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How to Improve the Delivery Accuracy in the Cargo Handling

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Division of Industrial Logistics

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MASTER'S THESIS

How to improve the delivery accuracy in the cargo handling

A study at Lufthansa/SAS -Cargo terminal at Gardermoen airport
Oslo, Norway

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&
Division of Quality Technology & Statistics

How to improve the delivery accuracy of the cargo handling

Master thesis in the subject of Industrial Logistics and Quality Technology at Luleå University of Technology and Lufthansa Cargo.

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Preface

This master's thesis was conducted during a time period from spring of 2002 to the beginning of 2003. This was the final project for both Industrial Logistics and Quality Technology divisions in the master's program of Science in Industrial Management and Engineering at Luleå University of Technology.

This thesis has been carried out for Lufthansa cargo at the SAS Cargo terminal in Gardermoen airport in Oslo, Norway. The purpose of this study was to investigate how the delivery accuracy could be improved these companies, both of whom are members of the cargo alliance WOW.

I would like to express my thanks to the employees at the SAS terminal in Oslo, Norway. Without their support, patience during the interviews, and their contribution in the discussions, this thesis would not have been possible.

Furthermore I am especially thankful for the opportunity to work with my supervisors Øistein Vandbakk at Lufthansa Cargo, Anders Sörqvist at the Division of Industrial Logistics and Görgen Edenhagen from the Division of Quality Technology & Statistics at the Luleå University of Technology. I appreciate their guidance and personal engagement during this work.

Luleå Mars 2003

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Magnus Cohen

Abstract

The main business for airfreight companies is to deliver shipments rapidly, punctually, and with the highest quality possible. Lufthansa has established a delivery accuracy rate of 98%, which means that 98% of all shipments shall arrive on time. To date, the SAS Cargo terminal at Gardermoen, which handles Lufthansa Cargo's shipments, has not achieved this level of accuracy. Therefore, the purpose of this thesis is to document and demonstrate the current shipment handling flow by utilizing flowcharts, to monitor the flow of information, to identify areas with critical problems, and finally, to propose a plan for improvement.

The Business Process reengineering method (BPR), has been utilized as a guide to structure the work. The information was gathered with assistance of existing SAS flowcharts, observations of the actual handling flow, personal interviews, and statistics from the Lufthansa IT system. The information was analyzed with existing theories as problem areas were identified. The general factors isolated in the terminal that decreased delivery accuracy were: decreased numbers of available staff, low motivation and insufficient training of the employees, and inefficient communication between the terminal departments.

Three areas with the highest deviation from the 98% accuracy goal were the shipment acceptance area, shipment check-in area and the document check-in area. Of these three areas, the shipment check-in area was selected for further in-depth analysis using the BPR selection criteria. The investigation revealed that the information collected from the IT system was insufficient and superficial. In addition, there is no visible priority system which makes it possible to identify urgent shipments; thus impairing our ability to fully understand and analyze the factors responsible for delays that may hinder overall performance.
06
The primary conclusion obtained from this study reveals that LHC and SAS Cargo do not have a systematic collection of information for identifying underlying problems and their causes. It is therefore recommended that a structured approach to collect and analyse the missing information is conducted by using a seven step method. This method provides an adaptive flexibility by employing different tools and different methods as they are needed in each step.

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Wordlist

AWB	(Airway bill) The handling document with all the information that is needed in the handling flow.
Belly	Goods transported without the use of ULD.
FSU	(Freight Status Update) Electronic information, that updates the LHC system. These messages are received during the handling flow and build up the logistics information flow.
FWB	(Electronic air way bill) Identical to an AWB but in electronic form, sent directly to the IT-system.
LAT	(Latest Acceptance Time) Latest time for customer to deliver goods according to agreed time frame (see more about time frame appendix 3-2)
MSAW	(Missing airway bill): In this situation the airway bill is missing and should be reported as MSAW in the SAS and LHC-system.
MSCA	(Missing cargo): When a shipment is not found in the arriving transport it should be reported in the LHC and SAS IT-system as missing cargo.
NFD	Notify the customer: FSU message when shipment is checked in and registered in the import flow.
PCR	(Process Control Report) statistics report showing the flawlessness of shipments delivered on time to customers located at end destinations.
RCF	Check-in status: FSU message when checking in shipments in the import flow.
R4C	(Ready for carriage) Approval check of incoming shipments regarding security requirements, weight and volume
TOA	(Time of Available) Agreed time when the shipment should be available to be picked up by the customer
ULD	(Unified loading devices) Containers used in the airfreight industry.

1 Introduction

This chapter details the reasons for initiated this master thesis and presents a problem discussion.

1.1 Background

Lufthansa Cargo AG (LHC) is an airfreight handling company independent of the passenger Flight Company Lufthansa AG. To continue as one of the leaders in this business sector, LHC needs not only to be efficient but dynamic, and must adapt to an ever-changing market. This has become increasingly difficult due to vast business networking as well as more stringent security regulations following the airline tragedy on September 11, 2001. In order to maintain the highest customer satisfaction while delivering excellent service, LHC joined WOW, an alliance that was formed by uniting SAS Cargo, Singapore Airlines Cargo and Japan Airline Cargo, on April 1, 2002. The alliance agreement details the handling of each other's goods and provides standardized services. For the past two years LHC has developed a project called Cargo Customer Care (CCC), which is based on the Service Partner Achieving Cargo Excellence (SPACE) objective, created to achieve standards that are not only equal in all markets, but are easily recognized by all involved parties. An important aspect of the SPACE project is to map all the significant processes such as import, export, and transfer located in terminals within northern Europe.

Throughout the world, stations connected to the WOW alliance generate data conforming to certain measuring points, which correlate to the network standards found in appendix 3-1. The objective is to keep track of the overall performance at each station, and to monitor the efficiency of the network standards. The target for Lufthansa Cargo is to achieve a rate of delivery that is greater than or equal to 98% on the handling side. This delivery rate corresponds directly to the delivery accuracy.

Over the years, the goal of flawlessness has risen steadily, and therefore stringent demands have been placed on well functioning processes. This not only has consequences for the labour force but also for the IT-systems, which provide the network inside the company, between the alliance companies, and interconnect with third parties. The movement towards standardized services the improvement of performance consistency inside the WOW-alliance is currently underway. The importance of this movement is underscored by the need to secure the consistency in customer services demands.

1.2 Purpose

The purpose is to:

- Document and analyse the information from the handling flow of goods.
- Propose improvements to the processes at the SAS terminal in Oslo in order to achieve improved delivery accuracy.

1.3 Demarcations and conditions

In order to focus on the SAS cargo provided services, the following documentation covers only the main flows inside the SAS terminal. These services start when the shipments arrive and end when the customer receives their product.

1.4 Glossary

The following abbreviations used in the thesis are the same abbreviations used in the terminal. These abbreviations can be found in the provided wordlist and it is suggested that the reader peruse them for a optimal understanding.

2 Method

This chapter describes the research approach and the validity and reliability of the method used to achieve the objectives of this thesis.

2.1 Validation and Reliability

Eriksson & Wiedersheim-Paul (1999) described the reliability of a tool as its ability to provide consistent and reliable measurements. The definition of validity is that the measuring tool measures what it is intended to measure.

The seven step business process reengineering method applied in this study was developed by Harbour (1994), and has been used in a cargo handling process by Khan (2000). This particular method was chosen, because it had previously been used in a similar environment and produced reliable and significant results. By using this established and effective approach, the hope is to increase the validity of this work. In addition, this method will provide a stepwise overview and structure throughout the work. This method will be adopted to fit the goal of this thesis by combining other successful theories in order to achieve the most reliable results. More details on this specific method can be found in chapter 3.4.3.

2.2 Research Approach

The research approach used has been divided in four phases seen in figure 2.1 which is correlated to the steps of the BPR method.

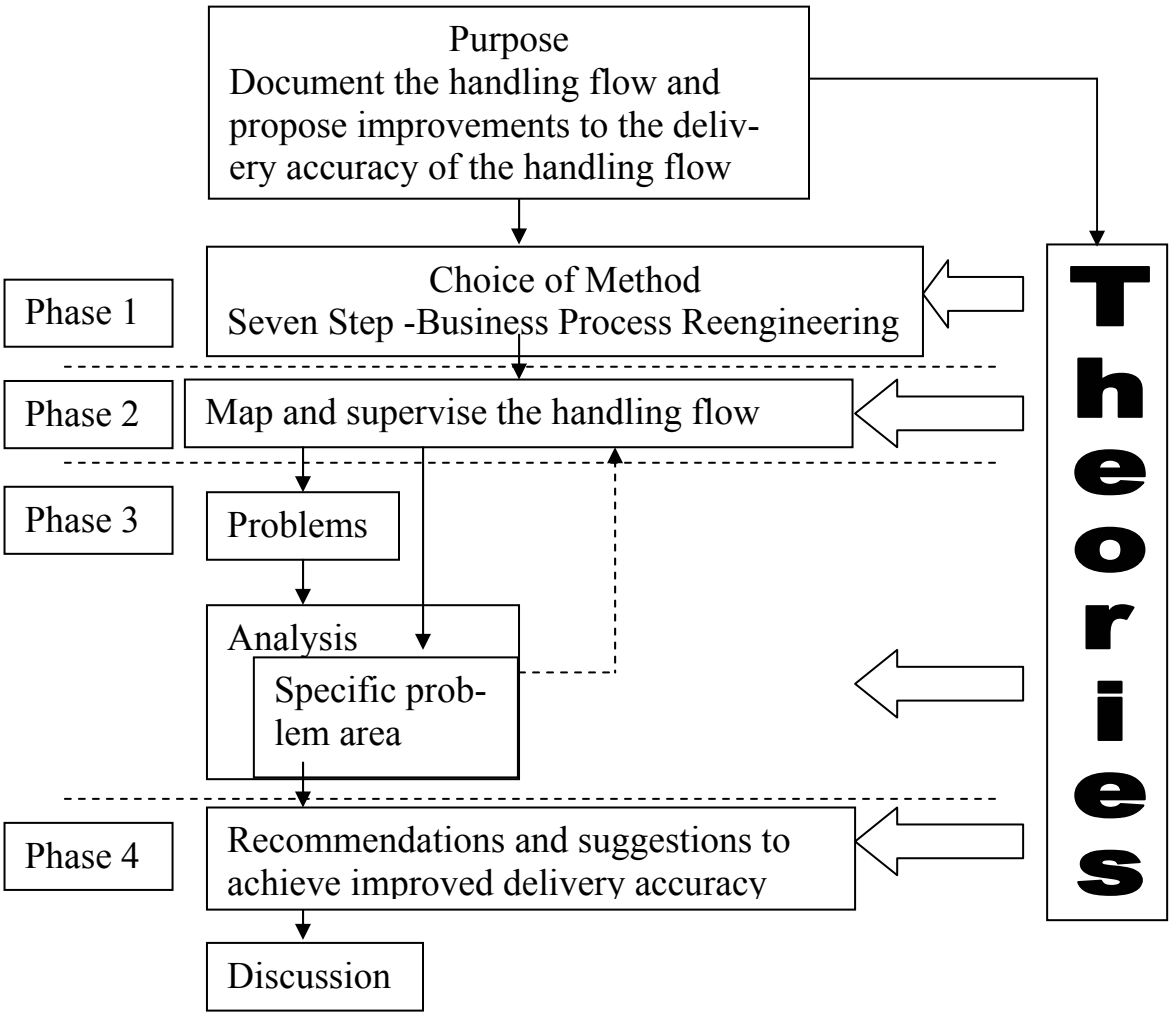

Figure 2.1 Research approach divided into four phases.

Phase 1

According to the previously expressed needs of Lufthansa cargo, the objective of this thesis is to document the handling flow and to improve the delivery accuracy. The method has been chosen accordingly. The first step of the seven step BPR is conducted to define the flow boundaries and demarcations. During the entirety of this investigation various theories were studied in parallel to

support each step of the seven step BPR and in the analyses of the problem areas.

Phase 2

The handling flow was monitored according to step 2 in the BPR-method and in accordance to the network standards (NWS) explained in appendix 3-1.

In order to identify specific areas in need of improvements in delivery accuracy, the current processes of SAS Cargo terminal at Oslo airport Gardermoen had to be documented and described. This activity outlines the second step in the seven step BPR. All flows are documented in flowcharts using Visio software and Lufthansa SPACE standards in conjunction with the network standards. This step describes the present situation in the terminal, which may be found in chapter 5.

Phase 3

The problems isolated were subsequently analysed in chapter 6. By using values shared between the two companies that could be connected with the seven step BPR , the most critical problem areas were identified. The chosen problem area was analyzed in detail using flowcharts and statistical information that was collected continuously at the different measuring points throughout the processes.

Phase 4

Conclusions drawn from analysis will be used to form recommendations that will be applied to how to proceed with the remaining steps of the seven step BPR method. Each remaining step will be supported with different methods and tools described in chapter 7. Upon completion of the seven step BPR the primary points of weakness in the specific flow area will be highlighted, and suggestions are made to reach the Process Control Report (PCR) goal i.e. delivery accuracy set by Lufthansa Cargo at 98%.

2.3 Data collection

Data has been collected from the following sources:

Primary data	Secondary data
• Interviews • Investigations of the handling flow	• Literature and Articles • Lufthansa Cargo and SAS Cargo – Documents

2.3.1 Primary data

2.3.1.1 Interviews

The interviews with SAS Cargo and LHC employees were conducted in person with prepared questions in the absence of supervisors.

2.3.1.2 Investigation of the handling flow

The flow of cargo conducted by the employees on the terminal floor was thoroughly investigated. Prior to observation, a draft chart was designed based on SAS's flowcharts. The chart was then repeatedly revised during meetings with LHC, who were not working with the flow of cargo.

The interviews with the people on the floor were conducted during regular working hours to understand how the cargo flow functioned on a day-to-day basis. The observations were then compared with the draft and the differences were documented and discussed with the managers in charge. This procedure was repeated in different work areas to document and obtain a more generalized understanding of handling flow.

2.3.2 Secondary data

2.3.2.1 Literature and Articles

Literature was collected from the Luleå University of Technology Library in Sweden and from the library in Jesshaim Norway. In Luleå the internet based library tool Bibdia was also utilized. Many articles were found on the internet site Emerald.

2.3.2.2 Lufthansa Cargo and SAS Cargo Documents

The existing flow charts and documentation detailing the handling flows and the history of the flow of cargo were received either electronically or as paper based material from both SAS and LHC.

3 Theory

This study combines two different academic disciplines, Logistics Management and Quality Management. The close connection between these two fields and their mutual influences on specific tasks will be demonstrated.

3.1 Logistics

Logistic chains are both quantitative and qualitative in nature. Quantitatively speaking they are characterised by mathematical numbers, storage levels, and route planning. The qualitative aspect of logistic chains consists of information flows and resource management.

Grosvenor Plowman refers to the “five rights” of a logistics system, namely supplying the right product, at the right place, at the right time, and in the right condition/quality at the right price (Lambert & Stock, 1993). These “five rights” are important for information flows, shipment flows, and production flows because the involvement of the supplier-customer relationship. In short, the primary objective for all logistical activities is to satisfy the customer.

This is also the case for the total cost concept (see figure 3.1), where placing the focus on the customer is part of the remains an important business concept. The task at hand is to form a correlation between the different processes so they support the business idea, reduce costs and at the same time keep a high delivery service. (Ibid)

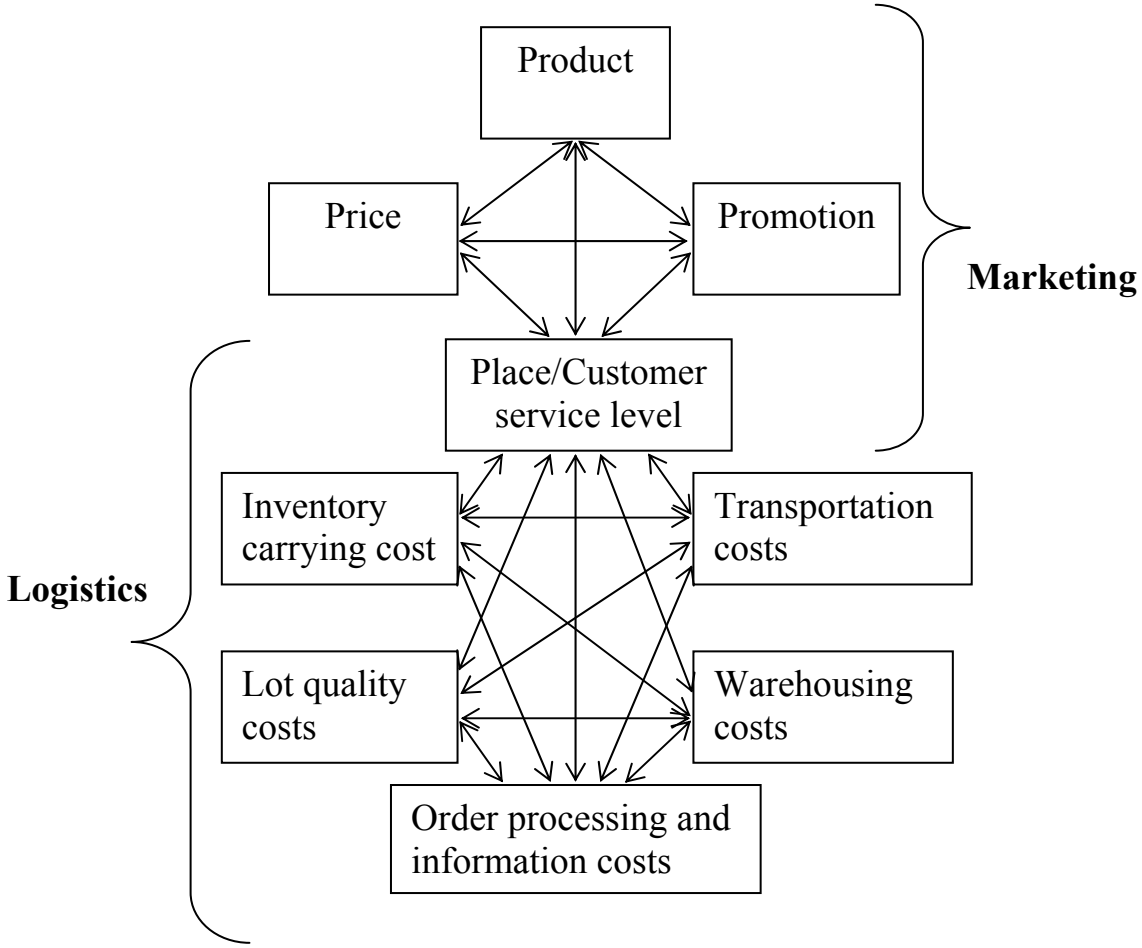

Figure 3.1 Total cost concept in relation to logistics and marketing. The primary areas in each category are labelled in addition to the interrelationships between each other and towards the customer. Citation from Lambert & Stock,1993, page 42 figure 2-1 "The Traditional Logistics/Marketing interface."

This also illustrates the relationship between logistics and total quality management by customer focus. Because the basic premises of TQM is "Putting focus on customers," as seen in chapter 3.3.1. As Coyle (1996) wrote "in order to achieve logistic value there has to be created customer value." This is represented in three ways, by efficiency, effectiveness, and differentiation. An important consideration is that value must be viewed from the customer's perspective which is represented by logistics and quality. Ultimately, it is the value of the customer that is most important.

3.1.1 Delivery accuracy

According to Lumsden (1998) delivery services are comprised of several factors including punctual time of delivery, delivery accuracy, service levels and flexibility. Furthermore, delivery service is a general concept that manages the performance afforded to the customer, which is clearly defined by (Øistein Vandbakk, Logistic manager LHC (OSL)) when they emphasize that in handling flow it is essential to maintain customer satisfaction. According to Ericsson (1997) delivery accuracy is one of the biggest problems in Swedish industry, and perhaps in the world.

The definition of delivery accuracy is:
"How good a shipment can be delivered in promised time" (Mattson 1999).

The reasons for the bad delivery accuracy performance are disturbances as described by Ericsson (1997) in Figure 3.2.

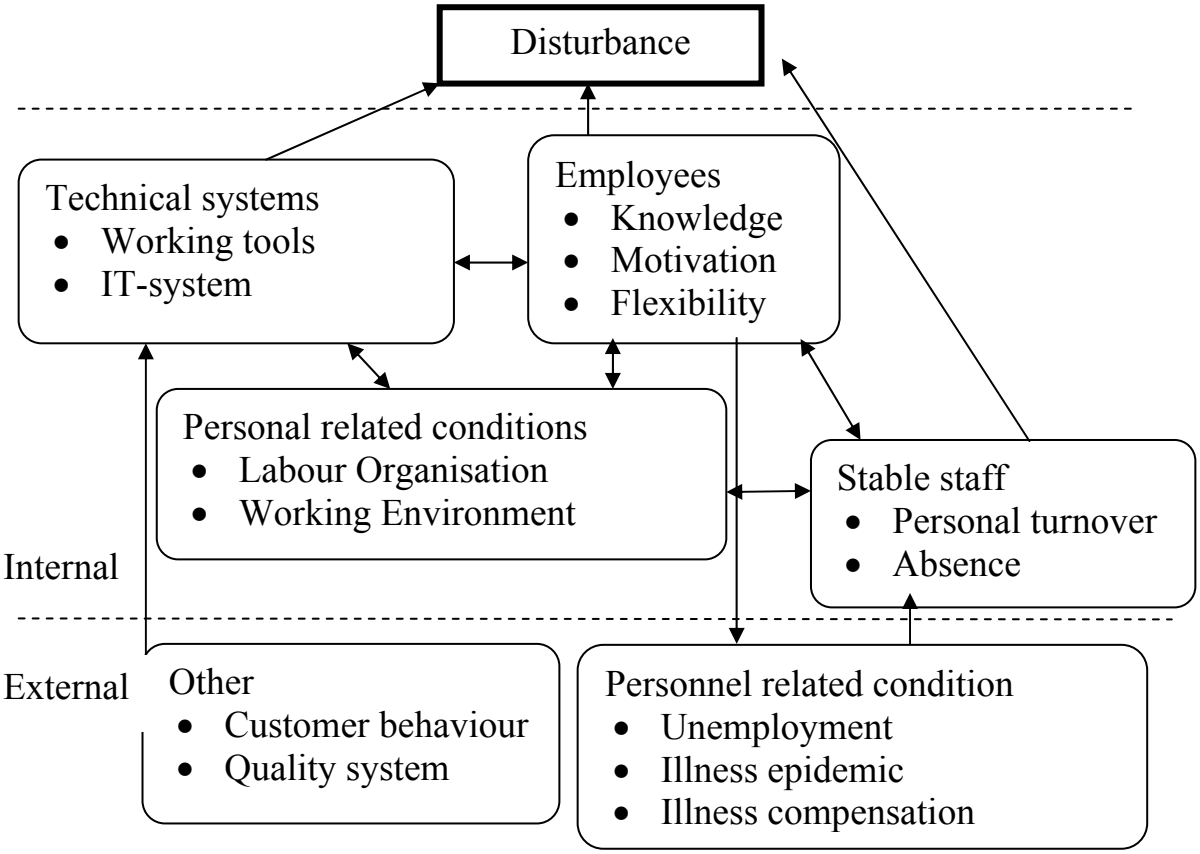

Figure 3.2 A model describing the issues behind the disturbances of the value creating process (Ericsson, 1997).

