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SERVICE BLUEPRINTING IN IRREGULARITY SERVICE IMPROVEMENT, CASE SWISSPORT FINLAND LTD

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ABSTRACT

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The trend of concentrating to core competencies leads to outsourcing of non-core activities. One such activity is logistics, where the responsibility is given to third-party service providers. This means the service provider acts as an intermediary between the buyer and the end customer.

This thesis concentrates on depicting the operational environment of one such service provider, Swissport Finland Ltd, and the improvement of their checked baggage irregularity service. The tools used for this work were service blueprinting, an illustrative method for service mapping, and failure modes and effects analysis. The theoretical part of the thesis offers a framework for using these tools for logistics services, while the empirical part consists of a study mostly qualitative in nature. Action research method was used for the service improvement research.

According to the results of this study the combination of service blueprinting and FMEA can be used successfully for irregularity service improvement. The most important result was an enhanced irregularity process that has been found to alleviate earlier problems.

PREFACE

I would like to thank professor Jukka Hallikas for his eternal patience and reassuring guidance, as well as anyone and everyone at Helsinki Airport who has helped me in any way during the making of this thesis.

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1 INTRODUCTION

1.1 Background

The trend of thinking specialisation through core competencies of a firm has enabled organisations to concentrate on skills from which their competitive advantage, and ultimately profit, is made. In effect, this means an organisation can focus on what it does best, while parts of the operation that could not or would not be developed for reasons of lack of resources or interest can now be developed further by specialists of these fields. In terms of supply chain management this has led to a shift from self-sufficiency to outsourcing of non-core activities. (Lysons & Farrington 2006, p. 122)

Outsourcing of non-core activities creates new business opportunities especially for business-to-business service providers. As companies try to outsource as much of their functions as possible, this creates a market for specialized service companies in branches of increasing complexity. On the other hand, a well-thought service offering can create a market for itself more easily than before as companies become more and more attracted to the concept of buying operations traditionally done in-house from third parties.

While the benefits of the methods described above are clear, the concentration on core competencies sometimes leads to a complex network of organisations, where organisational cultures and ways of thinking can be very diverse, but continuous and detailed communication is needed. The lack of common culture and conflicting objectives create friction which can lead to insufficient flow of information and puts massive strain on coordinating the effort and controlling the end result.

The problems of these complicated networks are compounded when the business environment requires reactiveness and adaptiveness from the stakeholders. One such branch is the airline industry, in which unpredictability, short lead times and peaks in throughputs and workloads are in the essence of the operation.

In order to succeed, an airline must control a wide variety of operations ranging from the flights themselves to aircraft maintenance, ticket selling, customer service, catering, baggage handling and cleaning with precision rarely required elsewhere as a delay of a couple of minutes can prove costly. These operations are linked with various supporting activities regarding air traffic control, safety and infrastructure which must also be performed in a timely manner.

1.2 Object

The main objective of this research is to review Swissport Finland Ltd's irregularity process in baggage services at Helsinki Airport with the target of developing the service while taking into account the different intricacies of third-party logistics services and the business environment. Performance during irregularities and anomalies is a focal point of the study.

To achieve this, several questions must be answered. In order to create a balanced view of baggage services that takes into account both the end customer and the various activities and background processes needed for providing it, the process has to be studied as a service. Thus, the first research problem is **how to define and depict a service**.

In providing enough background information about Swissport's processes, a detailed view of both material and information flows and the business environment in air travel is needed. This creates the problem of **mapping logistics processes in the most suitable way** keeping in mind the special characteristics of the field of operation.

While the necessary background information is taken into account with the first two research problems, an organized solution for finding the problems in the process and providing answers to the challenges identified has to be brought forward. Thus, the third research problem is about **analysing a service process in a systematic and methodical way** with the eventual objective of service improvement.

1.3 Definition

The theoretical part of this thesis is constructed with the view of answering the research objectives introduced in chapter 1.2. This leads to a structure where a wide variety of topics is discussed, which also means some of them are not talked in great detail, but only in the extent necessary for the objectives. The main outlines of the study are specified below. Definition on the case study is further defined in chapters 7.1 and 8.1 regarding details which are subject to the theories introduced in the theoretical part of the thesis.

For reasons of scope and practicality, service is discussed in the context relevant to a logistics service provider. While the view of the end customer is still considered important, the details and problems of defining business-to-business services and the quality of them have been acknowledged to offer a general view on the subject. In addition to that, special attention is given to concepts relevant to a third-party service provider regarding not only the concept of service, but also that of managing material and information flows.

Logistics processes are reviewed from the perspective of the airline business, i.e. the concentration is on subjects important to this field and the intricacies of the branch are striven to be taken into account where possible. On the other hand, subjects irrelevant to the business environment in question such as stock control or production planning are not discussed.

In the empirical section, the point of view chosen is that of a third-party service provider. Although the service process is attempted to be illustrated from the point of view of the end customer, the emphasis of the analysis is on what would be beneficial for the handling service provider. The scope of the case study has also been carefully outlined to ensure that the focus of the analysis does not blur. This is also discussed in greater length in chapters 7.1 and 8.1.

1.4 Methods Used

According to Hirsjärvi et al. (2009, p. 134) case study is a study where detailed information about an individual object is collected and processed. The aforementioned definition applies to this research. Furthermore, Hirsjärvi et al. (2009, p.135-136) state that qualitative and quantitative research methods are approaches that complement each other. While the quantitative approach is more about processing numerical information and qualitative research concentrates on analysing detailed information, an exact definition can not be made.

To perform this study, both qualitative and quantitative approaches were used. The main research process was twofold: firstly, the main processes in baggage handling were mapped by conducting theme interviews with stakeholders and by observing the processes in action. This model was then utilized as a baseline for a detailed analysis of the different parts of the process. In addition, a cursory quantitative study was made in order to roughly determine process cycle times.

The need for a quantitative study stemmed from the need to illustrate the time dependency of the processes in question to better depict the operational environment. Data was gathered from Finavia and Swissport systems and by logging baggage arrival times manually at the transfer baggage terminal.

All interviews were conducted as theme interviews as the case in question was applied in nature and thus the responses were known to be complex and clarifications and further questions were likely to be needed (Hirsjärvi et al, 2009, p. 133, 207-208). As the study concentrated on defining and understanding processes, it was determined that recording all the interviews was not necessary. Instead, outlines of the processes in question were made beforehand for the interviews by observing the environment and then refined during the interviews. Interviewees were selected with the view of composing an adequate overall picture of the environment.

For process analysis, action research was used as the main research method. This is defined as a method where the research work is done while taking part in the work or community that is studied. An essential problem arising from this is that the reliability and quality of the study is subject to the judgement of the research worker. (Heikkinen et al. 2001, p. 9-10) This was taken into account by taking a systematic approach to the study and by debating the observations made with different participants of the process. To ensure that the analysis was performed in an organized way, FMEA analysis (appendix 1) was used as a framework.

1.5 Structure

The theoretical framework of the study can be divided into two parts. The service analysis part concentrates on creating a framework for service development, while the material and information flow part is about creating a picture of the operational environment and thus linking the theory to the empirical section of the work. The theoretical framework is illustrated in figure 1 by listing the chapters and their main topics.

The theoretical part of the thesis is structured so that it starts by defining services. It then continues by introducing a tool for service analysis by combining service blueprinting with FMEA. This is followed by introducing the concept of logistics and supply chains and the basis of supplier relationship types in outsourced logistics services. Furthermore, the final chapter of the theoretical part acts as an introduction to the empirical part by introducing concepts of airport logistics important to the subject from a theoretical point of view.

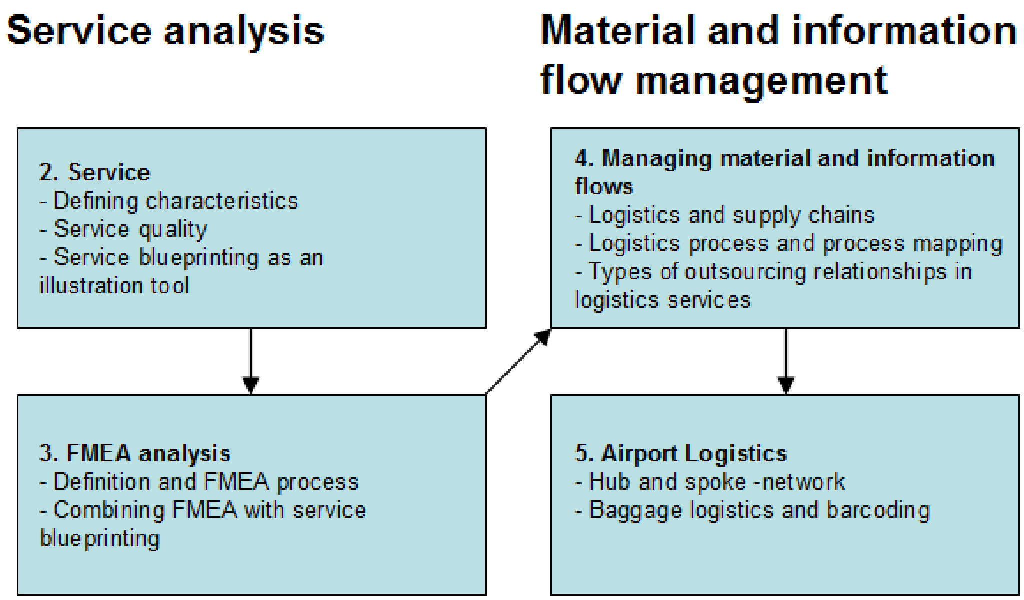

Figure 1. The theoretical framework of the research.

