• Do not share their cost structure with terminal operators and forwarders	A, C, D
TERMINAL OPERATORS	• Unwilling to share investment costs for standardization that will enable information exchange between actors.	D, F, G
	• Inefficient processing of the cargo through its facilities. (Inflexible on personnel scheduling due to union's restrictions)	H
	• Do not share their cost structure with airlines and forwarders	A
GROUND HANDLING AG.	• Unwilling to share investment costs for standardization that will enable information exchange between actors.	D, F, G
AIRPORTS	• Compete for business	A, B, C
SHIPPERS	• Do not use trained personnel when dealing with forwarders and airlines	C
	• Do not provide information about their cargo output to forwarders and airlines	G, H
	• Expect increases of service levels without any cost increases.	D, G, H
	• Do not package and document some shipments properly	C, H
	• Push inventories in the transport chain	D, F, H

TABLE 13-1 Bottleneck Contribution Matrix[134]

[134] Researcher's own matrix (Efstathiou)

13.3 The Result

The result of the bottleneck is that the traditional air cargo transport chain is suffering inefficiencies under its current structure. The primary outcome of such inefficiencies is stated below:

- Shippers do not receive the high level of service competitors i.e. integrators provide them with.

- Forwarders are incapable of assuming full control over their own operations because they must depend on the airlines who own the equipment for the service.

- Terminal operators and ground handling agents cannot assume control and become more efficient since they depend on the reliability of both the forwarders and the airlines.

- Airlines cannot utilize their equipment capacity to the maximum because they depend on the forwarders for 90% of their cargo business.

- Airports are fearful of investing further in necessary infrastructure because they have no clear information of their clients' intentions and therefore fear experiencing a situation involving sunk costs.

Moreover, the problems that have been identified in each chapter for each of the actors are a direct outcome of the result of the bottleneck as stated above.

14 RECOMMENDATION

14.1 Supply chain management practices by incorporating channel structure

The goal of the air transport industry is not to just move freight from point A to point B. The goal is to provide a premium service to a wide range of industries. These industries, as clearly indicated in the chapter of this thesis discussing the shippers, are heavily dependent on the performance of air cargo service providers. The air cargo transport industry should contemplate over the fact that its production is the key component for the successful implementation of many companies' supply chain strategies. That is, without the effective transport of cargo by air, supply chain management is seriously under-performed.

Considering this fact then, all air cargo service providers should take a good look at the lean supply chains for which they provide a key service to and learn from them. These industries share information in order to be able to successfully implement their uniform, overarching goals. And this is precisely what the traditional chain of the air cargo industry should do, to remedy the existing bottleneck and remove inefficiencies from its system.

The traditional chain of the air cargo industry should enforce supply chain management in its entirety of operations. The way to achieve such an objective is to establish a system structure identical to that of a channel.

The differences between traditional and supply chain management approaches exhibited in table 14-1 below, clearly indicate the existing management practices in the traditional air cargo transport chain, along with the suggested management practices based on the supply chain concept.

ELEMENT	APPROACH	
	TRADITIONAL	SUPPLY CHAIN
Equipment management approach	Independent efforts	Joint reduction in equipment related inventories
Total cost approach	Minimize firm costs	Channel-wide cost efficiencies
Time horizon	Short-term	Long-term
Amount of information sharing and monitoring	Limited to needs of current transaction	As required for planning and monitoring processes
Amount of coordination of multiple levels in the channel	Single contact for the transaction between channel pairs	Multiple contacts between levels in firms and levels of channel
Joint planning	Transaction-based	Ongoing
Compatibility of corporate philosophies	Not relevant	Compatible at least for key relationships
Breadth of supplier base	Large to increase competition and spread risk	Small to increase coordination
Channel leadership	Not needed	Needed for coordination focus
Amount of sharing of risks and rewards	Each on its own	Risks and rewards shared over the long-term

TABLE 14.1: Traditional and supply chain management approaches compared (changed by the authors)[135]

When viewing the table above, one can visualize the positive impact that would be the outcome of supply chain management utilization in the traditional air cargo chain's activities. Many of which contribute to the bottleneck (see chapter 13).

[135] Cooper, M C and Ellram, L M

14.1.1 Channel partnership criteria

However, in order for the segment of the industry in question to be able to operate under such supply chain management practices, some conditions must be satisfied first. These conditions evolve around the relationships between all the industry participants. The incorporation of all eight criteria for successful channel partnership stated in table 14-2, will help build the level of cooperation and trust needed to solve the sub-problems (as stated in the bottleneck above). These criteria will enhance the level of trust and commitment on behalf of all the participants in the traditional air transport chain. An introduction to these criteria is provided below the table. However, specific steps that would lead each actor toward the development of these criteria is not provided, as it is not the purpose of this thesis to do so.