3.2 Powering Logistics

To improve logistic chains, areas that are directly connected to the TQM world should also be considered because both the logistic and quality areas create customer value as previously described (see chapter 3.1). The level of customer service is directly related to the effort to minimize disturbances as referenced in Figure 3.2. The improved quality in the supply chain influences the success of an organization and its profitability in many areas (Bergman & Klefsjö, 2001). Lambert & Stock (1993) describe the nature of the relationship in another way by stating that: "Managing logistics without incorporating the cost of quality is just as short-sighted as looking at the management of quality without considering the role of logistics." An analogous example in this thesis would be not using quality tools and methods to improve delivery accuracy in the handling flow. Logistics and quality management may complement each other by unifying objectives and efforts to achieve overall improvement. This may be referred to as "Powering Logistics" (see Figure 3.3), which is best represented by the methods and tools that provide additional improvements in the quality of our logistics.

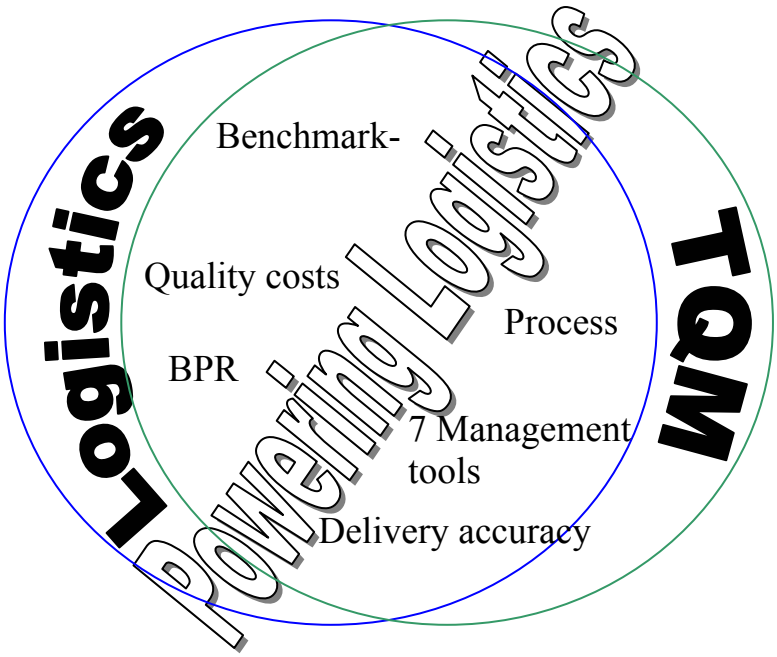

Figure 3.3 Illustrating the connection between logistics and quality (TQM).

3.3 Total quality management

Nowadays quality questions have become much more complex and are an integrated part of the company. It is now seen as a philosophy or culture and is the overall goal, described by Bergman & Klefsjö (2001) as:

"Through constant ambition to fulfil and hopefully overcome the expectations and demands of the customer with the lowest costs by continuously work for improvements were everybody are engaged with the focus on the processes of the organisation"

The impact of TQM in a company is dependent on the commitment of the companies top management, because they serve as a good example for the employees. The commitment is supposed to motivate the employees and imbue the company. TQM requires not only total company involvement but also the involvement of suppliers as well as customers.

Total commitment to quality thinking is founded on five basic elements.

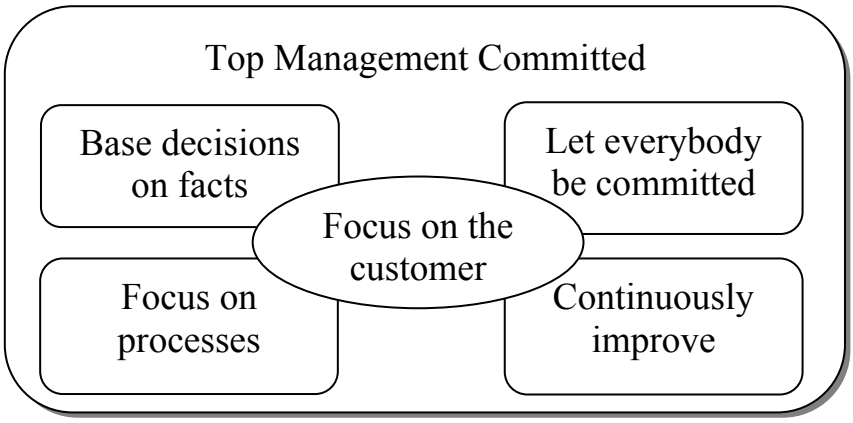

Figure 3.4 Describes the five elements of TQM. Taken out of (Bergman & Klefsjö, 2001) page 36 figure 1.9

3.3.1 Focus on the customer

"Focus on the customer" means that the quality of the product has to respond to the customer's needs and expectations. These are also influenced by factors like competitors as well as the type of product. (Bergman & Klefsjö, 2001)

When companies try to satisfy customer needs they are regarded as end customers or external customers. However, most of the significant multinational

corporations have large, complex organizations which purchase services from each other. These organizations are regarded as internal customers, as depicted in
Figure *3.5*. These two different but related types of customers must be distinguished. But at the same time it is important to note that the external customers can only be satisfied when the internal customers are concomitantly satisfied (Ibid).

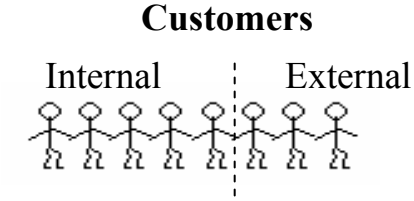

Figure 3.5 The relationship between the internal and external custmer. Fulfilling both the needs and expectations of our internal customer within our company as well as the external customer is demonstrated. (Bergman & Klefsjö, 2001) page 37 figure 1.10

3.3.2 Continuous improvement

Continuous improvement is an integral part of TQM which aims to maintain a competitive edge. It is important to continue making positive changes regardless of how significant these changes may be. According to Bergman & Klefsjö (2001) the implementation of simple steps frequently leads to significant quality improvements.

It is also essential to acknowledge that people can make mistakes. When these situations arise it is important not to look for scapegoats, but to react in a constructive manner. Mistakes should be utilized as an opportunity for education, growth and motivation to improve the process.

Many companies are unable to recognize the negative effects of poor quality do because they are unable to measure it correctly. Dan Bielinski, consulting manager in Business Strategy Group of Vichow, Krause & Co says in Chase (1998) that “if you are not measuring scrap and rework, you should start, because chances are that you have a real problem out there, and you can’t afford not to know where you stand.” “Even if you say you are good ‘My quality’s good, be-

cause I don't get complaints or returns', all that tells you, that what goes out the door is good. It doesn't tell you how much time you have to spend making it good. It doesn't tell you how much internal waste there is."

The basic rule for quality improvement is that there is always a better way to make products and services. In the end it is about how much flawlessness the company is willing to accept (see figure 3.6).

Projected outcomes in Sweden following acceptance of 99% correctness:

- Nine words spelled wrong per page in your newspaper.
- You will not get your morning newspaper almost four times per year.
- You will not have any electricity, water, and heat for about 15 min per day.
- At least 8500 medicine prescriptions incorrectly written each year.
- About 3000 checks would be drawn from wrong accounts each day.
- About 23,700 transactions would be done to the wrong account each day.
- The drinking water would be unfit for approximately 1 hour each day.

Figure 3.6 An illustration of the level of quality we would be willing to accept with 99% correctness. (Hedman &Lindvall, 1993)

3.3.3 Base decisions on facts

It is essential to obtain correct information in order to make the right decisions. The proper collection of information requires knowledge about what is being measured. In addition, the measured data have to be free from statistical variations and disturbances. Helpful tools that can be used to analyze the collected information are the seven quality control tool (QC-tool). Three of the QC-tools are present in this thesis and with descriptions to follow.

Check sheet:

The function of a check sheet is to present information in an efficient, graphical format. This may be accomplished with a simple listing of items.

Histogram:

Histograms provide a simple, graphical view of accumulated data. Histograms provide the easiest way to evaluate the distribution of data.

Flowchart:

Flowcharts are pictorial representations of a process. By breaking the process down into its constituent steps, flowcharts can be useful in identifying where errors are likely to be found in the system.

Facts not opinions are necessary on which the decisions have to be based on. (Bergman & Klefsjö, 2001)

3.3.4 Let everybody be committed

It is important to create the right conditions to make it easier for employees to get involved and to be motivated to participate in decision making and overall work improvement. Therefore it is necessary to remove the borders which restrict the opportunity for employees to participate in company operations. In turn, management should support and stimulate improvements in working conditions and encourage quality work. (Bergman & Klefsjö, 2001)

Söderlund, (2000) gives an example on how a company uses "teamwork" to measure the attitude and commitments from the workers toward the managers. They arranged regular meetings for each individual workgroup. The group manager presents the given results and the members of the group give feedback on the situation and suggestions for how to improve their work. This can be an effective tool to increase employee involvement in the cargo handling area.

According to Jan Carlzon from the book "Riv Pyramiderna"(Bergman & Klefsjö, 2001), the goal is to make workers feel valuable and appreciated for their contributions.

3.3.5 Focus on processes

The goal of a process is to satisfy the needs of the customers while minimizing use of resources. Processes are supposed to refine the delivered input into a product that fulfils the customer needs. The end-result of a process can consist

of products, service, and/or information. There are three types of processes as described by Egnell (1994) and as seen in Figure 3.7.

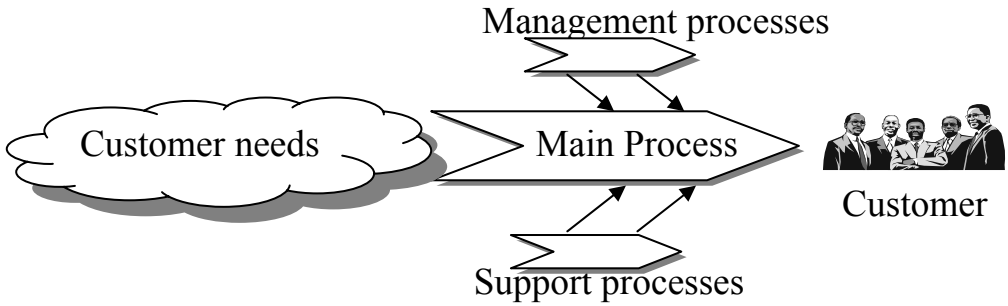

Figure 3.7 Illustrates the three types of processes (Egnell, 1994, after the idea from Rise & Wiklund, 1992)

- *Main Process*: These processes have external customers and the priority is to fulfil customer needs and expectations. Examples for these kinds of processes are production processes, product development processes, and distribution processes.
- *Support Processes*: These processes have internal customers and their task is to supply resources and operational processes. Examples for these kinds of processes are information processes, recruiting processes, and maintenance processes.
- *Management processes*: These processes also have internal customers and their objective is to make decisions about the main goals and strategies to improve the other processes active in the organization.

Processes can also be characterized by the organizational structure and by the people and hierarchies involved leading to three different process categories. (Bergman & Klefsjö, 2001)

- *Individual Processes* are performed by the individual person.
- *Functional processes* are associated with the organizational level connected to a certain department, function, or unit.
- *Main Processes* cross different departments and functions. Generally this type of process should bring revenue to the company.

To get an better overview of the processes, flowcharts are a useful QC-tool. In this thesis the functional level of details is used to see the details of the cargo handling and still see the general handling situation as seen in appendix 5-7.

3.4 Process improvements

The description of how a process is constructed and a general background information can be found in chapter 3.3.5.

Deviations from the expected performance should be considered as important information how the process is performing. This information is needed to understand the source of the variations within the process. Two aspects and one method will be presented to bring back processes to its expected performance.

An optimal method to use to build a robust goods handling system and provide empowerment for the employees is to use the business process reengineering method described in chapter 3.4.3. (Bergman & Klefsjö, 2001)

3.4.1 Empowerment

The idea of empowerment derives from chapter 3.3.4

To enable improvements in the processes, management should give co-workers more opportunities to take part in the work to improve processes. The management needs to support employees by providing them with increased responsibility, and the ability to establish goals. This allows employees to demonstrate commitment and to communicate freely within the company. It is also important to explain why changes need to occur and how they will go about making this change. It takes time for changes to take effect and to demonstrate measurable figures. The management has to work with patience over a long-term period.

The change of focus from the organizational processes to the functional one is difficult because it requires the change in the way one works and in the management style. The organizational culture is hard to change because it involves values of norms, roles, and behaviours well rooted in the organization. It is important to change the culture from promoting “We – They” with a vertical functional way of thinking to a “We – other” process view. This mentality should allow for more unity inside the organization. Promoting co-workers from different functions to work together and encouraging them to share knowledge with each other, leads to an overall improvement in the main process with which they are involved. (Bergman & Klefsjö, 2001)

3.4.2 Robust systems

Taguchi views the lack of quality of a product after delivery as a loss for the society as seen in figure 3.8.

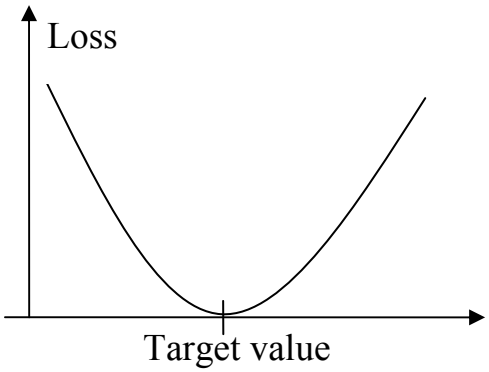

Figure 3.8 Illustrates Taguchis view on how deviations cause losses to society. The greater the deviation is from the target value the greater the losses. (Taken from Bergman & Klefsjö, 2001)

Taguchi distinguishes products according to their quality properties. Product properties are chosen for competitive reasons in the market. The quality of the product is defined by the deviation from its product property ideal. Each product is exposed to different factors of disturbances, which will have an impact on the product and contribute to variations. The product variations are most likely to be felt by the customer as dissatisfaction. Product variations can be results of tasks not executed correctly in the supply chain. In the cargo handling business it would mean that shipments have not been handled according to product type. Disturbances can never be fully avoided, therefore there is the need for a robust system. (Bergman & Klefsjö, 2001) Taguchi has designed a robust construction for production processes. This construction could also be used for shipment handling flows, where they deal with manual work instead with machines.

3.4.3 Business process reengineering (BPR)

BRP evolved in the late 1980's as a radical concept to substitute existing processes with something new and different. BPR has been in use and matured as method. One of the originators of BPR changed his view (Hammer (1996) (Bergman & Klefsjö, 2001): "Originally, I felt that the most important word in the definition was "radical". ….I have now come to realise that I was wrong, that the radical character of reengineering, however important and exciting, is not the most significant aspect. The key word in the definition of reengineering is "process"; a complete end-to-end set of activities that together create value for customer". The difference between redesigning a process and radically creating a new one is the risk of failure.

The risks of BPR (Dale, 1999):

- Inadequate analysis, planning and assessment, in particular, of current state analysis
- Management and staff not providing the leadership and direction to the process, leading to project failure in realizing its potential
- People fail to take ownership of the initiative
- Excluding people from the lower levels of the organizational hierarchy in the design and set up of new processes
- Lack of attention to the so-called 'soft issues'

Barriers that can complicate the project (Ibid):

- Traditional management behaviour
- Opposition, due to fear of what the changes might entail, in particular, during down sizing and outsourcing
- Lack of resources, time, commitment and belief
- The investment required in IT and other systems

The workflow that is selected for what a BPR should contain (Ibid):

- Significance to the business
- Degree of process failure
- Customer concerns
- Volume of paperwork
- Long lead-time
- Degree of fire fighting activities
- Financial cost to the organisation

Benefits at the end (Ibid):

- Improved quality and control
- Improved corporate flexibility
- Improved profitability
- Increased speed of service delivery and responsiveness
- Increased customer focus
- Improved measurability within the process

A method derived from the BPR is the seven step business process reengineering method (7 step BPR method). It is a standard method that has been used in

the cargo handling industry by Khan (2000). The seven step method is applied in a systematic manner using the principles of BPR.

The following seven steps are according to Khan (2000):

Step 1 **– Define process boundaries**: This step identifies the points where the process begins, where it ends, and quantifies the input and output. Define the purpose of the analysis and decide what to measure.

Step 2 –**Observe process step:** With the process boundaries, it is time to observe and describe the handling flow to understand the process. It is recommended is to use a flow chart.

Step 3 **-Collect process related data:** In this step the tools are selected to collect the data that are needed to understand the flow. It is not recommended to use time consuming methods to collect data, because the tool should not appear difficult and disturbing. More can be read about data collection in section 3.4.3.2.

Step 4 **– Analyse collected data:** The collected data are summarized and compiled for analysis. The data are interpreted to understand their significance. Depending on the data it is most easily analyzed with a tool or method, like the seven management tools.

Step 5 **– Identify improvements areas:** The goal of BPR is to eliminate or at least minimize waste. The areas of potential improvement have to be identified based on data analysis which shows where the greatest points of weakness are located. Can we shorten the handling times or minimize handling errors? Are different steps adding direct value to the handling flow?

Step 6 – **Develop improvements:** To improve the identified fields, proposals have to be made. The solution to the weak point has to be in relationship to the problem located. The ideas depend on the problems that have been identified, like changed working procedures, elimination of manual work by introducing IT tools or switch from a linear process into a parallel process.

Step 7 **- Implement and monitor improvements:** After the implementation of the improvements the let's-see-if-this-actually-works step follows. There may be a short period requiring adjustments. The general

task is to monitor the process and check for irregularities. The aim is a stable process that fulfils its goals.

3.4.3.1 Process mapping

Process mapping is a technique used to visualize and understand the process. When a process has been documented it is presented as a flowchart, showing its inputs, output, tasks and activities (Egnell, 1994). A flowchart also makes interpretation easier for the people working in the process. With these diagrams employees are better able understand their work in relation to the whole flow.

Melan (1995) recommends three approaches to gathering information when designing a flowchart.

- Observing the process
- Translate description into flowcharts
- Perform interviews with process participants. This is the most reliable method because the people working in the process are the experts of the process.

3.4.3.2 Data Collection

The purpose with data collection is to get an overall picture of how well a process performs. When collecting data, it is important that the people involved in the process are aware of it and understand the reasons behind the data collection.

The measurements generate data for the analysis of existing problems. This gives people the ability to focus on the important things for the company. It also gives the employees information about their performance. This information can work as a motivational tool. (Bergman & Klefsjö, 2001)

To identify important measuring points it is necessary to investigate the flowcharts and the existing monitoring system. Identify the areas that are vital to the effectiveness and efficiency of the total process. The best person to conduct a measurement is the person who performs the specific activity, because he/she receives direct feedback about his/her performance. (Harrington, 1991)

The data needs to be collected, recorded and plotted on a suitable chart. The data collection process described by Dale (1999) was developed for manufacturing processes. The general reasoning behind this data collection process will

be adapted to the handling industry, where the processes are not as continuous and regular as the ones in the manufacturing industry. Dale (1999) has selected specific criteria for data collection:

- Whether the data are to be collected as variables or attributes
- The frequency of collection
- Sampling risk – The risk that the sample indicates that the process is out of control even if it is not in reality or vice versa.

Different data collection plans may give different pictures of a process, but it should show changes in the process. It is also important that the management realizes that the charts generated with the data are a formal communication from the work floor about the current status of the process. If the outputs of the process do not reveal any irregularities, the data collection sampling can be less frequent or subsequently moved to other areas. The goal for any data collection is to increase the understanding of long time performances of the process. It is important that the data collection that is done is used for a specific and declared purpose. There has to be an active feedback system where the information is analyzed and returned to the work floor where it has been generated.

3.5 Benchmarking

Benchmarking is an opportunity to learn from the experience of others. According to Dale (1999), the benefits are the development of the staff and a better understanding of the processes. There are two ways of performing benchmarking, the informal and the formal. The informal benchmarking is mostly done in a unplanned way and will mostly be limited in its results because of its lack of structure and clear objectives.

Formal benchmarking is more frequently used of which there are three types: Internal, Competitive and Functional/generic -Benchmarking. The Internal one is a study of businesses inside the company. The Competitive benchmarking is a study of direct competitors. The Functional/Generic one is based on specific processes compared between different industries to find the “best in class”. Functional relates to the functional similarities of organizations, and generic refers to the broader similarities of the businesses.

A formal benchmarking is presented in the appendix 4-1.

4 Presentation of LHC and SAS Cargo terminal

This chapter gives a short presentation of Lufthansa Cargo and SAS terminal

4.1 Lufthansa Cargo (LHC)

In 1919 Lufthansa AG started to handle cargo. The cargo handling was an integrated part of the company until 1995 when it became a subsidiary named Lufthansa Cargo AG (LHC). During 2001 LHC was split up into three business groups “Logistic and Production”, “Marketing and Sales” and “Flight Operation”. These three divisions operate as independent companies and exchange services with each other.

