

# Packaging logistics at Schenker

## - a study of possibilities and advantages

Master thesis for the degree of  
Master of Science in Mechanical Engineering at  
Lund Institute of Technology

*Department of Design Sciences*  
*Division of Packaging Logistics*

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## Preface

This thesis is the outcome of my master thesis at the Department of Design Sciences, Division of Packaging Logistics, within Lund Institute of Technology. The thesis is made during the autumn and spring 2002/2003 and encloses 20 academic points.

As the concentration of my studies at Lund Institute of Technology has been logistics and in particular packaging logistics, it has been enjoyable to be able to write my thesis in this area at Schenker/4ROOMS in Gothenburg.

During the time working with my thesis I have learnt a lot in the packaging and logistics field. I have met many nice people, who have shown me great interest and helped me finding valuable information for my thesis.

I would like to thank everybody who has helped me during my thesis work. I would especially like to thank:

- My supervisors **Mats Johnsson** at Packaging Logistics and **P-O Knöös** at Schenker Consulting for their help during my thesis work. Mats has contributed with his packaging logistics expert knowledge and P-O with an insight of the Schenker company.
- **Kenneth Lilja**, **Maria Degerman** and **Andreas Wennberg**, damage-preventing employees at Schenker AB, for their kindness and help while learning about the packaging work at Schenker. They have also been very interested in my work and this has felt inspiring during my time working with my master thesis.
- All employees at 4ROOMS, especially **Eva-Britt Nilsson**, who has made my time at the office pleasant and memorable.
- All people present at my forum for discussion that took place on the 24<sup>th</sup> of February at 4ROOMS. This day was enjoyable for me to arrange and it was rewarding to be able to discuss interesting results from my thesis.
- **Anna Hedberg** for helping me proofreading my thesis.

Finally, I hope my thesis will be a contribution to a larger understanding of packaging and its value by making Schenker business more efficient and giving greater customer good will.

Gothenburg, 12<sup>th</sup> of March 2003  
Karin Samuelsson



## Abstract

- Title:** Packaging logistics at Schenker – a study of possibilities and advantages
- Author:** Karin Samuelsson
- Supervisors:** Mats Johnsson, Division of Packaging Logistics, Lund Institute of Technology and P-O Knöös, Schenker Consulting AB.
- Objective:** To study how Schenker can work with packaging related issues to achieve business advantages.
- Problem:** How is the package an important part of the supply chain?  
Who should make demands on packaging? Is a transportation company a main actor to help improving packaging?  
Is working with packaging logistics valuable for Schenker?  
Which requirements should the transportation company have on their customers' packaging?
- Method:** First a problem definition and objective was formulated. On the basis of this, relevant literature and information was collected. Finally the analysis and conclusions were made in accordance with the thesis objective, frame of reference and collected information.
- Conclusions:** Packaging is a dynamic part of logistics. Good packaging can achieve distribution advantages in the entire supply chain. Transportation companies are the actors in the Supply Chain Management whose core competence is logistics. They have the knowledge of distribution operations and its strains on packaging, which they can teach their customers. With better packaging, Schenker creates a more efficient and cost-effective business. By having well-educated packaging employees and a packaging organization that work towards customers with packaging related issues, Schenker creates good will and a decrease of the money paid out in damage insurance money. Below is a list of the thesis conclusions to achieve valuable packaging work at Schenker:
- Create a dynamic packaging knowledge and understanding in the entire company. Create an inspiring packaging leadership.
  - Increase the resources of the packaging organization.
  - Visit an American transportation company and their packaging department for inspiration.
  - Teach the customers the strains of the distribution and give them easy packaging tips, put it on the Schenker website.
  - Maintain a qualitative and efficient communication in the company.
  - Measure the influence of packaging in the different Schenker operations and visualize by economical figures.
- Key words:** Packaging, logistics, information, communication, leadership.



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# 1 Introduction

*In this first chapter the thesis background, purpose and limitations will be explained. There is also a company description and a description of the outline of the thesis.*

*To make the chapters in this thesis understandable along with the thesis objective, each chapter will begin with a small description of the chapter content.*

## 1.1 Background

Packaging has been part of life since the beginning of time. Stone Age people used leaves, shells and animal stomachs as packaging. The dramatic change in packaging use came during the industrial revolution, which in many ways changed the way of life for many people in the 18<sup>th</sup> and 19<sup>th</sup> centuries. The industrialisation made people leave their farms for the city and industry. The distance between the site of production and the consumer increased. The need for packaging grew to ensure that products as meat, milk and vegetables reached the city retail stores still maintaining the original quality.<sup>1</sup>

Packaging is of course still today an important part of distribution. Today information technology brings possibilities as for example to know the position of the package, provide information about the wrapped product and the destination of the package is easily read at the distribution centre. This technology innovation provides great possibilities for improving the transportation efficiency in the future.

The package is the smallest element of the transport and is often handled several times between the shipper and the recipient. Handling the packages is a critical operation during distribution. The destination has to be correct, package or product damages shouldn't occur and the handling has to be efficient.

Another aspect of the importance of packaging for an efficient distribution is that packages have to fit on their unit load and into the truckload. The wrapped product has also to fit correctly inside its package.

The package is exposed to several packaging requirements. Modern packaging researchers often describe these on the basis of the three aspects::

- logistics aspects,
- marketing aspects and
- environmental aspects.

Transportation companies are those who enclose the biggest knowledge about how products are transported and handled from the shipper to the recipient. Because of the importance of the package during distribution, knowledge within this area is essential.

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<sup>1</sup> Jönson G. & Johnsson M. (2001), *Packaging Technology for the Logistician*, Lund Institute of Technology, Lund University, Department of Design Sciences, Division of Packaging Logistics, pp. 1-4.

## **1.2 Objective**

The objective of this thesis is to study how Schenker can work with packaging related issues to achieve business advantages.

## **1.3 Problem definition**

The problem definition of this thesis is pointed out through the questions below.

- How is the package an important part of the supply chain? How can the package help improving the supply chain?
- Who should make demands on packaging? Is a transportation company a main actor to help improving packaging?
- Is working with packaging logistics valuable for Schenker?
- Which requirements should the transportation company have on their customers' packaging?

## **1.4 Focus and limitations**

The focus of the packaging handling procedures has been on domestic land transportation.

The focus of the thesis has been evaluating the importance of distribution packaging. Affects of different kinds of unit loads or consumer packaging have not been at focus in this thesis.

In the US, several transportation companies enclose packaging departments. As FedEx encloses a well-developed packaging department, FedEx Design & Development department, it has been studied as a role model for Schenker. Contacts with FedEx have mainly been made through e-mail contacts, as this is a convenient way of information exchange.

## **1.5 Schenker and 4ROOMS – A company presentation**



Schenker is an international company that provides integrated logistics services within land transports, air and sea freight. The company was founded by Gottfried Schenker in Vienna 130 years ago. Schenker has about 35 000 employees at 1 100 locations and has a turnover of Euro 6.4 billion per year. Schenker is a Stinnes AG company.<sup>2</sup>

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<sup>2</sup> Schenker website, [www.schenker.com](http://www.schenker.com), 2003-02-25.

# 4ROOMS

4ROOMS is a foundation owned by Schenker AG, which opened in 1999. 4ROOMS is situated in the heart of Gothenburg, in an old town house, in a lovely apartment.

4ROOMS is an innovative demonstration of Schenker's competencies. It is also a centre of business innovation where strategic decision-makers conduct dialogues on supply chains, business processes, networks and business systems. Other target groups are managers and key personnel within Schenker who require training in logistics and Supply Chain Management.<sup>3</sup>

## **1.6 Outline of the thesis**

Below, the content of the different chapters is described to help readers find their way through the thesis.

### **Chapter 1 – Introduction**

This first chapter introduces the aim of the thesis. It also explains the focus and limitations of the thesis as well as the outline of the paper.

### **Chapter 2 – Methodology**

This chapter outlines the approach to the thesis. Academically important methodology is described, and the approach to these concepts is illustrated.

### **Chapter 3 – Theoretical frame of reference**

In chapter 3 important frames of reference are presented. Packaging is explained, facts from well-known packaging and logistics researchers are illustrated and short definitions of packaging, logistics and packaging logistics are demonstrated.

### **Chapter 4 – Collected facts and information**

This chapter presents all facts and information collected by the thesis author. In this chapter the readers learn more about for example packaging and its requirements, goods handling at Schenker and the packaging work at FedEx Design & Development department.

### **Chapter 5 – Analysis and discussion**

In this chapter the thesis author discusses the collected facts and information along with the frame of reference.

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<sup>3</sup> 4ROOMS business plan, a paper from Schenker and 4ROOMS.

**Chapter 6 – Conclusions**

The conclusions involve conclusions of the thesis. The chapter also outlines further research that can be done on the thesis subject.

**Chapter 7 – References**

This last chapter presents the thesis references.

## 2 Methodology

*This chapter describes the approach to this thesis. Academically important methodology is described, and the approach to these concepts is illustrated.*

### 2.1 Systematic approach and a qualitative research

The systematic approach is a methodology that grew strong in the late 1960's. This system thinking is a methodology that studies a system in a complex environment and tries to understand the different components in the system and the interaction between them.<sup>4</sup>

A quantitative research is one of several approaches to study a problem. In a quantitative research the researcher seeks to find and understand an overall picture of a research problem through for example a survey sent to a statistically correct selection group. The analysis of the survey can further show for example the percentage of the population that have a certain opinion.

In a qualitative research is another approach to study a problem and in this the researcher is for example interested in trying to understand how people react or act. It could also separate different behavioral patterns among a group of people. The qualitative research can be made by for example qualitative interviews or observations. The researcher can in a qualitative research receive a deep understanding of the problem.<sup>5 6</sup>

To decide which approach would be the best in this research I used a metaphor:<sup>7</sup>

*Would I like to know how many different kinds of flowers I could find in the field I should count them (quantitative). Would I like to know which species there are and how they behave, I shouldn't count them, instead I should seek variation among them and try to understand each of their situations (qualitative).*

This thesis is based on a systematic approach with a qualitative research. The research is set into a complex system in which different actors are connected and the interaction between them is studied. The collection of data, by literature study, interviews and observations, has been made using a qualitative approach. The aim of this thesis has been to get an overall picture of the thesis problem. This has been carried out through interviews with a specific group of people and through observations. In the analysis the thesis problem and objective are analyzed along with the collected facts and information and the frame of reference. The analysis involves a complex system of several connected actors.

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<sup>4</sup> Wallén G. (1993) *Vetenskapsteori och forskningsmetodik*, Studentlitteratur, Lund.

<sup>5</sup> Trost J. (2001) *Enkätboken*, Studentlitteratur, Lund.

<sup>6</sup> Patel R. & Davidson B. (1994) *Forskningsmetodikens grunder*, Studentlitteratur, Lund.

<sup>7</sup> Trost J. (2001) *Enkätboken*, Studentlitteratur, Lund.

## 2.2 Quality of data

During a research there are some important concepts to consider, three of these are:

*Validity* – measure solely what you intend to measure.<sup>8</sup>

*Reliability* – the research should give a reliable and stable outcome.<sup>9</sup>

*Objectivity* – what extent the surroundings or individual persons affect the outcome of the research.<sup>10</sup>

Eriksson et al (2001) writes that in a research the researcher will always affect the outcome of the research with his own values. The outcome of a research will always have *limited objectivity*. Limited objectivity is described as a strive for the researcher to have some kind of relevance in the choice of what he will study, truthful conclusions, neutrality when doing the analysis and balance between different interests.<sup>11</sup>

In this thesis validity, reliability and objectivity have been considered in every step of the research. The literature has been found only at reliable sources, such as the national library, the library at 4ROOMS or has been recommended by the people at 4ROOMS or at the Division of Packaging Logistics.

During observations and interviews, objectivity has been of major importance. However, as written above, in some extent the researcher will always influence the outcome of the research by his values.

In the analysis and the conclusion of the thesis, the validity of what has been analysed has been of significance. The thesis objective and problem definition have always been the basis of the outcome of the analysis.

## 2.3 Primary and secondary data

Secondary data is information collected by another person, data that you find in for example books and articles. Primary data is information collected by the author, and collected particularly for the thesis.<sup>12</sup>

Secondary data in this thesis is data found in different books and articles. This information is found in chapter 3 “Frame of reference”, which presents important frame of references for the thesis outcome. Primary data is data collected through for example interviews and observations. This information is found in chapter 4 “Collected facts and information”.

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<sup>8</sup> Patel R. & Davidson B. (1994) *Forskningsmetodikens grunder*, Studentlitteratur, Lund.

<sup>9</sup> Eriksson L. T. & Wiedersheim-Paul F. (2001) *Att utreda, forska och rapportera*, Liber Ekonomi, Malmö.

<sup>10</sup> Trost, J. (2001) *Enkätboken*, Studentlitteratur, Lund.

<sup>11</sup> Eriksson, L. T. & Wiedersheim-Paul, F. (2001) *Att utreda, forska och rapportera*, Liber Ekonomi, Malmö.

<sup>12</sup> Eriksson, L. T. & Wiedersheim-Paul, F. (2001) *Att utreda, forska och rapportera*, Liber Ekonomi, Malmö.

### **2.4 Collection of data**

Collection of data has been made through literature studies, observations and interviews.

#### **2.4.1 Literature studies**

Within the thesis different kinds of information sources are used. The secondary data has been found mainly at the national library and at the library at 4ROOMS. Literature also originates from the Division of Packaging Logistics in Lund. These information sources give a great variety and a wide range of different literature needed for the outcome of the thesis.

Words, which have been used while searching for literature has been *packaging (förpackning and emballage)*, *logistics*, *supply chain*, *Supply Chain Management* and *material administration*.

Because knowledge is developed so fast in the logistics field, sources of information have also been magazines, journals and reviews from different organizations, universities and companies. These have given the thesis modern and newly produced facts and information. This data has mainly been found through electronic databases supported by the national libraries.

#### **2.4.2 Case studies and interviews**

Observations and interviews give an interesting analysis and a deeper understanding of the thesis problem. In this thesis several collections of primary data have been made. These are explained below.

##### **Terminal case study**

The observations have been made at the distribution centre in Gothenburg, the Bäckebol terminal. The observation concerned Schenker Parcel and Cargo, which are two of Schenker land transportation business areas.

Before arriving at the terminal some questions had been put together. These questions were used as indirect questions, and put to the terminal employees. To learn how the packages moved in the terminal the flow of the packages at the terminal was studied.

##### **Damage-preventing work case study**

The case study of the Schenker damage-preventing work has been made in cooperation with the damage-preventing employees. Meetings, interviews and joint terminal observations have been held together with the employees. Schenker documents concerning packaging have also been studied.

FedEx case study

The FedEx case study has mainly been accomplished through e-mail contact with FedEx Packaging Design and Development department in the US. FedEx packaging documents have also been studied as well as the FedEx USA website.

PackForsk case study

The PackForsk study was carried out because of their great packaging knowledge and was carried out through interviews with a PackForsk employee.

**2.5 Approach to this thesis**

To make a comprehensible picture of the proceeding of this thesis, figure 1 illustrates the thesis proceeding.

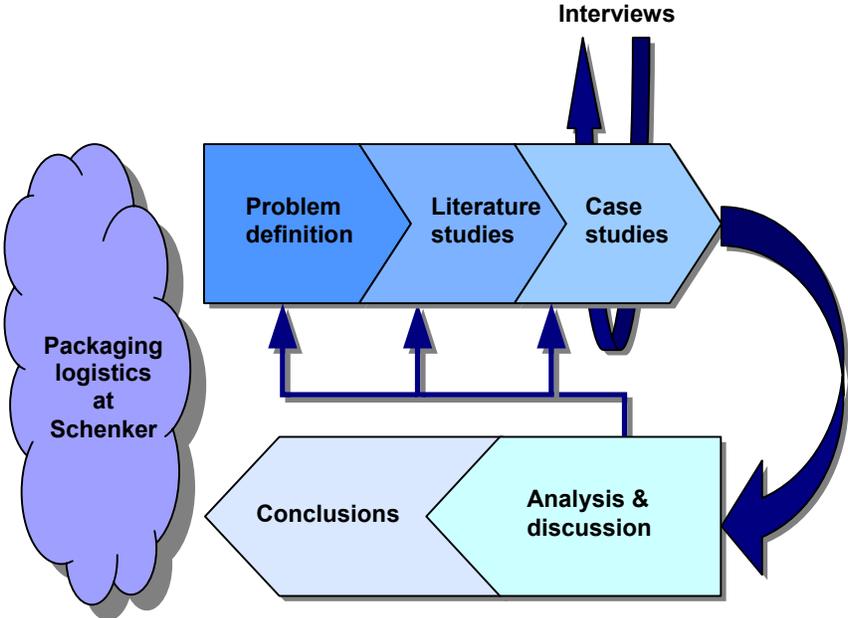


Figure 1. The thesis approach.<sup>13</sup>

The thesis began by formulating the thesis problem. The final problem definition was formulated when a wider understanding of the problem was achieved mainly through the literature study. The problem definition was formulated in cooperation between the author, 4ROOMS and the Division of Packaging Logistics at Lund Institute of Technology. Figure 2 on the next page illustrates this process.