The structure of the theoretical part should also be considered in relation to the research problems listed. Chapter 2 seeks to provide answer to the question of defining and depicting a service, while chapter 3 introduces an analysis tool for service processes, thus making it the framework with which this thesis tries to achieve its main objective. Chapters 4 and 5 on the other hand aim to provide a model and enough background information to map logistics processes in a suitable way for the thesis.

As described above, chapter 5 acts as an introduction to the empirical part of the thesis. This is then followed by an introduction of the operational environment, after which the study process is explained and the results reported. Thus, it could be said the empirical presentation examines the topics in an order opposite to the theoretical part. The presentation of the case study with the main topics of each chapter is depicted in figure 2.

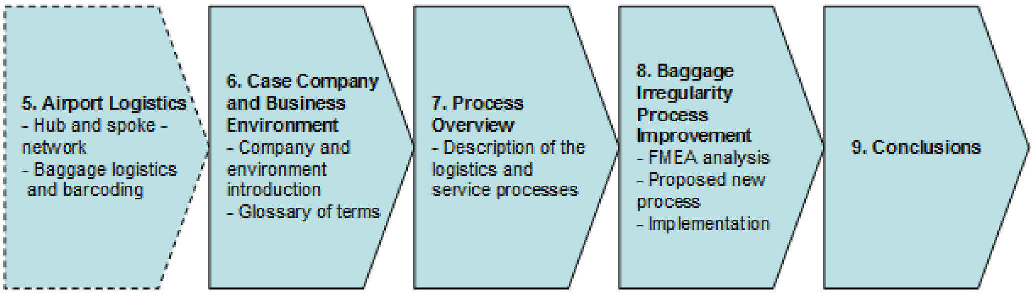

Figure 2. The presentation of the case study.

As determined in chapter 1.4, the case study consists of two parts. The findings of the first part of the process that could be described as information gathering are listed in chapter 7. With the groundwork laid, chapter 8 then concentrates on analysing the irregularity process. A proposed process is showcased and the implementation of it discussed. The thesis is then brought to a close by going through the conclusions made.

2. SERVICE

2.1. Definition

In everyday use the word service is normally associated with the way one is treated in a customer relationship. This is in many ways inaccurate as the actions visible to the customer are only a narrow part of what defines a service. To give the word its proper definition in this context, Grönroos's (1990, p. 27) description is a comprehensive and an often-used one:

"A service is an activity or series of activities of more or less intangible nature that normally, but not necessarily, take place in interactions between customer and service employees and/or physical resources or goods and/or systems of the service provider, which are provided as solutions to customer problems."

2.1.1 Characteristics of Services

There are many different ways to further define a service, but the most common one is to describe the ways trade in services differs from trade in goods. Usually (e.g. Zeithaml & Bitner 2003, p. 20-22; Fitzsimmons & Fitzsimmons 2006 p.21-25) four main attributes are found. These are:

- Simultaneous production and consumption
- Heterogeneity
- Intangibility
- Perishability

Simultaneous production and consumption implicates that the customer is usually present during the production of a service and will often participate in the production. The most significant effect of this is that unlike with goods, there seldom are economies of scale in service production. Services that require physical contact can not be centralised. (Zeithaml & Bitner 2003, p. 21-22)

Simultaneity implies **heterogeneity** as the interaction between provider, customer and circumstances varies from time to time (Lysons & Farrington 2006, p. 502). This makes it difficult to produce a consistent service - even if you find ways to control the production and the environment, the experience of a customer is still dependant on his needs and expectations. (Fitzsimmons & Fitzsimmons 2006, p. 25)

According to Zeithaml & Bitner (2003, p. 3) services in their pure form consist of deeds, processes and performances, thus they are **intangible**. The concept of a service can be difficult to grasp, which makes it challenging to advertise it. It is also very difficult to patent a service concept, hence there is often no way to prevent copying. (Zeithaml & Bitner 2003, p. 21)

Intangibility also leads to **perishability** as a service can not be stored or resold (Lysons & Farrington 2006, p. 502). An empty seat in a sports game or in an airplane is a lost opportunity, which can not be sold or used at a later date. This leads to problems in both pricing the service and managing production capacity as fluctuating demand is a common problem. (Fitzsimmons & Fitzsimmons 2006, p. 25)

It should be noted that very few services are purely intangible, but rather they normally have both tangible and intangible elements in them. On the other hand, many goods are offered with an intangible element at least in the way of customer service. The goal of any purchase is to fulfil a need, but this can often be done by either a service or a product. (Zeithaml & Bitner 2003, p. 5; Axelsson & Wynstra 2002, p. 13-14) For example, the need for a haircut can be fulfilled by either going to a barber or buying a hair trimmer and doing the work yourself. In figure 3, some product offerings are shown in order of their tangibility.

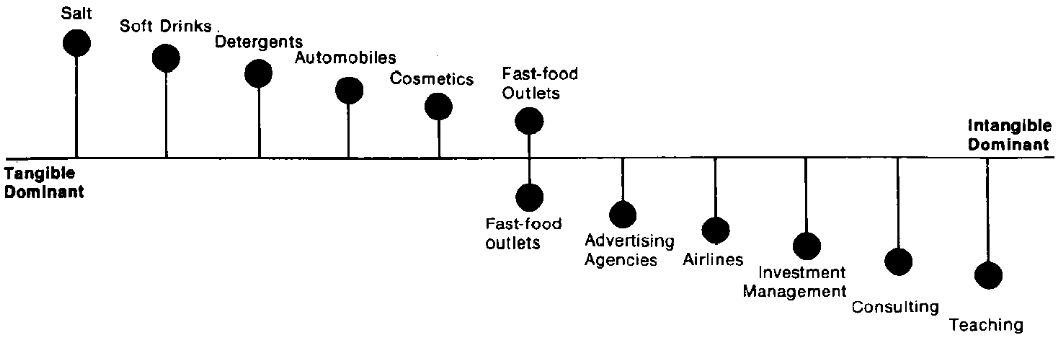

Figure 3. The tangibility spectrum (Shostack 1977, p. 77).

According to Boshoff (2003), services are riskier to buy than goods because of their intangibility. Three things are highlighted:

- the exact nature of what has been bought will be known only after the buying decision
- customers differ in information and expectations they have
- high level of human involvement makes standardisation of a service almost impossible

2.1.2 Components of a Service

To gain an understanding on what a service product consists of and how it is produced the product must be conceptualized. An often-used way to further define a service is the service package model (e.g. Lehtinen 1986; Normann 1991). This model divides the services offered in different groups based on their role in the service product. Three types of service are specified: **core service**, **facilitating services** and **supporting services**.

Core service is the reason why a company is doing business or the basic function the offering is to achieve. For example for an airline the core service is transportation. It must be noted that a company can have more than one core service. **Facilitating services** are services that are mandatory in completing the core service in the way it was designed, for example materials or premises the service could not be carried without. (Grönroos 2000, p. 166-167, Axelsson & Wynstra 2002 p. 48)

Supporting services on the other hand are services that are added in the interest of competition and differentiation. For example, an airline could have priority check-in for business class customers. Distinguishing facilitating services from supporting services can in some cases be difficult as the exact nature can depend on the exact type of core service provided. For example, a warm meal can be a supporting service at a short flight but it becomes a facilitating service on a long-haul flight. (Grönroos 2000, p. 166-167)

Another way to conceptualize a service is to examine it as a process, thus identifying the different facilitators in service production. The Activities-Resources-Actors model (Figure 4) was developed to analyze business activities in industrial systems, but it can be usefully applied to service processes as well. The main thrust of the model is that in any system, there are actors who are in control of various resources which are then used to perform different kinds of activities. (Axelsson & Wynstra 2002, p. 48-49)

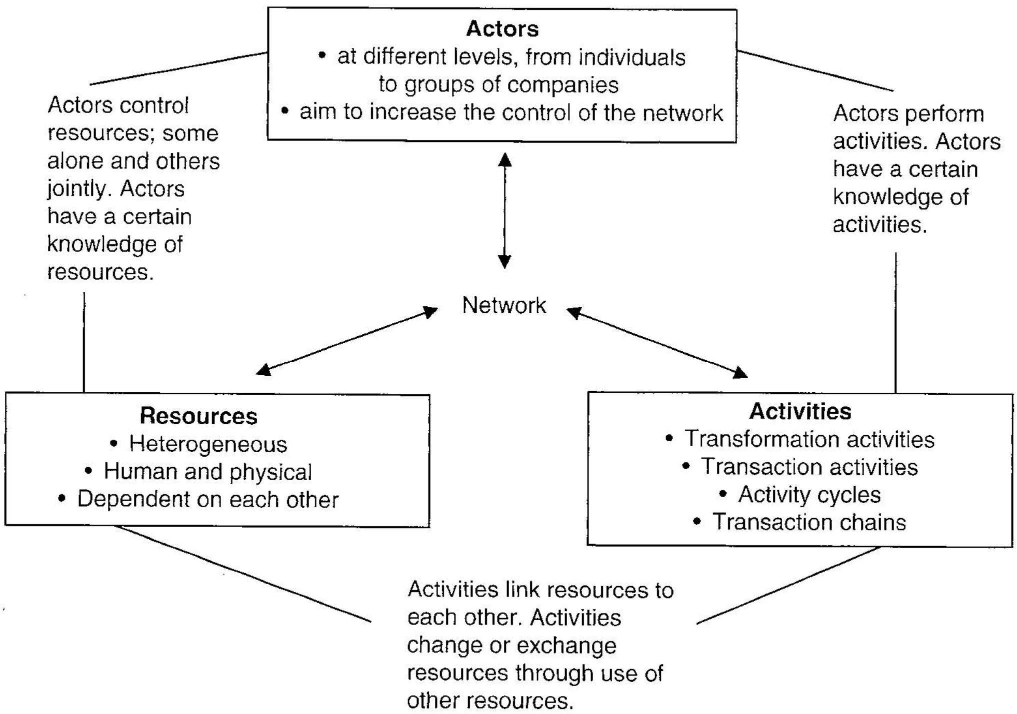

Figure 4. The A-R-A model. (Håkansson 1987, p. 17)

In effect, **activities** are the catalyst that activates actors and resources in the network. The way that a company works can usually be described through a certain activity cycle, like Just-In-Time or Total Quality Management. (Ford et al. 1998, p. 42-43) Defining activities is generally the starting point of the model, as the concept depicted can be seen as a pattern of activities, from which different resources and actors can be identified. (Axelsson & Wynstra 2002, p. 49)

Resources are controlled by actors and facilitated or used through activities. This link to activities means that the resources of one actor or company are usually linked to the resources of other actors or companies, which means they are often exchanged for each other and are of less value in isolation, i.e. without the complementing resource. (Ford et al. 1998)

According to Ford et al. (1998, p. 42) **actors**' relationships with customers, other companies and different stakeholders determine what a company (or in this context, a certain service) really is. While the picture one gets is determined through products, these are in fact dictated by relationships. Relationships between actors not only increase their knowledge, but also create and build up trust between them.