Through the years Lufthansa has always maintained an excellent reputation in all business areas. Because of well organized and educated staff, which work after well rooted processes, procedures and a large destination network.

LHC work according to network standards since 1999 and monitor them as seen in Figure 5.1 in the IT-system called Mosaik (see appendix 3-3). There are two ways to view the performance: one general with results at all the measuring points and a second one looking at the customer fulfilment level called Process Control Report (PCR). Monitoring has revealed symptoms of failure in the current flow performance. The Lufthansa board wants to see a performance of 98 % for the PCR, which is a higher goal then most other cargo companies. As the handling system is unable to fulfil these goals, the LHC’s management has issued orders to improve the performance figures.

4.2 Lufthansa Cargo –OSL

Lufthansa Cargo in Oslo (OSL) consists of a sales and a logistics department. The terminal handling services are purchased from SAS Cargo, which is LHC WOW-partner (find more about WOW in the appendix 1-2) at Gardermoen airport. Both companies have contracts which specify service quality and cost.

4.3 Lufthansa Cargo Services

Lufthansa Cargo provides three service levels: Td.Pro, Td.X and Td.Flash shown below. Real time information of any shipment handled can be retrieved through the Internet 24 hours per day. All shipments are booked and locked in a

time frame interval. The time frame (see appendix 3-2) interval starts with the Latest Acceptance Time (LAT) and ends with the Time of Available (TOA).

- **Td.Pro**

This is a basic product considered fast and economical. It is the most frequently purchased service and has no performance or capacity guarantees.

- **Td.X**

This is the premium product, that is faster then Td.Pro and includes performance, capacity and money back guarantees.

- **Td.Flash**

This is the premium plus product, the fastest service provided by Lufthansa Cargo. It has the same guarantees as Td.X but is conducted over a shorter time frame.

4.4 SAS Cargo terminal

The Gardermoen airport near Oslo was constructed in the year 1998 with the intention to create the main hub for flight/truck cargo and mail in Norway. The SAS Cargo terminal was designed and equipped according to state of the art technique. This included a fully new automated conveyor belt and scanning devices, to reduce the manual work.

5 Present situation

This chapter presents the current handling situation at all areas of the SAS cargo terminal in Oslo, Norway. Background, problems and the current measures are described.

5.1 General terminal situation

After the construction of the terminal the expectations on the handling performance were high. The results were however not as promising as expected. The terminal continues to suffer from some significant problems, which mostly concern the sophisticated conveyor belt. It was constructed to automatically read barcodes on the shipments and then sort them accordingly. However, the barcodes on the cargo have to be manually identified by the staff with help of hand scanners because the system can not read them automatically. In addition, the conveyor belt is not able to transport heavy and bulky shipments, which have to be transported manually in to the terminal.

The terminal is equipped with portable scanning devices for accepting and checking in shipments. At shadowed areas in the terminal, however the scanning devices don't work and the reason is that the transmitters used by the portable scanners are not positioned all over the terminal. One of these areas is at Gardermoen perishable centre (GPC) (see more in appendix 1-1) where the fresh fish shipments are received for export.

5.2 Problems related to monitoring the handling flow performance

The monitoring of the handling performance is done with the data input in the SAS Cargo terminal. Figure 5.1 presents an overview of the monitoring points in the terminal according to the network standards (NWS) (see appendix 3-1). The statistical evaluation of the information from the monitoring system makes it possible to understand how well the processes perform. Certain NWS monitoring data are also available to customers who like to see where their shipment is in the handling flow. However, if the monitoring instruments do not work properly the information service is of no value.

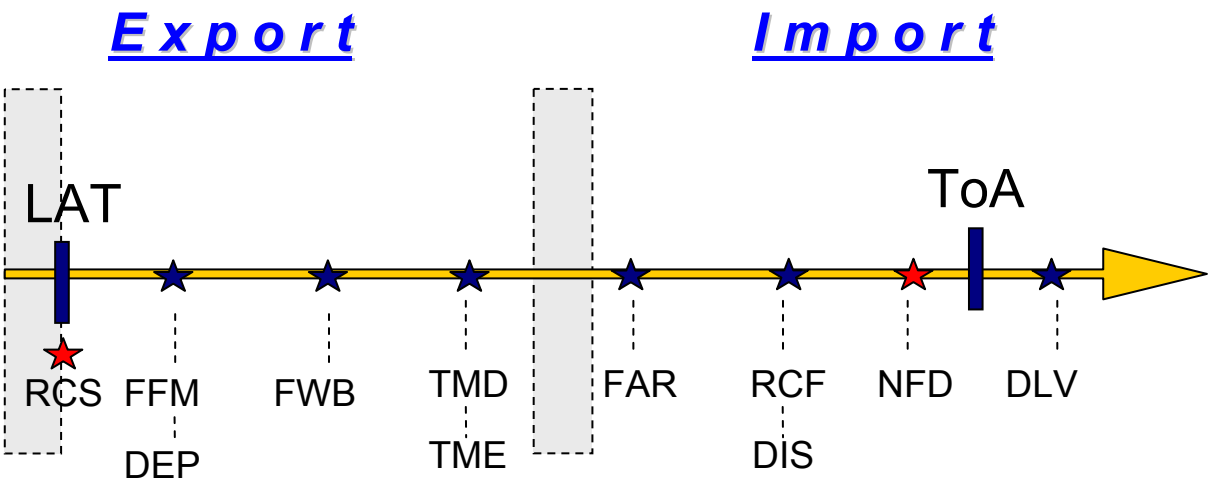

Figure 5.1 Monitoring points in the SAS terminal. Monitoring starts with RCS that is acceptance, which is part of the Export flow and finishes in the Import flow with DLV which is "Shipment Delivered".

There are more monitoring points in the NWS than are illustrated. However according to the Lufthansa staff they are of lesser importance and therefore not currently used.

One of Lufthansa quality goals is to perform better then 98% in all parts of the NWS. The most important points of the NWS are included in the statistics called Process Control Report (PCR). All measuring points in Figure 5.1 are part of the network standards but not all NWS are taken into account in the PCR statistic. The red stars in the figure are the PCR points, showing the beginning and the end of the handling flow. This information is used by Lufthansa Cargo's upper management to evaluate the performance in the SAS Cargo terminal.

PCR Performance		
OSL Performance in average	LHC goal	SAS Cargo goal
96,1 %	98 %	95 %

Table 5.1 Illustraits the average PCR performance at SAS terminal in Oslo and the goals for LHC and SAS Cargo

The current PCR performance is below the goal of 98%, which can be verified in table 5.1 which shows the calculated average from the weekly performance reports. The performance reports are from week 30, 2001 until week 21 , 2002. The weekly performance reports are composed and illustrated in figure 5.3,

Figure 5.4, figure 5.9 and figure 5.10. SAS Cargo, which handles the Lufthansa cargo shipments, has quality goal of only 95%, which is 3 % lower. Lufthansa Cargo in Oslo is aware and concerned about the discrepancy of its services handled by SAS Cargo. Lufthansa cargo in Oslo, therefore has actively monitored the major problems to assure that SAS Cargo fulfils the agreed quality goals. The monitored performance is presented to the SAS Cargo management during regular meetings

Because of the poor results in the PCR report, the LHC management has requested a detailed analysis of the statistical figures related to the PCR report and improve the PCR report to 98 % performance. Therefore, an integral part in the collection of information in this study were the deviations (see table 5.2) in the factual performance from the expected performance which have been manually extracted through checks on all imported shipments and then compiled. The task was to identify, quantify, and localize the deviations in terms of the type, percentage of deviation and where in the handling flow it occurred (see table 5.2). The shipments where checked through the LHC IT-system and if a deviation was found it was corrected in order to improve the PCR-report performance. This statistical analysis has been carried out for week 28 to 31and the results are presented in detail in form of pie charts (see appendix 5 figure B and C). No analysis prior to week 28 was possible because no standardized data collection has been done before.

Types of deviation
Late RCF = Shipment has been checked in late
No RCF = Shipment has not been check-in
Late RCF-Tranf = Transfer shipment has been checked in late *
No RCF –Transf = Transfer shipment has not been checked in *
Late NFD = Customer has been notified late
No NFD = Customer has not been notified
Late MSCA = Missing Cargo is set in to the system late
MSCA = Missing Cargo has not been set in to the system
MSAW = Missing Airway bill has not been set in to the system

Table 5.2 Explanation of currently used types of deviations.

* = Transfer shipment arrives in Oslo in transit to be forwarded to other destinations

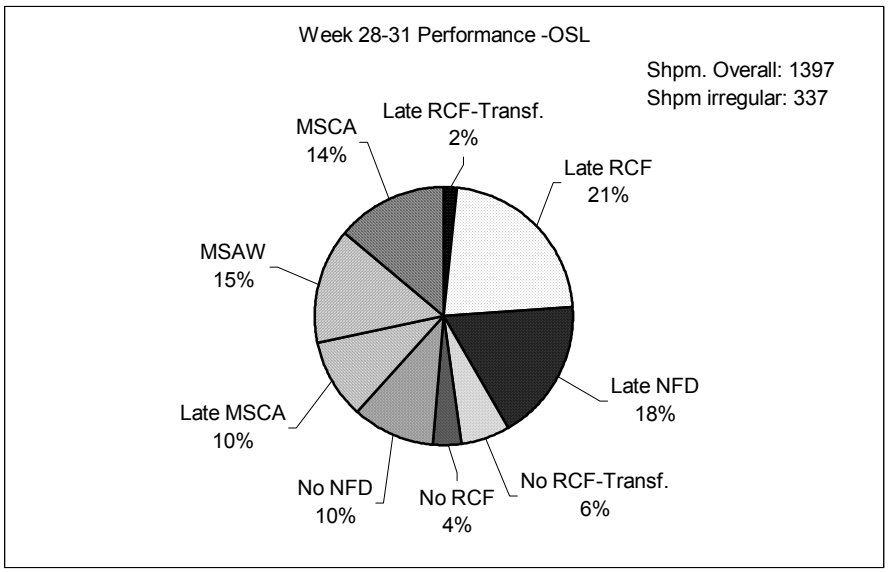

Figure 5.2 Average performance deviations in percentage from week 28 to 31 in OSL Import flow.

As seen in Figure 5.2, the largest part of all deviations is late RCF, late NFD and late MSCA with 49 % related to delays. The deviations related to MSCA and MSAW is 29 %, i.e. notifications not inserted into the IT-system by the staff. In the right upper corner of Figure 5.2 is the total number of imported shipments during this period. This is presented together with the number of shipments with one or more deviations.

5.3 Current situation of the main handling flow in OSL cargo terminal

This chapter gives a more specific description of the different areas highlighted in Figure 5.1 and the problems related to these areas in the logistic flow.

The information is based upon the documentation of the flowcharts (see appendix 6, 7 and 8), personal interviews, and on observations such as the collected statistics as seen in figure 5.2. As seen in the flowcharts, the different monitoring points are presented in NWS codes according to the NWS manual.

The general terminal plan can be seen in figure D, appendix 9. Presented there is the KR group which is responsible for transports that delivers the shipments to and from the aircrafts. From figure D, it should be recognized that there is an area outside the terminal building called the KR. This group is responsible for the transports of the shipments to and from the aircrafts. They currently meas-

ure the delivery accuracy on arrived shipments through time records. This measurement is not part of the monitoring points from the NWS.

The abbreviations below describe the different steps of the NWS which are connected to a specific NWS-code in order to facilitate reading for the SAS Cargo and LHC employees.

5.3.1 Export

The export handling flow consists of the following NWS monitoring points:

- RCS - Shipment accepted
- FFM/DEP - Flight departed
- FWB - Flight departed
- TMD/TME - Actual time of departure

A detailed performance analysis has been conducted only for the PCR part. Three other measuring points in the export flow i.e. FFM/DEP, FWB and TMD/TME are not included in the PCR report and are therefore, of minor importance. According to the process owners they do not influence the overall performance of the import flow.

Shipment accepted – RCS –(NWS code: EXP01)

The acceptance of the shipment from agent/private customer is reported to the LHC system. The RCS is part of the network standards and is included in the Process Control Report (PCR).

Shipment acceptance performance

After the goods acceptance staff has received and approved the shipment regarding the paid weight a RCS is inserted into the Lufthansa cargo IT-system. In order to be carried on to an aircraft or truck, the shipments have to pass rigid controls. The acceptance handling flow can be found in appendix 7, chart 5 and 6.

Figure 5.3 and Figure 5.4, illustrate the percentage of goods which have been registered according to time schedule from week 30 in 2001 to week 21 in year 2002. The results clearly show that during the 44 week study period the level of 98% fulfillment is reached or surpassed during only 4 weeks. The largest negative deviation from the target is 12.3 %. The average performance is 96.8%.

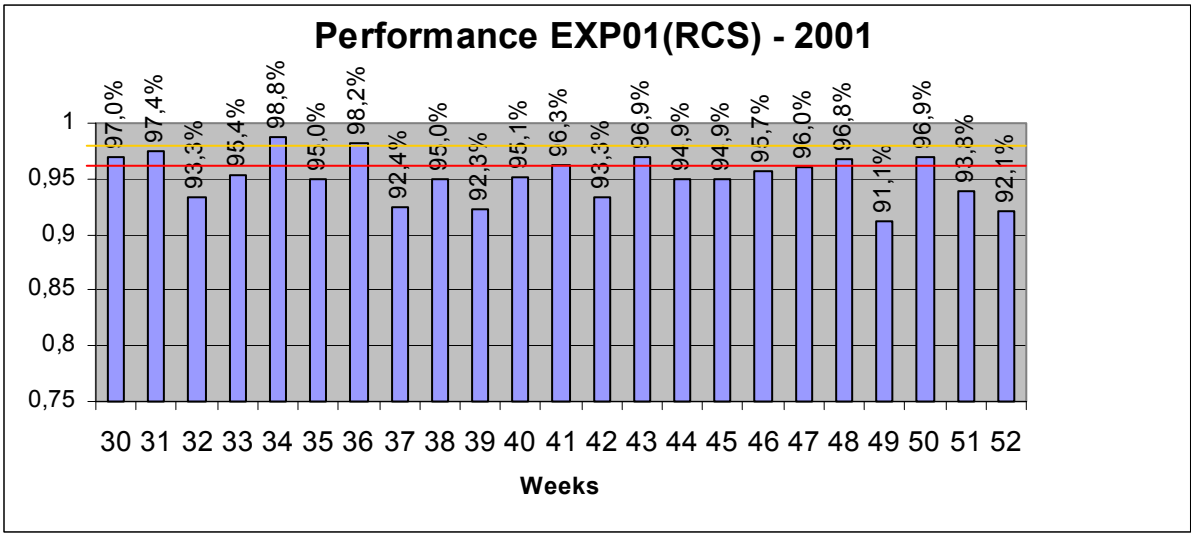

Figure 5.3 . Acceptance performance from week 30 2001 to the end of the year.

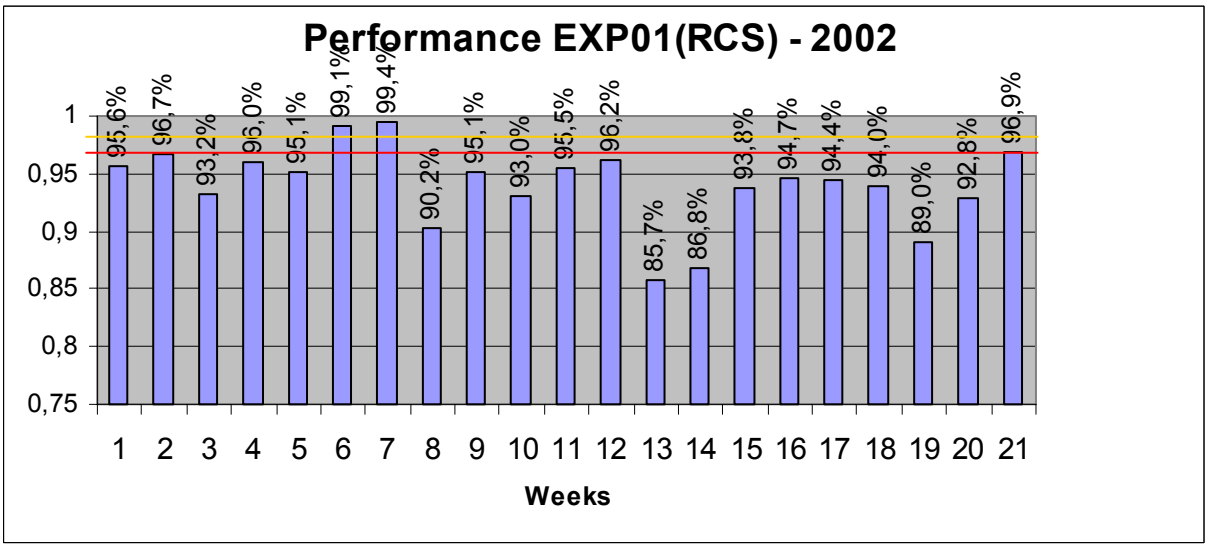

Figure 5.4. Acceptance performance from week 1 2002 to week 21 2002.

The shipment acceptance area consists of two main steps:

1- Late check-in
2- Ready for carriage check (R4C)

1- Late check-in:

There are problems with the acceptance at check-in after Latest Acceptance Time has past (LAT). Normally, goods are accepted and a RCS message is

transmitted between one and a half and three hours before the scheduled flight or truck leaves. The time difference depends on the service type (see chapter 4.3). If however, the customer delivers shipments to the acceptance area after LAT, the goods should not be accepted unless the customer is willing to change the time of availability (TOA). If the customer accepts, the shipment will go if possible on the scheduled flight, or with a later flight. If the shipment has been accepted without changing the customer's TOA the flight handling company has to deliver according to their established agreement. If the RCS message has not been sent the LHC-system assumes that the shipment has not been delivered. SAS goods acceptance performs the check-in with a scanner to avoid human errors and to automatically alert the system in case of check-in after LAT.

Other problems of late check-in are connected to fresh fish shipments, which are organised by a company called GPC (see appendices 1-1), which is located in another area of the terminal. SAS takes care of the check-in for GPC but they have problems because in that area the scanners do not work. The reason is that there are no receivers able to pick up the transmitted information from the scanners which therefore have to be manually put in.

Causes for late check-in:

- Agents deliver shipments late
- Not enough people to check-in
- Scanning equipment not working inside GPC area

2- Ready for carriage check (R4C):

The R4C involves weight and volume checks to avoid financial losses due to the handling and transportation of goods that are heavier and bulkier than agreed upon. It is obvious that handling of non-standardised goods in a standardised handling flow causes extra costs and work effort. The procedure has been worked out during the CCC project, which is described in appendix 2-1. In addition safety checks are conducted to ensure that shipments comply with international safety regulations. An agreement between LHC and SAS Cargo OSL stipulates that SAS should R4C-check 25 % of all LHC accepted shipment. Included in the 25 % RC4-checks all shipments, which are handled by LHC selected globally operating agents should be checked (see figure 5.6). During the last year and a half in average only 6.2 % instead of 25 % of all shipments have been checked (seen in Figure 5.5). Today all fish shipments are checked by GPC, which do not conduct a complete R4C check. They only per-

form a weight check. According to approximation from LHC in OSL 1.4 % of total weight is not paid for. Another issue is that non standardised cargo causes extra handling efforts that reduce efficacies throw out the handling flow according to the process owners.

Causes why shipments are not R4C checked:

- Recently introduced extra security checks on all unsecured shipments, i.e. a shipment sent to a non-regular customer. The additional check takes time and leaves no time for R4C checks.
- Agents generally come to the acceptance with their shipments just before deadline. The workload culminates therefore at LAT and the work force has no time to make R4C checks in combination with the security check.
- The R4C Weight & Volume checks are still conducted manually and are therefore time consuming.

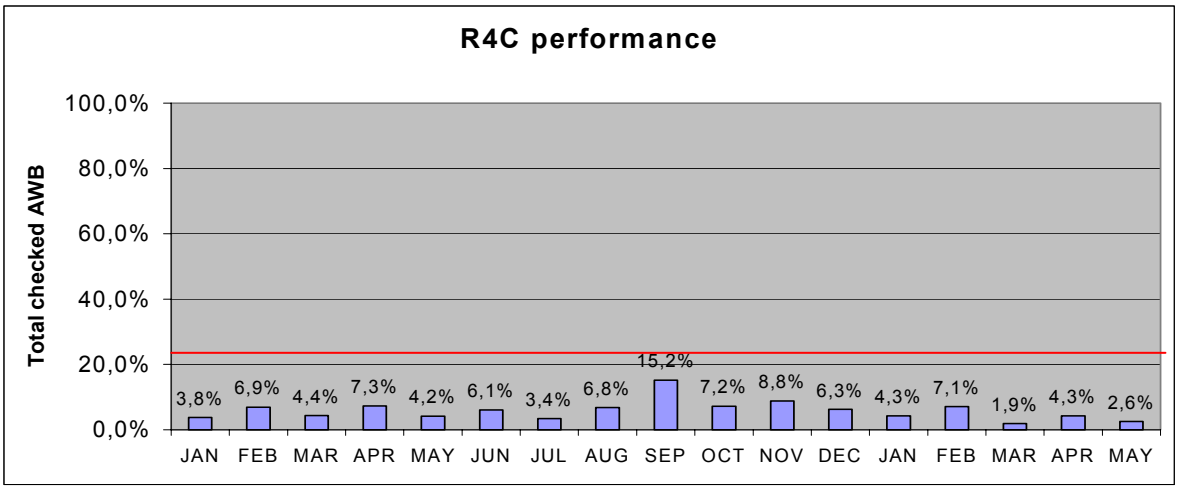

Figure 5.5 The overall R4C performance excluded fish for all checks done by acceptance. From Jan 2001 until May 2002.