<sup>13</sup> Figure illustrated by the author.

## 2. Methodology

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Figure 2. The figure illustrates how the problem area gradually delimits through the literature study, and finally specifies, which makes the final problem definition.<sup>14</sup>

On the basis of the problem definition a collection of secondary and primary data was made through literature studies, case studies and interviews. Based on the knowledge from the literature and the case studies the analysis was made. The problem definition was constantly in mind when formulating the analysis and the discussion.

In the chapter 7 “Conclusions”, the outcome of the thesis is presented. Here the reader can clarify the most important information from the thesis.

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<sup>14</sup> Figure originates from figure 8 in the book *Forskningsmetodikens grunder* by Patel R & Davidson B., 1994.



### 3 Frame of reference

*In this chapter the frame of reference will be described. As a start a definition of logistics and Supply Chain Management will be illustrated. Later in the chapter packaging logistics is explained and followed by some important issues such as integrating tools and cost and profitability. This chapter works as a basis to the analysis presented at the end of this thesis.*

#### 3.1 Logistics and Supply Chain Management – a definition <sup>15 16</sup>

The most common definition of logistics was made by the organization, The Council of Logistics Management (CLM), in 1986. This logistics perspective is found in most logistics textbooks. CLM defines logistics as:

*The process of planning, implementing and controlling the efficient, cost-effective, flow and storage of raw materials, in process inventory, finished goods and related information flow from point-of-origin to point-of-consumption for the purpose of conforming to customer requirements.*

The term Supply Chain Management (SCM) is relatively new in literature. Is SCM different from the term logistics? In literature various forms of these terms are found. Some authors use these words equally, others make a distinction between the two of them. In this thesis the use of the definition of SCM is developed by The Global Supply Chain Forum in 1998, they define SCM as:

*Supply Chain Management is the integration of key business processes from end user through original suppliers that provides products, services, and information that add value for customers and other stakeholders.*

In 1998 CLM announced a modified definition of logistics than the one from 1986. With this definition CLM declares that logistics management is only a part of SCM:

*Logistics is that part of the supply chain process that plans, implements, and controls the efficient, effective flow and storage of goods, services, and related information from point-of-origin to point-of-consumption in order to meet customers' requirements.*

Supply Chain Management can be described as a model (figure 3), where eight key processes make up the core of the Supply Chain Management:

- **Customer Relationship Management** involves identifying key customer targets markets and then developing and implementing programs with key customers.
- **Customer Service Management** provides the company's face to the customer using on-line information systems with current information about the order,

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<sup>15</sup> Cooper M. C., Lambert D. M. & Pagh J. D. (1997) "Supply Chain Management: More Than a New Name for Logistics", *The International Journal of Logistics Management*, vol. 8, no. 1, pp. 1-11.

<sup>16</sup> Croxton K. L, Garcia-Dastugue S. J., Lambert D. M. & Rogers D. S. (2001) "Supply Chain Management Processes", *The International Journal of Logistics Management*, vol. 12, no. 2, pp. 13-33.

- production and distribution. This process also provides product information to the customer.
- **Demand Management** recognizes the customers' demands and synchronizes this with the production, procurement and distribution. This process balances the customers' requirements with the company's supply capabilities.
  - **Order Fulfillment** provides for timely and accurate delivery of customer orders with the objective of exceeding customer need dates.
  - **Manufacturing Flow Management** deals with making the products and establishing the manufacturing flexibility needed to serve the target markets.
  - **Supplier Relationship Management** is the process that defines how the company interacts with its suppliers.
  - **Product Development and Commercialization** is critical to the continuing success of the company. Key customers and suppliers are integrated into the development process to reduce time to market.
  - **Returns Management** is important for establishing a competitive SCM environment. The returns process enables the company to identify productivity improvement opportunities and breakthrough.

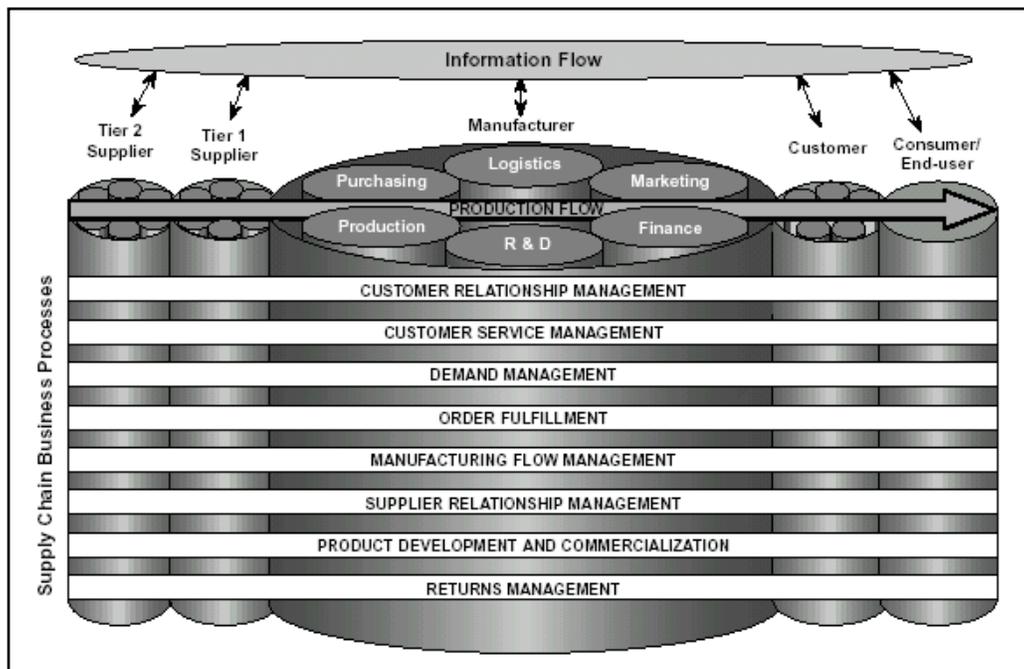


Figure 3. Supply Chain Management: integrating and managing business processes across the supply chain.<sup>17</sup>

<sup>17</sup> Croxton K. L, García-Dastugue S. J., Lambert D. M. & Rogers D. S. (2001) "Supply Chain Management Processes", *The International Journal of Logistics Management*, vol. 12, no. 2, pp. 14.

### 3.2 Packaging

Packaging is an old discovery and is needed in society to protect products during transportation, handling and storage. Over the years packaging has changed in character and the demand for it in various forms has increased. Jönson (1993) points out the following reasons for this development:<sup>18</sup>

- The point of production and the point of consumption have become separate.
- People have moved into cities while production is concentrated in a few places.
- Family members work to a great extent outside the home.
- Retail sale outlets have developed the self-service concept.
- Demographics have changed.

Today, packaging is a natural ingredient of the society. Packaging is used everywhere in society and is necessary to transport, handle and storage products. While the distribution environment changes rapidly the package also has to follow up to handle these new requirements. Examples of new distribution systems are Just In Time and postponement which bring new demands of packaging and its surroundings.

#### 3.2.1 What is a package? – a definition

In literature you can find many packaging definitions. Many logistics books contain a small chapter describing packaging. Below I will show definitions formulated by some packaging and logistics researchers and institutions. Figure 4 summarizes the definitions illustrated below.

*Packaging is the art, science and technology of preparing goods for market and sale.*

*...all products made of any materials of any nature to be used for the containment, protection, handling, delivery and presentation of goods, from raw materials to processed goods, from the producer to the user or the consumer. Disposables used for the same purpose are to be considered as packaging, too*

*Packaging is a means of ensuring safe delivery of a product to the ultimate user, in sound condition, at minimum overall cost.*

Figure 4. Packaging definitions.

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<sup>18</sup> Jönson G. (1993) *Corrugated Board Packaging*, Pira International, UK, pp. 1.

An ancient packaging definition is found in the British Standard, it says that *packaging is the art, science and technology of preparing goods for market and sale*. This definition points out that packaging is an interdisciplinary area in the supply chain.<sup>19</sup>

According to the EC document “Proposal for a council directive on packaging and packaging waste”, packaging is defined as:<sup>20</sup>

*Packaging is all products made of any materials of any nature to be used for the containment, protection, handling, delivery and presentation of goods, from raw materials to processed goods, from the producer to the user or the consumer. Disposables used for the same purpose are to be considered as packaging, too.*

Paine, a well-known researcher in the packaging field<sup>21</sup>, defines a package as:<sup>22</sup>

*Packaging is a means of ensuring safe delivery of a product to the ultimate user, in sound condition, at minimum overall cost.*

In contrary to the packaging definition made by EC, Paine also points out that packaging has an economic aspect. Packaging can by being an integrated part of the distribution network minimize cost, i.e. packaging provides an economical way of protecting products during distribution<sup>23</sup>. The EU document points out that disposables, used for the same reasons as written above, are considered as packaging too. Environmental aspects are central for the EU directives concerning packaging.

### 3.2.2 Packaging hierarchy

Packaging can be classified into three types, reflecting the levels of packaging layers:<sup>24</sup>

*Primary*, also called *consumer packaging* – a package that is in direct contact with the product.

*Secondary*, also called *transport packaging* – a package that encloses several consumer packages.

*Tertiary packaging* – a package that encloses several transport and consumer packages.

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<sup>19</sup> Johnsson M. (1998) *Packaging Logistics – a value added approach*, Department of Engineering Logistics, Lund Institute of Technology, Lund University, pp. 36.

<sup>20</sup> Prendergast G. P. (1995) “The EC directive on packaging and packaging waste: current status and logistical implications”, *Logistics Information Management*, vol. 8, no. 3, pp. 10-17.

<sup>21</sup> Johnsson M. (1998) *Packaging Logistics – a value added approach*, Department of Engineering Logistics, Lund Institute of Technology, Lund University, pp. 36.

<sup>22</sup> Paine F. A. (1981) *Fundamentals of Packaging*, The Institute of Packaging, Stanmore, UK, pp. 3.

<sup>23</sup> Jönson G. (1993) *Corrugated board packaging*, Pira International, UK, pp. 2.

<sup>24</sup> Johansson A. & Nordin J. & Ählman J. (1999) *Förpackningens affärsstrategiska betydelse*, PackForsk rapport no. 188, Kista, pp. 11.

#### Consumer packaging

Consumer packages hold the basic product. The basic purpose of the consumer package is to make the product available, protect and preserve it. This package also gives the end consumer information of the product. A consumer package should be relatively cheap and consist of a limited amount of material. It shall also sell the product, be easy to handle, to open and sometimes possible to seal.<sup>25</sup>

#### Transport packaging

The transport package is designed to enclose several consumer packages. The end consumer could bring the transport package home, but the package could also just help placing the consumer packages on the shelves in a store or be the package that protects the consumer packages during transport.<sup>26</sup> The aim of transport packaging is to provide the correct design for packaging such as its contents will arrive safely at the destination.<sup>27</sup> The transport package must be able to be removed without losing the identity of the product. Opening of the transport package should be able without damaging the consumer package.<sup>28</sup>

Corrugated board makes 90-95 percent of all one-way transport packages. Other examples of transport packages are barrels, wooden and plastic boxes and sacks.<sup>29</sup>

#### Tertiary packaging<sup>30</sup>

Tertiary packages come to use when a number of consumer or transport packages are assembled on, for example, a wooden pallet. Tertiary packaging helps attach the transport or consumer packages on a unit load, which makes the handling and transportation of the goods more efficient and convenient for the people handling the packages.

Tertiary packaging isn't always necessary. If the transport packaging is strong enough to manage transportation, tertiary packaging won't be used. Examples of tertiary packaging are shrink film, metal and plastic strapping.

#### Unit load<sup>31</sup>

Unit load is the name for the helping equipments which are used to facilitate handling and stacking of several packages. The most common unit load is the wooden pallet and in

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<sup>25</sup> Jönson G. & Johnsson J. (2001) *Packaging Technology for the Logistician*, Lund Institute of Technology, Lund University, Dept of Design Sciences, Div of Packaging Logistics, pp. 19.

<sup>26</sup> Johansson A. & Nordin J. & Ählman J. (1999) *Förpackningens affärsstrategiska betydelse*, PackForsk rapport no. 188, Kista, pp. 11.

<sup>27</sup> Bakker M. (1997) *The Wiley Encyclopedia of Packaging Technology*, John Wiley & Sons, New York, pp. 307.

<sup>28</sup> Johansson A. & Nordin J. & Ählman J. (1999) *Förpackningens affärsstrategiska betydelse*, PackForsk rapport no. 188, Kista, pp. 11.

<sup>29</sup> Dominic C. et al. (2000) *Förpackningslogistik – 2:a utgåvan*, Packforsk, Kista, pp. 26.

<sup>30</sup> Jönson G. & Johnsson J. (2001) *Packaging Technology for the Logistician*, Lund Institute of Technology, Lund University, Dept of Design Sciences, Div of Packaging Logistics, pp. 19.

<sup>31</sup> Dominic C. et al. (2000) *Förpackningslogistik – 2:a utgåvan*, Packforsk, Kista, pp. 26.

particular the standardized EUR-pallet, which is a returnable pallet and used several times between the actors of the supply chain. Other types of unit loads are containers and slip-sheets.

Unit loads are vital for an efficient distribution. They facilitate handling the packages with forklift trucks, which makes the handling of the goods efficient and ergonomically.

In figure 5 Schenker unit loads are presented. The steel-cage is used for transporting single packages with Schenker Parcel. The wooden pallet is a standardized EUR-pallet that the goods owner rents from Schenker.

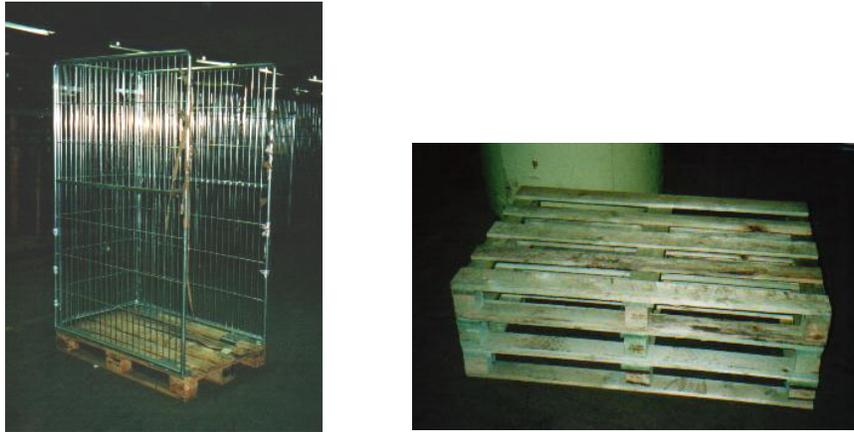


Figure 5. At the left a steel-cage and at the right three Schenker pallets.<sup>32</sup>

### 3.2.3 The packaging system

Depending on where in the distribution chain a package is handled different packages in the hierarchy are used. Each level in the packaging hierarchy is important, but it is also central that the levels work well together to make an efficient distribution. The packaging system can contain more or less levels than shown in the lower figure. Sometimes it is difficult to place a package in one of the levels, a half pallet used in the store can for example be both a secondary and a tertiary package.<sup>33</sup> Figure 6 presents an example of a packaging system.

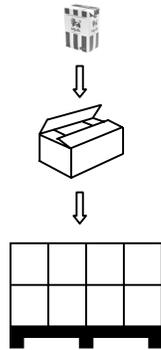


Figure 6. Consumer and transport packaging are put together on a wooden pallet. This makes a packaging system.<sup>34</sup>

<sup>32</sup> Pictures taken at the Bäckebo terminal in February 2003.

<sup>33</sup> Dominic C. et al. (2000) *Förpackningslogistik – 2:a utgåvan*, Packforsk, Kista, pp. 27.

<sup>34</sup> The picture is sketched by the thesis author.

#### 3.3 Packaging aspects

Packaging has to be efficient during production, use, distribution and recovery. The package makes up the interface between the product and the distribution environment, and this makes demands on the package.<sup>35</sup> The interface is illustrated in figure 7.

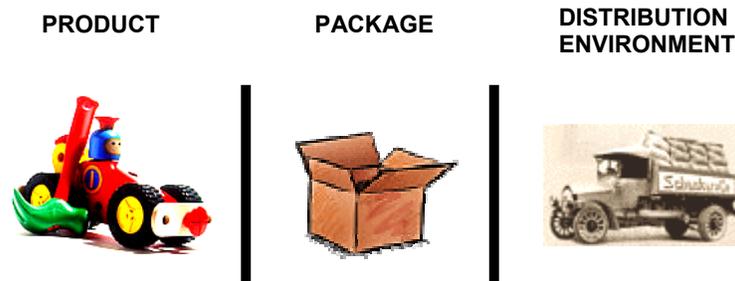


Figure 7. Packaging provides the interface between the product and the distribution environment.<sup>36</sup>

In the packaging and logistics literature, packaging is explained through two different aspects<sup>37</sup>. In this thesis these are named the *traditional* and the *modern packaging approach*. Below, these aspects will be described and the different packaging requirements within these aspects illustrated.