The A-R-A model can be linked to the service package model. Usually, core and supporting services are based on actions and activities, whereas facilitating services have more to do with resources. (Axelsson & Wynstra 2002, p. 48) This link and the different dimensions in the A-R-A model are particularly useful in linking services to the tasks of service modelling and process mapping. These topics will be elaborated on in chapters 2.3 and 3.x respectively.

2.2 Service Quality

Service components outlined in chapter 2.1.2 can be used to compose a picture of what is produced and why. However, these are of very limited use in determining the success of your service product. Instead, the quality of a service depends on how customer perceives it (Grönroos 2000, p. 165).

In effect, service quality is also the basis of planning or executing any service function - as Grönroos (2000, p. 164) states, the only valid way to conceptualize a service is through the perspective of the end customer. Thus it is of paramount importance to have a good perception of what determines service quality.

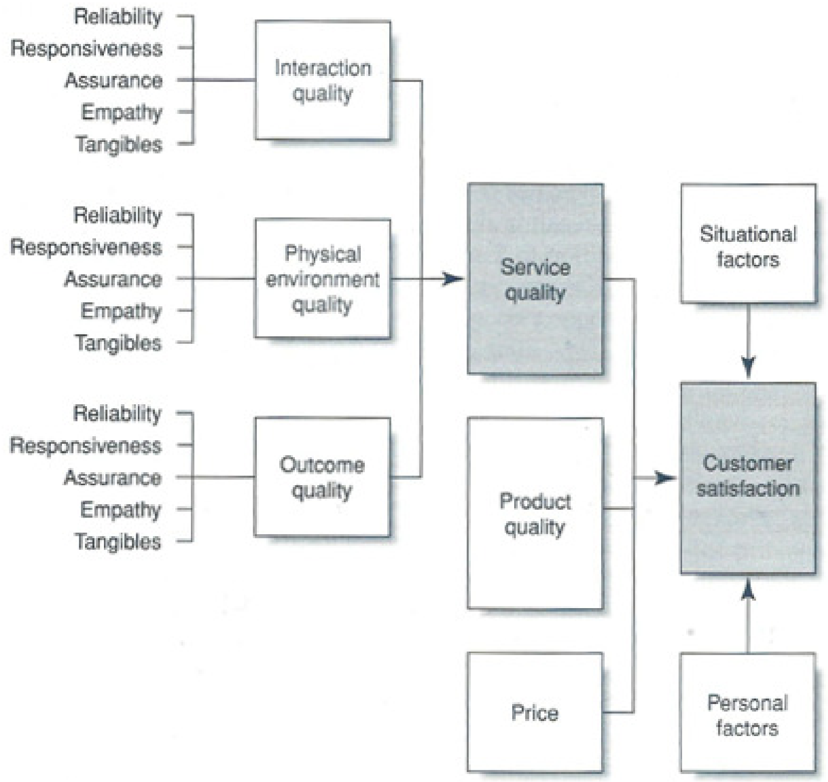

Figure 5. Customer perceptions of quality and customer satisfaction (Zeithaml & Bitner 2003. p. 85)

It must be emphasised that service quality is not a synonym for customer satisfaction, but rather one of the components that determine it. Zeithaml & Bitner (2003. p. 85) identify service quality as a factor that determines customer satisfaction, others being situational and personal factors at the time of consuming the service, the quality of possible tangible products and the price of the offering. Factors behind service quality and customer satisfaction are illustrated in figure 5.

2.2.1 Customer Satisfaction

Customer satisfaction is a complicated concept the intricacies of which are outside the scope of this thesis. However, it is of essence to understand the main drivers behind it keeping in mind the importance of the perspective of the end customer.

Oliver (1997, p. 13) defines customer satisfaction as follows: *"Satisfaction is the consumer's fulfilment response. It is a judgement that a product or service feature, or the product or service itself, provides a pleasurable level of consumption-related fulfilment."* According to Grönroos (2000, p. 67), the customer's response is dependent on not only the service received, but also on expectations. The judgement is made by comparing expectations with what was experienced.

Expected quality is dictated by the company's marketing communication, company or brand image, previous experiences of not only the provider in question but also of providers of similar services, recommendations the customer has been given and the customer's perceived needs. (Grönroos 2000, p. 67) To link this with Zeithaml & Bitner's view (Figure 5), expected quality is the result of how situational and personal factors affect the consumer.

In contrast, **perceived quality** can be linked to the service quality, product quality and price factors in Figure 5. Perceived quality can also be described by asking what was the result of the service and how it was done, referring to the technical and functional quality of the service respectively (Axelsson & Wynstra 2002, p. 153).

To conclude, customer satisfaction is dependant on matching the service provided with customer's expectations. In other words, to succeed as a service provider you have to have a good understanding on what your customer wants, which is the basis of Grönroos's statement about conceptualizing your service with the end customer in mind.

2.2.2 Dimensions of Service Quality

In both business-to-business and retail service relationships it can be observed that service quality is judged on a variety of factors relevant to the service in question. (Axelsson & Wynstra 2002, p. 151; Zeithaml & Bitner 2003, p. 93) As these factors differ widely, general performance criteria are needed.

Zeithaml et al. (1990) have identified five dimensions of service quality that are applied by customers when judging diverse types of services. The dimensions are **tangibles, reliability, responsiveness, assurance** and **empathy**. The customer will not necessarily use all of the dimensions in their judgement if the nature of the service does not require it, for which reason the model can be applied by using the dimensions relevant for the case in question. The dimensions were introduced in Figure 5 as components of quality and they are set out in detail in table 1.

Dimension	Definition	Example
Tangibles	Appearance of physical facilities, equipment, staff and communication material	Sales material, staff aptitude
Reliability	Ability to perform the promised service dependably and accurately	Service that is timely and up to specification
Responsiveness	Willingness to help customers and provide customer service	Customer assistance esp. in exceptional problems
Assurance	Customer confidence in the service providers based on belief in their competence, courtesy, credibility and security	Customers will return to provider if need arises
Empathy	Customer confidence that the service provider will identify with the customers' service requirements and expectations in relation to ease of access, good two-way communication and understanding	Customers will return to provider if need arises

Table 1. Dimensions of Service Quality (Zeithaml et al. 1990, adapted).

According to Zeithaml & Bitner (2003, p. 93), the dimensions have been found to be applicable to both retail and business services. These dimensions are used in an assessment tool called SERVQUAL, which can be used for specific service on service providers or service applications to measure both customer expectation and satisfaction (Lysons & Farrington 2006, p. 389).

To take into account the gap between expectations and satisfaction, SERVQUAL runs as a two-part survey conducted before and after the service situation. The basic questionnaires have 22 statements each that have been picked to measure the dimensions of quality detailed in table 1. (Fitzsimmons & Fitzsimmons 2006, p. 132-133)

2.2.3 Service Level Agreement

In business-to-business relationships, covering the risks of service buying outlined in chapter 2.1.1 is a common problem. From this standpoint, the problem is twofold: how to police service quality and how to recognize the qualities important to the end customer, i.e. what should be the focus when ordering or supplying the service or when the results are measured.

Service level agreements (SLA) are a commonly used way to specify and define business services and to police service quality. These agreements are used in both outsourcing deals and internal support services. Broadly speaking, a SLA consists of objectives the service provider is expected to reach and of pre-prescribed penalties for non-compliance. (Lysons & Farrington 2006, p. 388; Axelsson & Wynstra 2002, p. 142)

Lysons (2001) outlines four ground rules in determining the service levels. Firstly, the levels should be **reasonable** as determining unnecessarily high service levels can lead to higher charges and focus the attention solely on the aspects that are being monitored. There should also be **prioritization by the customer** to identify aspects most important to the result. The aspects measured should be **easy to monitor** to avoid subjective or unquantifiable levelling. Lastly, the levels should be **easily understood** by both the customer and the provider.

A general view of a SLA is hard to compose as the exact nature of the agreement varies widely depending on the service. Following is an adapted version of Hiles's (1993) checklist:

- Basic contractual information (goal, date, period, parties)
- Coverage and service levels (e.g. working days, peak workloads)
- A clear definition of each service element
- The level of manpower and other resources at each time
- Reaction times
- Precision
- Availability

To elaborate on how to define service levels with different types of service, Axelsson & Wynstra (2002, p. 144) introduce a specification method based on different parts of a generic service flowchart (input-throughput-output-outcome). The flowchart and different focuses are outlined in table 2.