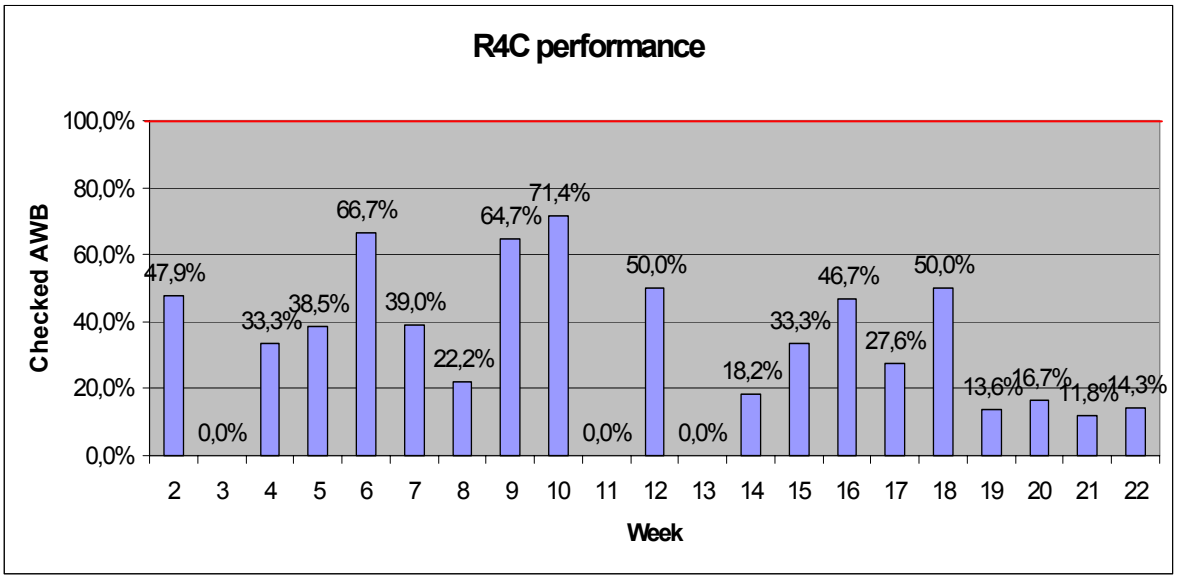

Figure 5.6 The performance level of the R4C checks performance on the shipments of the three selected global agents during weeks 2 to 22 in 2002. On average, 31.7 % of these shipments have been checked. In three weeks no checks were conducted.

Flight departed – FFM/DEP – (NWS code: EXP09)

Finalization of the activities on the flight/truck is reported in LHC system – 30 minutes after actual time of departure.

Flight departed – FWB – (NWS code: EXP08)

Entire air way bill (AWB) is entered into the in LHC IT-system.

Actual time of departure – TMD/TME – (NWS code: EXP08)

The actual time of departure for aircraft and truck.

5.3.2 Import

The import handling flow consists of the following NWS monitoring points:

- FAR - Flight arrived
- RCF/DIS - Goods check-in
- NFD - Shipment notified
- DLV - Shipment delivered

Flight arrived – FAR – (NWS code: IMP01)

The actual time of arrival of the transport at the SAS Cargo terminal is reported to the LHC system. The FAR is part of the network standards but not included in the Performance customer report (PCR).

Goods check-in – RCF – (NWS code: IMP02)

The RCF is part of the network standards but not included in the Process control report (PCR). At the check-in area the arrived shipment is checked in according to its priority, any damages/irregularities are registered. The RCF message is sent to the LHC system, which in this way is updated for tracking purposes and to make sure that the tight timelines for critical shipments are met. When a shipment has been accepted at check-in, it is not ready to be picked up by the customer. The documents have to be registered and completed before the customer is notified. It is very important that shipments are checked in accordance to their priorities, because of the money back guarantee that exists for shipments with short timelines.
It is important that the RCF status is inserted into the IT system to allow for customer notification in the next step: NFD-where the customer is informed that his/her shipment has arrived. Each shipment has a set TOA and the delivery accuracy for the customer will be directly affected if the RCF status is not send.

The registration of arrived shipments are made automatically by scanning the barcodes. This requires however, that the electronic manifest (FWB) has been entered into the system. Otherwise the registration has to be done manually. If shipments have been offloaded or have been lost during the transportation a check-in can not be carried out. Normally a missing cargo message (MSCA) is automatically sent into the system. This is done no later than 3-hours after the plane has landed, otherwise no one will be aware of the fact that the shipment is missing and no action can be taken.

Causes why shipments in arrival are not checked-in on time or are not reported as missing:

- The shipments from an arrived aircraft have been delayed by the transport personnel.
- The shipments have been picked up too late from KR belly parking outside the SAS terminal by check-in personal (see appendix 9).

- During hours when a lot of shipments arrive in the check-in area there are not enough people working.
- There is extra work due to FWB not being sent with the shipment and MSCA not being inserted into the system.
- The Belly wagons parked outside the terminal are not marked after highest priorities.

Figure 5.7 and Figure 5.8 show the monitoring performance of the RCF point between week 30 in 2001 and week 21 in 2002. It can be seen that the performance level of 98 % is only reached in a few cases. The average is 93.9 % with measured deviations reaching 20.9 %.

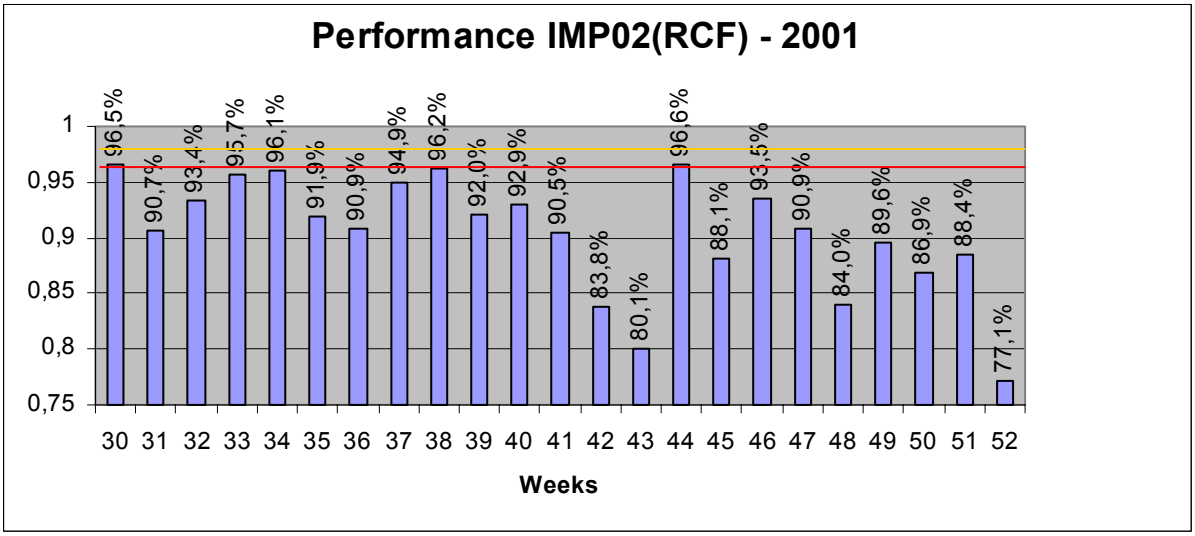

Figure 5.7 The monitoring performance of check-in from week 30, 2001 to the end of the year.

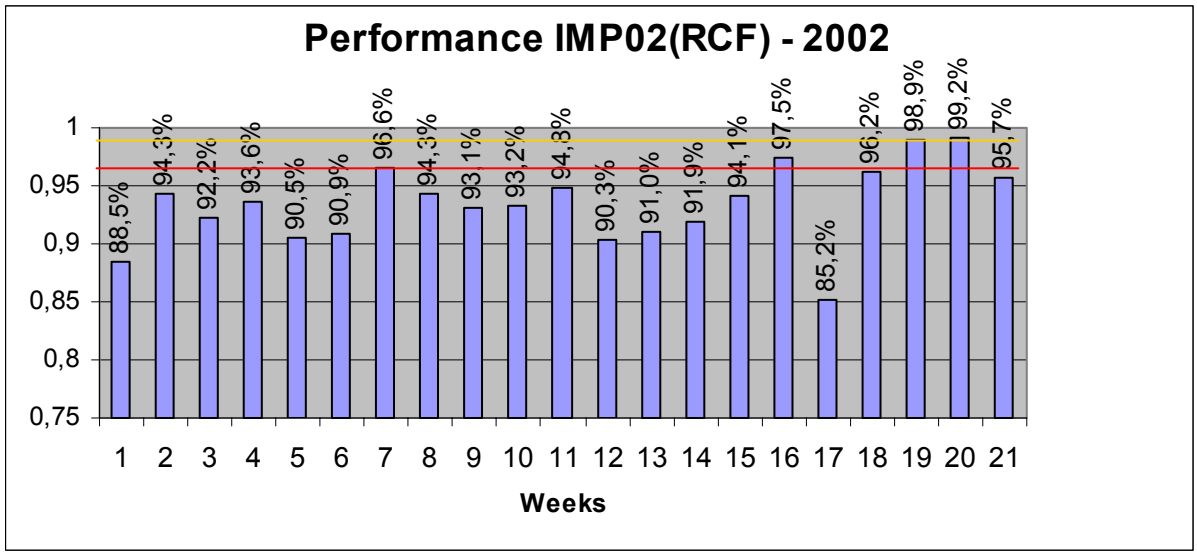

Figure 5.8 The monitoring performance of check-in from week 1, 2002 to week 21, 2002.

Shipment notified –NFD – (NWS code: IMP03)

The NFD is part of the network standards and is included in the Performance customer report (PCR) statistics.

The NFD is an automatically forwarded message that is triggered when check-in (RCF) is completed and the documents of a shipment have been accepted. The customer is notified that his/her shipment is ready to be picked up. This notice has to be sent before the TOA time has expired.

Problems with the NFD:

- Failure at this part will affect the delivery accuracy towards the customer directly. The problem at this area is that the NFD is not sent at all or has been sent late to the customer.

- Figure 5.9 and Figure 5.10 show the performance level of the customer notification during the period between week 30 in 2001 and week 21 in 2002. Obviously the performance level is relatively consistent at 97.5 %. This is, however, below the target level of 98 %.

Causes why not "hold for pick up" (NFD) is being sent:

- The SAS IT-system is not able to send NFD messages to customers which are not agents. For non-agent shipments they have to be sent manually by SAS personal. These messages are not done consistently, and sometimes they are too late or have not been done at all.
- The documents have been lost or arrived late at the electronic information

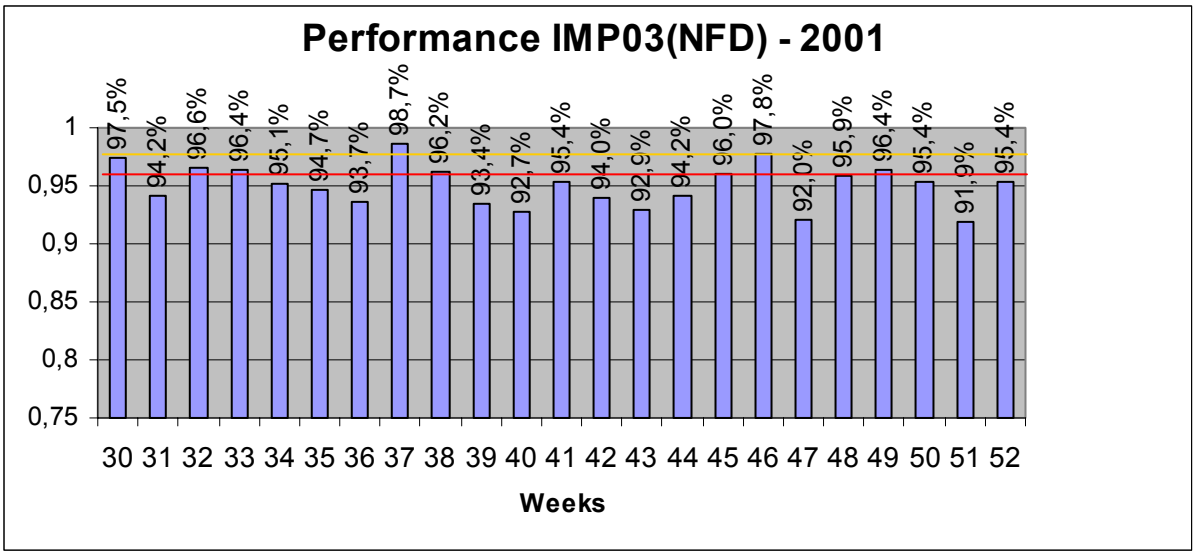

Figure 5.9 The monitoring performance of customer notification from week 30, 2001 to the end of the year.

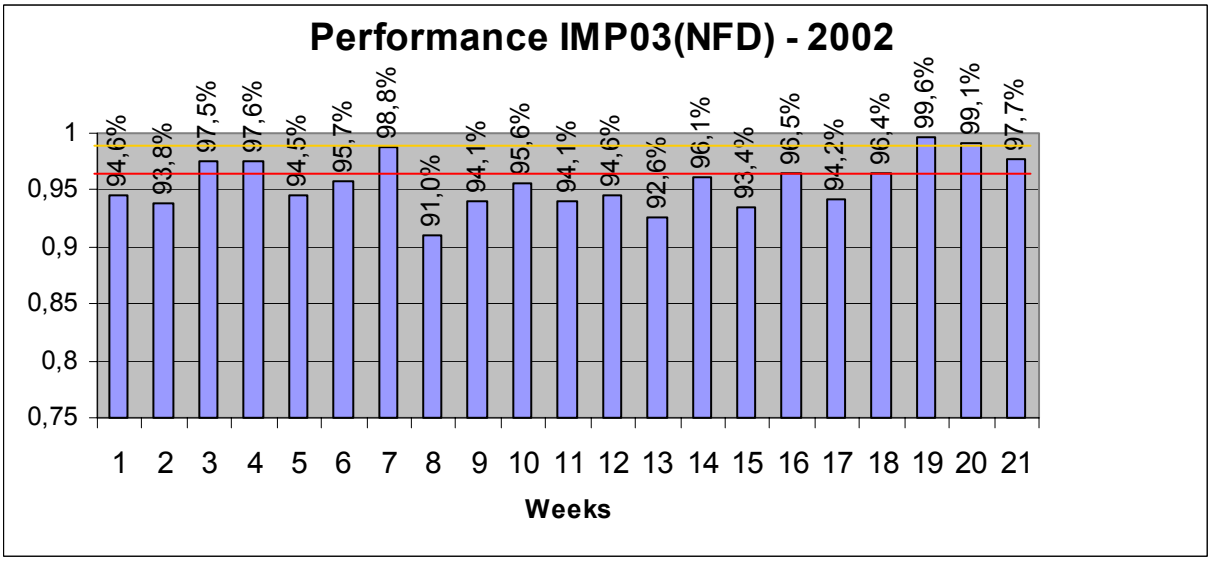

Figure 5.10 The monitoring performance of customer notification from week 1, 2002 to week 21, 2002.

Shipment delivered – DLV – (NWS code: IMP04)

At this point, the customer confirms the retrieval of their shipment. This is inserted into the IT system. The DLV is part of the NWS but not part of the PCR.

5.4 Regular meetings covering the handling flow performance

Every second week there is a meeting between the management of SAS Cargo and the logistic manager of LHC. During these meetings the current performance and problems connected to the services are addressed. Many of the issues that are focused upon during the meetings are old, unresolved problems.

5.5 IT-System comparability

SAS Cargo uses a different and older IT-system than Lufthansa Cargo. This leads to compatibility problems when exchanging information with other handling systems.

5.6 Common terminal issues discovered during interview and discussion

The documentation of the handling flow offered the author the opportunity to obtain detailed information from the employees working on the floor. The initial questionnaires were followed at a later point in time by another questionnaire to fully understand the responses from employees. The most common and relevant opinions are presented below. They offer a subjective viewpoint of the situations surrounding employees in the terminal.

5.6.1 Training

There is no current, systematic approach for work force training. However, some employees in functional positions may utilize training courses. The majority are introduced to their duties by more experienced workers. Therefore, it is difficult to understand how the handling flow really works from a flowchart. However most employees do not have direct access to a flowchart or even know that they exist. During the vacation period, people are sometimes moved to departments without any knowledge of the specific work. Some employees proposed to solve the problem by letting the summer workers come in earlier to overlap with the more experienced workers.

5.6.2 Workers engagement

The employees' general opinion is that they are understaffed because of down-sizing. In addition, it is difficult to get substitutes for people during absences. The employees are divided into small groups that work in specific areas and are hindered in their performance when someone is absent. Each area has different physical workload conditions. For example, one person works the whole time with the fork lift and another person may be assigned to more physically demanding activities without interruption. This is perceived as being unfair and may also lead to an early degradation in health. Some employees proposed to introduce job rotations, i.e. letting people work with changing tasks in the working area. In this case people could more easily support other groups during periods of intensive work load.

There is no feedback system intended to capture the employees' ideas or opinions. Problems and other issues from the floor do not reach the management. There is a recognizable interest on the floor to take part in improvements and to initiate activities that allow for these changes. Many employees expressed their feelings of frustration about not being taken seriously, and not being listened to.

The overall impression is that when things go wrong and the problems should be analysed and corrected, nothing really happens. The reason seems to be that responsible managers only want to get rid of the problems by passing them on to lower levels of the organization instead of engaging themselves in finding a solution finding.

5.6.3 Internal communication

Due to the recent merger of SAS Cargo with Braathens many people feel uncertain about their future, because not enough information has been given to them. Consequently, this has a negative effect on their performance. In general, communication between departments is inadequate. When the office responsible for registration of import documents does not inform the check-in area that the shipment documents have been inserted in the IT-system the shipments can not be checked-in and are therefore delayed. Another reoccurring problem is that information is not transferred from one shift to the next one. Therefore, tasks that should have been completed later that day are not executed and mistakes are made concurrently.

5.7 Current and future changes to Oslo terminal

- SAS IT system called “Carin” is being replaced by a newer system. The old system only has a limited capability to exchange electronic information with other companies. The new system is supposed to make the communication with external IT systems smoother and more flexible.

- Due to the take over of Braathens by SAS big organizational changes are underway. SAS Cargo has taken over the employees of Braathens Cargo and has retrained them for the work at the SAS terminal. The old station used by Braathens will not be closed for competitive reasons, but its final use is under investigation.

5.8 Summary of the present situation

LHC has a higher handling performance goal than SAS Cargo, which in fact handles their shipments. The upper management of LHC is not happy about the current situation and the LHC employees in Oslo have started monitoring the statistics in order to understand the reasons for the deviations in the handling performance. The monitoring points seen in Figure 5.1 are documented and described. The areas RCS, RCF, and NFD have the biggest problems regarding the handling performance goals and show the largest variations in the handling performance.
The general situation in the terminal can be summarized after the interviews and discussions with employees from all areas of the handling flow:

- Employees generally do not use the handling flowcharts which, in addition, are different between LHC and SAS Cargo.
- The SAS Cargo management does not take the employees ideas and opinions into consideration.
- The information flow from management to employees and the communication between the different areas in the terminal is not working well.

6 Analysis

In this chapter the results of the inquiry presented in chapter 5 are analyzed using the theories presented previously in chapter 3. The intention is to bring forth different ideas and proposals to improve the delivery accuracy.

6.1 Handling flow situation affecting the choice of action

6.1.1 Poor quality in the terminal

Generally speaking, the terminal flows are characterized by a lot of double work, because small mistakes are made and procedures are not followed. An example is the correction work to improve the PCR statistics, unnecessary double work because of mistakes done in the handling flow. A specific problem example is that shipments cannot be loaded on the aircraft because they are either too heavy or bulky or the aircraft is overbooked. The reason for the extra work in this case is the missing R4C check needed to make sure that the shipments comply with agreed weight, volume, and regulations. The real reasons behind this problem, however, are usually not investigated. Instead, the problems are rather named and described and the person responsible is put in question. In Chase (1998), it is mentioned that people can make mistakes and the solution is not to hunt scapegoats. Instead, energy should be used to find possibilities for improvement and for reduction of mistakes by using existing information. With fewer mistakes there will be less work to correct and find out why the mistakes occurred. Dan Bielinski (Chase, 1998) says “Even if you say you are good ‘My quality is good, because I do not get complaints or returns’, all that tells you that what goes out of the door is good. It does not tell you how much time you have to spend making it good. It does not tell you how much internal waste there is.”

6.1.2 Need for a robust system

Despite years of meetings and efforts to improve the steps in the handling flow, the problems are still not resolved. Appendix 5, figure B shows that the main problem areas vary from week to week. Measures to improve the problem area that are discovered are very short lived. According to Taguchi (Bergman & Klefsjö, 2001), a robust system is needed to reduce the negative factors of the flow in order to get away from variations in the handling flow. Also Ericsson

(1997) looks at issues behind the disturbances in a similar way. To find the disturbing factors, data needs to be collected regarding the performance inside the terminal. At the moment the monitoring system gives only a basic view of the handling flow performance. With the existing data alone it is difficult to find solutions, and to improve the delivery accuracy. Also Bergman & Klefsjö (2001) suggest measuring the information that can tell something about how the flow is performing to enable improvements.

6.2 Selecting the most critical area

During the documentation and investigation of the terminal many problem areas were found relating to the delivery accuracy. In order to make improvements in a limited time frame, there needs to be an increased focus placed on a specific area. This is accomplished by selecting the most critical problem area. This should be the first step in building a robust system capable of eliminating disturbances of the handling flow.

To develop the right criteria for the selection of the most critical area the BPR-method, Dales (1999) (see chapter 3.4.3) was rewritten to fit the handling flow. of SAS Cargo and Lufthansa Cargo (see table 6.1)

The criteria of importance for LHC and SAS – Cargo in combination with the aspects of Dale (1999) are as follows:

Criteria	
A	Elimination of work time, wasted for PCR performance correction
B	Direct responsibility for bad performance
C	Having direct effect on customers
D	Synergy effect with other areas
E	Influencing important performance requirements of LHC. (NWS, PCR -goals)

Table 6.1 Five criteria's used in the selection of the most critical area

Below are the three areas that are included in the PCR report and were subsequently found to perform poorly during the documentation. One area will be selected for the final in-depth analysis.