#### 3.2.4 Traditional packaging approach

In traditional packaging approach, the main purpose for packaging is protecting the product. The discussion among traditional packaging researchers mostly concerns the packaging material properties.

Logistics researchers regularly consider the package as a part of logistics, but researchers with a management approach and a value added perspective seldom discuss the importance of packaging. The package is only analyzed with a technical approach - a system approach is seldom or never used.<sup>38</sup>

The packaging purposes described in this literature are often the same. In *Fundamentals of Packaging*, Paine summarizes the packaging purposes as:<sup>39</sup>

- Protection and preservation.
- Containment.
- Machine Performance.

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<sup>35</sup> Jönson G. & Johnsson J. (2001) *Packaging Technology for the Logician*, Lund Institute of Technology, Lund University, Dept of Design Sciences, Div of Packaging Logistics, pp. 24.

<sup>36</sup> Ibid.

<sup>37</sup> Johnsson M. (1998) *Packaging Logistics – a value added approach*, Department of Engineering Logistics, Lund Institute of Technology, Lund University, pp. 145.

<sup>38</sup> Ibid, pp. 65.

<sup>39</sup> Paine F. A. (1981) *Fundamentals of Packaging*, The Institute of Packaging, Stanmore, UK, pp. 1-2.

- Communication.
- Convenience.

In *Emballage – Handbok i allmän förpackningsekonomi och förpackningsteknik* the authors are doing about the same summary of the packaging purposes. Here the purposes are divided into two groups, *technical* and *communicative* functions, where

technical functions involve

- delimit and contain
- facilitate handling and use
- protect

and communicative functions involve

- identify
- inform
- stimulate.<sup>40</sup>

The authors of this book further note that the packaging purpose could be expressed in one sentence:<sup>41</sup>

*The package shall protect the product that it sells, and sell the product that it protects.*

The different purposes presented above will be expounded below to illustrate each of their meanings. The splitting up will follow the division of *Emballage – Handbok i allmän förpackningsekonomi och förpackningsteknik*.

#### Delimit and unitize (Paine's containment)

Delimit and unitize belongs to the ancient packaging purposes from the first discovering of packaging. The package has to hold all that it encloses and keep it together in the distribution environment.

#### Facilitate handling and use (Paine's convenience)

The package has to provide easy handling and stowage. Some products are impossible to handle and transport without a package, for example fluids. The convenience of packaging affects both consumer and transport packaging. To the consumer the package has to be easy to open and possible to get rid of. The transport packaging has to fit the mode of transport, meet the needs of warehouse storage and order picking in the best possible way. To make handling lighter and easier for the people handling the packages in the distribution chain, the product shall also make it possible to use handling equipment (forklift, sorting conveyor etc.).

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<sup>40</sup> Hammenberg Y. & Widoff E. (1976) *Emballage – Handbok i allmän förpackningsekonomi och förpackningsteknik*, Nord-Emballage, Förlags AB T Fahlskog, Vällingby, pp. 41-42.

<sup>41</sup> Ibid, pp. 42.

#### Protect (Paine's protection and preservation)

The package has to protect its content from the outside environment between the manufacturer and the end consumer. The package must also protect the outside environment from possible risks when handling the product. Products have different characteristics and can be damaged in numerous ways. The package isn't of interest only by itself, the package must be seen as interplay between the product and the surroundings. Figure 8 demonstrates the interplay between the product, package and the surroundings applicable on protection.

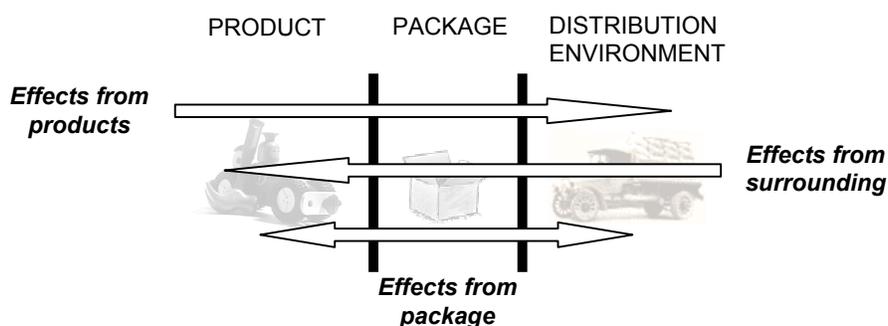


Figure 8. The relationship between product, package and the distribution environment.<sup>42</sup>

As demonstrated in figure 8 the package has to protect the product from both external and internal damages. These damages can be divided into three groups; *mechanical*, *biological* and *climatic*.

**Mechanical damages** are those caused by compression, shock (stresses of limited duration) or vibrations (stresses of periodical duration). Mechanical damages can be grouped into *vertical* and *horizontal impacts*, *vibration* and *compression*.

Vertical and horizontal impacts are those that make the greatest damages. Vertical impacts are those damages that occur while dropping during loading and unloading operations. Horizontal impacts are those damages that occur when packages aren't stabilized during transport. The packages swing against each other or against the walls of the transport vehicle. In table 1 some common vertical and horizontal impacts are listed.<sup>43</sup>

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<sup>42</sup> Hammenberg Y. & Widoff E. (1976) *Emballage – Handbok i allmän förpackningsekonomi och förpackningsteknik*, Nord-Emballage, Förlags AB T Fahlskog, Vällingby, pp. 44.

<sup>43</sup> Paine F. A. (1981) *Fundamentals of Packaging*, The Institute of Packaging, Stanmore, UK, pp. 23-24.

<b>Vertical impact</b>	<b>Horizontal impact</b>
Package dropped to floor during loading and unloading operations.	Swinging against each other or against wall.
Package rolled or tipped over.	Transport vehicle stopping and starting.
Fall from conveyor or transport vehicle.	Arrest when cylindrical package stops rolling.
Result of throwing.	Result of throwing.

Table 1. Examples of vertical and horizontal impacts.<sup>44</sup>

Vibration occurs in almost every transport. When the package is exposed to vibration a complicated swing affects the product. If the product is made of many parts, these can start swinging and create an eigenfrequency. These forces can be large and create fracture to the product even at of a relatively small vibration.<sup>45</sup>

In warehouses, in the factory, during transport and in the store the packages are stacked upon each other, usually to minimize the floor area and/or maximize cube utilization. A package is exposed to stacking several times during its lifetime. The package has to be well designed and strong to cope with these strains otherwise the package will break and the product be damaged.<sup>46</sup> In table 2 some common vibration and compression hazards are listed.

<b>Vibration hazards</b>	<b>Compression hazards</b>
From handling equipment.	Static stacks in factory, warehouse and store.
Engine and transmission vibration from the transport vehicle.	Transient loads during transports in vehicle.
	Compression due to method of handling.
	Compression due to restraint.

Table 2. Hazards i.e. vibration and compression.<sup>47</sup>

**Biological damages** are those that occur through microorganisms, insects or bigger animals, mostly rodents. The package shall protect the product against these biological damages.<sup>48</sup> In table 3 some biological hazards and their origin are illustrated.

<sup>44</sup> Paine F. A. (1981) *Fundamentals of Packaging*, The Institute of Packaging, Stanmore, UK, pp. 14.

<sup>45</sup> Hammenberg Y. & Widoff E. (1976) *Emballage – Handbok i allmän förpackningsekonomi och förpackningsteknik*, Nord-Emballage, Förlags AB T Fahlskog, Vällingby, pp. 46.

<sup>46</sup> Ibid, pp. 45-46.

<sup>47</sup> Paine F. A. (1981) *Fundamentals of Packaging*, The Institute of Packaging, Stanmore, UK, pp. 14.

<sup>48</sup> Hammenberg Y. & Widoff E. (1976) *Emballage – Handbok i allmän förpackningsekonomi och förpackningsteknik*, Nord-Emballage, Förlags AB T Fahlskog, Vällingby, pp. 46-48.

### 3. Frame of reference

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<b>Biological hazards</b>	
Micro organism	Are ubiquitous and adapt themselves to various conditions. Require moisture and will not grow at relative humidity of less than 70%.
Insects	In general high temperatures and a relative humidity of 70% is very favourable for most insects. The infestation usually starts from eggs being laid on packaging materials.
Rodents	May be present in warehouses, transit sheds, storage etc. Will attack most material to keep in condition, and softer material for making nests.

Table 3. Hazards i.e. biological strains.<sup>49</sup>

**Climatic damages** occur through moisture changes, bio-deterioration or corrosion. The package must be a barrier to provide protection from the surroundings and a barrier to prevent substances from the product enter the surroundings. In table 4 some climatic hazards and their origin are illustrated.

<b>Climatic hazards</b>	
Liquid water	Rain during transit, loading or unloading, warehousing and storage. Condensation.
Humidity	Humidity of the atmosphere, both natural and artificial.
Temperature	Unheated storage in cold climate. Exposure to sunshine.

Table 4. Hazards i.e. climatic strains.<sup>50</sup>

#### Identify, inform and stimulate (Paine's communication)

The package has to identify the contents as well as sell the product. The package is an important part of a company's competitive environment and an integrated part of the marketing process. The advertisement that the consumer package supplies is of great importance and has to catch the customers' interest.<sup>51</sup>

Packages, which are not for retail purposes must also communicate. Transport packaging must inform the distributor about the destination, provide handling and stowage instructions and inform the recipient of the way the package should be handled and opened.<sup>52</sup>

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<sup>49</sup> Paine F. A. (1981) *Fundamentals of Packaging*, The Institute of Packaging, Stanmore, UK, pp. 17.

<sup>50</sup> Ibid, pp. 15.

<sup>51</sup> Hammenberg Y. & Widoff E. (1976) *Emballage – Handbok i allmän förpackningsekonomi och förpackningsteknik*, Nord-Emballage, Förlags AB T Fahlskog, Vällingby, pp. 50-53.

<sup>52</sup> Paine F. A. (1981) *Fundamentals of Packaging*, The Institute of Packaging, Stanmore, UK, pp. 2.

### 3.2.5 Modern packaging approach – Packaging Logistics

In the modern packaging approach the package is seen as an integrated part of the entire organization. The trend goes to view packaging in terms of the value that it provides in logistics, rather than in terms of materials.

*Logistical packaging affects the cost of every logistical activity, and has a significant impact on the productivity of logistical systems.*

The packaging is a part of a total logistics system, and the goal is to minimize the cost of packaging material as well as to reduce the costs of damage, waste and the cost of performing logistics operations. Packaging has a responsibility to minimize the cost of delivery as well as to maximize sales. This is a new approach in the packaging and logistics literature.<sup>53</sup>

To evaluate this new packaging approach, the packaging purposes are classified into three overall groups. Jönson & Johnsson (2001) classifies packaging into

- logistical aspects,
- marketing aspects
- and environmental aspects.<sup>54</sup>

In figure 9 these aspects are developed in smaller divisions.

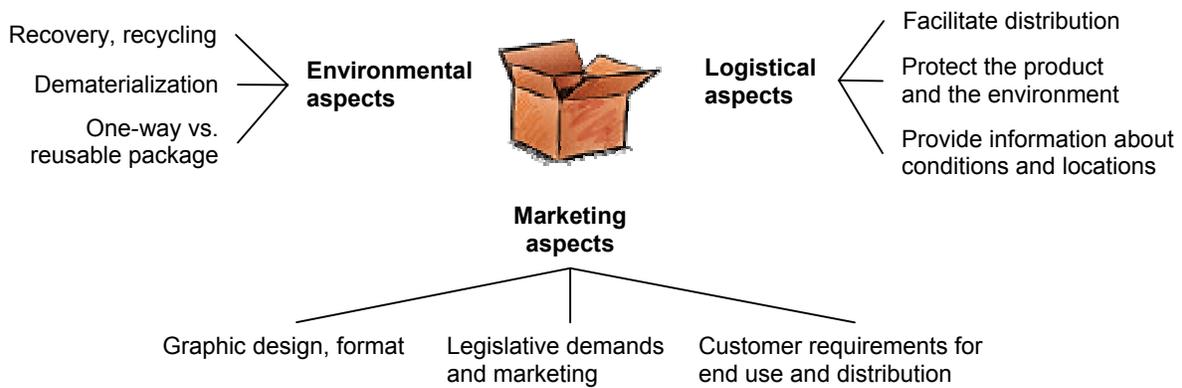


Figure 9. Requirements on packaging on the basis of three aspects.<sup>55</sup>

Logistical and marketing aspects were also found in the traditional packaging approach. However, environmental aspects are a new packaging requirement. The environmental issues can be found in all modern packaging literature, however it isn't always a specific

<sup>53</sup> Twede D. & Parson B. (1997), *Distribution packaging for logistical systems*, Pira International, Surrey, UK, pp. 1ff.

<sup>54</sup> Jönson G. & Johnsson M. (2001) *Packaging Technology for the Logistician*, Lund Institute of Technology, Lund University, Dept of Design Sciences, Div of Packaging Logistics, pp. 25.

<sup>55</sup> The figure originates from figure 3.2 in the book *Packaging Technology for the Logistician* by Jönson G. & Johnsson M. (2001).



Protection is also important from an environmental perspective. The amount packaging material used is regulated through legislation concerning over-packaging. The package must be selected to minimize material use.<sup>61</sup>

The package must also protect people in the logistical system from injury and accidents. The level of ergonomic demands depends on how the package is handled. Better ergonomics and safety can be solved through better packaging.<sup>62</sup>

Hazards that the package has to protect its contents from are the same as described under traditional packaging approach.

### Provide utility

The package shall facilitate distribution in the logistical system. The packaging purpose to provide utility relates to how packaging affects the productivity, efficiency and cost of logistical operations.<sup>63</sup> The package affects logistical operation in the entire logistical system, from truck loading and warehouse picking productivity, to transportation and storage utilization, to customer productivity and packaging waste reduction.

Logistical productivity is the ratio of the output (such as loading a truck) of a logistical activity to the input (such as labour and forklift time required). Smart packaging solutions can easily reduce the output of logistical activities.

Unitization of packages can improve the productivity of most material handling operations because then one person can handle lots of packages rapidly. Warehouse-order picking productivity can also be improved by making packages easy to find and to recognize.

Reducing the size of the package is also an effective way to increase logistical productivity. Smaller packages make room for more packages per transport. This means improving the transportation efficiency.

The compatibility between the packages with pallets and the other material handling equipment is another important logistical parameter that can be improved by adapting the package. The packages have to fit into the trucks and transport conveyors to get the most efficient handling.

Environmental factors will improve with an efficient packaging utility. Full truckloads decrease the amount of transports and a reduction of packaging size will decrease the amount of packaging material.

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<sup>61</sup> Johnsson M. (1997) *Packaging Logistics – a value added approach*, Department of Engineering Logistics, Lund University, pp. 143-144.

<sup>62</sup> Bakker M. (1997) *The Wiley Encyclopedia of Packaging Technology*, John Wiley & Sons, New York, pp. 575.

<sup>63</sup> Twede D. & Parson B. (1997) *Distribution packaging for logistical systems*, Pira International, Surrey, UK, pp. 15.

Personal ergonomic when handling the package increases with adjustments between the package and the material handling systems. Manual handling is a cost demanding system and doesn't provide value to the logistics system.<sup>64</sup>

#### Provide communication

That packages have to provide information was important even in the traditional packaging approach. The primary package has to promote the product, and the distribution package has to provide information about destination and how to handle it.

Nowadays communication has become even more important for logistical packaging, as logistical information systems become more comprehensive. In advanced bar codes, important information can be programmed. Electronic data interchange and control is today the key to an efficient and integrated management of material flow, inventory, transportation and warehousing.<sup>65</sup>

With a good information flow between the package and the distribution environment an efficient material handling is created. Reading the package and changing its status takes place in many logistical activities such as inventory control, shipping and receiving, order picking, sorting and tracking.<sup>66</sup>

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<sup>64</sup> Bakker M. (1997) *The Wiley Encyclopedia of Packaging Technology*, John Wiley & Sons, New York, pp. 575.

<sup>65</sup> Twede D. & Parson B. (1997), *Distribution packaging for logistical systems*, Pira International, Surrey, UK, pp. 18-20.

<sup>66</sup> Bakker M. (1997) *The Wiley Encyclopedia of Packaging Technology*, John Wiley & Sons, New York, pp. 576.

### 3.3 Packaging interested parties

#### 3.3.1 Presentation of the packaging interested parties

Interested parties are those that have common interests and make demands on the package. Throughout the Supply Chain Management there many interested parties.

In the packaging literature certain authors discuss what parties have an interest in packaging. Lorentzon & Olsmats (1992)<sup>67</sup> and Johnsson (1997)<sup>68</sup> have listed some interested parties, list 5.

Packaging interested parties listed by:	
Lorentzon & Olsmats	Johnsson
Packaging producer	Producer
Transport of the empty package	Distributor
Producer ("filler")	Customer
Transport, handling, storage of the filled package	Retailer
Retail store	
End customer	
Recycling	
Surroundings	

Table 5. Packaging interested parties listed by Lorentzon & Olsmats and Johnsson.