- INDIVIDUAL EXCELLENCE
- IMPORTANCE TO ALL PARTIES
- INTERDEPENDENCE
- MUTUAL INVESTNMENT
- SHARED INFORMATION
- INTEGRATION
- INSTITUTIONALIZATION
- INTEGRITY

TABLE 14-2 Successful partnership criteria[136]

14.1.1.1 Individual excellence

This criterion focuses on the importance of each channel participant. The logic behind the requirement for individual excellence, is that unique performance can justify the margins earned by the channel participant. Margin justification

[136] Moss, R

reduces friction between parties in a channel, because everyone feels that each is receiving what they contribute to the relationship. Moreover, individual excellence makes a channel participant indispensable to the successful operations of the entire chain.

When applying this criterion in the traditional air cargo industry, one can state that if all the actors in the system focus on their core competence, they can improve their service levels and at the same time establish themselves as specialists for the activities involved in their domain of operations.

For instance, airlines could focus on their core competence, which is moving the cargo instead of competing with their clients for business, those being the forwarders and the integrators. Airlines could become the capacity providers for both the integrators and the forwarders. In this way total system capacity may be more effectively managed, since both the forwarders and the integrators will feed the airline units' bellies. This additional business would come at very little cost to the airlines since, they would not have to sustain any marketing, sales, and administration costs in order to attract this business.

At the same time forwarding and integrated companies will be offered with additional capacity at very little cost. Integrators for example, would not have to invest in any assets (aircraft) to increase their capacity.

14.1.1.2 Importance to all parties

A channel partnership should be beneficial to all parties entailed in an agreement. When a partnership results in some important benefits for a partner, then that partner is more cooperative and willing to improve service levels, since he depends heavily on the successful outcome of the partnership. For example, a medium-size forwarder would be more willing to re-engineer its operations and conform to the channel's requirements, than a forwarding subsidiary of a large postal company participating in the relationship.

In the traditional air cargo industry forwarders and terminal operators are the most dependent on the successful outcome of air cargo transport services because moving cargo is their core business. On the contrary, airlines have the passenger traffic contributing revenue, even though most of their passenger flights need cargo to be economically viable. Similarly, ground handling agents can still stay in business by operating mostly passenger related services for airlines based at an airport.

However, such dependency experienced by forwarders and by terminal operators, should not be exploited by the not-so-dependent channel participants as pressure leverage. Instead, airlines, ground handling agents and airports should, through constructive conflict, assist them in their efforts, since the target is the increase of the outcome of the entire channel.

14.1.1.3 Interdependence

When viewing the interaction model found in the introduction of the industry's description, one can clearly realize the level of dependence existing amongst all the actors, for their cargo operations. Such high levels of interdependence make this segment of the industry, ideal for the implementation of supply chain management practices.

The current structure of the traditional cargo chain is similar to that of a channel as far as the level of dependence amongst participants is concerned. To illustrate, a shipper depends on the performance of his forwarders in order to be able to maintain a lean supply chain. Forwarders depend on the efficiency of operations of the terminal operators (both at origin and destination airports) to meet their lead times. Ground handling agents need successful forwarders and terminal operators to provide them with cargo to load on aircraft. Airlines experience similar dependence with the terminal operators and at the same time need prosperous forwarders to fill their belly capacity. Finally, airports need to be surrounded by efficient forwarders, terminal operators, ground handling agents, and airlines, so as to remain attractive to new accounts (airlines) wanting to establish operations there.

The problem is that even though there is such high level of dependence, there is no information exchange to support that dependency.

14.1.1.4 Mutual Investments

When channel participants invest equally in necessary investments for the improvement of the total channel output, their relationship becomes more potent. Through the assumption of financial risk, partners ensure both their commitment and their interest in the success of the channel they belong in. Vested capital, in the form of an investment also reduces the propensity of any partners leaving the relationship.

An illustration of such a capital investment, essential for the improvement of the traditional air cargo chain, is that of an information system that if materialized it will enable standardization of operations between the partners that will share this relatively large investment.

In addition, industry participants must invest equal amount of time in the relationship, and work with each other to establish a strong channel structure.

14.1.1.5 Shared Information

As it may be viewed in figure 14-1 below, information sharing must be present for any channel to have the capability to utilize supply chain management approaches. Hence, shared information is the most essential element that makes a channel partnership successful.

When discussing shared information for the traditional air cargo chain, it is done so in the context of sharing cost structure information, capacity requirements and availability by all channel members, along with continuous conveyance of any other relevant information transmitted though a standardized information system.

14.1.1.6 Integration

Organizations engaged in a partnership need to integrate their operations in order to fully exploit the opportunities found in cooperation. To stimulate integration, all partners must develop inter-organizational linkages. These linkages should not be limited at the top management level. They should extend throughout all organizational levels. Integration is the element that will enhance the competitiveness of the channel as a whole, since partners will have the advantage of joint planning i.e. capacity requirements, information sharing i.e. demand forecasts and combined use of resources i.e. information system.

Moreover, partners can further strengthen integration though the implementation of joint training programs in which trainees will have the opportunity to learn about the needs (learn about importance of employee contribution to the outcome) of each channel participant. Also, partners may consider co-optation of key employees (representatives situated at the premises of partners, actively engaged in operations).