Input	**Throughput**	**Output**	**Outcome**
Focus on resources and capabilities of the supplier	Focus on processes or production of the service	Focus on the function or performance of the service	Focus on value in economic terms for the user

Table 2. Methods for specifying business services. (Axelsson & Wynstra 2002, p. 144)

Focus on processes (throughput) means that the activities performed by the provider are precisely defined and there are minimum quality levels that should be met. The customer must be able to describe which service activities should be performed and how they should be done. **Focus on function or performance** (output) indicates that what is done and when is policed, but the provider gets varying degrees of freedom to decide the processes. (Axelsson & Wynstra 2002, p. 145-146)

Focus on value (outcome) is about determining what the service should accomplish. This can be done through outcome, results or customer value. **Focus on resources** (input) is not about a specific service per se, but rather about capacity or special competence offered to the customer. This kind of specification can be beneficial especially when the specific service needed is not known yet. (Axelsson & Wynstra 2002, p. 146-148)

2.3 Service Blueprinting

The components and qualities outlined in chapters above describe service as a series of actions that can be difficult to grasp in its entirety. This becomes problematic when there are several different stakeholders involved all assessing the service from their own viewpoints. To enable a systematic review on a service process, a balanced, general view is needed.

A solution first coined by Shostack (1984) is the service blueprinting method. Zeithaml & Bitner (2003, p. 233) describe it as a picture or a map of the service system that portrays it in an objective way which can be easily understood regardless of your point of view in the process. A general service blueprint template is shown in figure 6.

The blueprint simultaneously depicts not only the delivery process, but the points of customer contact, the roles of employees and customers and visible service elements as well. It also makes it possible to review the service process action by action. (Zeithaml & Bitner 2003, p. 233) While the blueprint is most commonly a drawing, Bitner et al. (2008) note that more elaborate solutions, such as blueprints with video links to service elements, have been developed.

The main benefits of the method concern facilitating service improvement and innovation. Service blueprinting is by design customer-oriented, which sets it apart from other process-based designing tools. This makes it particularly useful in visualizing customer perspective and developing customer experience. As the scope of a blueprint can be changed depending on its usage, blueprinting can be adapted for both micro-management (e.g. quality improvement) and strategic level planning. (Bitner et al. 2008 p.71)

As an example of the flexibility of the model it has been successfully tailored to depict product-service-systems, i.e. product offerings where the product is sold as a part of a longer service agreement. Such deals are becoming more pertinent as consumers' preferences shift towards more sustainable products.(Boughnim & Yannou 2006, p.1-2) The method has also been found useful at all organizational levels because it connects support processes to the end result and thus makes it easier to understand one's role in executing the service. (Bitner et al. 2008 p.71)

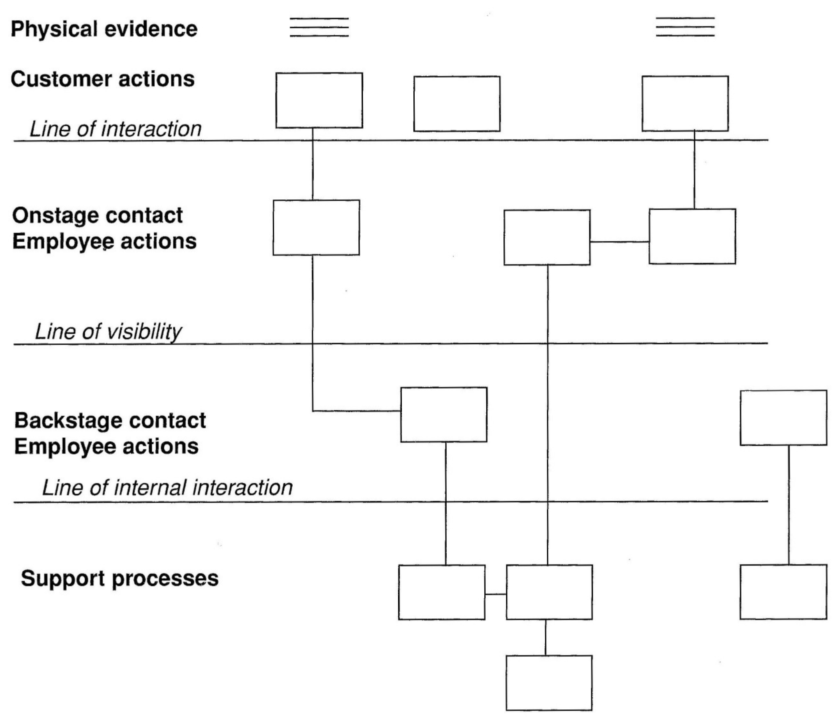

Figure 6. A service blueprint template (Zeithaml & Bitner 2003, p. 234).

2.3.1 Layout of a Service Blueprint

A service blueprint reads out as a flowchart of sorts that gives special attention to customer interaction at different levels of the process. As Bitner et al. (2008, p. 71) state, service blueprinting is not as formal as other mapping techniques and can be modified depending on its usage. Unlike in other process mapping tools, the icons used are not standardised.

The service blueprint template in figure 6 is explained below. It is a generic model that has the most common components service blueprints normally have. Some more complicated models are introduced in brief in the end of this chapter.

The horizontal axis of the blueprint represents time, whereas the vertical axis assorts the different participants of the service process in their own components (Boughnim & Yannou 2006, p.7). Bitner et al. (2008, p.72) list the components as follows:

- customer actions
- onstage or visible contact employee actions
- backstage or invisible contact employee actions
- support processes
- physical evidence

As mentioned by Axelsson & Wynstra (2002, p.48), the A-R-A model is closely related to service blueprinting. Indeed, every box on the first three levels of the blueprint can be seen as activities described in the A-R-A model. **Onstage and backstage actions** differ in their relation to customer - onstage actions are done with the customer face-to-face, whereas backstage actions take place without customer. It is important to notice that a backstage action can also have interactions with customers by phone or email i.e. the defining factor is personal contact. (Zeithaml & Bitner 2003, p. 233)

The thing that sets service blueprints apart from other mapping techniques is the way **customer actions** are depicted. They are the first level of the blueprint around which all employee actions and physical elements of the service are organised and consist of everything the customer does to complete the service process. (Bitner et al. 2008 p.72)

Physical evidence and **support processes** differ from other parts of the model as they do not depict actions. Physical evidence consists of everything the customer can notice during the service encounter. It is closely related to resources in the A-R-A model, but can consist of actions and actors as well. Support processes on the other hand connect the service to other action chains elsewhere. (Axelsson & Wynstra 2002, p. 48; Zeithaml & Bitner 2003, p. 233-235)

The lines between different components are used to define different types of interactions that take place during the service process. If the process crosses the **line of interaction**, a moment of truth, i.e. a customer interaction, happens. Crossing the **line of visibility** means something that can be perceived by the end customer has taken place even though he is not directly involved. The **line of internal interaction** is important as it determines the parts of the process that require cooperation between different functions or departments of the company. (Zeithaml & Bitner 2003, p. 233-235; Bitner et al. 2008, p. 70-72) It should be noted that these links are often the ones that suffer from asymmetrical information and other transaction costs as specified by transaction cost theory (Coase 1937; Williamson 1979), which is described in greater detail in chapter 4.3.1.

Service blueprinting has been further developed to connect service processes to background functions relevant to it. A fourth line, the line of implementation, is sometimes added to depict management activities relevant to fulfilling the service (e.g. Kingman-Brundage 1989). Fliess & Kleinaltenkamp (2004) have developed this further by adding the line of order penetration, which divides customer-induced activities from customer-independent ones. This makes it possible to examine the blueprint in the context of value chain as opposed to the organizational structure of service operations it normally depicts.

2.3.2 Building a Service Blueprint

Before building a service blueprint some prerequisites should be met. A common mistake is to give the responsibility of the build to one functional area or even to one individual. This will not work - the process should involve all stakeholders relevant to the service, not forgetting customer information. (Zeithaml & Bitner 2003, p. 234) On bigger and more time-consuming projects, strong support from management is often needed to ensure all relevant departments and individuals participate. (Bitner et al. 2008 p. 72)

The process of building a service blueprint can be divided to six parts. These are listed in figure 7.

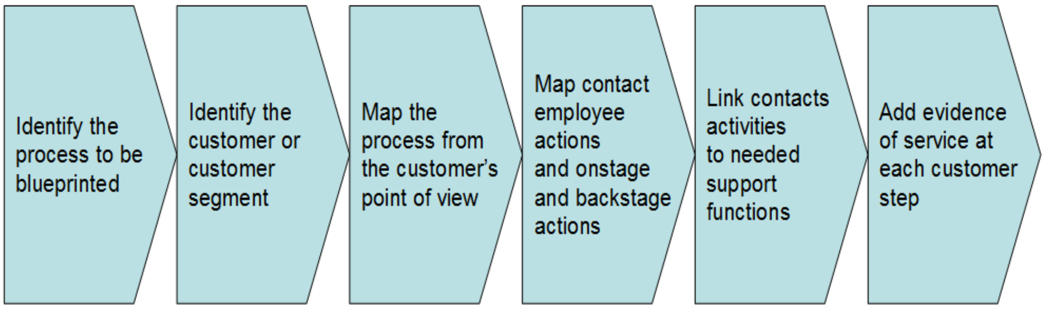

Figure 7. Building a service blueprint. (Zeithaml & Bitner 2003, p. 239, adapted)

The first decision made when composing a blueprint has to be a clear definition of what will be modelled. This is in fact determined by the purpose of building the blueprint - when done for management purposes the blueprint is going to have a different scope than when it is made for improving the service. (Zeithaml & Bitner 2003, p. 240) It is also important to agree precisely on the process that is being mapped - the blueprint could depict either a currently offered service or a desirable service process, but not both! To help keep focus during the work, the detail a single action is pondered upon should be decided concerning the intended usage of the blueprint; a thorough examination of a support process for example is normally not needed. As the exact presentation of the blueprint can be modified depending on its usage, this should also be considered in the planning phase. (Bitner et al. 2008 p. 79-80)