NR 1. Export - RCS – Acceptance and R4C check
NR 2. Import - RCF - Shipments check-in
NR 3. Import – NFD – Shipment availability

The above criteria A-E are in the following applied to these three areas.

Starting the selection process:

1. Export - RCS – Acceptance and R4C check

Problems arise when customers deliver shipments after agreed LAT and shipments of selected agents are not R4C checked every week.

A: Officially the work to correct the performance data in the IT-system is minimal. There are no current statistics which could quantify the amount of work time. From my own experience and from Øistein Vandbakk, LHC Logistic manager Oslo, this correction work represents about 1-5% of the total corrections.

B: Most of the poor PCR figures are caused by the fact that shipments are delivered by the customer before LAT and are not accepted by the personnel before LAT. If a customer delivers his shipment after LAT, it will not be accepted without changing the time frame agreed on.

Shipments accepted without prior R4C check and are sent with wrong dimensions or/and weights. SAS and LH encounter problems when these shipments are to be loaded on the aircraft or truck because they are too bulky or to heavy to be loaded.

C: This particular part of the handling flow usually does not have a direct effect on the customer. If a shipment was accepted, although it has been delivered late, the shipment can oftentimes be recuperated by expediting later steps in the handling flow. This can give a stressed customer extra benefit/satisfaction. There is however no guarantee to recuperate lost time in the flow.

D: One of the synergistic effects would be an extra income from the R4C checks. The charge of all overweight in acceptance and at GPC could generate 1.4 % more income in the SAS Cargo terminal. There will not be given any numbers but it is about a lot of money. Better R4C checks would also lead to fewer problems of loading A/C and trucks. The agents could also get better feedback regarding the quality such as weight, labelling and packaging of shipments delivered.

E: The logistic manager for Europe wants to see better figures for PCR, and RCS is part of that statistic. The RCS statistic is not the largest contributor to the poor PCR in Oslo terminal. The performance can be seen in the Figure *5.3* and Figure 5.4, with cumulative average of 96.8 %.

2. Import - RCF - shipments check-in

A: The correction of RCF in the Mosaik-system is time consuming. The RCF corrections represent about 33% of all corrections, including corrections made on RCF-Transfer, as can be seen in figure 5.2.

B: LH and SAS are directly responsible for the poor PCR statistics seen in Figure 5.7 and Figure 5.8. When the shipment and its documents arrive, procedures have to be followed and timelines have to be met to enable other activities in the terminal to be performed well. It is critical for the total performance goals that poor quality is not produced internally.

C: This phase of the handling flow has a direct influence on how the customer perceives quality. When the documents of the shipment have been registered, the shipments can be checked-in and the customer receives confirmation that the goods are available for pickup.

D: A significant amount of time wasted for correcting irregularities could be saved if shipments would be checked-in on time and the MSCA registered according to the deadlines. The parallel working flow of documents (see appendix 6, chart 2) would get better statistics, because the NFD depends on a time corrected RCF message in order to notify the customer that their shipment is ready for pickup at the agreed time.

E: Because of the large amount of work needed to correct RCF, which is a part of the PCR statistic, it is important to make improvements. The average performance for RCF is 93.9%, significantly below the goal of 98%. This can be seen in
Figure *5.7* and Figure 5.8.

3. Import – NFD – Shipment availability

A: The correction of NFD in the Mosaik-system is very time consuming. The NFD corrections constitute nearly 28% of all corrections as can be seen in figure 5.2.

B: LH and SAS are directly responsible for the bad PCR statistics seen in Figure 5.9 and Figure 5.10. Many procedures are not followed and timelines need to be met.
C: This aspect of the handling flow has direct influence on the check-in area. Without the registration of the documents the check-in area can not check-in and notify the customers of the availability for pickup.

D: If the documents as well as MSAW would be registered immediately, wasted time for corrections would be saved. The parallel work flow of goods would also get better statistics, because goods can not be checked-in before document registration occurs.

E: Because of the increased amount of extra work that is put in to correct NFD, which is part of the PCR statistic, it is important to make improvements. As seen in Figure 5.9 and Figure 5.10 the average level is 97.5%, which is almost at the target level of 98%.

6.2.1 Conclusion of the selection

In the table below the results of the areas selection process is completed.
For each criterion, A to E, the area or areas (1, 2 or 3) with the worst performance has been selected.

A: NR 2, check-in has the largest amount of corrections, slightly more then NR 3, NFD.

B: Both NR 2 and 3 have their own responsibility for the poor performance. NR 1 has only a partial responsibility. The key aspect is the quality, which is influenced by external factors.

C: A customer will react in a negative way when a shipment is not ready to be picked up in time. Therefore it is important that NR 2 and 3 work well. For NR 1 it would be necessary to influence the internal customers in the organization. At the moment, this is not as important as showing good performance towards the end customer.

D: The synergistic effects are linked together for NR 2 and 3 and would consequently cause improvement simultaneously. For NR 1 there are synergistic effects seen only in the long run, in the internal handling flow, as well as in the cooperation with the customers.

E: The focus is to improve the handling flow performance for PCR statistics. The worst performance was by far NR 2, with a check-in average of 93.9 % since week 30 2001.

Criteria	A	B	C	D	E
Most critical area	2	2 and 3	2 and 3	1,2 and 3	2

Table 6.2. Selection of the most critical area

The area that has been chosen from table 6.2 is NR 2. Import – RCF – Check-In. It has the most critical problems and it shows the worst performance. In addition, it has the largest improvement potential. The following analysis will therefore focus on the import flow using the 7 step BRP method.

6.3 The Check-in area

6.3.1 Connecting the check-in flow with the terminal plan

The check-in area is divided in to two areas (see appendix 9). The Check-in ULD area is responsible for check-in of all incoming ULD (Unified loading devices) such as containers or pallets from aircrafts and trucks. The check-in belly area is responsible for checking-in all belly transports coming only from aircraft.

The KR group seen in the appendix 9 is responsible for bringing in the ULD and belly from the aircraft. The ULDs are brought directly to the ULD port and the belly wagons are parked outside the terminal. There is no priority system or method allowing to see if a belly wagon is more urgent then another. Consequently, shipments of high priority are sometimes not handled in time.

6.3.2 The situation in the check-in area

6.3.2.1 Statistical figures

The data in figure 5.2, collected during monitoring, show that the irregularities in the check-in area are: late check-in of shipments (RCF), not checked in shipments and late reported Missing Cargo (MSCA). Collectively they add up to 35% of all irregularities corrected in the PCR statistics. Despite repeated efforts to resolve these problems the statistics in
Figure *5.7* and Figure 5.8 reveal unstable figures over longer periods. Appendix 5, figure B, shows that the irregularities in the check-in area are varying from week to week. The conclusion is that the applied measures did not lead to consistent improvements over a longer perspective. The reasons behind the irregularities are difficult to identify. We cannot speculate if the problems are caused inside the terminal or outside as Missing Cargo (MSCA). It is only clear that the current situation causes extra work for the staff.

MSCA represents about 14 % of corrected irregularities. This can not be improved by the Oslo terminal, because it is caused in Frankfurt and can only be improved there by sending on right time. MSCA creates additional work for the check-in area, because the employees first have to look for shipments that have not arrived and then register them as missing.

Unfortunately, there is no documentation regarding the amount of extra work and no clear insight into the causes of these problems. To avoid speculation statistical figures are therefore needed. By continuing to step 3 in the 7 step BPR method we can power the logistics by using the effective tools of quality.

6.4 How the terminal situation affects the check-in area

The general situation and problems discovered in the terminal also affect the performance in the check-in area. It is therefore important to resolve these problems in order to get the expected results in the check-in area.

6.4.1 Handling flow documentation

The recently developed handling flowchart tries to present the current real flow of today (see appendix 6, 7 and 8). The idea is to use the flowchart both by Luf-

thansa and SAS Cargo and make it less complex with details on a functional level. The document and goods flows are included as well as the NWS.

The new flowchart developed can be used by LHC and SAS Cargo in order to align their views on the status of the handling flow. It should not only be a tool for the management but also useful for the employees on the floor. As described in chapter 5.4, SAS Cargo and Lufthansa Cargo often discuss the same problems without reaching any results. The reason could perhaps be that they see the organization and its handling flow from different perspectives. Another issue is that the employees on the floor do not have direct access to the SAS Cargo flowchart. With their practical experience they could suggest modifications and improvements to the charts. Bergman & Klefsjö (2001) explains that when relying on individual workers and their commitment to customer satisfaction, the right conditions must be established to get workers involved and engaged by taking away the borders and restrictions. It is therefore important that they understand the whole process as well as the work done in other departments. In Bergman & Klefsjö (2001), Jan Carlzon talks about the importance making the employees feel appreciated for their contribution to the value chain.

6.4.2 Promote employees engagement

The general impression from the interviews and discussions with the employees was that they were not engaged in the organization and work. Without a positive attitude from the work force, it will continue be difficult to improve the delivery accuracy in the handling flow.

Inadequate resources and time have been allocated to improve the human situation. Instead many organizational changes have burdened the work force.

The philosophy “Let everybody be committed” is one of the corner stones in TQMs and should be applied to increase employee engagement and commitment to the company. According to Bergman & Klefsjö (2001) everybody has to be well trained for their duties. Without knowledge of one’s work it is difficult to be part in the decision making and to take an active part in the improvement activities. (See chapter 3.3.4)

According to Bergman & Klefsjö (2001) (see chapter 3.4) the engagement, long term support, and commitment of the management is needed to improve the processes in the organization. The management has to improve communication by continuously informing the employees and helping them to understand the reasons behind the decision making. According to Söderlund (2000) (see

chapter 3.3.4) employees need to have the opportunity to give feedback about the current situation. It is important that the management is seen as a good example. It means that company goals and visions must be reinforced and followed also by management. With SAS Cargo having a performance goal of 95 % and LC of 98%, the work towards one common goal has been diverted by different standards and visions. How can management expect the employees to work towards one goal when they give different orders?

In a complex organization it is important that everybody is guided by the same vision. The vision should be focused upon the ability to satisfy the end customer. As Rubel (1995) in (Söderlund, 2000) says: ”you can not have customer satisfaction unless you have employee satisfaction.” Bergman & Klefsjö (2001) share a similar view when they say: “internal satisfaction is important since internal customer satisfaction is necessary in order to reach external customers satisfaction”. In a large organization with different departments, which buy services from each other, the departments easily start to look at each other as “We-They” instead of “We-Others”. “They” in this context, is seen as some one outside the company. And the “Other” is someone inside the company. When looking at each other as internal customers and suppliers which work in the same company, the aim must be to satisfy each others needs.

The first step taken must be that departments get to know the other departments and learn how their own work affects the others. A key factor in the improvement of the delivery service is flexibility according to Lumsden (1998). To be flexible is to be able to change and improve the work and flow in order to make improvements for the internal customers.

7 Recommendations

In this chapter recommendations will be presented for the improvement in the delivery accuracy in the selected check-in area. These recommendations are to be implemented by SAS Cargo and Lufthansa Cargo.

7.1 Preparation before proceeding with the third step

The author has selected to improve the check-in area and to implement the seven step BPR.

The first two steps have been completed in the seven step BPR method which include investigation and documentation of the handling flow in connection to the check-in area. The results can be seen in appendix 6 and chapter 5.3.2 - Goods check-in. Before further steps in the seven-step BPR can be conducted, some problems that have arisen during interviews and discussions need to be clarified.

It has become evident that employee willingness for approaching something new is inhibited due to other difficulties in their work. In order to proceed with the third step of the BPR method, the willingness of collecting data in a correct and orderly way has to be established. According to Bergman & Klefsjö (2001) it is important to clarify the goals and how to achieve new procedures. The involved people have to understand why the organization is in need of the data. The staff should have the ability to participate in the questions in order to achieve good results.

7.1.1 Improve the engagement and commitment

In order to improve the commitment of the employees, it is recommended that each working area should have regular meetings. This method was used by the company Teamwork and was a great success according to Söderlund (2000). In these weakly meeting each group manager presents the achieved results and explains how they relate to the goals and the visions of the company. It is important that the group managers ask for feedback from the employees and take their responses seriously.

After these meetings the group managers have to meet with the management to discuss problems and solutions in the different working areas. The goal is to combine measures throughout the organization and make use of the combined

knowledge. This will grant the individual workers more responsibility and influence of the results performed. It is also important that the group managers help everybody understand the goals and the general visions of the company.

As many new employees from Braatens have joined the SAS terminal there is a good opportunity to make changes, instead of introducing them to a insufficient working environment. They could especially improve the willingness to implement the third step of the seven step BPR method, because they are not influenced by the old routines.

7.2 Improve the delivery accuracy for the check-in area

In addition to the remaining steps in the process an extra step is added with the purpose to identify and use the "know how" that already exists in the specific organization. The idea with this step is to benchmark inside the company but outside the local organisation or in an allied company. This extra step is performed after step 5 "Identify improvements areas". The benefits in conducting step 5 before benchmarking is to get people involved in the project and updated about the problem situation in the import flow. The purpose with benchmarking is to get answers to local problems by looking how other cargo terminals solve them.

The complete and adapted 8 step BPR method:

Step 1 – Define process boundaries:

The definition of the boundaries and the flowcharts that belong to the import flow can be found in appendix 6 and 8.

Step 2 –Observe process step:

The import flow has been documented and monitored on the basis of observations of the handling flow. This is described in chapter 5.3.2 and the flowcharts in appendix 6.

Step 3 -Collect process related data:

As stated in chapter 5, only insufficient and irrelevant data is available. Therefore in the context of this work new data has to be collected, which helps to clarify the current handling flow situation. The only promising way to establish new information is to collect it directly from the work force on

the floor. The difficulty, however, with this procedure is that it should not take too much time and energy from the people on the floor.

A suitable plan for data collection that fits the purpose of understanding the handling flow is taken from Dale (1999). The suggestion is to use existing monitoring points NWS: FAR and RCF in combination with additional measuring points in the KR group (see chapter 5.2). The aim is to register the cause of failure, by using the monitoring points seen in appendix 9. The use of the NWS monitoring points means however at the moment to measure only the symptoms, but not the underlying reasons. According to Dale (1999) the best person to conduct the measurement is the person who is performs the activity in reality.

For example, there are no data sets correlating the number of people working in an area to the occurrence irregularities. Moreover, we need to understand the reasons behind the occurrence of irregularities and in what proportions these different types of reasons are appearing.

In order to get useful background information it is recommended to perform the data collection in the areas KR, check-in ULD and check-in belly in the following way:

- Let the person who performs the activities on the floor collect the data and perform the measurements.

- Each area performs its own data collection. Check-in ULD and check-in belly have the same type of data but irregularities and reasons are different. (see figure 6.1)

KR group - data to be collected

- Time log when the aircraft land (FAR) is done automatically.

- Time log on incoming shipments from one flight. Compile the number of late arrivals and their causes for a certain period of time like in figure 6.1.

- Document the number of people working in the area at that time period. (see figure 6.2)

Check-in area - data to be collected

- Time log when shipments are being checked in (RCF).
- Compilation of number of late arrival check-ins caused by the various irregularities during a certain period of time, like in figure 6.1
- Compile the number of people working in the area at that time period. (see figure 6.2)

The information in figure 6.1 and 6.2 are made up and dose not relate to the true situation.

Compilation of delayed shipments

Week/Month: _____

Area: _____

	Days								
Typ of irreg.	1	2	3	4	5	6	7		No.
Lost goods		I	I						2
Missing info	I		II	II	I	I	II		9
type 3	I			II		I			4
type 4		II			I				4
type 5			I			I			2
type 6									
	2	3	4	4	2	3	2	Tot.	18

Figure 6.1 The number of late shipments for each irregularity for every day during a reported week.

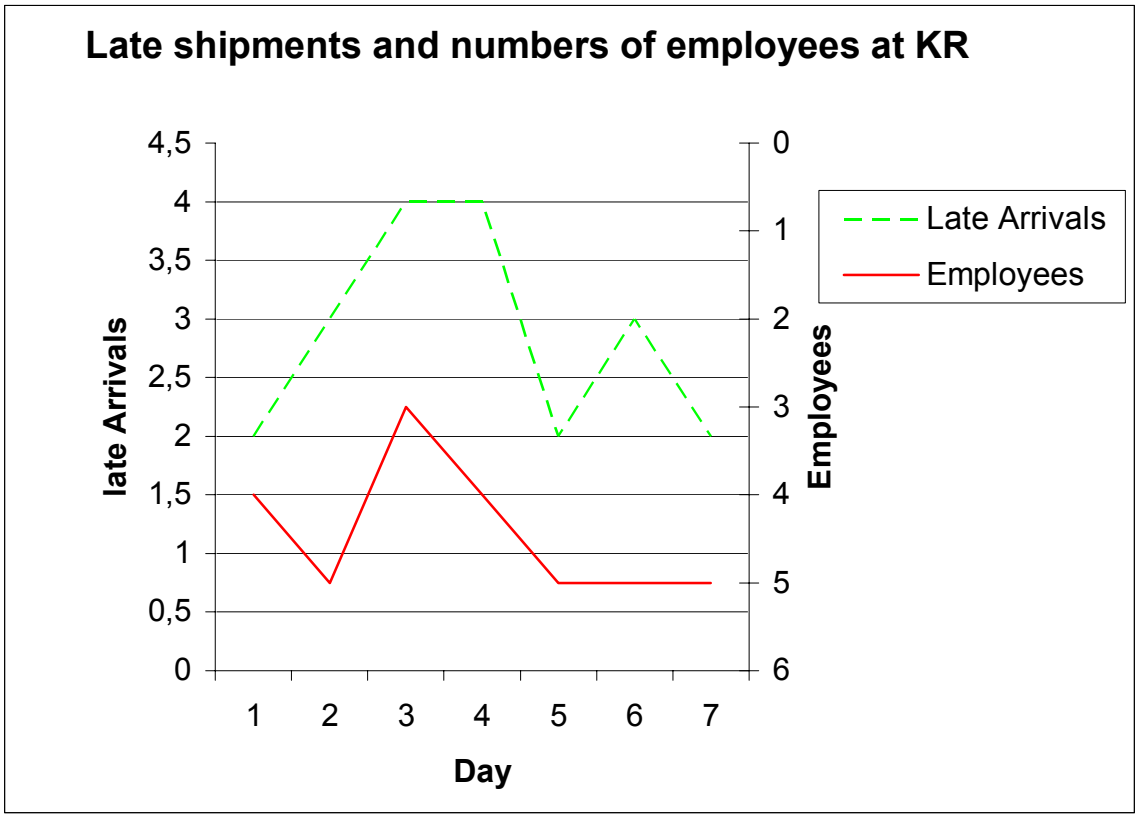

Figure 6.2 Shows number of late arrivals and number of employees at KR during a measuring week.

Step 4 – Analysis of collected data:

Figure 6.2, relates the amount of delays to the number of people working at the time in the area. By inverting the number of people on the right axis both curves have a maximum when there are few people working when there is a maximum of delays. This clearly indicates that low presence of people causes more delays.

The figure 6.1 shows the correlation between the number of shipments delays and the most common types of irregularities. The most common types of delay causes are used for further analysis, when enough data has been collected during a time period, using the relationship diagram (see more in appendices 2-2). The results explain the real causes for the irregularities detected by the monitoring system.

Step 5 – Identify improvements areas:

The causes of the disturbances in the flow have been identified as result of the tools in step 4. The task now is to sort out the result received from the relationship diagram depending on the goals that have been set up.

Step 6 - Extra step -Benchmarking:

A benchmarking between different cargo stations should be performed to identify all causes of delays and get a better understanding of the correlation between irregularities and delays. A benchmarking method is proposed in appendix 4-1. The last 2 steps in the benchmarking process in figure A are identical to the following steps of the BPR, described below.

The stations that should be targeted are the ones in northern Europe, because they resemble the environment of the Oslo terminal.

Step 7 – Develop improvements:

First of all, it is necessary to involve people from all levels of the organization. Establish working groups with the task to brainstorm around the separate causes, using the knowledge from the benchmarking to find new ideas.

In the following three specific improvement examples are given:

- Eliminate the manual check-in of all shipments in the ULD. Instead, use the IT-system by connecting all shipments in a ULD to the unique ULD number. Consequently, all shipments could be checked-in by scanning the ULD barcode instead of each separate shipment.

- Shipments parked in wagons outside the KR (seen in appendix 8) should be prioritized according to their TOA. Today shipments are not systematically picked up by the check-in staff according to their priority. The solution could be as simple as using a priority marking system to visualize which wagon is the most urgent one to be checked-in.

- Eliminate high workload during rush hour. Increase the flexibility to be allowing employees to move in the terminal, crossing department borders, to where manpower is needed. This requires certainly motivation and skilled personal together with good organization from the management.

Step 8 Implement and monitor improvements:

This step consists of implementing the improvements. It usually requires some time for the handling flow to stabilize after the introduction of changes. Therefore, adjustments have to be made during this intermediate period in order to make it run smoothly. When the flow is stabilized the first expected results can be noticed. This step is called “let’s-see-if-this-actually-works”. It is important to continue the monitoring and, if necessary, adjustment of the handling in order to keep the handling flow stable and robust.

During this introduction period the employees have to be trained and prepared for new tasks and to set new goals for their work. In the end it is a matter of how much they are willing to accept. In figure 3.6 the relationship is showed.

7.3 Recommendation to merge the partnership

The WOW partners must have the same quality goal. Therefore SAS Cargo has to adopt LHC’s higher quality level. Consequently it must also adopt the handling flow in the same way. This can be done in Oslo buy using flowcharts that fit both partners. A proposal is to use the documentation presented in appendix 5, 6 and 7 where the handling flow of today is described. The flowcharts should be easy accessible to all employees and should be used as living documents.

8 Discussion

The conditions for the thesis work were not optimal. It was carried out at the SAS Cargo terminal of the Oslo airport during the summer period when many employees were on vacation. In addition, the poor economic situation after September 11th, 2001, kept the airline industry busy with other essential problems. Furthermore, the Norwegian Airline Company Braathens bankruptcy further hindered the study climate. SAS took over the Braathen cargo division with its terminal in Oslo. It is difficult to speculate how these events have affected the outcome of the thesis. It is certain that no more steps in the implementation of the BPR could be conducted. All the necessary information could not be collected, because all the right people were not present or they did not have enough time. On the other hand it challenged me to study and analyze the handling flow on my own terms and gave me the opportunity to formulate my own views. Because I was less influenced and biased by the employees, I had more freedom of mind to conduct the analyses.