14.1.1.7 Institutionalization

This criterion touches the formalization of a channel relationship. By doing so, all members will feel comfortable enough to share vital confidential information with companies that not long ago, were their competitors. Also, formalization of the channel implies that each actor will have a clear position in the system and assume clear responsibilities. Clear positioning will secure the partners from experiencing channel conflicts, usually happening when a partner operates outside their designated domain.

14.1.1.8 Integrity

Channel participants depend on each other's performance to successfully satisfy the requirements of shippers. Dependence may be an asset when it is constructively used, as it may result in effective coordination i.e. integrator system that in turn generates a competitive advantage. However, dependence

automatically becomes a liability when one of the channel participants displays opportunistic behavior through the exploitation of that very dependence.

By diverging from its predefined goals, a partner will damage the performance of the entire channel in exchange for a few individual, short-term advantages. Such behavior may result in the brake of the channel. Channels need commitment on integrity from all the participants. Trust is a key channel element, since without trust a channel cannot exist.

14.2 Proposed outcome of recommendation

Solution of the sub-problems will essentially treat the main problem currently faced by the industry, which is the lack of information sharing. Information sharing will make possible the establishment of supply chain management practices and make feasible the favorable impact on the industry's elements (as described in table 14-1) resulting in the optimization of the system.

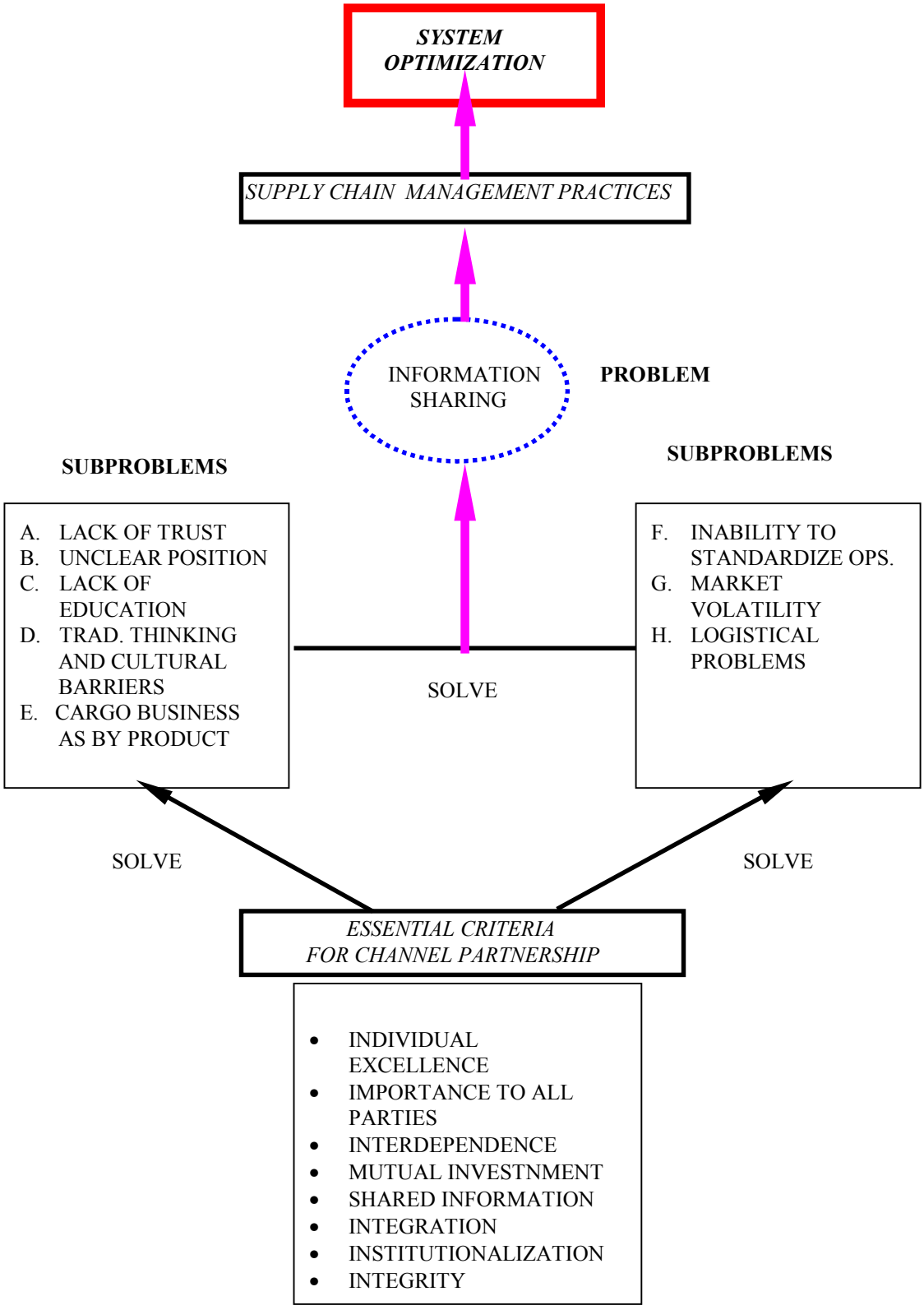

FIGURE 14-1 Recommendation[137]

[137] Researcher's own model (Efstathiou)

A productive start toward the implementation of the industry's re-engineering process is provided in the LENS Priority steps below:

14.2.1 LENS Priority steps

14.2.1.1 Learn

Participants in the traditional air cargo transport system should implement co-optation of key individuals from within each department and place them at the premises of every actor they do business with. These individuals must maintain in-depth knowledge of the processes that happen in their respective departments. The objective for the co-optation should be for these individuals to first understand and then actively participate in the operations of the organization they are situated in. In this way, these key individuals will enjoy the opportunity to learn exactly how the competitor and future business partner operates. Moreover, these individuals will be introduced to the culture and to " the way of doing things" of the industry participant they will be working with.