As pictured in the table, the different researchers have made about the same division. The one made by Lorentzon & Olsmats are more detailed than the one made by Johnsson. Apart from this they have pointed out the same actors, which all are found along the supply chain. I figure 10 these interested parties are illustrated. The distributor isn't pointed out in the picture but is found as an actor between the others.

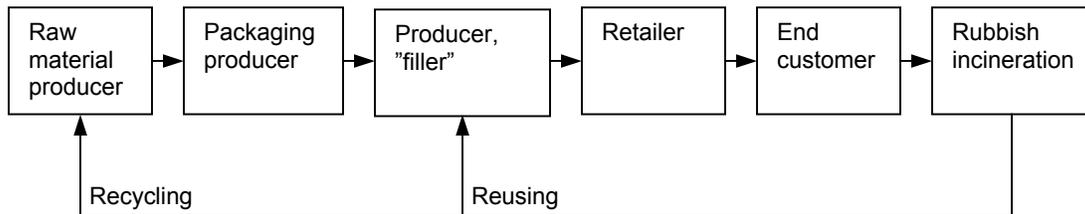


Figure 10. An example of packaging interested parties during the lifetime of a package. The distributor is found as an actor between the others.<sup>69</sup>

<sup>67</sup> Lorentzon A. & Olsmats C. (1992) *Förpackningens integration med distributionen*, PackForsk meddelande nr 155, Kista, pp. 72-78.

<sup>68</sup> Johnsson M. (1998) *Packaging Logistics – a value added approach*, Department of Engineering Logistics, Lund University, pp. 41.

<sup>69</sup> Picture sketched by the thesis author.

### 3.3.2 Requirements demanded by the interested parties

As the package adds value in different ways among these parties, they have different requirements on the package. Below is a description of common demands that these parties make on the package.<sup>70 71</sup> The division is made after the Johnson model.

<b>Packaging requirements according to the different interested parties</b>	
<i>Producer requirements</i>	Simple and cost effective to produce the package.
	The package should be easy to fill, seal and pack.
	The package should have a flexible size to fit to several products
<i>Distributor requirements</i>	High amount of cube utilization. This is applied to the utilization in the truckload, on the unit load and in the package.
	The package must have a weight well adapted to the supposed handling equipment.
	The package must make it possible to have as few repacks as possible.
	The package shall be designed to provide convenient handling.
	The package shall be designed to provide an ergonomically environment.
	The package must protect the product from damage and against losses, such as theft.
<i>Customer requirements</i>	The package shall inform about its contents.
	The package shall be adapted to desired wishes. An example is that a milk package should fit into the door of the refrigerator.
	The package should be easy to handle, open and seal.
	The package should inform the customer about its contents.
<i>Retailer requirements</i>	The size of the package shall be adapted to sales frequency and to the size of the store.
	The package should fit into the store shelves.
	The package shall be easy to handle within the store. Removal of the transport package must be time effective and create a small amount of waste.
	The package shall sell the product towards customers

Table 6. A list of packaging requirements demanded by the different packaging interested parties.

<sup>70</sup> Lorentzon A. & Olsmats C. (1992) *Förpackningens integration med distributionen*, PackForsk meddelande nr 155, Kista, pp. 72-78.

<sup>71</sup> Johnsson M. (1998) *Packaging Logistics – a value added approach*, Department of Engineering Logistics, Lund University, pp. 40-41.

Apart from the requirements listed in the table some environmental and surrounding requirements are:<sup>72</sup>

- As little packaging material as possible.
- The package should be energy effective.
- The package should be reusable or recyclable.
- The package should minimize surrounding and people hazards.

The requirements demanded from the packaging interested parties are various and many. The interface between making a demand and being exposed of one can be difficult to visualize. Which actor can make a demand and who has to manage this demand? This interface is today not discussed in the literature found for this thesis.

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<sup>72</sup> Lorentzon A. & Olsmats C. (1992) *Förpackningens integration med distributionen*, PackForsk meddelande nr 155, Kista, pp. 72-78.

### 3.4 Integrating packaging and logistics

When definitions of logistics and packaging now have been performed, a definition of packaging logistics can be made. This subchapter illustrates this aspect according to some different researchers.

#### 3.4.1 Packaging logistics – a definition

In chapter 3.3 “Packaging aspects” we first showed how packaging is an interface between the product and the distribution environment and how this interface makes demands on the package.

This interface can also be illustrated as a circle in which the product is found in the middle and surrounded by the packaging system and the packaging demands (figure 11). They are collected into the three comprehensive aspects logistical, market and environmental demands, compare this with Jönson & Johnsson’s classification in figure 9. The packaging system protects the product against external and internal damages and therefore works as a barrier.<sup>73</sup>

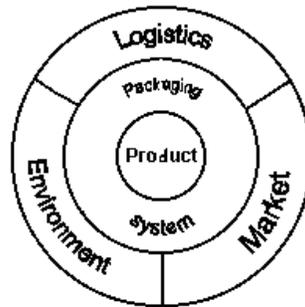


Figure 11. The packaging system is an interface between the product and its surrounding, here illustrated as the three packaging demands: logistical, market and environmental aspects.

A definition of the concept packaging logistics is not common in the today’s literature. Today this definition mainly originates from the University of Lund. Below two definitions are illustrated.

*Packaging logistics is an approach that aims to develop and create packages and packaging systems that support logistics and that meet customer requirements.<sup>74</sup>*

*Packaging logistics is the interaction and relationship between the logistical system and the packaging system that add value to the combined, overall, system – the Enterprise.<sup>75</sup>*

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<sup>73</sup> Dominic. C. et al. (2000) *Förpackningslogistik – 2:a utgåvan*, Packforsk, Kista, pp. 32.

<sup>74</sup> Ibid, pp. 33.

Diana Twede, Associate Professor, School of Packaging, Michigan State University, states that talking about packaging logistics, as a concept is rare in the US. However, they speak about packaging as:

*Packaging is one of the elements of logistics, responsible for protection and facilitating productivity.*

Twede finally points out that the packaging language between the US and Sweden may be different, but that there're talking about the same thing.<sup>76</sup>

### 3.4.2 Integrating tools

In the modern packaging approach, striving for integrating the package into the total distribution chain is of great importance. An increase of the understanding of packaging issues has within the latest years become a bigger issue for people higher up in hierarchies of the companies. The cause of this can be traced to a change in behaviour among companies. There has been more awareness of costs related to distribution as well as the requests from the customers. This changed approach has made packaging issues an area of discussion among groups of designers, packaging technicians and marketing men.

The target of the modern packaging approach is to put packaging into a wider understanding, a logistical system understanding. This means that the request of all interested parties have to be taken into consideration.<sup>77</sup>

Most common is still that companies today haven't perfect packaging system understanding. Johnsson (1997) points out that in companies of today most influences go from logistics to packaging, not the other way around. The package has to adjust to already existing logistics systems within the company.

Developing a superior integration between logistics and packaging can result in added value by all who are a part of the supply chain (customers, suppliers and others). The packaging design should be integrated to optimize cost, maximize productivity, and minimize damage and handling.

Before designing packages a study of its handling methods, facility dimensions, damage sources, and communication needs is central to facilitate integration. The more complex the system is, the greater the need to study the system. Different disciplines emphasize different aspects.

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<sup>75</sup> Saghir M. (2002) "Packaging information needed for evaluation in the supply chain: The case of the Swedish grocery retail industry", *Packaging Technology and Science*, no 15, pp. 37-46.

<sup>76</sup> Twede D. Associate Professor, School of Packaging, Michigan State University, E-mail contact, December 2002.

<sup>77</sup> Andersson Å. et al. (1985) *Emballage – Transportförpackning och varuhantering*, Förlags AB T Fahlskog, Vällingby, pp. 110-111.

### 3. Frame of reference

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To establish integration between logistics and packaging, Johnsson has created a model. Due to the complex environment of packaging, it is important to develop a dynamic model.<sup>78 79</sup>

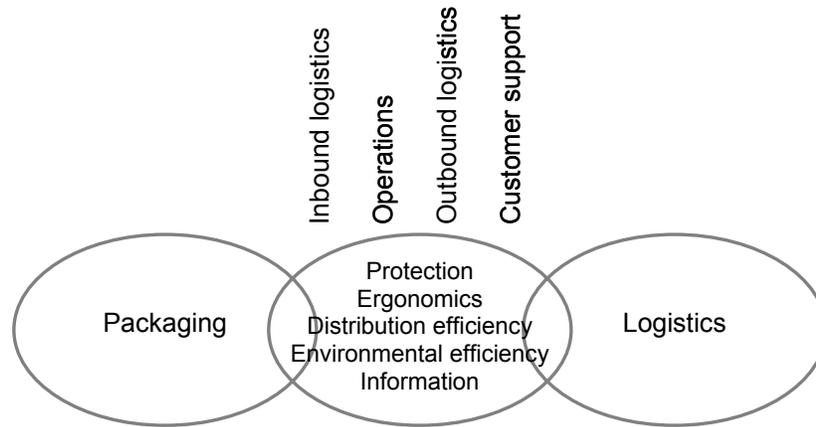


Figure 12. Vertical and horizontal integration between packaging and logistics.

The model in figure 12 describes how the primary activities (activities within the logistics system vertical illustrated in the figure) are linked to packaging and logistics. The horizontal integration shows how the package must be selected from a logistics perspective and how the logistics system must be selected from a packaging perspective. This packaging and logistics approach will increase the value of the product during handling by the supplier, in the production, in the distribution and also for the customer.<sup>80</sup>

To create a well-organized integration between packaging and logistics, communication is important. Packaging responsibility extends far beyond the concern of a single company. To create a good package environment an efficient communication is needed between all packaging interested parties.<sup>81</sup>

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<sup>78</sup> Twede D. & Parson B. (1997) *Distribution packaging for logistical systems*, Pira International, Surrey, UK, pp. 23ff.

<sup>79</sup> Johnsson M. (1998) *Packaging Logistics – a value added approach*, Department of Engineering Logistics, Lund University. pp. 133ff.

<sup>80</sup> Ibid.

<sup>81</sup> Twede D. & Parson B. (1997), *Distribution packaging for logistical systems*, Pira International, Surrey, UK, pp. 23ff.

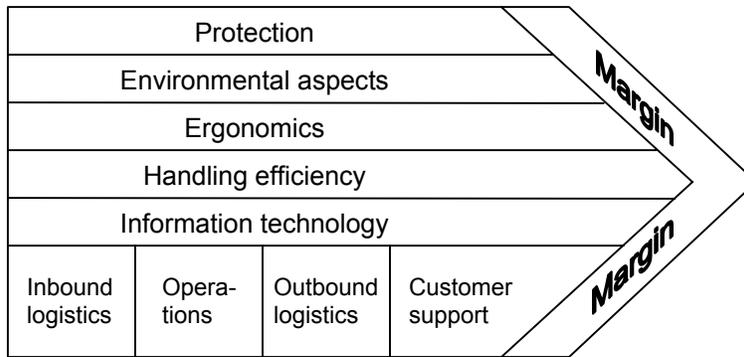


Figure 13. The value chain model by Porter applied on the packaging logistical environment.

In figure 13 an additional model is introduced of integrating packaging and logistics. This model is based on Porter's value chain and applied to the packaging and logistics environment. This model gives a better understanding of linkages between packaging requirements and the logistics system. The model also helps people to work in more structural to analyse cost effectiveness and competitive solutions involving transport packages. The added value that is created by packaging logistics depends on how well the value added activities are managed.<sup>82</sup>

A packaging logistics model helps people within the logistics environment to understand the packaging importance and to develop a packaging logistics strategy. A summary and some examples of packaging development targets are found in table 7.<sup>83</sup>

**Targets in an optimized packaging logistics work**

- A complete control and leadership of the packaging interests.
- All packaging interested parties should be aware of the packaging purposes and importance.
- The packaging purposes should be able to be measured.
- The packaging damage risks should be able to be measured.
- An awareness of the packaging purpose within marketing.
- Understand how the package gives competitive advantages.
- Continue a long-term developing work.
- Communication between all packaging interested parties.
- Have a well-organized feedback on the packaging work.
- The packaging work has to contribute to an optimal economic situation.
- Establish a packaging policy as a measurement instrument.

Table 7. The table illustrates some important aspects making packaging logistics work as optimized as possible.

<sup>82</sup> Johnsson M. (1998) *Packaging Logistics – a value added approach*, Department of Engineering Logistics, Lund University, pp. 133ff.

<sup>83</sup> Hammenberg Y. & Widoff E. (1976) *Emballage – Handbok i allmän förpackningsekonomi och förpackningsteknik*, Nord-Emballage, Förlags AB T Fahlskog, Vällingby, pp. 37.

### 3.5 Packaging costs and profitability

Packaging generates costs in the distribution environment. The package follows the product through the total distribution chain and affects costs in handling, storage and transportation. The package has an influence on and is influenced by everyone and everything it encounters. Many of these encounters will affect manufacturing and distribution costs, or product integrity with indirect impact on sales. If the package is well designed for its purpose, it will add value to the product.

Costs can be divided into direct and indirect costs, where direct costs are those that are caused by a certain cost unit and indirect costs caused by resources needed by the cost units. In traditional packaging approach the cost-conscious is focused on direct costs, such as packaging material used. In modern packaging approach, where the package is put into a system, indirect costs are also of great importance. If the package is slightly larger and/or heavier than it really has to be, costs appearing during handling, storage and transportation will be higher than necessary<sup>84</sup>. Examples of direct and indirect costs are illustrated in table 8.<sup>85</sup>

<b>Direct costs</b>	<b>Indirect costs</b>
Packaging material.	Transportation.
Packaging (filling).	Stowage, warehousing.
Package recycling.	Handling.
	Garbage costs (appears if the whole package can't be recycled).

Table 8. Direct and indirect costs generated by the package.

Packaging generates costs, but it also saves costs. Modern society and modern distribution systems need packaging. Without packaging products would be damaged, food would be bad and impossible to eat. Lots of products would not be consumed and become garbage.<sup>86</sup>

The total product can be described as a combination of a core product and additional supporting services. The core product supplies the product quality, but the product also needs some services that add value to the product. These supporting services are almost as important as the product itself. Examples of such services are service agreements, insurances, counselling and packaging.

<sup>84</sup> Bakker M. (1997) *The Wiley Encyclopedia of Packaging Technology*, John Wiley & Sons, New York, pp. 308.

<sup>85</sup> Dominic C. et al. (2000) *Förpackningslogistik – 2:a utgåvan*, Packforsk, Kista, pp. 38 ff.

<sup>86</sup> Andersson B. et al (1997) *Förpackningshandbok V – Ekonomi och Teknik*, AB Thorsten Fahlskog, Vällingby, pp. 26.

A good package adds value by increasing the delivery quality. This increases the customer appreciation and makes therefore packaging important when creating customer good will, which will result in profitability. See figure 14.<sup>87</sup>

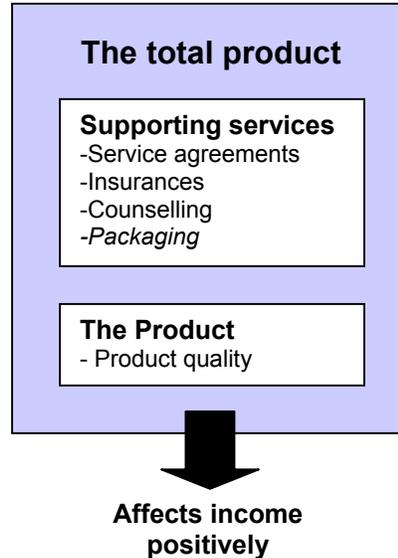


Figure 14. The total product exists of the product itself together with some supporting services including packaging.<sup>88</sup>

Consumer packaging has an important marketing role, and will therefore generate marketing income.

A well-designed transport package increases efficiency during handling and storage. This will increase the delivery safety, which will increase the quality, which will create good competitive advantages and customer good will. A small reduction in package size and weight could mean much savings in transportation, handling and storage. A reduction of packaging can for example make packing faster, require less cube and fewer handling trips, permit more units per unit load, per storage cube and per truck load. All these advantages make overall economic savings. Apart from this, the transportation efficiency also creates environmental advantages as more units per truck load enables less numbers transports. The customers of today are well aware of environmental issues. A company market itself as an environmentally friendly company creates good will.<sup>89 90</sup>

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<sup>87</sup> Dominic. C. Et al. (2000) *Förpackningslogistik – 2:a utgåvan*, Packforsk, Kista, pp. 38 ff.

<sup>88</sup> Ibid, pp. 44.

<sup>89</sup> Bakker M. (1997) *The Wiley Encyclopedia of Packaging Technology*, John Wiley & Sons, New York. pp. 308.

<sup>90</sup> Dominic. C. Et al. (2000) *Förpackningslogistik – 2:a utgåvan*, Packforsk, Kista, pp. 38 ff.