In case the service process varies depending on the customer or customer segment, the blueprint should be made with a particular customer in mind. This not only avoids confusion, but maximises the usefulness of the blueprint as well. As an exception, a *concept blueprint*, a blueprint of the basic steps of the process (Bitner et al. 2008, p. 74), is usually made with a general customer profile in mind. (Zeithaml & Bitner 2003, p. 240, 242)

The mapping of the blueprint is then started by depicting all the actions customer performs and everything that he experiences during the service. (Zeithaml & Bitner 2003, p. 240). This is done to ensure that the focus of the work stays on the customer instead of steps that happen inside the organization and thus have no customer contact. It has been found challenging to delineate when a service actually starts and ends from the customer's point of view. (Bitner et al. 2008, p. 73, 80)

After all the customer actions are on the blueprint, the lines of visibility and interaction are drawn. Then the process is mapped from the point of view of a customer contact person who can verify which actions are done in a way that a customer can see them and which are not (the line of visibility). It should be noted that required visible actions by a technology interface are onstage actions as well. (Zeithaml & Bitner 2003, p. 240-241)

In the following phase all the internal actions and processes connected to the service but not in direct contact to the customer are specified and connected to relevant actions. While this helps in clarifying the supporting processes' role in fulfilling a customer need, a blueprint can also in some cases expose actions that are not actually needed to complete the service. (Zeithaml & Bitner 2003, p. 241)

Finally, all the physical evidence the customer sees and receives is recorded. Every customer action and every moment of truth should be examined to recognize everything that can influence customer's quality perceptions. (Bitner et al. 2008, p. 72-73) In this phase, material such as photos or videos of the service process can be of help. As mentioned above, these can also be made parts of the blueprint. (Zeithaml & Bitner 2003, p. 241)

It must be noted that the service blueprint is not the only thing gained when one is composed. In the process of building it a clearer picture of the service concept is obtained, thus the vision behind the concept should become clearer to the stakeholders involved. It also forces you to pay attention to details that could otherwise go unnoticed. (Zeithaml et al. 2009, p. 271)

2.3.3 Criticism

To better understand the limitations of the blueprinting method, the cons and potential pitfalls of the tool should be considered. Johnston (1999, p.103) notes that while service blueprinting has evolved into a tool that aims to customer focus, it still is oriented towards the service fulfilment process. As the layout still is a chronology of tasks, the model will likely lack in depicting how the customer assesses service quality.

While Fliess & Kleinaltenkamp's (2004) work introduced in chapter 2.3.1 goes some way into changing the orientation of the service blueprint, the task-oriented nature of it will always be too rigid to truly see how the end customer perceives the service. As an example, it has been discovered that when a service blueprint is used as a basis of evaluation, more subtle interpretations of the service can go unnoticed. (Johnston 1999, p.103)

Johnston (1999, p.103) states that a structured approach to service evaluation should be based on four key elements:

1. The service concept
2. The service process
3. Transaction quality assessment
4. Messages - the customer's interpretation of the service

When this list is reviewed from the point of view of service blueprinting, it becomes clear that the model should not be used in isolation. It is, however, of great help in the first two parts of Johnston's approach. While **the service process** is in the core of the blueprinting method, **the service concept**, the way the company wants its services to be seen by the customer, is often depicted in the form of a concept blueprint. It should be stated that the service concept is a prerequisite for a working service process and that the concept is determined by several factors such as the image of the organization, thus making it a decision that stems from the strategy and mission of the company. (Johnston 1999, p.103-104)

The **transaction quality assessment** and **messages** elements aim to a better understanding of the customer's view of the service. While the moments of truth identified in the service blueprint are a valid starting point for assessing the different transactions with the customer, this leaves out important transactions; according to Bitner and Hubbert (1994), overall satisfaction stems from all the experiences the customer has had with the company. These may or may not have happened during the service process. Customer's interpretation of the service on the other hand is something blueprinting can never grasp. The most efficient tool for this is called a walk-through audit, i.e. experiencing the service first-hand and gathering all the evidence. (Johnston 1999, p. 104-105)

These elements have been combined to a tool called Service Transaction Analysis (STA), which focuses on customer's interpretations during every step of the service. STA is built around walk-through audits, which should be done by mystery shoppers or independent advisers in order to get a truly independent customer view of the service. (Johnston 1999, p.105) While STA claims to have combined all the elements covered above, the model concentrates on the customer view. Consequently, it could be said that it lacks scope on internal dealings of the organization.

3 FAILURE MODES AND EFFECTS ANALYSIS (FMEA)

Failure modes and effects analysis (FMEA) is a tool for reliability analysis developed in the U.S. military in 1949 (Ramu 2009, p.37). Nowadays it is most commonly used in the manufacturing sector to identify potential failures in production systems. Possibilities for failure are identified and ranked by their severity and probability of occurrence. This data is then used to focus improvement work. FMEA has been found especially useful in automotive, aerospace and electrical industries for pre-release quality improvement. Other means of usage include service systems in the field of health care, although literature regarding applications of this kind is rare. (Chuang 2007, p. 93, 95; Pillay & Wang 2003, p.69)

FMEA can be used for quantitative, semi-quantitative or qualitative analysis. Quantitative analysis requires not only good statistical information on failures, but also knowledge of dependency relationships in the system that is analyzed. When used in qualitative analysis, FMEA evaluates the effects of system failures, then attempts to identify critical components the failing of which could lead to accident or property loss. This information is then utilized to develop enhancements or administrative changes to improve the reliability of the system. (Pillay & Wang 2003, p.70-71)

Although the FMEA model can vary widely depending on its usage, common terminology has been developed. The most important terms are introduced in table 3. (Pillay & Wang 2003, p.75) It must be clarified that although Risk Priority Number (RPN) is normally generated as stated in table 3, a variety of industry-specific approaches with variables better suited to a specific branch have been developed. In probability, detectability and severity rankings, scales from one to five and one to ten, where one represents low risk, have gained most popularity. (Welborn 2007, p. 18)

Term	Description
Failure mode	The way in which product or process could fail to perform its function. Examples: fatigue, collapse, cracked, performance deterioration, deformed, stripped, worn, corroded… Term “categories of failure” is also used sometimes.
Potential causes of failure	List of potential causes of failure for each failure mode. Examples: incorrect material, poor weld, bad maintenance…
Severity	Assessment of how serious of the failure mode is on the customer/user.
Effect	Consequence of the failure for customer/user.
Risk Priority Number (RPN)	A number used to sort potential failures. Commonly counted as probability of failure X detectability of failure X severity of failure.

Table 3. FMEA terminology. (Pillay & Wang 2003, p. 75; Welborn 2007, p.18)

3.1 FMEA Process

When used for production systems, FMEA is a painstaking process consisting of tens of actions each important in trying to achieve as few defects as possible (e.g. Ramu 2009, p. 38-39). However, to obtain a general view of the procedure it can be summarized in four main steps (Chuang 2007, p. 96):

1. Identify all potential failure modes of the service system.
2. Relate the possible causes, effects and hazards of each failure.
3. Prioritise the failure modes relative to their probability of occurring, criticality (or severity) of failure, and ease of detection.
4. Provide suitable follow-up or corrective actions for each type of failure mode.

In order to ensure that all potential failure modes are identified, the FMEA team should be divergent in its responsibilities and levels of experience. A team of four to six members is normally recommended. This team should then work together to identify possible ways the product or process could fail. (Johnson 2002) It is important that these prerequisites are met as inadequate expertise on the subject and poor planning have been identified as frequent problems in FMEA work. (Ramu 2009, p. 38)

When coming up with causes, effects and hazards of the failures, historical data of complaints, internal issues and comparable products are used in addition to brainstorming. This data should also be utilized in assigning the occurrence and detection ratings of the failures. The severity of a failure can not usually be estimated purely by statistical analysis, which means subjective views of the team come into play. (Johnson 2002; Ramu 2009, p.38)

Finally, the RPN numbers for each failure are counted to prioritise risks for action, after which the data is used to discuss possible cures. After the different functions have done their corrective measures, the FMEA team should meet again to re-estimate the failure modes to see how well the actions have worked. (Johnson 2002)

As mentioned, FMEA can be adapted by changing the components of Risk Priority Number for ones that represent the system or model FMEA is used for. Quality certification issuer ASQ offers a standard FMEA worksheet combined with general rating factors (appendix 1). The worksheet is provided with questions to steer the process as well as threshold values to help evaluation and decision making.

As an example of a different approach, Welborn (2007) uses FMEA for outsourcing risk assessment by grading the outsourcing options for risk opportunity, severity and probability. This would also alter the FMEA process; in Welborn's model opportunity represents the frequency a risk would materialize while probability is the measure of a risk happening at all. This would move the focus of the process from statistical analysis towards human evaluation.