14.2.1.2 Educate

Upon completion of the learning period, the key individuals must return to their respective organizations and initiate a training program. All knowledge gained during the learning step should be communicated by the training program throughout the entire company. In this way all employees in each company involved in the system will become aware of the implications of their activities toward the performance of the entire channel.

14.2.1.3 Negotiate for total system solutions

Upon completion of the education period, all industry participants should establish a group of representatives that will negotiate on their behalf. These representatives should first negotiate a structure that will dictate action steps for each participant to take. The steps should focus in meeting all eight criteria essential for successful channel partnerships. When all participants of the

traditional air cargo transport system meet the criteria, the sub-problems will be eliminated resulting in the elimination of the main problem, the lack of information exchange. With a flow of information established, supply chain management practices will be feasible. Such practices will provide for further optimization for the total of the system.

14.2.1.4 Supervise

The same representatives should continue their cooperation by supervising the performance of the air transport channel as a whole. Moreover, they should continuously revise activities that may endanger the harmony in the channel. Also, they should observe and ensure the conformity of all channel participants to the eight criteria on which the channel will be constructed. Finally, these representatives should propose solutions on how to assist channel members that may be struggling with their objectives.

15 CONCLUSION

The combination of knowledge provided by the industry's participants along with the research executed by the authors, generated the current result. The authors hope that the study will serve its purposes, as these were identified in Part 1 of the Thesis. These purposes are re-stated below, along with some conclusive comments.

A. *To describe the structure of the system.* Information for this subject is found in Part 2 of the Thesis. Part 2 is divided into seven chapters. These chapters define the present the structure of the industry and offer a comprehensive explanation of the position of each industry participant along with the identification of the services they offer. This information is relevant for SCAA and for authors that are interested in the subject.

B. *To analyze the costs as they currently exist in the system*. Information on this subject is found in Part 3 of the Thesis. The chapter qualitatively defines the cost structure of the actors operating in the industry, while providing an explanation of the complexities involved in compiling such cost information. This information is relevant to SIKA and to authors that are interested in the subject.

C. *To identify possible bottleneck that affects the output of the traditional airfreight system and provides recommendations on how these should be treated.* Information related to the bottleneck is found in Part 4 of this Thesis. The bottleneck drivers are clearly stated in the form of sub-problems. Further, existing activities resulting from these bottleneck drivers are found in the contribution matrix. Finally, a recommendation that aims at providing a direction for the re-engineering of the traditional airfreight system is found in Part 4. Information found in this part of the Thesis, may be of particular interest to the industry and to SCAA.

D. *To establish an information source.* Information found in this Thesis are added to the currently limited sources dealing with the subject of air

cargo transport. Authors that have an interest in the air cargo transport industry may use this work.

15.1 Suggestions for further research

Throughout the research process the authors had the opportunity to identify several areas, which may appear as interesting to authors that will select to conduct further research in this industry. Some suggestions of topics for further investigation are stated below:

- Consideration of the environmental impact of the airfreight industry.

- The Environmental impact of each airfreight transport flow. For instance, the transport of a specific product through the integrator's traffic system may be compared to the transport of the same product through the traditional air cargo traffic system. The comparison may consider the environmental performance of these different traffic systems.

- Individual study of the internal processes (cargo related) of each participant (i.e. forwarders, terminal operators, airlines etc.) in the traditional air cargo transport system.

- Individual study of the external processes (cargo related) of every participant (i.e. forwarders, terminal operators, airlines etc.) in the traditional air cargo transport system. Specific consideration should be warranted to the interaction between the different actors.

- Investigation that may provide solutions that will enhance the application of inter-modal transport by the air cargo industry.

- Compilation of market prices paid by shippers and their statistical analysis. Results may be included in a model aiming at the quantitative measurement of the industry's costs.

- An investigation of airport operations in different locations (both domestic airports and foreign) with a target to optimize the existing condition of operations.

As a conclusive remark, the authors would like to state that the opportunity to conduct research in the Swedish air cargo industry has been a rewarding experience.