### 3. Frame of reference

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Cost of product protection is a tradeoff between packaging and damage. As shown in figure 15 there is an inverse relationship. When designing a package this tradeoff is important. No matter where packaging design takes place, in engineering, manufacturing, shipping or at the supplier, the tradeoff must be regarded and the packaging design involved in a total system approach.<sup>91</sup>

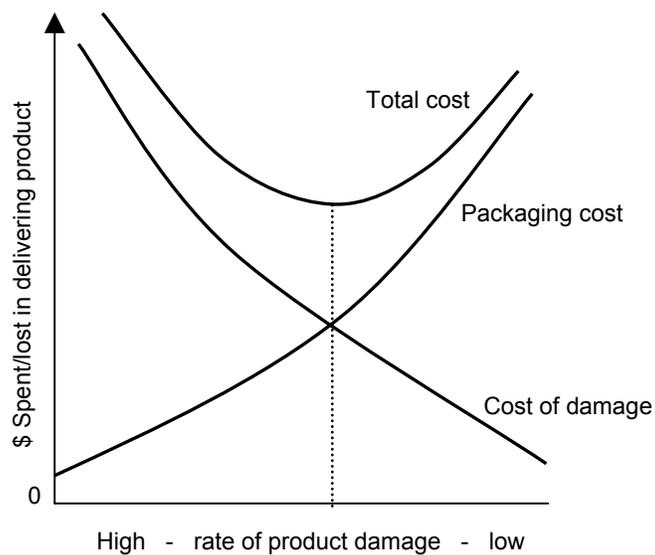


Figure 15. An inverse relationship exists between packaging cost and maintaining product integrity with low cost of damages.

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<sup>91</sup> Bakker M. (1997) *The Wiley Encyclopedia of Packaging Technology*, John Wiley & Sons, New York. pp. 308.



## 4 Collected facts and information

*This chapter includes a collection of data interesting regarding the thesis objective and problem definition. The chapter begins with a presentation of the Schenker goods handling procedures. This is followed by an illustration of the damage-preventing work operated at Schenker today. The last two sub chapters are presentations of FedEx and PackForsk. These last presentations are vital for the analysis and discussion presented in the last chapters of the thesis.*

### 4.1 Goods handling at Schenker

This study is made on domestic land transports and on the Schenker Parcel and Cargo businesses. The study has been performed at the distribution centre in Gothenburg, the Bäckebol terminal, in the autumn of 2002.

#### 4.1.1 The Parcel business area

Schenker Parcel transports small individual packages, from door to door. The packages that are transported by Parcel should have the maximum size and weight listed below. This information is the only packaging information found in the Parcel documents.

*Maximum weight* is 30 kg/package and 99 kg/consignment.

*Maximum size* per package is 1.5 meter in length and a maximum of 2 meters in length+perimeter. Bulky packages should have a maximum length of 2.5 meters and a maximum of 3 meters in length+perimeter.<sup>92</sup>

Parcel started in Sweden in October 1977 and involves today about 25 000 customers around the country. The number of employees is quite small due to the fact that transportation companies mostly are self owned and affiliated to Schenker through agreements. At the terminal there is a small number of employees running the sorting procedure.<sup>93</sup>



Figure 16. A Schenker Parcel local delivery van. <sup>94</sup>

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<sup>92</sup> Schenker AB Corporate Communications (2002) "Faktablad Parcel", art. no. 0903, Gothenburg.

<sup>93</sup> Personnel interview with Roland Lindau, Product Manager at Parcel Operations, 2002-10-25.

<sup>94</sup> Wakeus J. (2002) "Parcel PowerPoint presentation", Schenker Parcel AB, Gothenburg.

#### 4.1.2 The Parcel work description<sup>95</sup>

A package can be distributed long- and short-distances. In long-distance transports (between two or more Schenker districts) the packages are transported in steel-cages and on trucks. These steel-cages are developed by Schenker and consist of a Schenker EUR-pallet as base and a steel cage on top. This steel-cage is presented in figure 5 in the chapter 3.3 “Packaging aspects”.

Within the short-distance transports the packages are handled individually and delivered in delivery vans (figure 16 on the former page). The packages are picked up at the shipper and transported to the door of the recipient or to one of the 900 elected representatives. The customer can choose whichever of the two ways of delivery they prefer.

A transport can look like the one described in figure 17. Sweden is divided into 23 Schenker districts between which the long-distance transports operate. In the figure the package is picked-up at the shipper in district 1, transported in a long-distance transport to district 2. Here the package is delivered to the recipient by a delivery van.

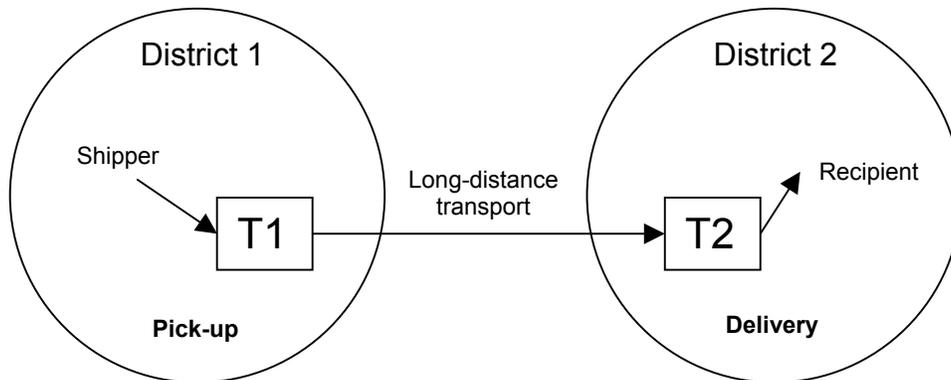


Figure 17. An example of a shipment between two Schenker districts. T1 means the departure terminal and T2 the delivery terminal.<sup>96</sup>

#### Pick-up handling procedure<sup>97</sup>

The packages are picked-up at the shipper and delivered to the departure terminal. On the package the shipper has put on a transport label consisting of a bar code. The bar code holds information such as the customer’s number, consignment number, if the consignment is an express and so on. During sorting, the bar code is read and due to this the sorting is done automatically on a sorting conveyor. The sorted package drops down in the correct destination line, where the package has to be placed manually in a steel-

<sup>95</sup> Personnel interview with Roland Lindau, Product Manager at Parcel Operations, 2002-10-25.

<sup>96</sup> The picture is sketched on the basis of a picture made by Roland Lindau, 2002-10-25.

<sup>97</sup> Interviews and study at the Bäckebol terminal, 2002-11-04.

cage. The steel-cages are then placed on the correct truck to the correct destination. This is the long-distance transport.

#### Incoming long-distance transport procedure<sup>98</sup>

The packages arrive at the delivery terminal in steel-cages. The truck driver has the responsibility to place the cages next to the sorting conveyer. Here the packages are once again sorted through a sorting conveyor. The bar code is read and the packages automatically drop down in the correct sorting line. Apart from reading the destination, the packages are also weighed and measured in size in the sorting procedure. After they have dropped down in the correct destination line the packages are manually placed in cages. The cages are finally placed at a marked position in the terminal for storing until the next morning. These storing positions are placed next to where the packages will exit the terminal for delivery.

#### Delivery handling procedure<sup>99</sup>

The delivery van driver has the total responsibility to find and stack the packages in his van and to his specific destination. In the Gothenburg district there are around 30 delivery vans which all have their starting point at the terminal in Bäckebo. The Gothenburg district reaches from Kungsbacka in the south to Stenungsund in the north.

The delivery procedure starts by the drivers arranging all their consignment notes in the correct delivery order. They then find their steel-cages and start sorting all the packages in a proper order. Finally they stow the packages into the van.

One delivery van can at a maximum be loaded with around 180 packages, but the average number of packages is around 100. Usually several packages have the same destination. The driver has to stow the packages very carefully into the van, otherwise there won't be room for all. When the packages are well stowed into the van it's time to leave the terminal and start delivering in the Gothenburg district.

*“The stowing is an enormous 3D puzzle...”*<sup>100</sup>

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<sup>98</sup> Interviews and study at the Bäckebo terminal, 2002-11-04.

<sup>99</sup> Interview and study at the Bäckebo terminal, 2002-11-05.

<sup>100</sup> A statement from one of the delivery van drivers at the Bäckebo terminal, 2002-11-05.

### Information concerning packing<sup>101</sup>

Schenker Parcel transports all kinds of packages and the packing material can be of many kinds, but most common is packages made of corrugated cardboard.

During distribution a package is handled manually and automatically several times. Examples of points of handling of a shipment are:

- *Pick-up and departure procedures*
  - Picking up the package at the shipper and placing it in the van.
  - Moving the package from the van to the sorting conveyor.
  - Moving the package from the conveyor to the steel-cage.
  - Placing the cage into a truck.
- *Incoming and delivery procedures*
  - Picking out packages from cage to sorting conveyor.
  - Moving package from conveyor to steel cage.
  - Moving package from steel cage into the delivery van.
  - Picking the package out of the van and delivering it to the recipient.

Pictures of badly packed and stacked products are presented in appendix 1. The terminal and delivery van employees at the terminal in Bäckebo point out several packaging inconveniences. Some of these are explained below.

Sometimes products are wrapped in insufficient packing material. An example is products wrapped only in brown paper. This packing material can easily be damaged on the conveyor and in the cages. Problems also occur if the package is filled incorrectly. If the product inside the package is free to move, and the package is made of corrugated board, the package can be damaged when stacked in the cages and in the vans. Another bad packing example is when a corrugated board package is filled with a too heavy product. Then, the package easily breaks in the taped sealings.

Another difficulty pointed out is that the package sometimes is too big to handle manually. Furthermore the product inside is often a lot smaller than the package itself. Another problem is that due to the several points of handling, the packages can easily be damaged, especially the corners of the package.

Apart from the bad adapted packages, the terminal employees point out other reasons why packages become damaged during transport. One is that the time to sort packages in the terminal is short and due to this the packages are often stacked roughly into the steel-cages.

The terminal and delivery van employees describe a perfect package as a package that is small, well filled and adapted to the size and weight of the wrapped product.

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<sup>101</sup> Interview and study at the Bäckebo terminal, 2002-11-04/05.

#### 4. Collected facts and information

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In table 9 the packaging problems and difficulties according to the Parcel employees are summarized.

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**A compilation of packaging problems during handling according to Parcel employees**

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Packing material is too weak.

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Bad adapted package due to the size of the wrapped product.

---

Bad adapted package due to the weight of the wrapped product.

---

Too large package to make an efficient delivery.

---

Several manual handling points.

---

The time to sort the packages is short.

---

Table 9. A compilation of packaging problems according to the Parcel employees.

### 4.1.3 The Cargo business area

Schenker Cargo offers transportation of all kinds of goods. Several different kinds of agreements and prices are offered. Table 10 illustrates a brief description of the most common ways of Cargo transports.

Single consignment $< 1\ 000\ \text{kg}$	<p><b>Budget</b></p> <p>Within Budget, the shipper stows and fixes the goods on a EUR-pallet. He has also the responsibility to mark the consignment with a correct consignment note. Budget transport is the cheapest way of transport for the customer.</p> <p>Maximum weight per pallet is 375 kg, maximum height is 1.3 meter including the pallet. The maximum number of pallets per consignment is 3, larger consignments are transported as Direct.</p> <p>Information about sealing the goods is included in the Budget information. It is said that the goods have to be sealed with an appropriate material, for example plastic shrink film or pallet collars. The goods also have to fit on the pallet, goods that don't fit on the pallet will be charged as Comfort. The pallet has to be an approved EUR-pallet.</p>
	<p><b>Comfort</b></p> <p>Within Comfort the shipper has the responsibility to mark the consignment with a correct consignment note and put together the goods.</p> <p>Maximum length for a package is 2.4 meters and a maximum height is 2.3 meter or maximum <math>3.57\ \text{m}^3</math>, including the pallet. Maximum weight is 1 000 kg. If the package exceeds any of these measures, the consignment will be charged as Direct or Special (charged with a larger fee).</p>
Quantity consignment $> 1\ 000\ \text{kg}$	<p><b>Direct</b></p> <p>Direct is the way of transport that serves customers with a large shipment volume. The shipper has the responsibility to mark the consignment with a correct consignment note.</p> <p>Maximum size and volume of the package is only limited to the size and volume of the transport vehicle. However, the minimum weight or volume of a consignment is 1 000 kg or <math>3.57\ \text{m}^3</math>. There are no regulations about the shapes of the goods.</p>

Table 10. Information about the ways of transport within Cargo and some packaging regulations.<sup>102</sup>

<sup>102</sup> The Schenker AB website, [www.schenker.se](http://www.schenker.se), "Fakta om Direct", "Fakta om Comfort" & "Fakta om Budget", 2003-01-23.

In 2001, Schenker Cargo transported 8 773 000 consignments, which is an average of 730 000 consignments per day. These consignments had an average weight per consignment of 1 320 kg.<sup>103 104</sup> Figure 18 illustrates a Schenker truck.



Figure 18. A Schenker truck distributing goods.<sup>105</sup>

### 4.1.4 The Cargo work description<sup>106</sup>

Schenker Cargo transports goods long and short distances. They pick up the package at the shipper and deliver it at the recipient. In figure 17 on page 36, an example of a transport was described. A transport in Schenker Cargo can look the same.

In a Schenker Cargo transport the goods are transported on unit loads. Most of the Cargo packages are carried on EUR-pallets, which Schenker has the possibility to supply to the customers. The Schenker EUR-pallets (see figure 5 in chapter 3.2.3) are return packaging, which the customer rents for their transportation. The goods are always handled with helping devices such as forklift trucks.

#### Cargo handling procedure<sup>107</sup>

The Schenker Cargo goods are picked up at the shipper. The shipper has the responsibility to stow and fix the goods on a unit load. The goods are placed by the truck driver in the truck and stowed the best way possible.

Schenker Cargo measures the coefficient of fullness of the total transportations in Sweden. In 2002 the coefficient of fullness was 73 percent, estimated coefficient of fullness in 2003 is 74 percent and in 2004 75 percent<sup>108</sup>.

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<sup>103</sup> Presentation of goals and estimated development goals, Svante Carlsson, Product Manager at Cargo Operations, 2002-09.

<sup>104</sup> Personnel interview with Svante Carlsson, , Product Manager at Cargo Operations, 2002-11-21.

<sup>105</sup> The website of Schenker AG, [www.schenker.com](http://www.schenker.com), "Photo archive", 2003-01-23.

<sup>106</sup> Personnel interview with Svante Carlsson, , Product Manager at Cargo Operations, 2002-11-21.

<sup>107</sup> Interviews and study at the Bäckebol terminal, 2002-11-27.

The picked-up packages are transported to the terminal where the driver has the responsibility to empty the truck and put the goods in a marked area. The goods shall be marked with a consignment note. The personnel at the terminal read this note to be able to move the goods to the correct destination spot. The terminal area is divided into several spots of destination. The goods are temporary stored at these spots until the truck that will transport the goods to the correct destination arrives. Taking Bäckebol terminal as starting point, several permanent long-distance transports are made every day between the 23 Schenker districts.

The goods transported within Schenker cargo always make a stop over at one or more terminals. The handling procedures do of course increase if the goods have to be transported between several terminals before arriving at the correct destination. The goods are finally delivered to the recipient by a Schenker truck.

### Information concerning packaging<sup>109 110</sup>

The packages transported by Schenker Cargo are always put on some kind of unit load. The packages are therefore never handled individually.

Some packaging problems according to the damage-preventing and terminal employees are pointed out below. Pictures of badly packed products are presented in appendix 2.

Product damages can easily happen if the package doesn't fit on the pallet. During transportation the package is than rubbed against other packages and damages can occur on the faulty package as well as on the package that it is rubbed against.

Another problem is that the product is difficult to transport if it is badly fixed to the pallet. Problems that can occur is that the entire product can fall during transportation. Damages can occur on the product as well as on other products.

Difficult products to transport are for example white goods (for example refrigerators, stoves, dish washers) and furniture, mainly wooden benches, bookcases and windows. These kinds of goods are often badly wrapped. Damages occur on the edges of the benches, refrigerators fall during transportation and the legs of the bookcases fall in between the boards of the pallet.

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<sup>108</sup> Presentation of goals and estimated development goals, Svante Carlsson, Product Manager at Cargo Operations, September 2002.

<sup>109</sup> Interviews and study at the Bäckebol terminal, 2002-11-27.

<sup>110</sup> Interviews and study at the Lunda terminal, 2002-10-15.

#### 4. Collected facts and information

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In table 11 the packaging problems according to the Cargo and damage-preventing employees are summarized.

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**A compilation of problems concerning packaging during handling according to Cargo workers**

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Product doesn't fit on the EUR-pallet.

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The product is badly fixed to the pallet.

---

Bad adapted package due to the weight and size of the wrapped product.

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Table 11. A compilation of packaging problems according to the Parcel and damage-preventing employees.

## **4.2 Packaging related operations at Schenker**

### **4.2.1 The damage-preventing work<sup>111 112</sup>**

#### Structure of employees

Within Schenker AB there are five people working part or full time with packaging related issues. Maria Degerman and Andreas Wennberg in Jönköping, work towards the south districts, Kenneth Lilja in Stockholm and Stig Hugosson in Umeå, work towards the north districts. Ann-Cathrine Svensson is placed in Gothenburg and has the responsibility to assemble the other four in meetings a number of times per year.