3.2 Combining FMEA with Service Blueprinting

As repeatedly stated in chapter 2, customers' perception of service determines whether the service process was completed successfully. Conversely, a service failure occurs when the service can not meet customers' expectations (Mueller et al. 2003, p. 396). Therefore, combining service blueprinting with a failure analysis tool offers self-evident benefits for service providers. While the blueprint shows potential fail points by making customer contacts visible, the systematic approach to failure analysis provided by FMEA helps in identifying and prioritising risks for service failure. (Chuang 2007, p. 93)

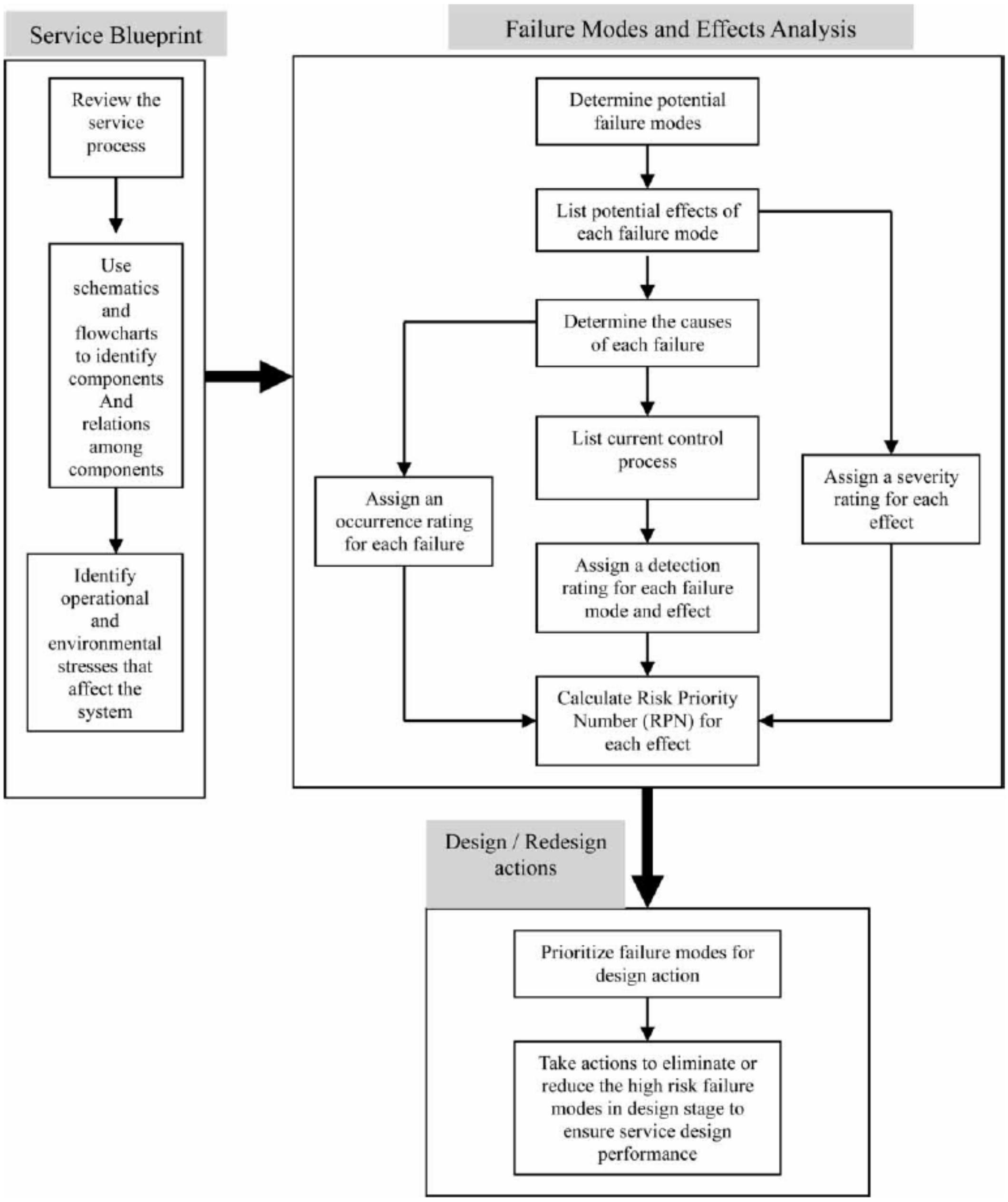

Figure 8. Failure-free service design model (Chuang 2007, p. 94)

From this basis, Chuang (2007, p.93-94) has combined service blueprinting and FMEA into one model. The *failure-free service design model* works by first developing a service blueprint focusing on potential fail points and failure modes in both front and back office activities, then evaluating prioritising them by applying FMEA. The path of the analysis is portrayed in figure 8. A similar approach to service risk assessment has also been used by Rotondaro & Lopez de Oliveira (2001).

When service blueprinting is done for FMEA purposes, the basic process remains as described in chapter 2.3. However, possible stresses affecting the service should be emphasised when mapping the process. In depicting these stresses, the informal structure of the blueprint can be utilized. The blueprint can be altered to show moments of truth, other fail points or repeated potential failures such as customer waiting points with their own icons, while failure modes can later be included in the graph itself. (Chuang 2007, p. 96-97; Rotondaro & Lopez de Oliveira 2001, p. 7)

To help conducting the FMEA, Chuang (2007, p. 96-99) divides the service process into following subsystems: service facility, prior-service, in-service and post-service. This is useful in finding the experts of a certain part of the process and makes it possible concentrate on a specific part of the service process as well. It should be noted that while the other three subsystems are determined by their chronological place in the process, the service facility subsystem consists of physical evidence that can not be classified under just one of the other subsystems.

To underline the multitude of options for prioritizing failure modes it is interesting to notice that Chuang (2007, p. 98-99) conducts an employee questionnaire with the standard RPN components in his case study, while in Rotondaro & Lopez's (2001, p. 3-4) case traditional FMEA groups were formed. Rotondaro & Lopez also added an element to the RPN score - as it was felt that the service process could correct itself thus preventing the risk from happening or minimizing it, failure modes were scored on recuperation as well with a working corrective process getting the score of one.

As in any FMEA, RPN scores are then counted, results analysed and preventive actions designed. The blueprint made for failure mode detection can now be utilized again to plan and carry out the improvements by showing how and where the service system should be changed. (Chuang 2007, p. 94, 102)

4 MANAGING MATERIAL AND INFORMATION FLOWS

4.1 Defining Logistics and Supply Chains

The term logistics has its origins in military, where it has been used to refer to the craft of moving and quartering troops since the Napoleonic Wars (Lysons & Farrington 2006, p.85). In management, the term originally referred to physical distribution and warehousing of goods in the interest of balancing supply and demand. While this is only a part of the concept that constitutes logistics, the perception is still common. (Sakki 1999, p. 23)

The modern meaning of logistics is best summarized as follows (Crompton & Jessop 2001, p. 88): *"Logistics is the process of managing both the movement and storage of goods and materials from the source to the point of ultimate consumption and the associated information flow."* From this, two important observations must be made. Firstly, both acquiring raw materials from their source and distributing the products are parts of what comprises logistics. Secondly, in addition to the materials flow, there is also an information flow.

In order to distinguish inbound and outbound logistics from the point of view of the organization, terms **production logistics** and **consumer logistics** are used (terms acquisition logistics and operational logistics are also sometimes mentioned respectively). Production logistics consists of everything that is done before the point of manufacture, including contracting and procurement but also specification and production processes. Consumer logistics on the other hand comprises of everything that is made to get the product to the end customer. Thus, stock control, transport and reliability and defect reporting amongst other things fall in its area. (Lysons & Farrington 2006, p. 85-86; Sakki 1999, p. 26-27)

The task of controlling the flow of materials is referred to as **materials management**. By consisting of procurement, warehousing, work-in-progress and finished goods, it encompasses both production and consumer logistics. (Institute of Logistics and Transport 1998, p. 10) The information flow runs to the opposite direction from the materials flow and makes logistics a part of the customer service process; the information flow that starts from the end customer should in fact be steering the logistics process. (Sakki 1999, p. 24) Thus, the original meaning of logistics would now be considered the consumer logistics part of materials management. The concept introduced in the last two paragraphs is illustrated in figure 9.

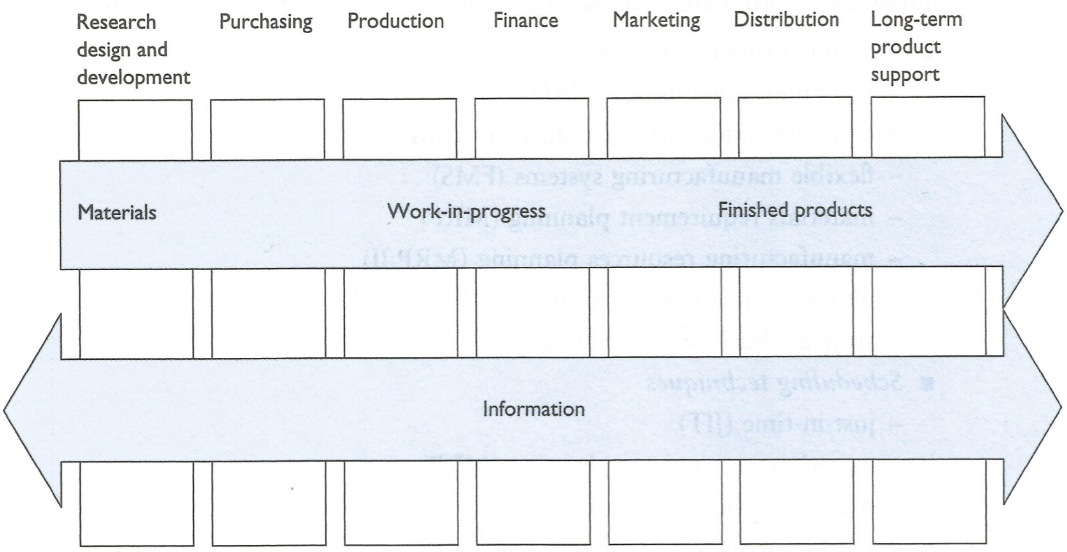

Figure 9. Material, products and information flows across an organization (Lysons & Farrington 2006, p. 90)

Logistics is a subordinate term to **supply chain management**. The two terms are often used synonymously, but there is an important clarification to be made: while logistics aims to control material and information flows within an organization, the goal of supply chain management is to integrate all important business processes across the supply chain. (Cooper et al. 1999, p. 11)