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Holst Christer, Arlanda Airport, Stockholm

Jacobson Ann, Landvetter Airport, Gothenburg

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Strömbäck Ulf, SAS Cargo, Gothenburg

APPENDIX

Appendix 1

A 300

Noise data:
Approach 99,1
Take off 88,5
Sideline 97,4

Noise factor 11,41104

Emission data:
Nox 49,84
Hc 10,94
Co 51,8

Charge class: 4

B 737-600
Noise data:
Approach 95,8
Take off 81,8
Sideline 90,6

Noise factor 4,06708

Emission data:
Nox 30,58
Hc 14,61
Co 0

Charge class: 5
This selection is based on the most frequently used air types in Sweden for Airfreight and Pax Belly.

Source: Rolf Ringborg, SCAA, Norrköping, 2000

Appendix 2

Calculated landing costs for different Airports in Sweden

A300

	Landing charge	Emission charge**	Noise charge	Terminal Navigation Charge (TNC)	Total cost	Cost per ton
Stockholm-Arlanda	10 044	1004	342	1 725	13 116	279
Göteborg- Landvetter	8 764	876	228	1 725	11 594	247
Malmö- Sturup	8 508	851	228	1 725	11 312	241
Skavsta* **		X	X	X		

B737-600

	Landing charge	Emission charge**	Noise charge	Terminal Navigation Charge (TNC)	Total cost	Cost per ton*
Stockholm-Arlanda	3 401	170	122	1079	4 772	239
Göteborg- Landvetter	3 031	152	81	1079	4 343	217
Malmö- Sturup	2 957	148	81	1079	4 265	213
Skavsta* **		X	X	X		

* Estimated that 10 % is allocated to the goods

** Calculated on class rate 5 for B737-600 and 4 for A300

*** Confidential information. Landing charge approx. the same as Arlanda.

X= no charge

Spec. for A300 and B737

	MTOW(ton)	Load(ton)	Emission class	Noise constant
A 300:	153	47	4	11,41104
B737	62	2	5	4,06708

Appendix 3

Cargo Terminal Costs based on tariff's

Import

	Terminal charge (SEK/ton)
Stockholm-Arlanda:	
SAS Cargo Terminal	650
Cargo Center	620
Göteborg- Landvetter	630
Malmö- Sturup	200
Skavsta**	455

Export

	Terminal charge (SEK/shipment)*
Stockholm-Arlanda:	
SAS Cargo Terminal	40
Cargo Center	35
Göteborg- Landvetter	42
Skavsta**	28

*the reason for this charge rate per shipment is due to historical reasons.
** Confidential information. Approx. 30 % cheaper than Arlanda

Ground handling

700-1200 SEK/ton***

***(Market price 2000)
Source: Gunnar Melin, SAS Cargo Stockholm

Appendix 4

1. PROCUREMENT ACTIVITIES

The goal of all procurement activities is Customer Service. In this case the customer for a company is internal and specifically in the form of a department, requesting raw material to enable itself to perform its function. Departments are treated just like external customers because the level of internal quality of service departments receive, has a direct impact on the performance of these departments, and ultimately an impact on the quality of the product these departments produce.

1.1. Key Procurement Activities:

- Transportation.. Companies must somehow arrange for the transport of the raw material from their supplier's production location to their choice of destination. Agreements must be in place on who, and how the materials will eventually arrive at the firm's plant, or elsewhere for that matter. Air transport is seldom used for the transport activities of raw materials, as the economic value of raw materials or components is very often low, since prior to the entry of these articles inside the plant, no specific value is allocated to them.

- Inventory Maintenance. This procurement process is of critical importance for organizations especially since the introduction of the JIT concept in the world of business. Correct estimation of inventory requirements is essential for the avoidance of stock-out situations. To that end, several companies maintain a safety stock level. Firms also maintain a standard re-order point. When the re-order point is reached, a new order is placed to the supplier requesting the pre-determined quantity of inventory.

- Order processing and information Flow. This function deals with the flow of orders from all departments of a company to the purchasing department. The amount of information exchanged between the different departments throughout this process is the primary determinant of the efficiency with which a company's procurement department can perform its objective.

1.2 Procurement Support Activities:

- Warehousing. Considering that the key activities are performed correctly, the result would be to have some kind of raw materials or components arriving at the plant. These items are now inventories owned by the company in the form of vested capital. Depending on the company's manufacturing system, part or the entire inventory batch may be stored in a warehouse. Effective warehouse management may generate savings for a firm in the form of reduced inventory carrying costs. These costs are further analyzed in chapter 5, and in Appendix 6.

- Materials Handling. The process of properly storing the inventories at the plant, involves some form of a handling process performed at the site. Handling is an important contributor to costs and must be implemented through seemly planning and utilization of the appropriate equipment, in order to keep these costs under control.

- Purchasing. The purchasing function has undergone through significant changes in the past few years. There has been a shift from multiple supplier sources toward the minimization of the amount of suppliers. Organizations set strict requirement guidelines to all their suppliers. In this way suppliers that are willing and able to comply with these demands are kept on the company's supplier list, while all the rest are rejected. Further discussion on this issue is provided in chapter 5, in the Supply Chain Management section.

- Protective Packaging. The type of packaging required for the sourced material, is determined based on the articles' physical conditions. Moreover, consideration is assigned toward the handling requirements of the material when it arrives at the plant.