Apart from these five people, the damage-preventing employees have built a network of one to four people in every Schenker district. These work as an extra resource in the damage-preventing work. Kenneth Lilja is the only employee who works full time as a damage-preventing employee.

#### The aim of the damage-preventing work

The aim of the damage-preventing work is to suggest packaging improvements that will decrease the damaging claim costs as well as improve the distribution quality.

Another purpose of this work is to teach the customers what happens to their products during shipping. The customer has to understand how packages move within the distribution, and how this will affect their particular packages. Lilja comments the following:

*“It is always the customer who has to adapt their packages to the chosen way of transport, not the other way around...”*

#### Working procedure

The damage-preventing work is generally based on a list with the 20 customers that have been affected by most product damages during the last quarter of the year. However, indications of affected customers can also be delivered by the customer’s key account or sell agent, sometimes also from the employees at the distribution centres.

Below is a list of important items to investigate in a damage-preventing analysis:

- Is the customer frequently a member of the 20 worst product damages affected customers?
- What are the damaging costs?
- What kind of problem, damaged goods or missing goods?
- Is the product too fragile for transportation strains?

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<sup>111</sup> Interview with Kenneth Lilja, damage-preventing employee, personnel 2002-10-15 and by e-mail 2002-12-04.

<sup>112</sup> Schenker AB intranet, nova.btl.com, Holm M., ”Skadeförebyggarna – Sparar pengar både för oss och kunden”, 2002-02-07.

- Is the product especially liable to be stolen?
- Is the package overexposed?
- Is the package too weak for the supposed handling?
- Is the package adapted for the supposed handling?
- Shall there be an adjustment of the way of transportation?
- How is the package handled during distribution?
- Is the handling at the terminal wrong?
- Is the incorrect handling equipment used?

When the work of investigation has demonstrated the reasons why the packages are damaged, a proposal of how these problems can be solved is established. If this proposal involves changes for the customer, this proposal is first introduced to the customer's key account. Finally the proposal is introduced to the customer. The damage-preventing employee also reports the results to the region management and the department of risk management.

Generally, the damaging problems can be solved through giving the customer advice regarding change of the package. Often the customer has a lack of knowledge of how their goods actually are handled during distribution. If this knowledge is increased it is easier to discuss an introduction of a stronger packing to decrease the frequency of damages. Sometimes a simple packing advice is not sufficient. Then a more complex work of investigation has to be done and several internal and external meetings held to establish a plan of how to decrease the number of damaged goods.

Schenker doesn't propose exact advice of how the customer shall develop or change their packages. For these packaging technology tasks Schenker refers either to the customer's packaging supplier or to PackForsk, The Institute for Packaging and Logistics. The damaging preventing work by Schenker is free of cost for the customers.

#### **4.2.2 A real-life damage-preventing work example<sup>113</sup>**

In 2000 a Schenker customer was found on the list of high rates of goods damaged. The north district damage-preventing employees contacted the customer, and their damage statistics was presented.

The damage analysis discovered a relationship between the way of transport and the customer's heavy product/weak packaging. The customer was informed and Schenker expected a focus from the customer to improve the package of the product.

The customer reacted positively to the result of the analysis and successfully influenced his supplier to change and improve the package.

The entire process of improvements took about two years and it ended in success. Table 12 presents the result.

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<sup>113</sup> Example presented by Kenneth Lilja in February 2003.

Year	Shipments [Qty]	Claims [Qty]	Sum claims [Kr]	Damages [%]	Claims [%]
2000	6833	170	173 083	11.76	2.49
2002	8990	96	155 219	7.43	1.07
<b>2</b>	<b>+2157</b>	<b>-74</b>	<b>-17 864</b>	<b>-4.33</b>	<b>-1.42</b>
	<b>+32%</b>	<b>-44%</b>	<b>-10%</b>		

Table 12. Achieved results from the damage-preventing work.

The improved package was gradually introduced in the spring of 2002. The results in the period of two years show that in spite of the increased number of shipments, the claims and damages had decreased.

The customer was happy with the result. Their employees didn't have to waste time working with claims and answering unhappy customers, but could instead perform valuable business related work. Schenker gained good will and a decrease of paid out insurance money.

#### 4.2.3 Packaging related documents at Schenker

During 2002 some documents containing packaging related issues were produced at Schenker. These are short written papers about claims, the damage-preventing work and distribution of responsibility<sup>114</sup>.

In the paper about claims, the customer responsibility is explained. A short extract says:

*Fragile goods can easily be damaged. Therefore, it is necessary that these goods have such solid package that they stand average distribution strains.*

This paper also informs the customers of how he or she shall act if his or her goods have been damaged during transport. For example, it states that it is always the customer's responsibility to require compensations for the damaged goods. In appendix 3, the entire document about claims can be found.

In appendix 4, the entire document "Damage-preventing work" is found. It contains information about the Schenker damage-preventing work. Apart from that, it also illustrates some concise packaging advice. Below is a short extract:

*To keep the distribution costs down, the goods have to cope with average distribution strains. This involves managing movements occurring during transportation as well as managing forklift truck handling, stowing and stacking. The product has therefore to be wrapped in a protective package.*

In the document "Distribution of responsibility", the distribution of the responsibility between the customer and Schenker is illustrated. One part of this paper contains short

<sup>114</sup> Produced by Schenker AB Corporate Communications in January/February 2002, Art. No. 0994, 0995 and 0613.

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packaging advice. The information is about the same as the one in the damage-preventing paper but a small part also treats the following:

*The group fragile goods contain for example carpentry, white goods and computer equipment. These goods require special treatment in choice of packaging. Omission to provide the goods with an appropriate packaging ..... can result in limitations of the right for damaged goods compensation.*

The paper further explains what shall be done if the goods have been damaged during distribution. The entire document “Distribution of responsibility” is found in appendix 5.

In the Schenker document “Terms of transport”<sup>115</sup>, which is found in appendix 6, some packaging information is found. A short extract is:

*The package shall be designed so that the wrapped product can't cause damage to other packages during distribution.*

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<sup>115</sup> Produced by Schenker AB Corporate Communications in October 2002, Art. No. 0609.

## 4.3 Packaging related operations at FedEx USA

### 4.3.1 FedEx – a short company overview<sup>116</sup>

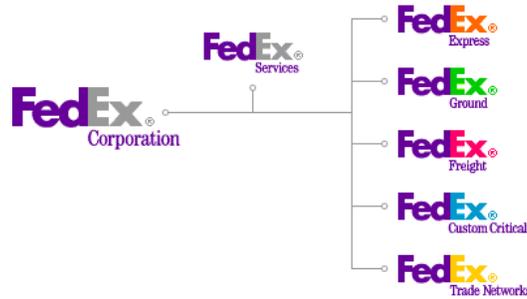


Figure 19. FedEx Corporation.

As the above picture shows, FedEx Corporation involves a family of companies, which perform the following operations:

- *FedEx Express*: the world's largest express transportation company.
- *FedEx Ground*: North America's second largest ground small-package carrier.
- *FedEx Freight*: the leading provider of regional less-than-truckload (LTL) freight services.
- *FedEx Custom Critical*: the world's largest expedited, time-critical shipment carrier.
- *FedEx Trade Networks*: customs brokerage, consulting, information technology and trade facilitation solutions.
- *FedEx Services*: integrated sales, marketing and information technology support for the FedEx companies.

Important companies in this thesis are FedEx Express, Ground, Freight and in particular FedEx Services. FedEx Design & Development is found in FedEx Services.

### 4.3.2 FedEx Design & Development<sup>117</sup>

FedEx Design & Development department (FedEx PD&D) works in many ways to help their customers improving their packaging. FedEx PD&D designs and engineers packaging for their customers' products which will reduce damages when shipped by FedEx. They also test their customers' packaging to ensure that the packaging is sufficient to protect the product during shipping.

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<sup>116</sup> FedEx Corporation website, [www.fedex.com](http://www.fedex.com), 2003-01-30.

<sup>117</sup> Interviews made by e-mail with Thomas J. Wood, Packaging Project Engineer at FedEx PD&D, during the autumn of 2002 and spring of 2003.

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The PD&D department originates from senior management within FedEx realizing the importance of packaging and the benefits it provides. The packaging operations reduce claims, company wide and help find ways to reduce the risk of package damage during the sorting and moving of the package.

These packaging services are at no charge for the FedEx's customers. Tom Wood, a packaging project engineer at the department, comments that the biggest advantage of the packaging services is that it provides a value added service to the customer. These services differentiate FedEx from others and it also provides one of FedEx Corporation's major objectives. That objective is *superior service to the customer*.

*"Packaging services provide a value added service to the customer..."*

By reducing damages, FedEx pays less in claims and the customer is much more satisfied since they have less claims. The services also present a positive image of FedEx to the recipient of the package. If a recipient of a package receives the product damaged, they will in most cases assume that FedEx caused the damage. They do seldom think that the product was not packed properly.

*"Undamaged products present a positive image of FedEx to the recipient of the package..."*

Another advantage of having good knowledge of packaging and packaging services within a transportation company, Wood says, is that FedEx can educate customers about the way their products move while distributed. FedEx is the largest company within shipping small express parcels. The way the products are handled within this environment differentiates from normal shipping. Shipping a pallet load of product differs a lot from shipping individual items. This education helps the customer provide superior service to their customers.

*"Educating the customer about the shipping environment helps the customer provide superior services to their customer..."*

#### **4.3.3 Determination of packaging requirements<sup>118</sup>**

FedEx has put together general Package Test Standards. They expect their customers to have their package engineered to protect their product based on these FedEx Package Test Standards. These tests are based on normal handling, and if the customers' packages can't pass the FedEx Test Standard the packaging isn't sufficient for the distribution environment. In appendix 7 the FedEx Package Testing Procedure is found. The Package Test Standards are normally based on handling within the express/small parcel environment. This is because the handling in this distribution environment differentiates from normal distribution.

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<sup>118</sup> Interviews made by e-mail with Thomas J. Wood, Packaging Project Engineer at FedEx PD&D, during the autumn of 2002 and spring of 2003.

*“The requirements for packaging should mostly be determined by the transportation company...”*

The transportation company can ask the customer (the shipper) to change the packaging for many reasons. If the packaging causes harm to an employee of the transportation company or cause damage to the sorting equipment or to another customer’s package, the transportation company will demand a compensation from the shipper. The transportation company can also ask for better packaging if there is a high damage rate for the product being shipped. The shipper may be forced to change their packaging or the transportation company will not pay their damage claims.

The ideal option, according to Wood, is that both the transportation company and the shipper work together to solve the packaging problem. This will save the customer’s non value claims work and money as well as increase the FedEx customer satisfaction. A win-win situation is achieved.

#### **4.3.4 Benefits of packaging competent employees at FedEx<sup>119</sup>**

Wood believes that it is important to have a high competence of packaging knowledge within a transportation company. He says that packaging engineers are the employees that are most knowledgeable of understanding the distribution environment and how packages need to be designed to protect the product for that particular shipping environment. They can also answer questions and issues that will be asked by packaging engineers from other companies.

*“A transportation company having packaging engineers on staff will be able to measure the environment and help their customers determine how a package should be engineered...”*

*“Without package engineers, the transportation company would have no way of guiding or helping their customers to tell them how to package to prevent damage...”*

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<sup>119</sup> Interviews made by e-mail with Thomas J. Wood, Packaging Project Engineer at FedEx PD&D, during the autumn of 2002 and spring of 2003.

### 4.3.5 FedEx packaging guidelines and information

FedEx has a number of packaging tips available for their customers. This information can easily be found on the FedEx USA website. However, this information is not available on any other FedEx websites than the one in the US. Figure 20 shows how the packaging information easily can be found under the Service Info headline on the FedEx USA website.

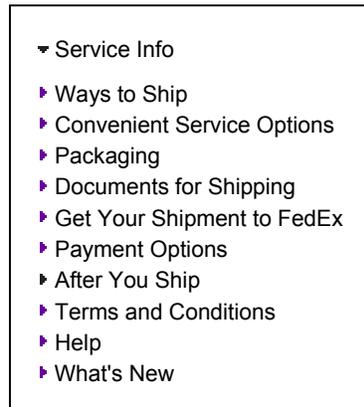


Figure 20. The packaging tips can easily be found on the FedEx USA website.

The Packaging website is divided into tips for the different ways of shipping made by FedEx. These are Express, Ground and Freight shipping. However, on this main packaging website the following text describes the importance of having well adapted packaging as well as what the company has to offer its customers:

*Smart packaging can help your shipment arrive on time and in good condition. FedEx Express packaging offers a range of sizes to fit your express shipments and symbolizes quality across the world. FedEx has tips and guidelines for cushioning, sealing, and labeling packages, whether you are using FedEx packaging supplies or your own boxes.*

FedEx has their own packaging that their customers can use while shipping their goods Express. These packaging comes in several different sizes, from sturdy boxes to white plastic overwraps. Some examples are shown in figure 21.<sup>120</sup>



Figure 21. Examples of FedEx packaging.

<sup>120</sup> The FedEx main Packaging website, [www.fedex.com](http://www.fedex.com), 2003-01-30.

## Express packaging tips<sup>121</sup>

This website is the most developed of the three. This site is divided into tips about *Packing Your Package*, *Sealing Your Package* and *Addressing Your Package*. The tips are simple. The guidelines given are the following:

<b>Packing Your Package</b>	
<i>Box Weight Specifications</i>	Don't exceed the weight specifications for your box.
<i>Contents</i>	Position contents in the center of the sturdy box and surround by cushioning (bubble wrap, "peanuts", or foam pads).
<i>Fragile Items</i>	Cushion fragile items inside one box, then put into a larger box with 2" to 3" of cushioning around and inside the inner box.
<i>Size</i>	Packages should be larger than 7" x 4" x 2".
<i>Sharp Edges</i>	Cover all sharp or protruding edges with taped corrugated panels or pads.
<i>Protective Containers</i>	If finishes could be damaged or soiled in transit, place in protective container.
<i>Unwrapped</i>	Do not wrap the outer box with paper.
<b>Sealing Your Package</b>	
<i>Good Tape</i>	Seal seams and flaps with pressure-sensitive plastic tape. Tape should be at least 2" wide, but preferably 3" wide.
<i>Bad Tape</i>	Do not use cellophane tape, masking tape, duct tape, kraft paper tape, string or rope.
<i>Perishables</i>	Use insulation to protect perishables from extreme temperature changes.
<b>Addressing Your Package Label</b>	
<i>Complete Information</i>	Provide complete sender and recipient addresses, including phone numbers and ZIP codes. Make sure all required information is included.
<i>Orientation Markings</i>	We cannot ensure compliance with orientation markings such as "This End Up" or up arrows. Place shipping labels on the top surface of your box to increase your chances for preferred orientation.
<i>Backup Information</i>	Include your address and the destination address inside shipment as well (business cards are ideal).
<i>Tie-on Tag</i>	For FedEx Sleeves, golf bags, skis, tires, etc., use our tie-on tags.
<i>PO Boxes</i>	FedEx cannot deliver to P.O. boxes within the U.S.

Apart from these guidelines, the customer can download additional tips and guidelines. Some of these guidelines concern tips on packaging for certain products, for example packaging for computers. Others are general guidelines about packing, sealing, labeling and preparing the package for shipping. These papers are found in appendix 8 and 9.

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<sup>121</sup> The FedEx Express Packaging Tips website, [www.fedex.com](http://www.fedex.com), 2003-01-30.

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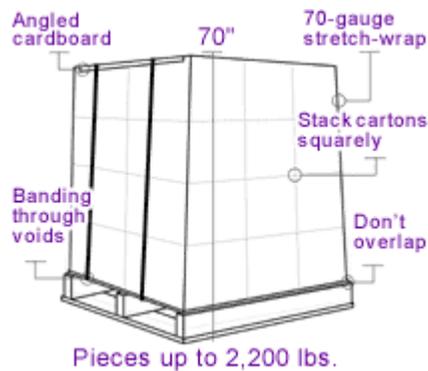
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### Freight packaging tips<sup>122</sup>

Freight (less-than-truckload regional shipments) packaging tips involves the following information.

#### Palletizing Your Shipment

<i>Base</i>	Freight must be on a pallet, skid or other forkliftable base.
<i>Size</i>	Maximum skid dimensions: 70" (height), 119" (length) or 300" (length plus girth).
<i>Weight</i>	Each piece (pallet) must weigh no more than 2,200 lbs. Distribute weight evenly on the pallet to avoid excess weight being placed on carton contents.  Stack boxes squarely on the pallet, corner to corner to maximize compression strength. Stack cartons to the pallet's edge, but do not overhang. Top of pallet must be flat to minimize chances of lost or damaged cartons. Place angled cardboard between cartons to prevent crushing.
<i>Wrapping</i>	Use 70-gauge stretch-wrapping. Pass a minimum of two bands (tightly secured) through the pallet voids and around all cartons.