To link the service and logistics parts of this thesis, it is justifiable that the link between logistics and customer satisfaction is considered. This can be done by briefly introducing value chains. These are largely synonymous with supply chains and can be described as the ways in which value is added to a product through the supply chain. (Lysons & Farrington 2006, p. 101)

While the traditional business approach starts from the beginning of the supply chain and aims to profitability, Hines's (1993) value chain model turns the thought process on its head. Hines suggests that the objective should be customer satisfaction, which means the business should be evaluated on its ability to produce value to the end customer. To achieve this, Hines proposes teams concerned with different activities of the organization that are jointly responsible for the whole supply chain. From the point of view of logistics this would mean that the different teams would jointly decide which ways of dealing with the materials and information flows produce value for the end customer and do away with them. (Lysons & Farrington 2006, p. 104-105)

4.2 Logistics as a Process

The reason for observing business as series of processes is that the traditional functional approach tends to concentrate on organizational structure. This is contrasted by processes, which are a set of interlinking activities and corresponding resources that focus on the execution of tasks. (Gersch et al. 2011, p. 733) Usually a process cuts through the whole company and, possibly, over the boundaries of companies. Thus, what is shown in figure 9 is in fact an integrated logistics process that goes through a multitude of functions. (Kaplan & Murdock 1991, p. 31)

Karrus (2001, p. 20) states that process thinking is especially suitable for examining real and information processes. As stated in chapter 4.1, these are in the core of logistics, which makes process perspective a natural fit. Indeed, in order to lead logistics in an organization, a common type of action is to view it as a process, the lead of which is referred to as process ownership. The process owner is responsible for process performance and evolution. Depending on whether the process is aligned to consumer or production logistics, the ownership should be given to a quarter that is close to the end customer or manufacturing respectively. (Sakki 1999, p. 24-27)

4.2.1 Process Mapping

One way of understanding and developing logistics processes is process identification and modelling. An often-used tool for this is process mapping, the craft of which is closely related to that of service blueprinting presented in chapter 2.3. As is understandable, the methods do share some benefits such as showing an individual their place in the big picture and offering a basis to build improvements on (Jacka & Keller 2002, p. 7). Hereby a convenient way to introduce process mapping is to list the ways these two tools are different from each other.

The differences between the two methods stem from their different points of view: the customer orientation of service blueprinting means that it is unilateral in its analysis, i.e. both the provider and the customer are thought of. Process mapping on the other hand is internal in its perspective, which makes it a tool for information management. The focus is on efficient use of cost and time, while service blueprinting is about effectiveness. (Gersch et al. 2011, p. 736) Thus, process mapping is a tool for processes that are truly internal, such as those identified as support processes in service blueprinting, or in the field of logistics, production logistics processes.

There are several ways to build a process map. When done inside an organization, a workshop with representatives from different functions is often used (e.g. Fülscher & Powell 1999). Another way of doing this is through interviewing the different participants. When creating a process map, the work starts by identifying the process that is modelled. Then, material on the said process such as earlier documentation is collected. It is important that the author of the map is open to modifying their view of the process as the work goes along. A preliminary view of what is being done is also a prerequisite for this work, as knowledge of where to find information is obligatory. (Jacka & Keller 2002, p. 44-46)

The information gained is then used to build a preliminary process map and to pick interviewees. A preliminary map can be especially useful in showing the interviewee their place in the process as the author is also responsible of giving sufficient guidance. The map is then further defined through the different interviews, after which the information is analysed and the final process map created. The exact manner of representation of the process map depends on its purpose - the most suitable documentation for its usage should be given thought. (Jacka & Keller 2002, p. 46-50)

The underlying reason for process mapping is process improvement. The improvement cycle is depicted in figure 10.

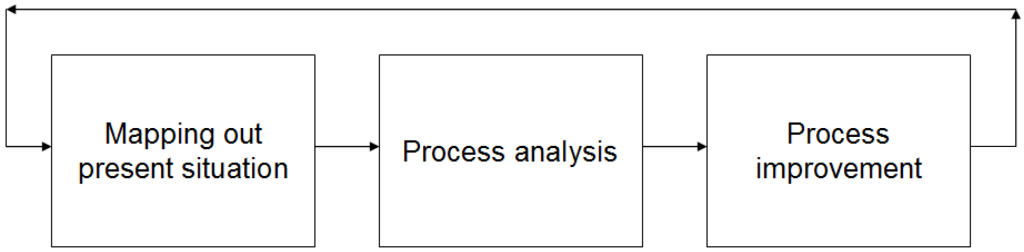

Figure 10. Process improvement (Lecklin 1997, p. 141)

4.3 Logistics Outsourcing

While the shift of thinking towards integrated supply chains explained in chapter 4.1 would call for greater integration, logistics activities are normally seen as something that organizations should not handle themselves. Although there are good reasons for this, the line of thinking does create some challenges in controlling the supply chain.

4.3.1 Outsourcing Decision

Considering the thinking behind logistics outsourcing makes it easier to understand its workings. Sohal et al. (2002, p. 59) list the reasons for it as increased focus on core competences, efforts to conserve capital and the desire to take advantage on logistics service providers' leverage and best practices.

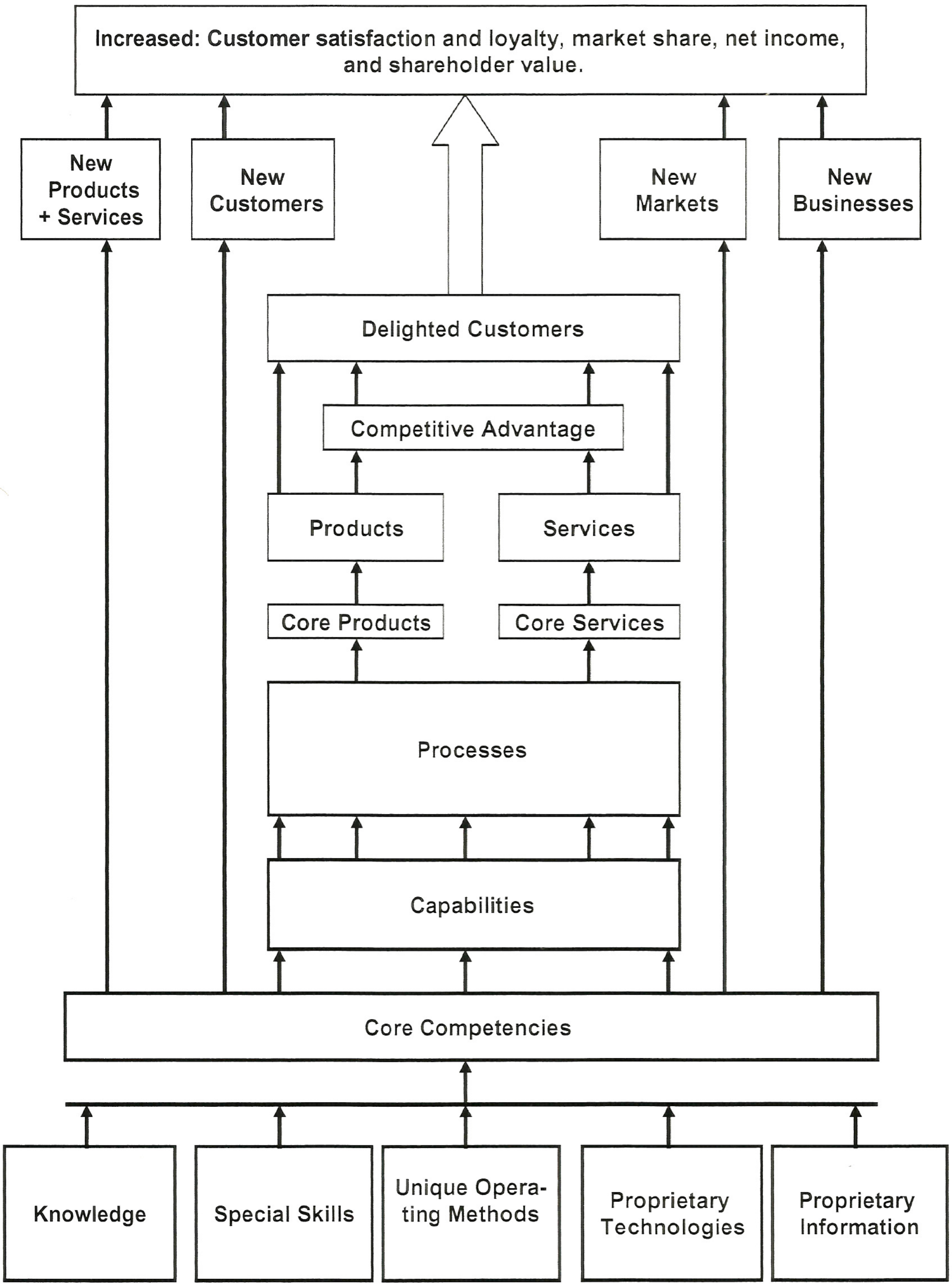

Figure 11. Adding value through core competencies. (Greaver 1999, p. 91)

Chief among the reasons for outsourcing is the trend of investing in core competencies. These are defined as the unique capabilities that set the business apart from others and attract clients. Typically, these skill sets are about coordinating diverse abilities across different functions of the organization in a way that brings competitive advantage. (Glagola 1999, p. 48) The mechanism of how concentrating on core competencies boosts companies' profits is illustrated in figure 11.