The purpose of the thesis was to document the handling flow in Oslo terminal and to propose improvements to the delivery accuracy. The flow charts were to describe the document and the physical handling flows. It was, however, difficult to match the charts with the real flows as it changed continuously due to new security regulations and new procedures intended to improve quality. Therefore I have to make reservations regarding possible mistakes.

The target to raise the delivery accuracy to 98% PCR in the check-in area should be reached with help of the modified seven step BPR method. The finalization of the method was not possible, not only because of lack of time but also and importantly because the people doing the analyses and the selection have to be part of the actual improvement area. There are of course risks involved in the application of the BPR method. There are other methods of approaching this goal. However, it was important in this situation to use a simple, rapid, structured, and tested method. The seven step BPR method from (Harbour, 1994) was also chosen because of the simplicity of its structure and the fact that it had been used in a cargo terminal environment before by Khan (2000). There are of course no guarantees that this method will improve the PCR. On the other hand, there has not been a structured analysis of this kind before at LC.

There is a risk connected to the choice of method and tools used in each of the different steps of the BPR. The use of the mapping method from Melan (1995) and of LH flowchart standard SPACE turned out positive. The importance was

to visualize the shipment and document -flow as clearly as possible. This was achieved as demonstrated in appendix 5, 6 and 7. The goal was fulfilled but the practical end results how to use it will depend directly on the work and resources of the organization, in other word SAS- and Lufthansa cargo.

A question which is not part of this thesis is if it makes economic sense to raise the delivery accuracy to 98 %. What increase in sales volume is required to break even with the customer service costs, when going from 95% delivery accuracy level to 98%? On the other hand, we should also need to calculate the breakeven point within the company and need to raise sales volumes to cover up poor quality and logistical costs. Is the company going to win on this? Although this is not specifically addressed in this thesis, it remains an important future consideration as highlighted by Lambert & Stock (1993).

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Chase N (1998), Accounting for quality: Your company invests a lot in quality. What dose it get in return?, Quality Magazine: (http://www.baldrigeplus.com/Exhibits/Exhibit%20-%20Cost%20of%20quality.pdf)

9.3 Interviews

SAS Cargo

- Jan Schellander - Terminal Manager OSL
- Lill-Harrieth Degerud - Process Improvement Manager
- People associated with the handling flow at the SAS Cargo terminal.

Lufthansa Cargo

- Øistein Vandbakk - District Manager Logistics Oslo, Norway.
- Joni Purimaeki, EDI Manager Scandinavia.
- Other Logistics Managers in Scandinavia

Appendix

1-1 Gardermoen Perishable Centre - (GPC)

The company was found in 1998, to take over the handling of fresh fish from SAS to build up the fish export ULD. GPC that is located in the SAS terminal, receives fresh fish from the suppliers and prepare the loads for departure. Their responsibility is to check the weight of fresh fish before each ULD is departing. It is very important that each shipment is built up according to regulations and precautions for perishable goods. The company's IT-system is not connected to the LHC or SAS -system. Data is only reported to LHC by manually monthly written excel sheets. They contain information about weight and arrival time.

1-2 WOW-partnership

Lufthansa Cargo, SAS Cargo, Singapore Cargo and JAL cargo (part of Japan Airline) have signed a co-operation agreement. The aim is to become one of the worlds leading air freight and logistics companies. The alliance was started on April 1, 2002 with the new identity "WOW", with the objective to harmonise the Express and General Cargo products. The brand statement is "Powering World Trade" which is not a shortening of WOW. WOW does not stand for anything else then the three letters.

The reasons behind the alliance were to concentrate resources and to deal more efficient with changes in the market. The competition has increased dramatically and the customers demand of a global service network. As an answer WOW can provide cargo services to any destination in the world by using the flight network of each member.

The means of harmonising the products is to standardise express and general cargo products. This is done to make it easier for the employees of the WOW-partners to deal with each others products and of course to make it easier for the customers to get quality services.

More information concerning the WOW-partnership can be found in the new web page: www.wowtheworld.com

2-1 Cargo Customer Care (CCC)

The CCC - project was started in early 2000. The aim was to engage all parties involved in the shipment flow in Europe, to improve the level of quality. The reason was that Lufthansa had problems with partner, who delivered shipments too late, or shipments which were heavier or bulkier than agreed upon. The airline companies are often the last link in the transport chain, and they have to correct the mistakes of other parts in the transport chain. The objective was to standardise the shipments, which arrive to the airline and the procedures in order to provide better service.

This could only be achieved by a closer co-operation between customer, agents and dispatchers. The ready for carriage (R4C) check came out of the CCC project, and is explained in chapter 5.3.1 under RCS non-R4C check. In this way all stations will have the same services and can work approximately in the same way. The idea to check the arrived shipments is also to give feedback to the agents, in order to give those updates about the progress and educate them to follow the agreed standards.

2-2 The seven management tools

The seven management tools are based on different scientific fields as behaviour science, operation analysis, optimisations science and statistics. The Union of Japanese Scientists and Engineers (JUSE) have created a powerful set of tools, consisting of:

- Relationship diagram
- Affinity diagram
- Tree diagram
- Matrix diagram
- Matrix data analysis method
- Arrow diagram
- Process decision diagram

(Bergman & Klefsjö, 2001)

Of these seven tools the mostly used ones to identify problems and select the possible solutions are the relationship diagram, tree diagram and matrix diagram. These tools can also be used in combination with each other. More can be found from the books of (Klefsjö 1999) and (Dale 1999).

3-1 NWS (Network standard)

The NWS is a manual, which stipulates the way of working for the people involved in the WOW-partnership in order to follow along the entire transport chain specific quality standards. The NWS manual version 1.0 has been issued by the newly started WOW-partnership.

The best way to explain the meaning of "Network Standards" (NWS) is by using some examples from our daily life:

When a customer orders a burger at a worldwide known restaurant he/she will always receive the same product with the same quality in other words: Same package, same colour, same texture and same taste. The customer has a similar experience when he/she buys a car, a TV or any other electronic device from global manufacturers in the automotive or electronic industries.

The PCR (Process Control Report) is a control method used by LH to measure the handling flows. The goal for LH is to reach 98 % of the working flow. The measuring points used by PCR are all part of the NWS. On the other hand not all NWS are part of the selected PCR measuring points. The reason for this need is to give management an easier overview over then main flow and a rapid indicator of how well the flow works. The measurements at the selected points are directly related to the quality performance criteria towards the customers. More about this can be found under chapter 5.2.

3-2 Time frame

The time frame is an agreement between the customer and dispatcher, defining the time a shipment has to be handled from LAT until TOA (See Figure 5.1)

3-3 MOSAIK –System

This IT-system is used by Lufthansa cargo in all business areas from booking to statistics.

4-1 Benchmarking

When using a formal Benchmarking, Dale (1999) points out some main steps.

- Identify the subject to benchmark and create a draft project plan. The process chosen shall have a significant impact on customer satisfaction and/or internal efficiency. The management must be committed to improve the process.
- Based on critical success factors identify which companies or internal departments to select.
- Develop a data collection plan. Choose the most appropriate data type and determine how to collect data and how to map the process that is going to be investigated.
- Tabulate and analyse the data. Look for gaps in performances and for any trends.
- Define and establish goals to reduce or increase the gap in performance.
- Develop action plans to achieve goals. Important is to get the acceptance and involvement of the employees.
- Implement the actions, plans and strategies.
- Assess and report the results of the implemented action. It is also important to follow up and monitor the actions. If necessary recalibrate.

Almost the same steps are found in Bergman & Klefsjö, 2001 who put the use of the Plan Do Study Act (PDCD) cycle into the benchmarking procedure as seen in figure E-1.

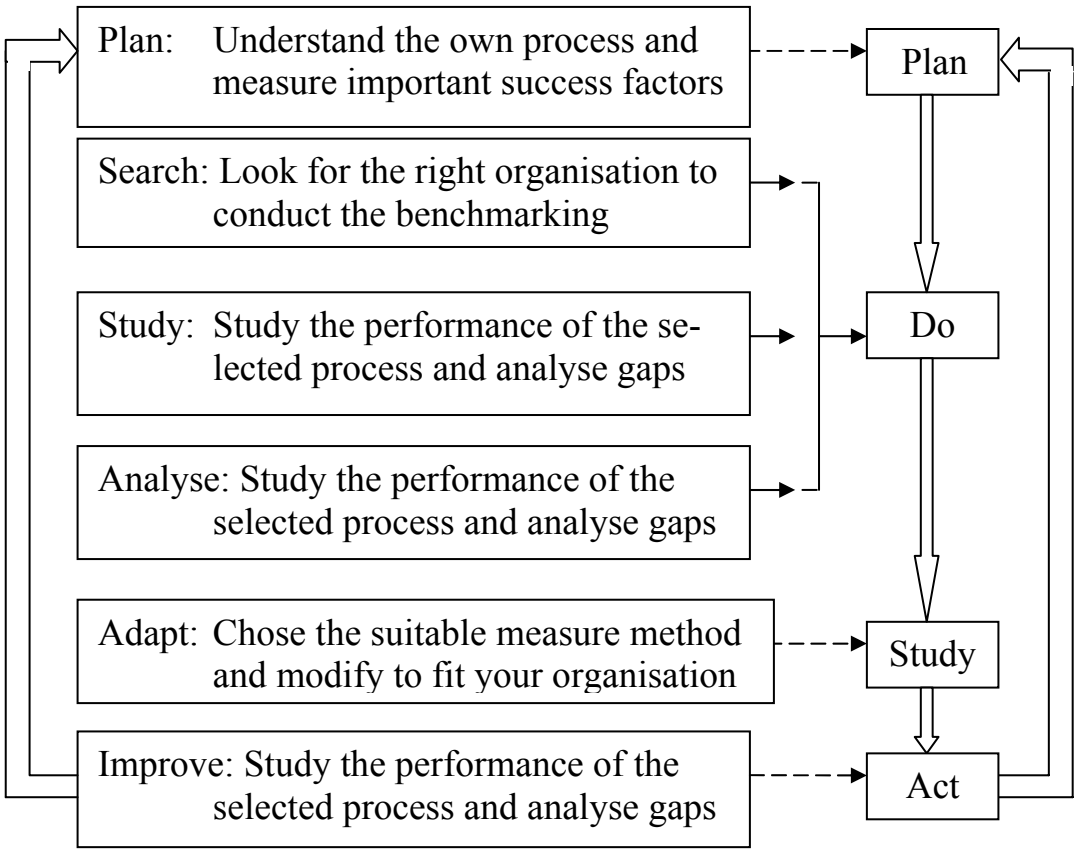
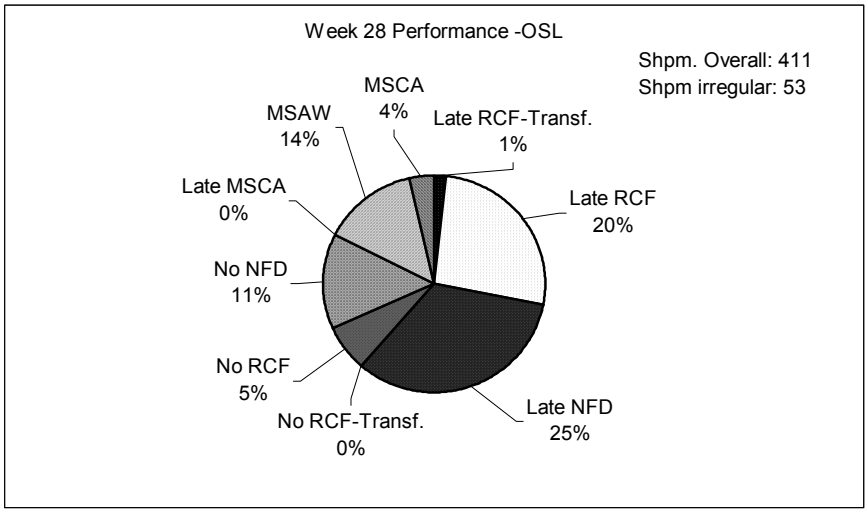
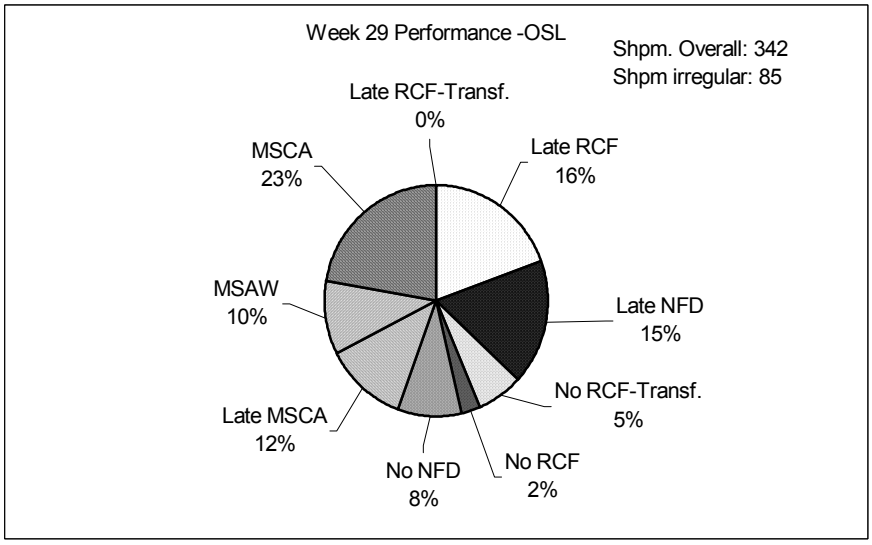


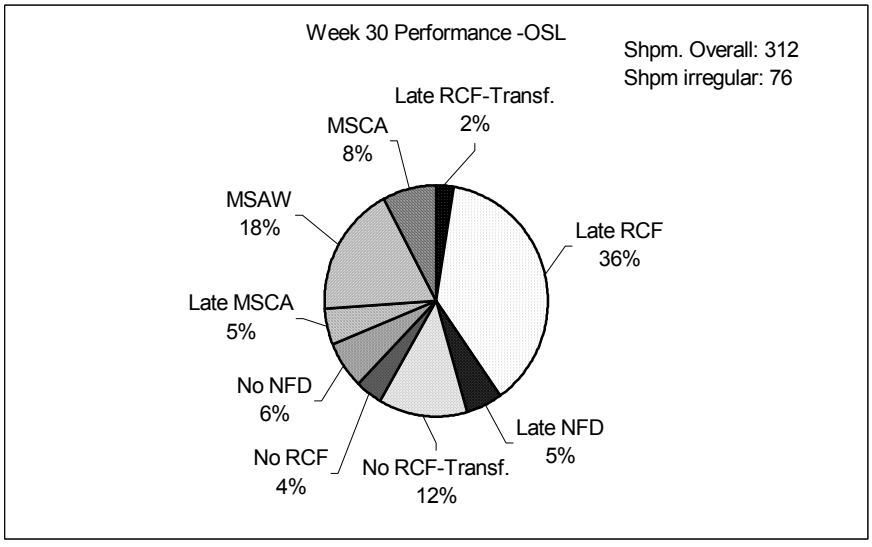
Figure A. Taken out of (Bergman & Klefsjö, 2001) page 438 figure 19.18

When conducting a benchmark it is suitable to use 4-5 organisations. When performing a benchmark it will take time to get the potential results. It is also important to identify the own organisation's strong sides. The plan is a living document that can be changed during the benchmarking.

The motive to make a benchmark is to make people look outside their current process and identify opportunities for improvement. The aim is to focus on processes rather than individuals and abandon the traditional "Blame culture". The possible benefits gained from a Benchmarking should always be related to the scope of the problem and weighed against the return of investment as well as level of improvement. There is no idea to spend considerable time, money and resources on benchmarking a process, if it will not give benefits and affect the customers in any significant way. It is important to start with clear goals and to have good communication with the people involved. Be careful with just coping other companies processes, and try to use them in the own company, instead to adjust the process based on the knowledge in the company. (Dale, 1999)


Week 28 Performance -OSL
Shpm. Overall: 411
Shpm irregular: 53
MSCA 4%
MSAW 14%
Late RCF-Transf. 1%
Late MSCA 0%
Late RCF 20%
No NFD 11%
No RCF 5%
No RCF-Transf. 0%
Late NFD 25%


Week 29 Performance -OSL
Shpm. Overall: 342
Shpm irregular: 85
Late RCF-Transf. 0%
MSCA 23%
Late RCF 16%
MSAW 10%
Late NFD 15%
No RCF-Transf. 5%
Late MSCA 12%
No NFD 8%
No RCF 2%


Week 30 Performance -OSL
Shpm. Overall: 312
Shpm irregular: 76
Late RCF-Transf. 2%
MSCA 8%
MSAW 18%
Late RCF 36%
Late MSCA 5%
No NFD 6%
Late NFD 5%
No RCF 4%
No RCF-Transf. 12%

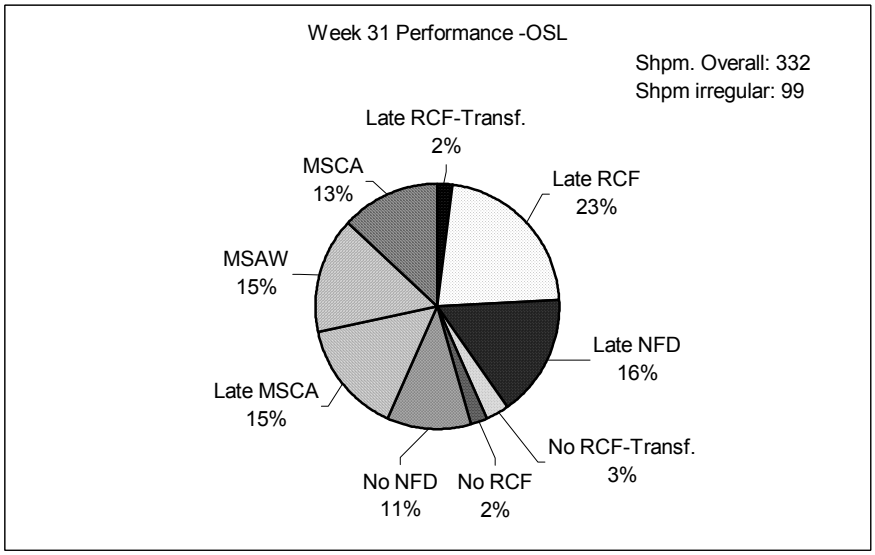


Figure B. Weekly deviations for week 28, 29, 30 and 31 for the OSL Import flow.

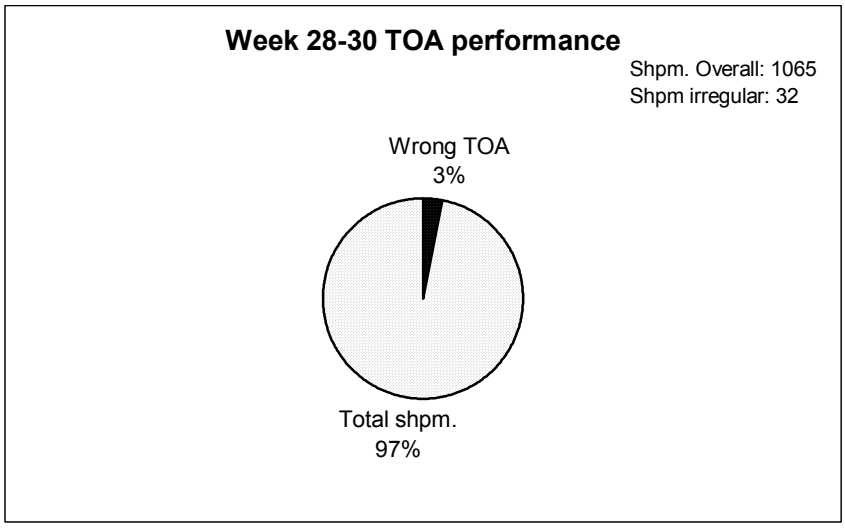


Figure C. show the IT related deviations during weeks 28 – 30. Three percentage of all shipments do not arrive at set TOA times, because these deadlines have been set incorrectly in the IT system.

Main flow chart at Oslo cargo terminal

There are two main flows in the terminal, Import and Export. Each section is presented with an overview flow chart, to give an understanding how the flow looks like. The flow charts are presented according to the S.P.A.C.E standard.

Import flow

The Import flow is documented in one chart on two pages called “SAS Import OSL".