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<sup>122</sup> The FedEx Freight Packaging Tips website, [www.fedex.com](http://www.fedex.com), 2003-01-30.

## Ground packaging tips<sup>123</sup>

The packaging guidelines given applied on the ground shipments (small packages carrier) are distributed between choosing the correct box, inside cushioning, sealing and labeling. Information is also given about irregularly shaped products. The guidelines given are shown below.

<b>Corrugated Boxes</b>	
<i>Sturdy Boxes</i>	Use sturdy boxes with flaps intact.
<i>Heavier Items</i>	Use double-wall boxes for heavier items.
<i>Reusing Boxes</i>	If reusing a box, make sure there are no holes, tears or corner dents. Remove old labels.
<i>Room for Cushioning</i>	Make sure your box is large enough to put adequate padding around contents.
<b>Inside Cushioning</b>	
<i>Cushioning materials</i>	Use corrugated fiberboard, molded plastic material, loose "peanuts", densely packed shredded paper, or bubble wrap as cushioning.
<i>Minimum cushioning</i>	Use at least 2" to 3" of packing material all around the item (item should be centered). Fragile items require more cushioning.
<i>Shifting</i>	Use enough packing material so that the item does not shift or move during transit.
<i>Multiple items</i>	If you're shipping many items in a box, wrap each separately and put sufficient packing material between them.
<i>Sharp Edges</i>	Cover sharp or protruding edges with taped corrugated panels or pads.
<b>Sealing Your Package</b>	
<i>Tape</i>	Tape all seams securely end-to-end with one of these kinds of tape: <ul style="list-style-type: none"><li>▪ Pressure-sensitive packing tape, minimum 2" width.</li><li>▪ Water-activated paper tape, 60-lb. grade, minimum 3" width</li><li>▪ Water-activated reinforced tape.</li></ul>
<i>Do Not</i>	Please do not use duct tape, kraft-paper tape, cellophane tape, masking tape. Also, do not wrap the outside of your package with string or kraft paper

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<sup>123</sup> The FedEx Ground Packaging Tips website, [www.fedex.com](http://www.fedex.com), 2003-01-30.

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### **Proper Labeling**

<i>Correct Placement</i>	Position bar code/address label squarely on largest surface. If using a preprinted bar code label, place the address label next to it. Correct placement of the bar code/address label helps ensure efficient handling and on-time delivery.
<i>Incorrect Placement</i>	Labels should not be bent over edge of package. Do not position labels over seams, closures, or sealing tape.
<i>Visibility</i>	Avoid placing tape or film over the label, and do not insert them into plastic sleeves.
<i>Label Condition</i>	Avoid wrinkles, tears, stains or stray marks on labels. Don't mark on borders.
<i>Odd-shaped Containers</i>	Place the label on the largest side of irregularly shaped containers. Do not wrap labels around a handle or cylinder so that the edges overlap.
<i>Addresses</i>	Provide complete sender and recipient addresses, including suite numbers, ZIP codes and phone numbers. Include duplicate delivery information inside the package.
<i>Packing Slips</i>	Attach any packing slips near the address label.
<i>PO Boxes</i>	FedEx Ground does not deliver to P.O. boxes.

### **Irregularly Shaped Shipments**

<i>Tires</i>	Wrap pressure-sensitive tape around the tire to create a flat, smooth surface for the bar code/address label. Attach them securely, and do not cover the bar code with tape or film.
<i>Banded Packages</i>	FedEx Ground prefers individual boxes instead of banded ones. If you must band your boxes, please combine same-size packages and band them together at both ends; be sure bands are tight and secure; place address information on each box; and keep bands away from address and bar code labels.
<i>Rolled Goods</i>	Attach an address label to the inside of the roll before covering it in protective wrap. Attach a second address label to the outside of the protective wrap near the bar code label, unless the inside address label shows through. Avoid tie-on tags because they can detach during transit.

## 4.4 PackForsk

### 4.4.1 PackForsk – The Institute for Packaging and Logistics<sup>124</sup>

PackForsk is a Swedish institute for packaging and logistics, which is owned by the Swedish government and PackForsk member companies. The member companies are around 250 companies and organizations in Scandinavia, which support and finance the research at PackForsk. PackForsk core businesses are found in figure 22.

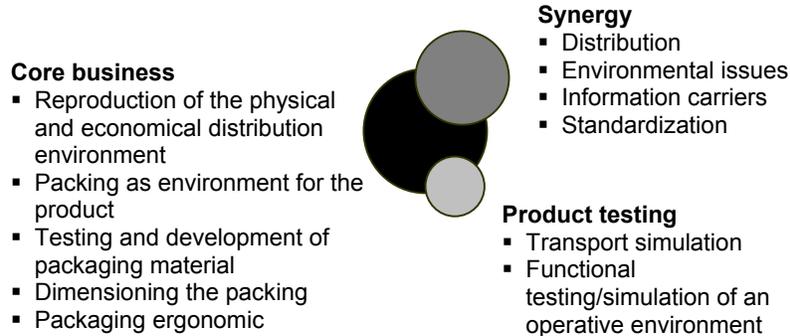


Figure 22. PackForsk core business areas.<sup>125</sup>

### 4.4.2 PackForsk Consultant

The core competence of PackForsk Consultant is development of customer adapted packaging. They offer well-educated people with experience within the packaging area.

In their laboratory they can analyze transportation strains and on the basis of that develop a precise package for a certain product for a certain way of distribution. PackForsk also helps the customer produce their package. The way PackForsk package development work is described below.

They start by analyzing the product. If the transport strains motivate changes and improvements of the product, PackForsk will point that out for the customer. They offer product testing, product improvement proposals, distribution adaptment and an impartial damage inspection.

Parallel to the analyzes of the product PackForsk develops a new package adapted to the product. They can offer a wide range of knowledge within this area, from dimensioning and choice of packaging material to teaching the customer about lean packaging administration.

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<sup>124</sup> Information found at the PackForsk website, [www.packforsk.se](http://www.packforsk.se), 2003-01-20/21.

<sup>125</sup> The figure originates from the website of PackForsk, [www.packforsk.se](http://www.packforsk.se), 2003-01-20.

Within the distribution area PackForsk offers help within:

- Measuring and mapping of the distribution environment.
- Investigations and project leadership within packaging logistics.
- Setting out a plan for one-way or returnable packages.
- Environmental and ergonomic studies.
- Life cycle analysis.

### **4.4.3 PackForsk vs. transportation companies<sup>126</sup>**

Today PackForsk and Schenker don't have a relationship. A couple of years ago there was a relation between the two but this relationship ended with the retirement of the former manager of the Risk department at Schenker AB.

The people working as damage-preventing employees have been educated at PackForsk during three days. This education involves training in packaging knowledge and packaging logistics, and is held at different Swedish companies.

In America both FedEx and UPS have packaging departments within their businesses. Henriksson points out that the packaging knowledge within American transportation companies is larger because of the larger numbers of universities teaching packaging knowledge. Examples of these universities are MIT and Wisconsin. In Sweden, Lund is the only university teaching packaging knowledge.

PackForsk started a project in the autumn of 2002, EUROTTEST, which will analyze distribution strains. This project has started with cooperation between the companies owning the goods and PackForsk. Measurement instruments have been placed in the package, which measure strains in every physical direction. The aim of this project is to evaluate these modern distributions strains in order to develop new packaging test standards.

Henriksson also wants PackForsk and the transportation companies to cooperate. Furthermore PackForsk could develop standard strains for one type of product and package where the product wouldn't be damaged during transport. Henriksson believes that such a standard would be favorable for both the transporter and goods owner.

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<sup>126</sup> Telephone interview with Kjell-Åke Henriksson, Consultant Manager at PackForsk, 2002-11-18.



## 5 Analysis and discussion

*This chapter discusses and analyzes the frame of reference in relation to the collected facts and information. The aim of this chapter is to answer the problem definition and achieve a relevant discussion according to the thesis objective.*

*The chapter begins with a general analysis of the importance of packaging in the supply chain and is completed with an analysis of the interest of packaging at Schenker.*

### 5.1 The packaging interest of the supply chain

The package is an important element in the distribution environment. The package is handled and transported many times during shipping. A package can be shaped in innumerable different shapes and handled in many different ways. It can for example be a package made of corrugated cardboard handled individually or it can be a wooden pallet loaded with fragile windows only wrapped in shrink film and handled by a forklift truck. The package is important in the entire supply chain because of its purpose to protect and make the distribution efficient. The different packaging shapes also make demands on the distribution operations among all actors in the supply chain.

In the presentation of the two Schenker businesses Cargo and Parcel in the former chapter, the terminal employees and truck drivers pointed out several interesting points of views regarding packaging in the supply chain. The personnel had all something to say about packaging, it could concern problems handling the packages, loading or stacking them. They realized the importance of well-adapted packages for the particular distribution environment to achieve distribution efficiency and a good working environment.

To illustrate the significance of packaging in the supply chain, some interesting aspects have been put into the Supply Chain Management model first illustrated in figure 3 in chapter 3.1. This modified SCM model is found in figure 23 on the next page.

The Supply Chain Management involves many actors along the supply chain. All have expectations on the package. The package has for example to protect the product against distribution strains, be easy to open and to throw away. The actors have different requirements on the package. In chapter 3.3 in the “Frame of reference” some packaging researchers pointed out packaging interested parties and their respective requirements. These requirements among the different supply chain actors are an aspect of the importance of packaging in the supply chain.

Who is supposed to make demands on the package and who should take the responsibility to develop a well-adapted package? The transportation company is the link between all supply chain actors. While transporting the products between the actors the transportation hear everybody’s point of view about the package. The transportation company is also the actor with the best knowledge of the distribution environment and its strains. It is the transportation company who encloses how to develop a package that fits the distribution

environment. The transportation company could be the actor who takes the responsibility to be the link between the supply chain actors to improve packaging.

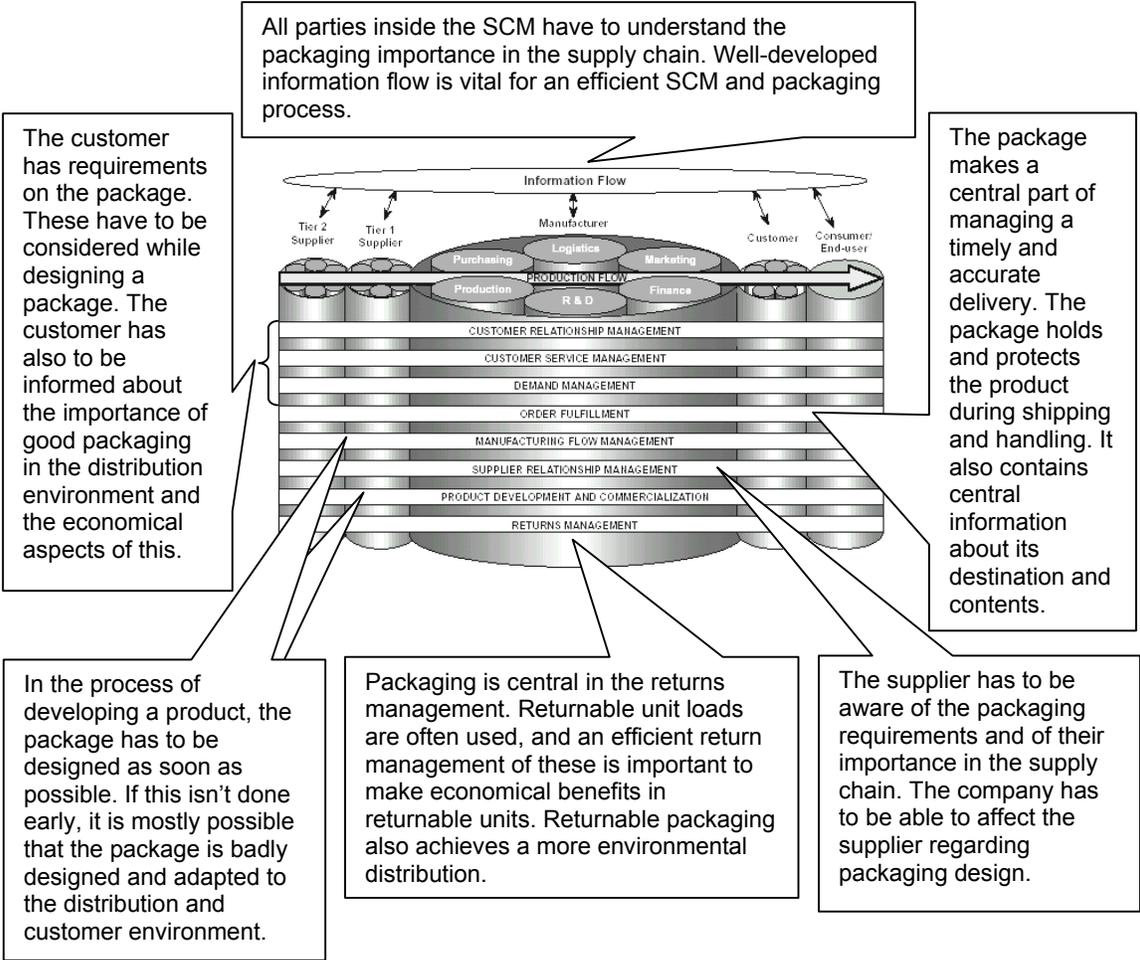


Figure 23. The SCM model modified to illustrate the packaging importance within the supply chain. Packaging is an important element all over the supply chain and at all actors.<sup>127</sup>

<sup>127</sup> The model is a modified version of the Supply Chain Model presented in chapter 3.1.

### **5.2 Schenker packaging activities of today**

The knowledge of packaging logistics is rather vague at the main office in Gothenburg. Not many employees realize the importance of packaging. The package is not commonly put into a system along with the logistics by Johnsson described in the “Frame of reference”. The package is only considered as an element of the distribution that should not be damaged during shipping. The effects of good packaging such as an improved efficiency and a decrease of paid out damage insurances money aren’t sufficiently analyzed at Schenker today.

The damage-preventing work that is organized under the Risk Management department is however a good start of developing packaging as an important element of the Schenker business. The existence of the damage-preventing employees shows that Schenker has the intent to set packaging as an important element of the business. The damage-preventing employees are well educated in the packaging importance in the supply chain and they are showing a great interest of increasing this business at Schenker. They see the affects of good and bad packaging and realize the benefits of working with improving the packages. The damage-preventing business has however to be developed to reach all benefits that good packaging creates.

Today the damage-preventing employees don’t have the time to work with all customers’ packaging. Kenneth Lilja is the only employee that works with these issues full time, the others also have other duties. The damage-preventing work done today is mostly made with the customers having a very high rate of number of damaged products. Not many of the Schenker customers do today get help with improving their packaging.

As illustrated in chapter 4.2.2 “A real-life damage-preventing work example” the packaging activities that are performed by the damage-preventing employees have major positive result of the money paid out in damage claims. This example showed that in spite of an increase of shipments of 32 % the decrease in claims was as much as 44 %.

Apart from these economical benefits, the customer also became happy with a decrease of damaged goods and the customer’s customer became happy while receiving undamaged goods. With a well-organized packaging work, Schenker creates customer good will, which is important in a low margin business like transportation.

The packaging documents that were described in chapter 4.2.3 are a good example of how Schenker can work with improving the packaging standards in the distribution and educate customers about simple packaging issues.

In the Schenker “Terms of transport” there are little information about packaging. The information only concerns maximum size and weight of the package. There is no fact of how the product should be wrapped in a package, sealed or fixed to a unit load.

### **5.3 FedEx packaging activities**

FedEx has a large packaging organization where helping the customer with their packages is at focus. The PD&D department is well known inside the organization and is considered as an important part of the FedEx business even by the top management.

At FedEx, simple and easy understandable packaging knowledge is distributed to the customers through the employees at PD&D but also through the FedEx USA website. The customer can easily find packaging tips regarding packing, sealing and addressing. The packaging tips are divided into the different ways of transports as the packaging requirements differ in each of the shipments. Through this information the customer is educated and informed of packaging knowledge, which results in better packaging moving through the FedEx distribution.

The PD&D department helps customers develop good packaging for free. This is a business that makes great customer good will. Of course the shipper chooses FedEx as they can help develop a good and exclusive package for free. The customer doesn't need to have a packaging organization at their company, instead they can entirely concentrate on their core business.

FedEx also has requirements on their customers' packages. They should cope the FedEx Packaging Standard Tests. If the package doesn't cope this test, FedEx can't insure that the package will arrive undamaged. Of course FedEx offers to test the customers' packages for free, and if necessary, also develop an improved package that fits the way of distribution. FedEx is here the one making demands and the customer has to follow their requirements.

Through the PD&D department, FedEx educates and helps their customers in packaging knowledge. They can by these employees communicate with the customers about packaging issues, which results in a better packaging knowledge and understanding. As illustrated in the SCM model, communication is vital to create a good supply chain environment.

They FedEx management has realized the packaging importance in their business. PD&D helps customers for free and earns damaged goods insurance money and good will for the company. Maybe this is one of the reasons for the FedEx business success?