- Information Maintenance. Constant communication with the supplier ensures that the order is processed adequately, the right material is being transported and that these materials will arrive at their destination on time and in the right condition. Information exchange between the different participants in the procurement process is essential, as it reduces uncertainty in this segment of the system.

- Materials Requirement Analysis. The analysis on the requirements for materials is often done by computerized systems such as MRP (Master Requirement Planning). During this analysis a company may consider the amount of materials required, based on forecasts. Also, through these types of analyses a firm may scrutinize components of the existing product, in order to find other components that may exist in the market

to replace the existing ones. The target of such a task is that of improving the overall quality of the product or reducing its manufacturing cost, or both. Quality characteristics of components and their respective cost data are constantly evaluated for the purpose of improving the value generated by the product to both the manufacturer and its customers. An example of such activities is the maintenance of a components database by Volvo's Truck division. This database enables the company to screen suppliers and evaluate each component of any Volvo truck.

- Forecasts. Forecasting of the obligations toward manufacturing in terms of material, is performed in accordance to the sales forecasts of a given product. Forecasting enables a firm to evaluate its supplier needs, as the quantity forecasted is an important factor in the firm's negotiation process with suppliers. Based on the forecasts a company can negotiate volume discounts, order quantities, the final sourcing location and the rate of production in a manner that reduces its overall procurement costs.

- Inventory Position. Finally, a firm's logistics department must determine where to deliver the raw material, as large organizations may have plants located in several parts of the world. The purchasing department assigns the material based on its market presence in different countries, on the production capacity of each of its plants and in accordance to its inventory and distribution strategies.

2. DISTRIBUTION ACTIVITIES:

The goal of all distribution activities is Customer Service:

Customer service is the product of the entire system and is considered to be one of the most critical factors for the success of a distribution system for a company. Furthermore, high levels of customer service have become essential for the viability of any firm, irrespective of which segment of the economy they belong to. The job of the logistics department is to accomplish a given level of service at a lower cost. Such a task is rather challenging when one considers that customer service is difficult to visualize as it comprises of mostly intangible characteristics.

Some of the main issues concerning organizations while performing this activity is their speed of delivery, their on-time-error-free delivery, their ability to provide information on the shipments location to their clients, and their policy of handling complaints. Another customer service concept deals with the ability of a company to expedite shipments for its clients if requested,

through the provision of special handling, premium transportation, and fast order processing. Such capability may increase transportation costs but at the same time it increases customer loyalty, as clients are offered superior customer service.

2.1 Key Distribution Activities.

- Transportation. The mode of transportation to effectively implement the product's distribution, is mainly determined based on the type of product. Typical candidates for shipping by sea for example are almost all commodities. High-tech, high-value, emergency shipments, documents, small packages, and perishable goods are the most common 'air freight users'. Value related conditions are enough to justify the increased transport costs usually associated with air transport.

- Inventory maintenance. The amount of inventory necessary to satisfy the company's orders is continuously monitored so that no quantity of excess inventory is kept low in the system. Inventory cost data is taken under consideration here.

- Order Processing and Information Flow. Order processing is the process responsible for turning a firm's inventory into revenue, a fact that may be clearly read in the definition of the order cycle, "The customer order cycle includes all of the elapsed time from the decision by the customer to place the order until the shipment is received, inspected and placed into the customer's inventory". Most importantly, a company is concerned with its ability to make it simple for its customers to place an order to the company. Ease of ordering implies convenient order forms and rules. It also implies that the company has the capability to communicate with its clients through all forms of communication.

In addition, efficient order processing requires that the flow of information between a company and its clients be kept well developed and maintained. Sufficient information flows generate savings for everybody in the system. The sharing of information facilitated by EDI technology for example, enables a firm to perform parallel processing during the execution of its order fulfillment process, and thus effectively reduce the order cycle. More about this issue is discussed in the Supply Chain Management section, in chapter 4.

2.2. Supporting Distribution Activities.

- Warehousing. Traditionally, when the product is assembled at the plant, it is distributed first at a central warehouse and sometimes redistributed to a regional or even a local warehouse. This approach to inventory strategy creates buffers in the system and ensures the avoidance of stock-outs, and enables high service levels through the provision of enough product to the market any time, any place. However, this inventory strategy appears to be rather costly for companies with extremely large inventories. If one considers that inventory averages 25% of the cost for a product, then the magnitude of the costs for maintaining buffers in the system may be clearly visualized.

- Materials Handling. As previously stated it is essential that correct handling of the materials takes place during their storing process at the warehouse location. Again appropriate scheduling and correct equipment utilization helps companies keep these costs low.

- Aggregate Production Planning (APP). To perform APP companies render an analysis of the current demand for the product in question. Further, organizations usually forecast the demand for the product so that they can anticipate the capacity required to meet that demand.

- Protective Packaging. The overall quality of the product depends to a large extend on the quality of its packaging. Nonetheless, there are some trade-offs involved in such decisions. That is, if the product is provided with quality packaging, hence higher product cost, then the risk of the product getting to the market damaged is minimized. Yet another trade-off concerning packaging is found in the provision of lower transport costs, offered by carriers when the product is properly packaged. However, protective packaging may at the same time use more space and thus increase the transport cost per unit. Lower costs are offered primarily due to easier handling and secondarily due to the better utilization of the carrier's transport equipment.