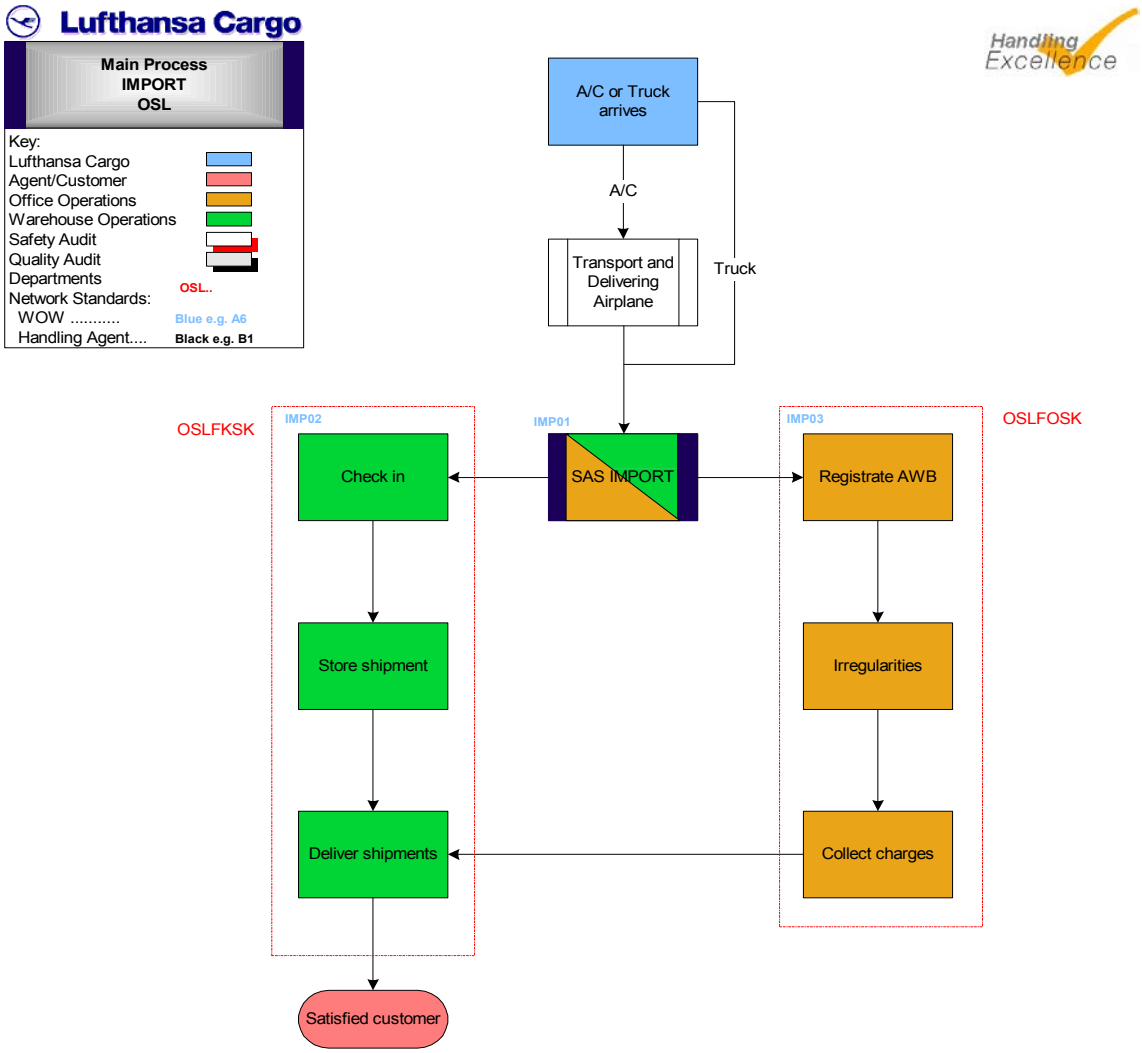


Chart 1. Complete import flow, where the red borders are defining the departments

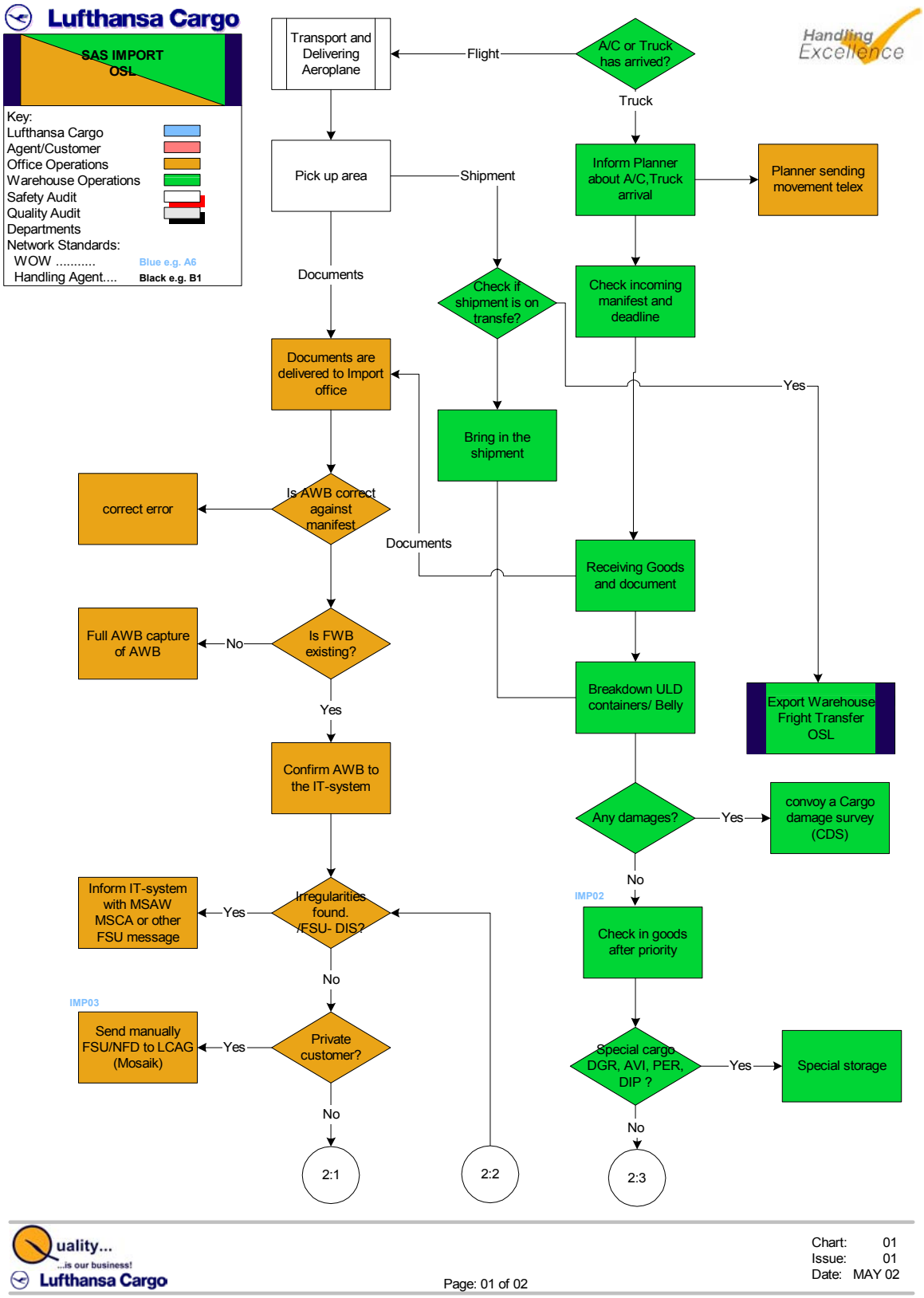


Chart 2. More detailed description in the beginning of the import flow. The shipments are arriving and are further more processed in the terminal.

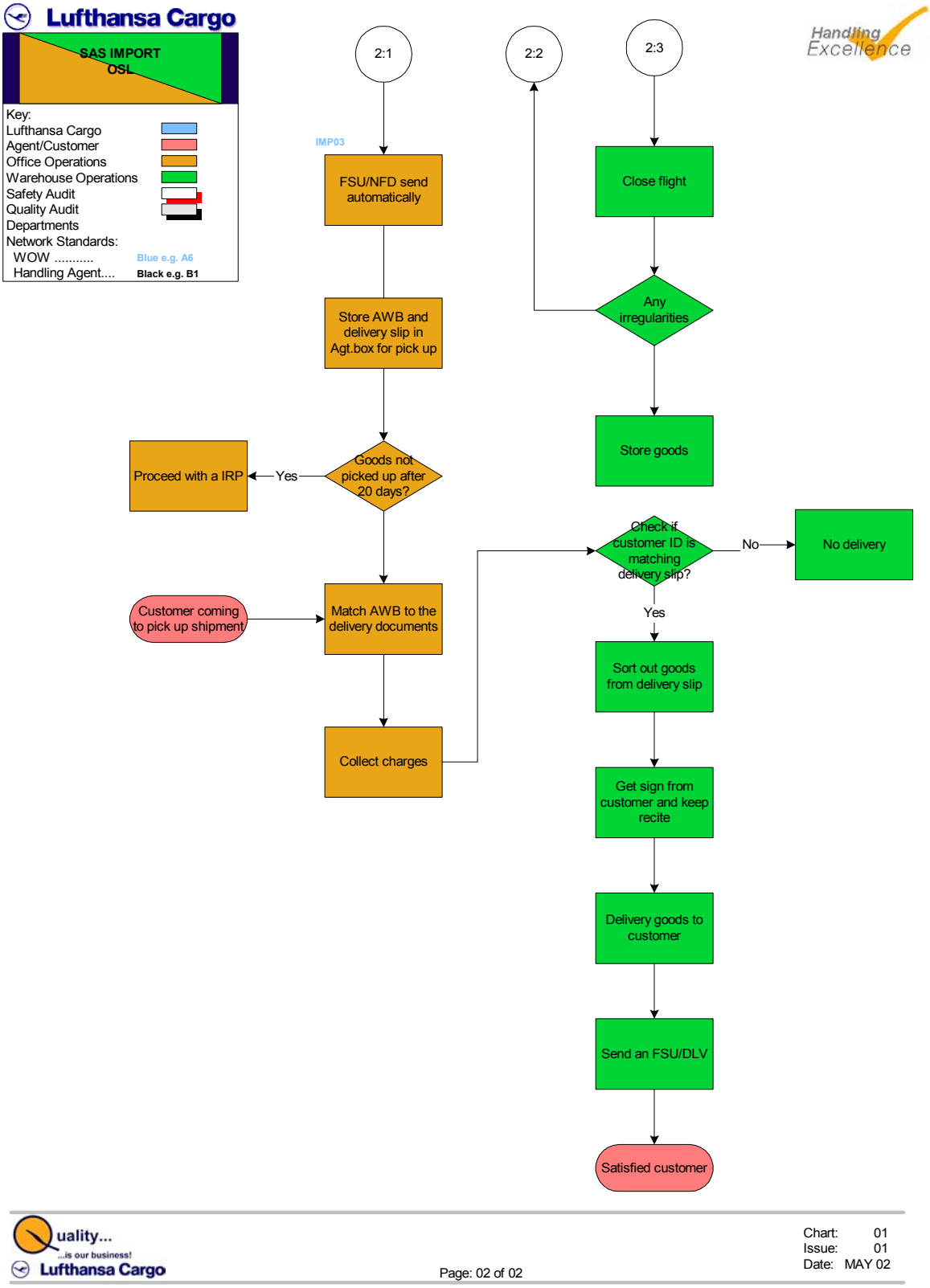


Chart 3. End of the import flow delivering the shipments to the end customer.

Export flow

The export flow is divided into three parts. It starts with the “SAS Acceptance, Export OSL” and then splits in on document flow “Export warehouse, freight handling OSL” and one shipment flow called “Export office, Document process OSL”. The transfer flow is also presented at the end, in order to connect the Import flow with the export flow.

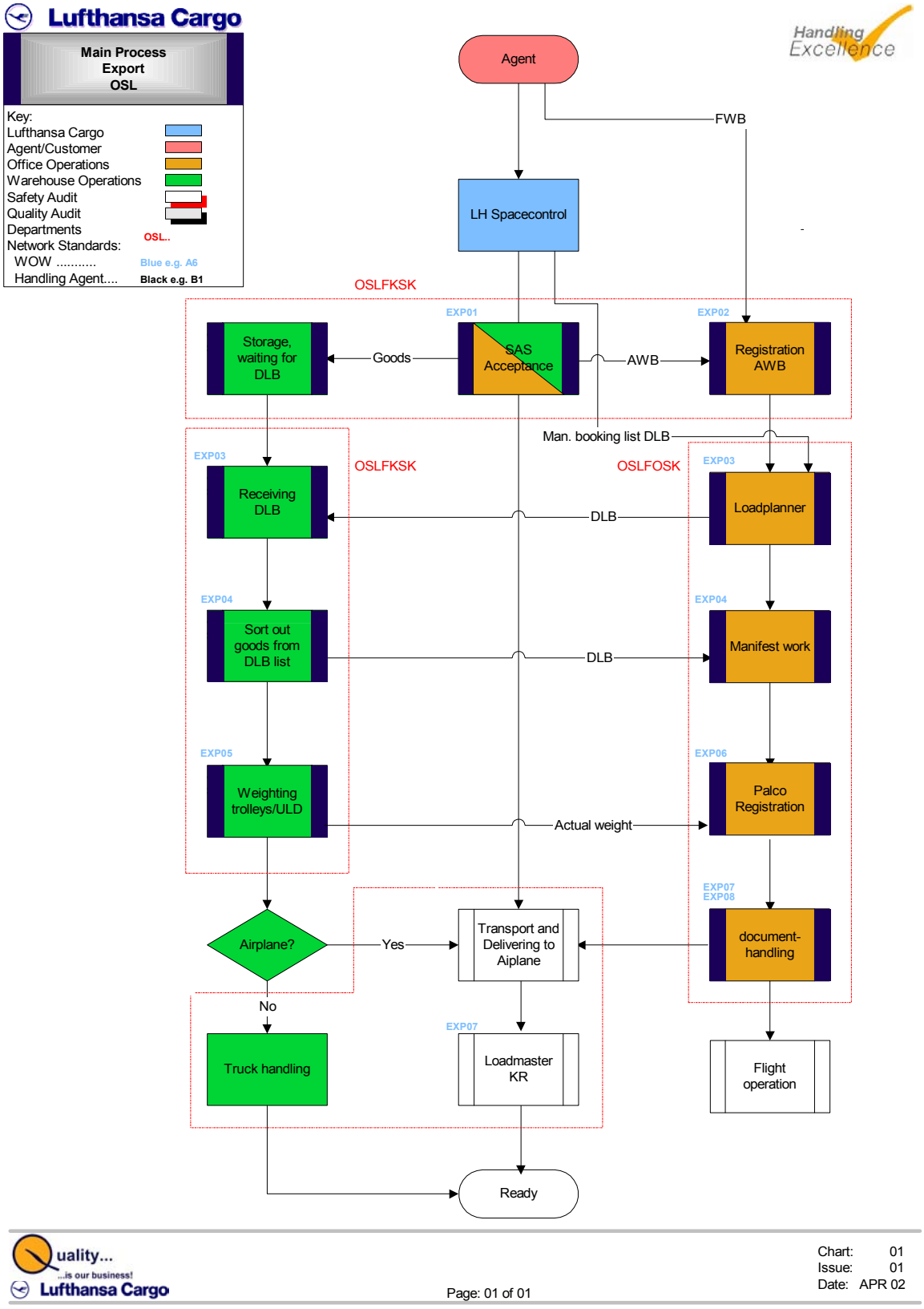


Chart 4. Complete export flow, were the red borders are defining the departments.

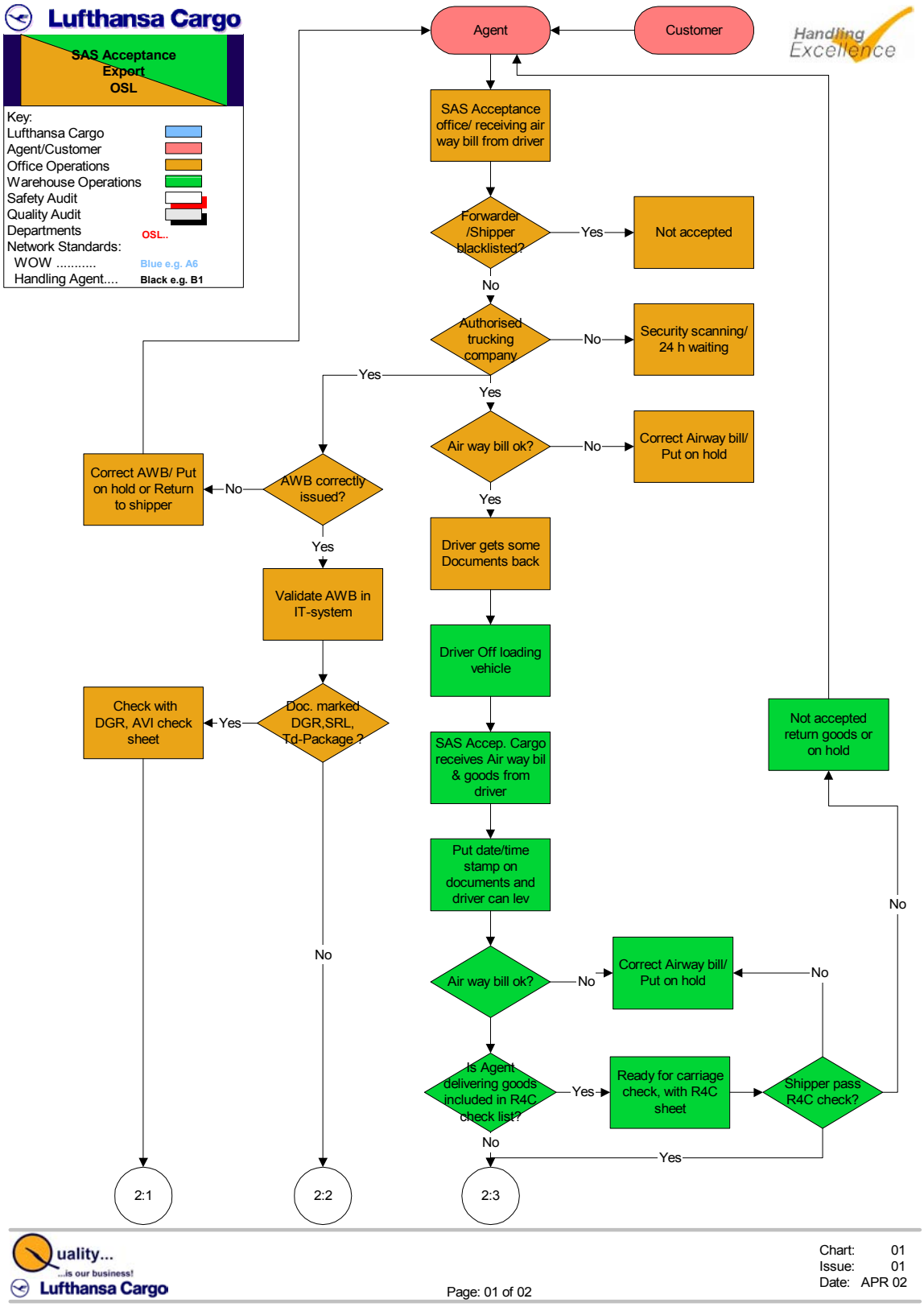


Chart 5. The start of the export flow, begins with the goods delivery of the agents at the terminal.

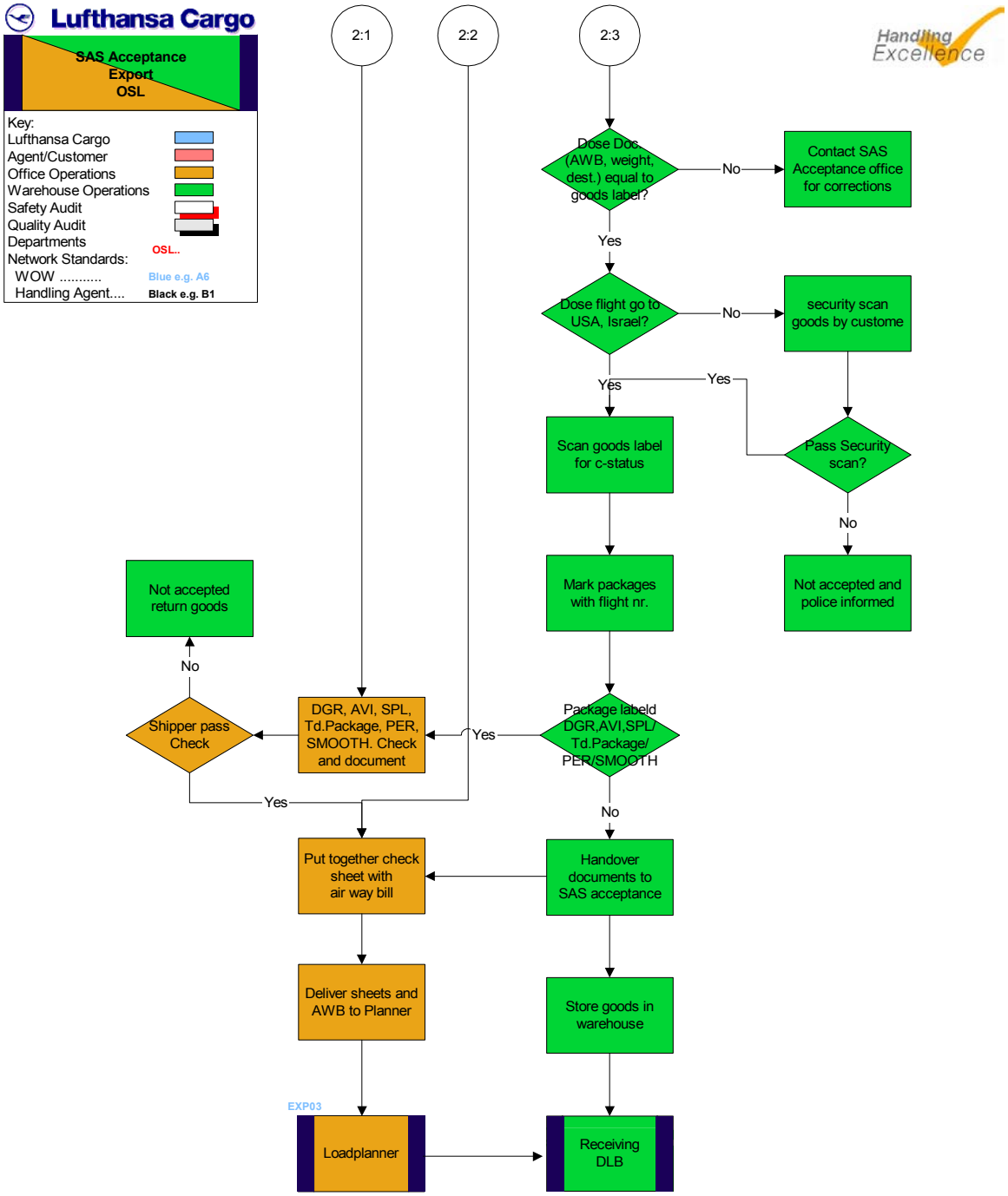


Chart 6. The second, part of the acceptance export flow.