## **5.4 Future packaging operations and management at Schenker**

### **5.4.1 Why increase the packaging knowledge and importance?**

It would be valuable for Schenker to increase and improve their packaging organization. By increasing the packaging services given towards customers Schenker can increase customer good will, decrease paid out damage insurance money and improve the distribution efficiency.

Packages are an important part of the Schenker activities, every year numerous shipments are handled by the Schenker employees. If the packages would be designed to cope transportation strains and handling operations, the efficiency and productivity would increase. This can result in running more shipments per year per employee. The work of damage reporting and arguing with the goods owner would disappear. These advantages can be achieved through a deeper relationship to the customer where Schenker educates the customer of distribution strains and make demands on the customer's packages. This work can be made through a new and improved packaging organization. The work performed by FedEx PD&D is a great role model for creating an improved packaging work at Schenker.

In the "Frame of reference" one chapter contained information about packaging costing and profitability. The indirect costs presented in table 8 in chapter 4.1 are the costs that are important for Schenker. If Schenker can decrease those costs, the operations and activities at Schenker would cost less and would instead generate a greater profitability.

A well-designed package transported by Schenker can increase the environmental advantages and making the packaging handling more safe for the employees.

Environmental issues are important for a transportation company. The environmental regulations are getting more restrict every year when EC or the Swedish government are setting harder environmental targets concerning transport pollution. Good packaging can result in a higher amount of cube utilization during transportation, which results in less trucks moving along the roads.

It will probably take a lot of effort for Schenker to achieve an improved packaging work but the outcome would however result in benefits for the company. Below, some tips are presented to start changing the current packaging philosophy and work at Schenker.

### **5.4.2 Increase of the packaging understanding in the entire organization**

The modern packaging aspect is a dynamic understanding of the packaging importance in the society and logistics. Today, not many people think of the package as a valuable element of the supply chain. The two dynamic packaging models found in figure 12 and 13 in chapter 3.4.2 illustrate how packaging can be involved in the company operations and create value. The later model that is based on the well-known Porter value chain

model is good for visualizing how packaging add value in the logistics system. Schenker can by using these models create a better understanding of the dynamic importance of packaging within every company activity.

Figure 24 illustrates a company hierarchy and how the understanding of the packaging importance has to be well known in the entire hierarchy. Today, it seems like the employees actually working with and handles the packages are the ones who understand the influence of good and bad packaging. The top management doesn't seem to have the same understanding.



Figure 24. The understanding of the packaging importance should be well known in the entire company.<sup>128</sup>

### **5.4.3 Inspiring leadership from the top management**

The top management has to perform a leadership that inspires a change in the packaging philosophy. To manage this, the top management first has to realize the importance of having packaging knowledge in the company and see the benefits and competitive advantages of this work.

The understanding of the importance of the damage-preventing packaging work can easily be illustrated through the economical benefits and customer good will it provides. The real-life example presented in chapter 4.2.2 shows that the number of claims decreased after the damage-preventing work. The amount paid out insurance money decreased and the customer became happy.

At Schenker, the leadership concerning the packaging activities would have to be more distinct. Today the damage-preventing employees work in many ways by themselves and the management at the Gothenburg office isn't involved in the damage-preventing work

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<sup>128</sup> Picture sketched by the thesis author.

that much. If this work is going to change the management has to change their point of view concerning the importance of packaging and be more active in their leadership.

### **5.4.4 Educate the customers**

The customer has to be educated in essential packaging logistics. The transportation company can educate their customers about how their packages are handled and transported during shipment. The customers have to realize the importance of creating good and well-adapted packages for their products. The recipient wants to receive a non-damaged product and the shipper wants to eliminate product damages during shipping. The delivery quality involves a good protecting package.

The transportation company encloses great knowledge of the distribution environment. The terminal employees and truck drivers have knowledge of how the packages should be designed to manage this environment. The Schenker customers don't have the same knowledge about the distribution environment and its strains. The transportation company should therefore take the opportunity to educate and instruct the customer of packaging improvements.

FedEx has developed easy read packaging tips and information for their customers. Such documents can also easily be created at Schenker and preferably be put on the Schenker website where the customer can download them. The information should be short and distinct and pleasurable for the customer to read. The new documents produced by Schenker concerning for example the damage-preventing work (appendix 4) is a good example of how these tips can be design to catch the customers' sight. Documents containing information of the strains of the distribution environment could also be created and put on the website.

Information that can be presented to the customer could involve fact about for example packing, sealing and addressing. The FedEx documents are an excellent role model for the creation of these. Some of FedEx packaging documents can be found in appendix 8 and 9. All FedEx packaging documents can also be downloaded from the FedEx USA website at [www.fedex.com](http://www.fedex.com).

It is important to make it possible for the customer to easily catch these documents. It is also of importance that the Schenker personnel are aware of their existence so they can forward them to the customers.

#### **5.4.5 Introduce packaging test standards**

To eliminate the arguing taking place between Schenker and the shipper regarding the guiltiness of the distribution product damages, Schenker could develop general packaging test standards. The shipper has to create a package that manages the strains of the Schenker packaging test standard, otherwise Schenker can't guarantee an undamaged product while arriving at the recipient. If the product will be damaged wrapped in a package managing the standard test, Schenker will automatically be the one to pay for the damages.

Today, Schenker doesn't have the resources to create such packaging test standards. As a beginning there could therefore be valuable to start cooperating with for example PackForsk. They have both the recourses and knowledge to develop and perform such test standards. The project EUROTTEST<sup>129</sup> that started during the autumn of 2002 is also a start of developing such standards.

FedEx already has these packaging standard tests. Their customers can for free use their services but are also engaged to design packages that manage the tests, otherwise FedEx can't assure a non-damaged shipment and the customer has to pay for the damages.

While Schenker today can't offer many packaging services to their customers, they can't force their customers to design packages that manage such standard tests. Maybe this can be something to consider in the future, however as long as Schenker can't offer free packaging design services it would be most profitable to mainly inform and educate the customers about important packaging facts regarding the distribution environment.

#### **5.4.6 Information flow and exchange**

In a well-managed supply chain a good information flow is vital. To help creating a better packaging understanding in the Schenker organization the exchange of information is essential. Communication between all parties, both within and outside Schenker, has to be considered as important.

The Schenker customers have to be informed of the packaging work that is taking place at Schenker and how the customer can use this knowledge. If a larger packaging organization will be developed at Schenker, it is also vital to market this business towards the customers. The customers have to be aware of the packaging possibilities found at Schenker to create customer good will for Schenker.

Many times the information about bad packaging doesn't leave the terminal employees and doesn't reach the main office employees or the customer's key account. The lack of information exchange results in an inefficient working environment. To reach a new and improved packaging work, the information exchange between the Schenker employees have to be better. Communication is a vital tool for making the packaging work improve.

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<sup>129</sup> In chapter 4.4.3 the project is shortly described.

Figure 25 illustrates the importance of an information flow between all parties in the company.

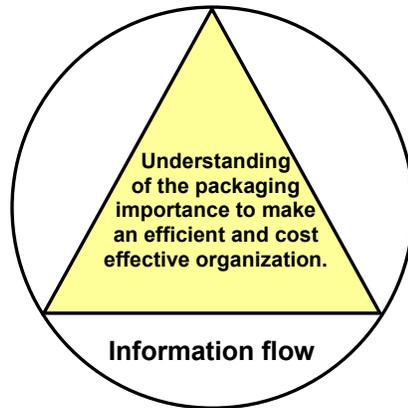


Figure 25. The company is surrounded by the information flow.<sup>130</sup>

### 5.4.7 Measure the influence of packaging

The packaging influence of the Schenker business has to be visualized through economical figures. The influences of packaging in operations have to be measured. Schenker has to be aware of how better packaging can improve operations.

It would be profitable to for example measure how the Parcel operations are affected of bad packaging. How often doesn't the packages fit the sorting conveyor? How often does the packages damage during shipping? Which products are the most affected?

In the Cargo business it is interesting to measure cube utilization in the trucks and how this is affected by bad packaging. How often does bad packaging affect the distribution efficiency? Where does the product damage, is it during shipping or at the terminal?

These measurements above are only suggestions. There are numerous ways of measuring the packaging influence of the Schenker business. Measurements are important for realizing the importance of working with packaging. In table 7 "Targets in an optimized packaging logistics work" in chapter 3.4.2 the importance of measurements are also presented.

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<sup>130</sup> Picture sketched by the thesis author.



## 6 Conclusions of the thesis

*This chapter illustrates the thesis conclusions. The chapter ends with future research that can be performed to evaluate benefits of packaging logistics at Schenker.*

The “Frame of reference” presented the importance of packaging in the supply chain by several packaging and logistics researchers. The package was illustrated as a dynamic element of the Supply Chain Management and an element that can achieve distribution advantages. A good package can achieve greater efficiency in many steps of the supply chain. It can make the handling more efficient, environmental and ergonomically as well as it can inform about the package contents and market the product.

Packaging activities exist at Schenker today through the damage-preventing operations. However, packaging is not considered as an interesting element of the Schenker business among many people at Schenker. The employees that really handle and transport the packages do however realize the packaging influences of distribution efficiency. In the future this awareness also has to be moved upward in the organization hierarchy to achieve packaging advantages.

The FedEx packaging services are a good role model for the Schenker packaging work. At FedEx the top management are well aware of the packaging importance and the PD&D department performs a great work.

To start creating better packaging moving in the Schenker business educating the customers about distribution strains and packaging knowledge is vital. Easily read tips about packing, sealing and labeling can be produced and put on the Schenker website where the customer easily can download the documents. The documents produced by FedEx are a role model. Furthermore can documents containing information of distribution strains be produced and put on the website.

Communication is very important for an efficient organization. I believe that there is a lot of hidden packaging knowledge within the Schenker organization. The terminal employees who everyday handle the goods are a good source of knowledge of problems with packaging. This knowledge has to be known also in the upper organization.

Communication between the damage-preventing employees and the selling organization has to work well. The employees at the selling organizations have contact with the customers every day and they hear lots of information about problems with packaging. The sellers have to be aware of how the damage-preventing employees work and what they can do for the customer.

While starting to create a larger packaging organization within Schenker I believe that it would be good to cooperate with a company or institute that already encloses

packaging knowledge. An example is PackForsk. PackForsk has great packaging knowledge and can be a big help for the creation.

I also think that it would be valuable for the today existing damage-preventing employees to visit the FedEx Design and Packaging Development department in Memphis, USA. The visit would create inspiration for a change in the packaging work and also see the benefits of a larger packaging organization and the benefits it creates. Probably can much of the work being done at FedEx also be done at Schenker. Maybe Schenker can cooperate with FedEx?

Below, a list is presented with activities that I think should be done at Schenker to create a better packaging organization.

1. Create dynamic packaging knowledge and understanding in the entire Schenker organization.
2. Increase the resources of the packaging organization.
3. Teach the customers of the distribution operations. Create simple and easy read packaging tips and place them at the Schenker website.
4. Maintain a qualitative and efficient communication between the different Schenker departments.
5. Visit FedEx Design and Packaging Development department for inspiration.
6. Cooperate with for example PackForsk to start valuable packaging services, such as developing packaging test standards.
7. Measure every activity in accordance to the influence of bad packaging. Find out the dynamic importance of having well adapted packaging in Schenker operations.

I think that packaging is an element of the supply chain that will be even more important in the future. The world is getting smaller, i.e. people and companies of the world are using the entire world as working space. The transportations will increase as well as the number of handled packages. If the packages are designed to fit the way of transportation, the efficiency will increase and the transportations will be more cost effective.

A company such as Schenker has the knowledge of the distribution environment and the strains the goods have to endure. It is therefore companies like this that can and should educate other actors about how their packages should be designed to manage the distributions strains. Schenker can create more customer good will by having packaging services. The customers become happy if a larger number of their products will remain intact during transport. The Schenker operations could improve and be

more efficient with a larger number of well-designed packages. Schenker can also contribute to a more environmental distribution with better-adapted packages to the wooden pallets and the cube of the trucks.

### **6.1 Further research**

My work has showed the importance of packaging within the supply chain. It also illustrated the packaging importance of the Schenker business and how the packaging services and work could improve to achieve larger distribution efficiency and customer good will. I believe however that further research can be done in the thesis subject.

It would be interesting to do a customer research about packaging issues. What do the customer think about the importance of packaging and who should take the responsibility to improve packaging?

It would also be interesting to visit FedEx and other American transportation companies that work with packaging. What economical advantages have these companies achieved by their packaging organization?

Finally, it is essential to develop valuable measurements of the packaging activities. How and where should Schenker measure the activities?



## 7 References

### 7.1 Literature

Andersson B. et al (1997) *Förpackningshandbok V – Ekonomi och Teknik*, AB Thorsten Fahlskog, Vällingby.

Andersson Å. et al. (1985) *Emballage – Transportförpackning och varuhantering*, Förlags AB T Fahlskog, Vällingby.

Bakker M. (1997) *The Wiley Encyclopedia of Packaging Technology*, John Wiley & Sons, New York.

Dominic C. et al. (2000) *Förpackningslogistik – 2:a utgåvan*, Packforsk, Kista.

Eriksson L. T. & Wiedersheim-Paul F. (2001) *Att utreda, forska och rapportera*, Liber Ekonomi, Malmö.

Hammenberg Y. & Widoff E. (1976) *Emballage – Handbok i allmän förpackningsekonomi och förpackningsteknik*, Nord-Emballage, Förlags AB T Fahlskog, Vällingby.

Johansson A. & Nordin J. & Ählman J. (1999) *Förpackningens affärsstrategiska betydelse*, PackForsk rapport no. 188, Kista.

Johnsson M. (1998) *Packaging Logistics – a value added approach*, Department of Engineering Logistics, Lund Institute of Technology, Lund University.

Jönson G. (1993) *Corrugated Board Packaging*, Pira International, UK.

Jönson G. & Johnsson M. (2001) *Packaging Technology for the Logistician*, Dept of Design Sciences, Div of Packaging Logistics, Lund Institute of Technology, Lund

Lorentzon A. & Olsmats C. (1992) *Förpackningens integration med distributionen*, PackForsk rapport no. 155, Kista.

Paine F. A. (1981) *Fundamentals of Packaging*, The Institute of Packaging, Stanmore, UK.

Patel R. & Davidson B. (1994) *Forskningsmetodikens grunder*, Studentlitteratur, Lund.

Trost, J. (2001) *Enkätboken*, Studentlitteratur, Lund.

Twede D. & Parson B. (1997) *Distribution packaging for logistical systems*, Pira International, Surrey, UK.

Wallén G. (1993) *Vetenskapsteori och forskningsmetodik*, Studentlitteratur, Lund.

## **7.2 Articles and papers**

Saghir M. (2002) "Packaging information needed for evaluation in the supply chain: The case of the Swedish grocery retail industry", *Packaging Technology and Science*, no. 15.

Cooper M. C. & Lambert D. M. & Pagh J. D. (1997) "Supply Chain Management: More Than a New Name for Logistics", *The International Journal of Logistics Management*, vol. 8, no. 1.

Croxtan K. L. & García-Dastugue S. J. & Lambert D. M. & Rogers D. S. (2001) "Supply Chain Management Processes", *The International Journal of Logistics Management*, vol. 12, no. 2.

Prendergast G. P. (1995) "The EC directive on packaging and packaging waste: current status and logistical implications", *Logistics Information Management*, vol. 8, no. 3.

Wakeus J. (2002) "Parcel PowerPoint presentation", Schenker Parcel AB, Gothenburg.

Schenker AB Corporate Communications (2002) "Transportvillkor", art. no. 0609, Gothenburg.

Schenker AB Corporate Communications (2002) "Fördelning av ansvar", art. no. 0613, Gothenburg.

Schenker AB Corporate Communications (2002) "Faktablad Parcel", art. no. 0903, Gothenburg.

Schenker AB Corporate Communications (2002) "Reklamationer", art. no. 0994, Gothenburg.

Schenker AB Corporate Communications (2002) "Skadeförebyggande arbete", art. no. 0995, Gothenburg.

4ROOMS Business Plan, a paper from Schenker and 4ROOMS, Gothenburg.

### **7.3 Interviews**

Carlsson S., Product Manager at Cargo Operations at Schenker AB, 2002-11-21.

Henriksson K., Consultant Manager at PackForsk, 2002-11-18.

Lilja K., Damage-preventing employee at Schenker AB, 2002-10-15 and 2002-12-04.

Lindau R., Product Manager at Parcel Operations at Schenker AB, 2002-10-25.

Twede D. Associate Professor, School of Packaging, Michigan State University, December 2002.

Wood T. J., Packaging Project Engineer at FedEx PD&D, 2002/2003.

Interviews with the employees at the Bäckebo and Lunda terminal, 2002-11-04/05 and 2002-10-15.

### **7.4 Websites**

nova.btl.com, Schenker AB intranet, 2002/2003.

www.fedex.com, FedEx Corporate website in the USA, 2003.

www.packforsk.se, PackForsk website, 2003-01.

www.schenker.com, Schenker AG Corporate website, 2002/2003.

www.schenker.se, Schenker AB website, 2002/2003.