- Information Maintenance. The introduction of new technologies has made the flow of information between a producer and its customers a necessity. An effective information flow enables the inclusion of a company into a channel and its participation in the supply chain activities performed by that channel. This capability allows the company that engages itself in information exchanges with its customers, to generate tremendous savings on its overall costs. More information available in chapter 4. in the Supply Chain Management section.

- Inventory Positions. A key activity for an organization is to maintain a constant awareness on where its inventories are located. Inventories may be on transit, stored in one of the company's warehouses, or on their way for delivery to the market. This type of information helps the firm control its inventories. Also, the company has a base of information that may be used to identify inventory optimization possibilities[138].

[138] Lecture, Arne Jensen 1999

Appendix 5

SIKA and the STAN-model

The Swedish Institute for Transport and Communications Analysis, SIKA, is an agency that is responsible to the Ministry of Industry, Employment and Communications. SIKA was established in 1995 and has three main areas of responsibly in the transport and communication sector:

- To carry out studies for government
- To develop forecasts and planning methods
- To be responsible authority for official statistics

SIKA has almost 30 employees and is organized in three departments- for Analysis, Research and evaluation and Statistics. SIKA analysis and presents data and work out basis for planning in the transport sector. SIKA provides the actors in the sector with statistics, descriptions of the present situation, forecasts, and consequence analysis. SIKA also participates, together with traffic authorities, in the work of following up and working out details of the national transport policy goals that the politicians has formulated.

This means that SIKA:

- co-ordinates the basis for long-term planning of the infrastructure in the transport and communications sector,
- carries out descriptions of the present situation and forecasts of the development of transport and communications for passengers, goods and information,
- develops methods for economic analyses and evaluations of the planning and expansion of the infrastructure,
- makes socio-economic analyses of policy, pricing and investment,
- carries out transport policy and other investigations in the transport and com-munications sector,
- co-ordinates national transport and commodity flow surveys,
- is responsible for official statistics in the area of transport and communications including mail and telecommunications activities,
- is responsible for Sweden's international commitments to, for instance, EU and UN/ECE for development work and statistics in the transport and communications sector.

SIKA has a co-ordinating role in relation to the transport agencies with respect to the basis for planning. In addition to the National Rail Administration, the Civil Aviation Administration, the National Maritime Administration and the National Road Administration. SIKA also works together with other agencies in the field of statistics, transport and communications, as well as with institutions of higher education and other research bodies.
SIKA has established relations with a number of work and reference groups with external representatives from other agencies, organizations, etc. Together with the transport agencies, SIKA has set up an inter-agency group for infrastructure planning. SIKA has also set up a scientific advisory group to guarantee a good contact with the research within the Institute's field of work.
There are statistical councils in the field of statistics for matters relating to content, methods and development. Within the EU and UN/ECE, SIKA works together with member states and international organizations.

SIKA carries out a number of commissions for the Government each year. During the next years, SIKA will be working intensively with infrastructure planning for the next planning period 2002–2011. In November 1998, SIKA presented an analysis about the current situation as a first step in this process. In the analysis proposals are made about that should be dealt with in the strategic analysis, which is the next step to be presented at the end of 1999. This work is taking place in collaboration with the transport agencies.
SIKA has also been given a governmental commission to evaluate how the transport policy goals are attained. This work is also taking place in collaboration with other agencies.
From 1995 to 1997, SIKA worked on producing material for transport policy bill that the Government presented in March 1998. Other examples of accomplished projects are analyses of the effects of a deregulation of long-distance bus transport and of Sweden's future needs for international passenger and goods transport.
In the field of statistics, SIKA is working in various ways to develop the content, quality and availability of statistics. The Institute's task is to improve statistics on telecommunications activities together with the various actors in the sector and produce new comprehensive statistics on public transport and community-financed travel, among other things. A new statistical field is about information and communication technology, in which SIKA has been given an extensive commission to be responsible for the development of a new statistics system in collaboration with other relevant agencies.
SIKA is also responsible for the large, on-going national surveys of the Swedish people's transport and communication patterns, RES and KOM.

2. The STAN-model

The STAN-model is a Canadian computer model for Strategic Planning of Multi-Modal-Product Freight Transportation. The modelling tools have been developed within the SAMGODS-project, a co-operation between SIKA and the Institute for Communication Research, KFB. In the STAN-model all transports are supposed to be connected to each other in the same transport system from origin to destination. The goal is then to system optimize the total transport costs that are defined to be the added costs for the transport, from origin to destination. Both costs at the links and the nodes are considered. The results are displayed as flows (tonkm) for the different links and transport modes. The results can be used to support governmental decisions about infrastructure planning etc. The cost functions that are used in the model will reflect the costs equal to the carrier and they are assumed to be the same, as the shippers have to pay for a transport work, from origin to destination. The model uses four different modes: truck, rail, ship and air. The different transports are defined in Sweden and for Swedish import and export activities. Transports of mail, parcels and domestic flights are not included in the model today. Also transports inside communities and under 2,5 miles are excluded.