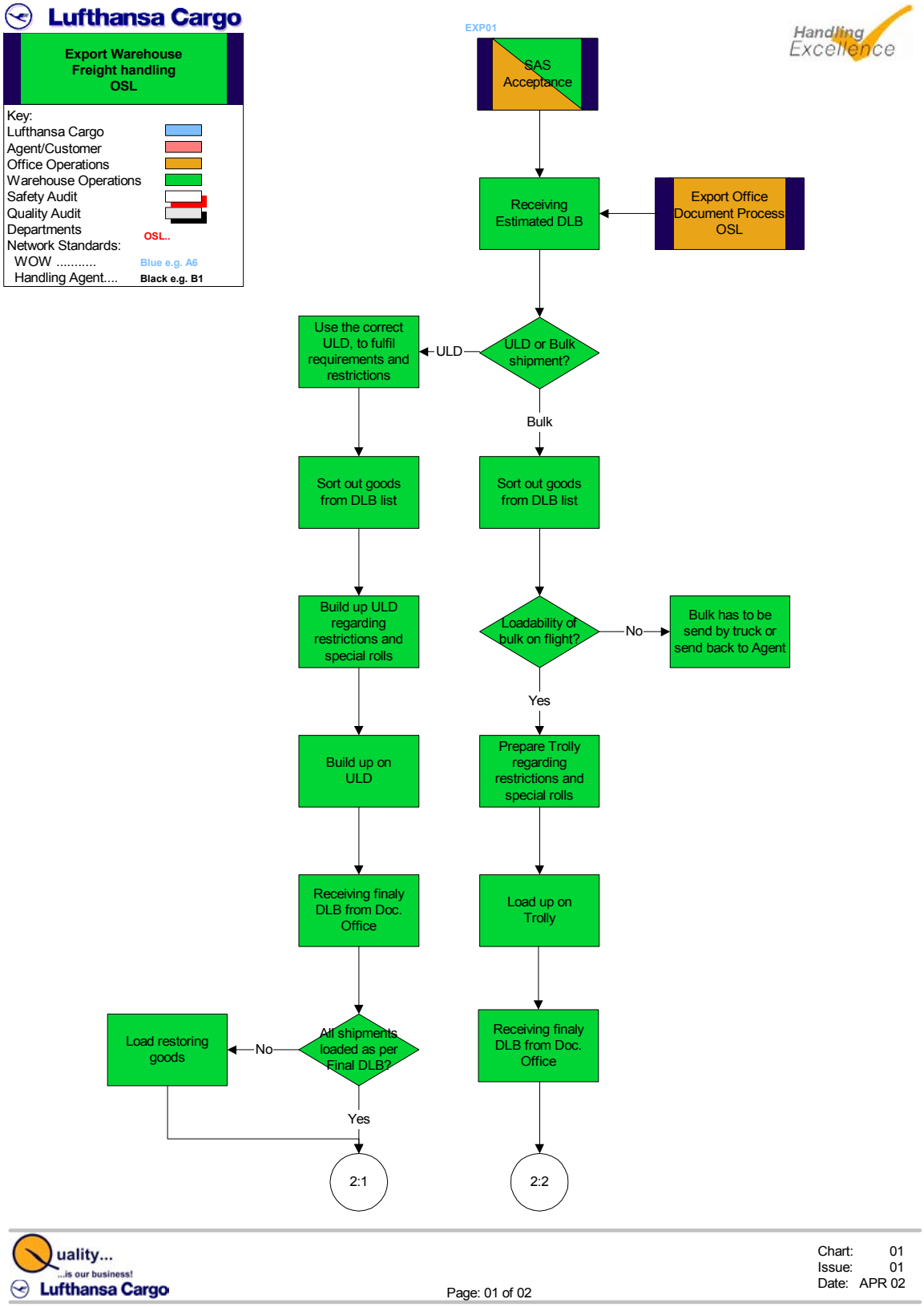


Chart 7. This chart describes the shipment flow, after acceptance the first part of the export flow. This flowchart is only regarding the goods flow.

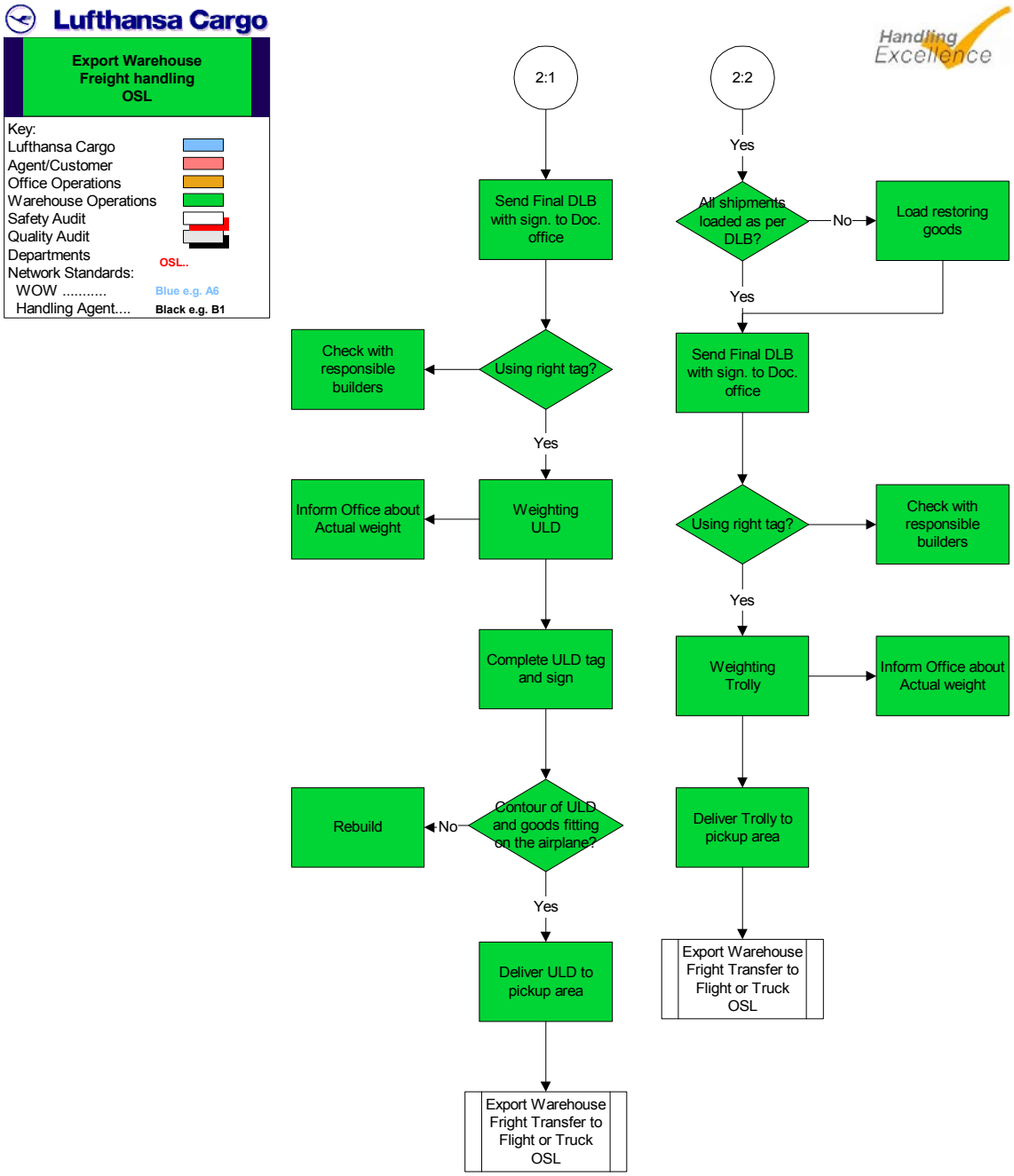


Chart 8. The second part of the goods flow in the export flow.

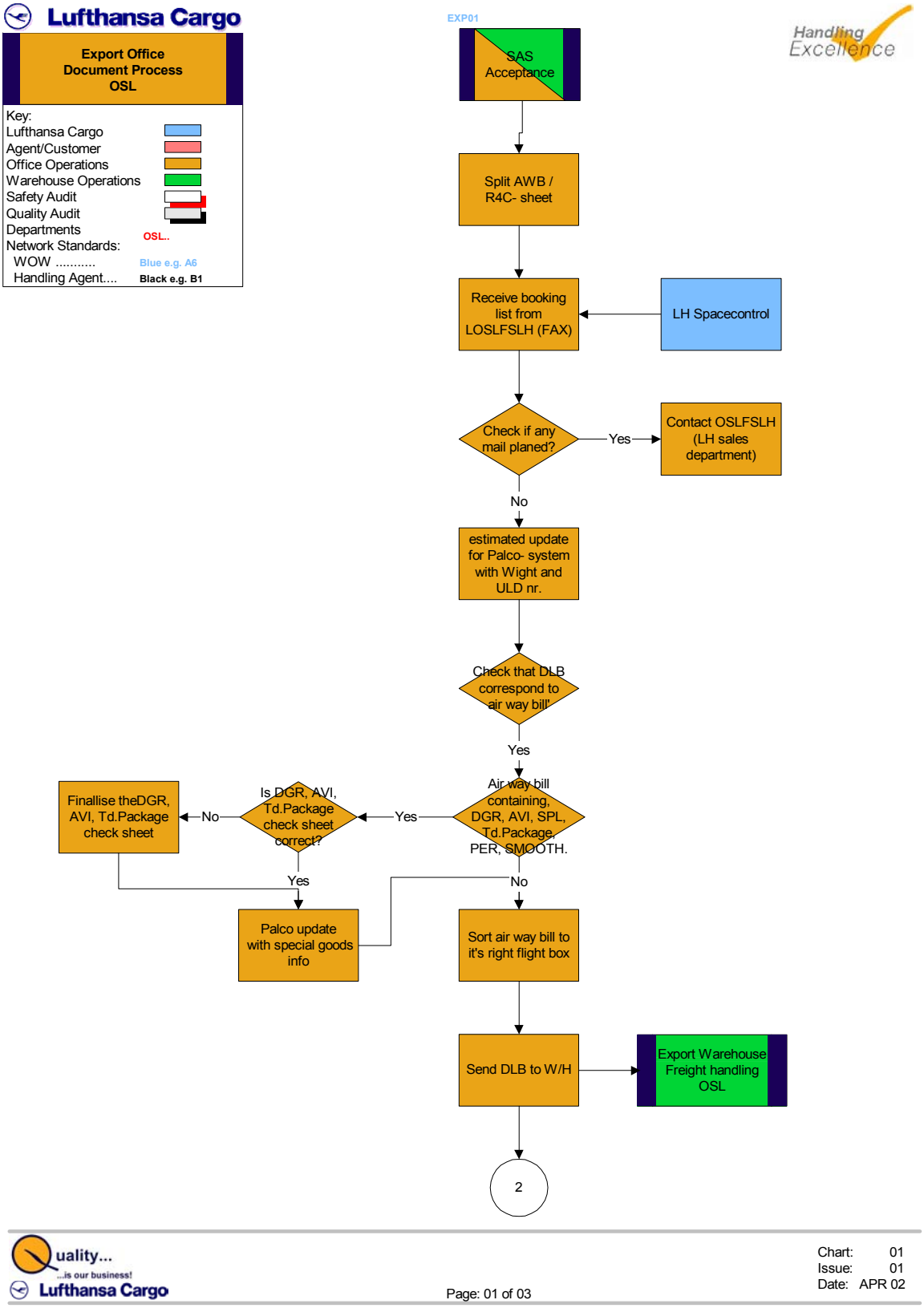


Chart 9. Parallel to the shipment flow is the documents export flow.

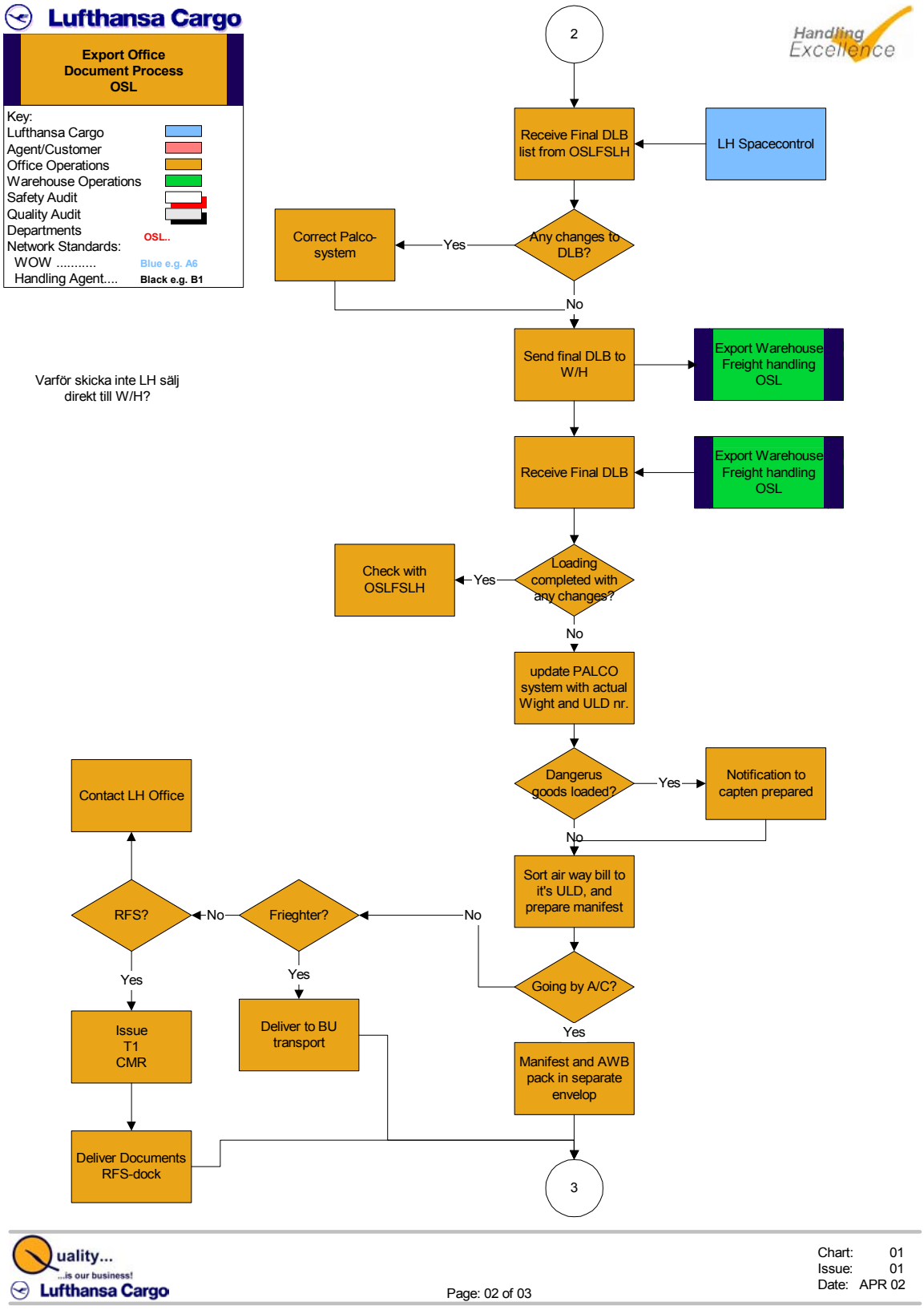


Chart 10. The second of three steps of the document flow.

Chart 11. The third and final step in the export flow of the documents.

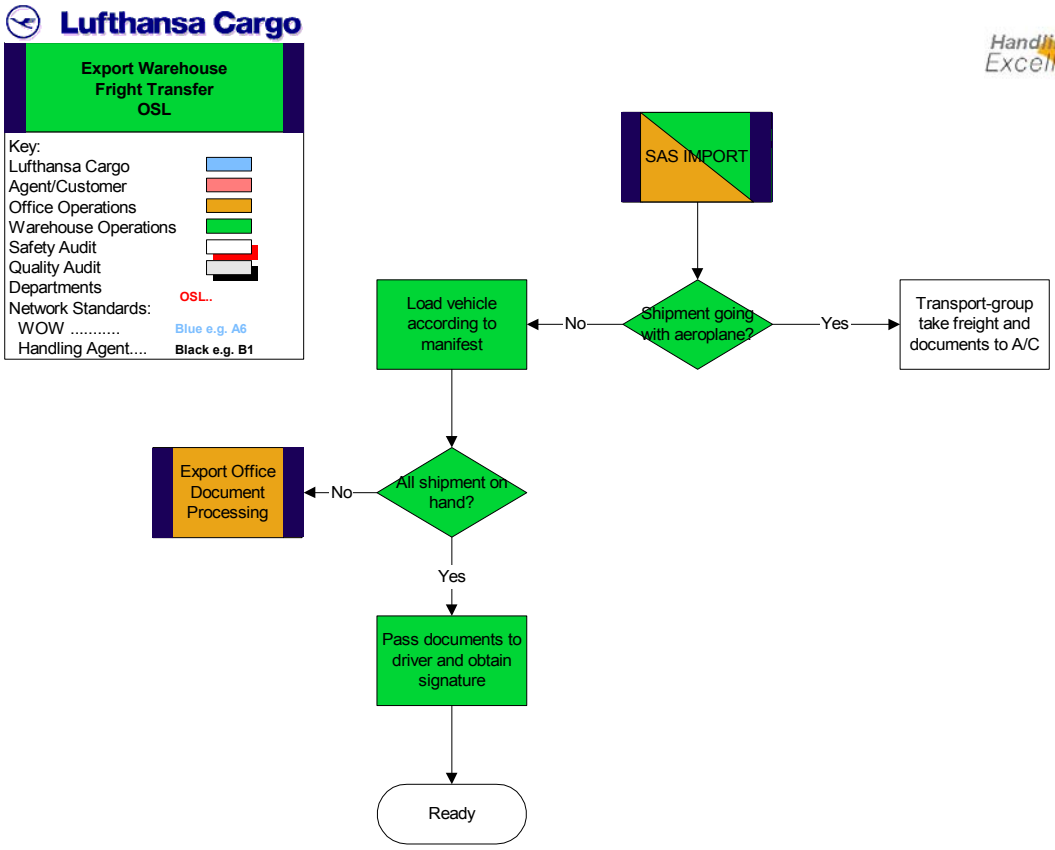


Chart 12. This is the transfer flow in the terminal. Used when shipment are being transferred from the Import flow to the Export flow. See figure 9.1 for more information about transfer.

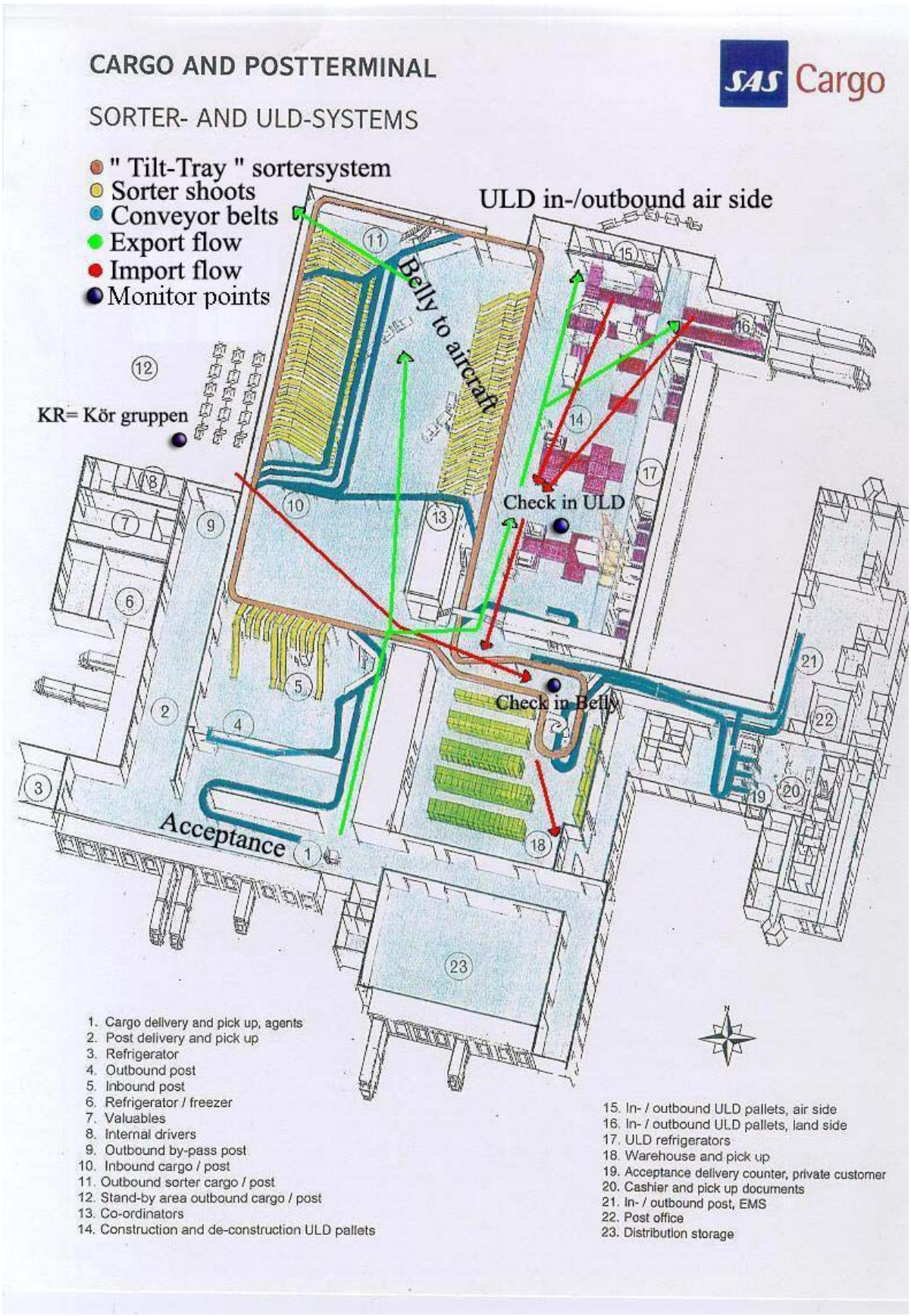


Figure D "Terminal plan". Illustrates the Import- and Export flows inside the SAS cargo terminal.