3. Description of the Air components in the STAN-model

The airfreight is divided in Air freight (A300) or Pax belly:

Air Freight:	Load (ton)	47
	Length (m)	54
	Width (m)	45
	Fuel consumption	138 l/mil
Air-pax belly:	Load (ton)	2
	Length (m)	31
	Width (m)	34
	Fuel consumption	52 l/mil

The air transportation is therefore divided in two transport means and in two transport networks.

The costs in the model are divided in operative costs and quality costs. Below is a description of how Air Freight costs are defined:

3.1 Operative link costs

The costs are separated in distance dependent costs (SEK/tonkm) and time dependent costs (SEK/tontim).
Airfreight and Pax belly are assumed to have same link costs despite a variation in Enroute fees that is a component in the distance dependent link cost. The Enroute fee is defined for all links and is measured in SEK/tonkm.
The Enroute fee is based on distance, ”unit rate” and ”max take off weight (Mtow)”, see below.

$$\text{Enroute fee} = \frac{Unitrate * dist}{100} x \sqrt{\frac{Mtow}{50}}$$

Unit rate is a distance dependent fee. STAN 99 estimate a mean value for all countries. The value is: 438 kr/100 km or 4,38 kr/km. Max take off weight dvs. max airplane weight inclusive goods is supposed to be 153 ton for airfreight and 62 ton for pax belly.

3.2 Operative node costs

The operative cost for airfreight includes handling costs and landing fees. The landing fee differs from airport to airport. The landing fees are calculated on a tariff basis.
In STAN 99 has the total consolidation costs been estimated to 200 SEK/ton for both Air Freighter (A 300) and Pax Belly (B737).
This value is very rough and don’t take landing fee, take off or handling costs in consideration!

3.3 Quality costs

In the STAN 99 model is the quality costs divided in a) time-and delay risks related to the goods and b) costs related to the transport frequency.

3.3.1 Time costs

Costs of having capital tied up in the system. Interest rate for the goods during the transport (links) and at the nodes. Distance and the speed on the links determine the costs. Also the time at the nodes, goods value (SEK/ton), calculated rate and a factor 2 that consider the fact that the customer values the time they get the goods earlier to more than just the capital cost.

3.3.2 Risk of delay

The value of a minimized delay risk is also considered. These values are gathered from a study performed by INREGIA.

3.3.3 Frequency related risks

Describes the frequency at terminals, ports and airports. The costs are estimated from a calculated mean value at the nodes. A factor (0,3) reflects the shippers (customers) flexibility to the amount of departures and the time.

Appendix 6

Inventory Carrying costs

Capital costs apply to the capital vested by a company into Raw Materials, Work in Progress (WIP) and Finished Goods Inventory (FGI). Companies now aim to reduce the amount of inventories in the system through the implementation of Supply Chain Management as it is described in chapter 4. Supply chain management reduces the amount of inventory needed to serve the demand, as inventories as substituted with information. Information then eliminates the need for buffers in both the procurement and distribution flows.

Inventory Service costs refer to the insurance cost for carrying inventory. Even though this cost is small it is always present and therefore must be given consideration. Taxation is the second element of this type of costs. Taxation of inventory may not apply in all cases, as some countries do not tax inventories. Naturally the lower the quantity of inventories the lower these costs will be.

Storage Space costs include the cost of maintaining warehouses, whether they are privately, publicly owned, or rented by the company. Organizations have specifically focused on the reduction of these costs. To this extend they have shifted toward centralization of their warehousing operations. Regional warehouses are removed from the system and premium transportation is employed to compensate the longer distance to the market.

Additional cost savings are generated by the reduction of overhead costs when inventories are centralized. Moreover, through centralization a company generates savings in the form of increased productivity at the central warehouse, as it is possible to automate the facility. This capability may not have been economically viable had the company kept all its warehouses, since automation must be evenly provided to all locations in order to be successfully implemented. Moreover, better scheduling of labor generates even more savings, as idle time is minimized.

Finally, increased control resulting from centralized operations maintains and often increases the level of service a company can offer its customers while at the same time reduces the costs for the process. To elaborate, the level of service increases as a company can afford to provide more frequent deliveries to its customers and therefore generate more value enabling savings for them, in the form of reduced inventory.

Inventory Risk Costs pertain the risk of maintaining inventory. Risks involve the possibility of damages sustained by the stock while in transport due to poor handling. An even greater risk is that of obsolescence which has become even more relevant in our time due to the reduction of the product life cycle. Hence, if the wrong distribution flow is designed the result may be that the inventory will get to the market after the demand surge resulting in lost sales, and discounts. Also, obsolescence may be the result of an over-estimation of demand during the forecast for the product due to the inability of the supplier to have access to direct market information. In addition to over-estimation of demand there may an under-estimation of demand in regional markets. In this case a supplier may have to relocate inventories from one warehouse to another and therefore sustain all the costs related to such activities.