There are three criteria that a core competency should fulfil. Firstly, the competency should potentially offer an access to a variety of markets. Secondly, it should have a considerable part in what is thought desirable in the end product. And finally, it should be something that competitors can not imitate easily. (Lysons & Farrington 2006, p. 122)

On the other hand, there is also a cost to be allotted to the loss of authority and weaker integration that result from outsourcing the activities identified as non-core. The transaction cost theory developed by Coase (1937) and Williamson (1979) lists the different kinds of costs that are associated with purchasing as opposed to producing within the organization. Comparing these transaction costs with the benefits gained can be seen as the basis of any outsourcing decision.

According to the theory, there are three types of transaction costs (Lysons & Farrington 2006, p. 227):

- Transaction costs
- Asset specificity
- Asymmetrical information distribution

Transaction costs cover all the costs of contracting, such as searching, bargaining with and deciding on the supplier and policing and enforcing the contract. Asset specificity refers to features that cannot be transferred to other uses. A certain site, a human asset or a specific brand needed would be good examples of these. (Lysons & Farrington 2006, p. 227)

Asymmetrical information distribution is a problem that arises when one of the parties has gained or has access to more information than the other. This may lead to a situation where the information gap is taken advantage of by for example switching to partnerships more beneficial or exploiting the lack of knowledge of the other party. (Lysons & Farrington 2006, p. 227)

4.3.2 Third Party Logistics

Outsourcing logistics activities traditionally performed inside an organization is known by the term **third party logistics**. The logistics service provider can be responsible for the logistics process as a whole, but it is more common that only selected activities are outsourced. (Sohal et al. 2002 p. 59) The name stems from the fact that the relationship is actually a triad, where the service provider acts as a middleman between the buyer and the end customer. (Stefansson 2006, p. 76-77)

While the degree of outsourcing varies, it is agreed that in a third party logistics contract a considerable number of logistics activities is performed for the buyer. The exact arrangements wary from simple arm's length -type of relationships to complex logistics solutions with high level of integration. (Stefansson 2006, p. 80)

The different types of relationships in third party logistics are depicted in figure 12. It should be noticed that the level of integration grows with increased asset specificity and level of core competence as described in chapter 4.3.1. Also worthy of note is the fact that the aim is not to have the most integrated solution, but to find the most suitable one. In other words, moving downstream in the figure might sometimes be needed to find the most fitting solution (Halldórsson & Skjøtt-Larsen 2004, p. 196).

The lowest level of the scale, **market exchanges**, portrays a situation where the service provider offers very standard skills. The buyer on the other hand makes the decision mainly based on price, and the contracts are short and adversarial. (Halldórsson & Skjøtt-Larsen 2004, p. 195)

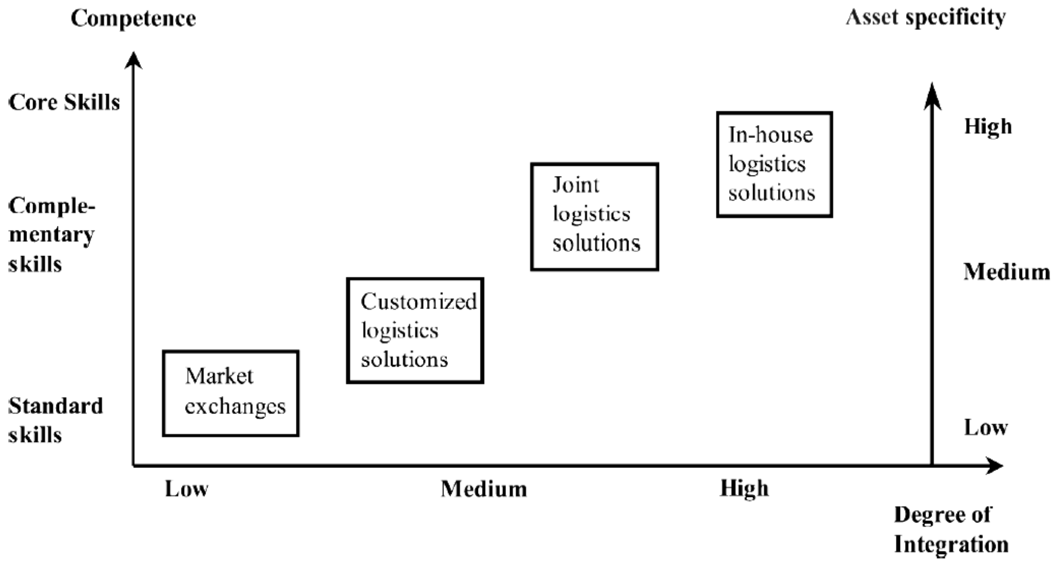

Figure 12. Buyer-supplier relationships in third party logistics services (Halldórsson & Skjøtt-Larsen 2004, p. 195)

Customised logistics solutions are a wide array of standard services offered as modules, from which customer makes his selection. Asset specificity stays moderate as the services need little tailoring from one customer to another. From the point of view of the service provider, these customised solutions are a possibility to differentiate from competition. (Van Hoek 2000, p. 37-38)

On the next level, the buyer and service provider cooperate to create a **joint logistics solution** that is unique for that customer relationship. Both participants are willing to solve any problems; these kinds of relationships often involve human or physical assets such as exchange of personnel or joint information technologies. Buyer's and service provider's competences have to complement each other. Contract lengths mirror the partnership status. (Halldórsson & Skjøtt-Larsen 2004, p. 195)

When an **in-house logistics solution** is used, logistics has been identified as a core skill for the (prospective) buyer. This means there is dedicated assets or know-how among the in-house staff. The solution is in accordance with both competency and transaction cost theory, as the former requires keeping core competencies in-house, while the latter states that in cases of high asset specificity, a hierarchical governance structure should be acquired. (Halldórsson & Skjøtt-Larsen 2004, p. 196)

Bolumole (2003, p. 104) states that while third party logistics providers are apt in supply chain integration, they have trouble building enough trust to get a chance to show it. Their clients are afraid of losing control on processes that are seen as important. In other words, service providers lack credibility to get organizations to outsource.

5. AIRPORT LOGISTICS

Airport logistics is a huge subject concerning concepts as wide-ranging as air traffic control, airplane fleet management, airplane parking and passenger, cargo and baggage logistics just to name a few. A thorough presentation of the subject would be both arduous and harshly beside the scope of this thesis. However, a brief introduction to a couple of airport logistics intricacies is necessary in understanding the case business environment.

5.1 Airline Network Types

Broadly speaking, airlines can be divided into two groups. When air travel was deregulated, the traditional airlines (sometimes called legacy airlines) got competition from low-cost carriers that offered cut prices with only bare minimum of services. The biggest shift however was the way low-cost carriers built up their network. They concentrated on **point-to-point** routes with destinations in smaller airports as these offered smaller landing fees. (Tampere University of Technology 2003, p. 66)

The way traditional airlines build their route network is hugely different. They tend to centralize their operations on one airport, which is called the hub. Other cities of the network are connected to the hub with non-stop flights, so-called spokes. This **hub-and-spoke** network forces the customer to swap flights during journey unless he is flying to or from the hub, but on the other hand the airline can offer a much wider network of destinations. It has been found that a hub-and-spoke network offers considerable economies of scope and traffic density. (Aguirregabiria & Ho 2010 p. 377)

Despite the indisputable gains, hub-and-spoke networks also have considerable drawbacks. In an attempt to minimize passenger transfer times for connecting flights, the arrivals and departures have been stacked close to each other. The result is very high traffic during peak hours and little action outside of them. This leads to inefficient use of personnel and infrastructure. (Luethi et al. 2009, p. 57)

Depeaking - spreading flights more consistently throughout the day instead of stacking them - is one solution to the inefficiency problem. It has been used successfully on major hubs to decrease congestion at airports, but has not been tried for cost reduction specifically. While depeaking would bring savings on employee costs especially for ground handling organizations, on the flipside the airlines' core business would suffer from reduced flight connectivity and longer connection times to the customer. (Luethi et al. 2009, p. 57)

5.2 Baggage Logistics

After the 2001 terrorist attacks in the USA air travel safety regulations were tightened around the world. One of the regulated areas was baggage. The regulations depend on whether the baggage is taken to the cabin or checked to the hold of the aeroplane (checked baggage). Both types of baggage are scanned for dangerous material. While the methods used are not for public domain, it can be said every airport has a system for scanning all checked baggage. In addition to that, checked baggage will only be loaded to the airplane cargo hold if its owner is onboard. (Tampere University of Technology 2003, p. 88)

5.2.1 Barcoding

Barcoding is a long-standing solution for accelerating the flow of products and information throughout business. The best-known example of this is the system used in retail shops called electronic point of sale (EPOS). In addition to the verifying and charging transactions that is visible to the customer, the system provides instant sales reports, monitors and changes prices and shares data in and between stores. (Lysons & Farrington 2006, p. 321)

Gains achieved by barcoding are listed as follows (Lysons & Farrington 2006, p. 321-322):

- Faster data entry and greater accuracy compared to keyboard entry
- Reduced labor costs
- Elimination of over- and understocking
- Better decision making by providing more and better information
- Faster access to information
- Greater customer and supplier responsiveness

Barcode scanning is made possible in airport baggage handling by tagging all checked baggage with a sticker that has a unique barcode. This is then utilized in infrastructure baggage sortation systems, but also in baggage reconciliation systems (BRS). One such system is SITA Bagmanager. It works by scanning the barcode of every bag during the loading phase of an airplane.

Thus, the location of every bag is known, be it in a container, a baggage cart or in the hold of an airplane. The biggest benefit of the system is that it reconciliates passenger and baggage information, and alarms if checked baggage is loaded without its owner. The system also reduces loading mistakes as flight information is checked during scanning. The handler is given an alarm if the baggage is loaded to an incorrect load device. (SITA 2013)

6 CASE COMPANY AND BUSINESS ENVIRONMENT

6.1 Swissport

6.1.1 Swissport International Ltd

Swissport International Ltd. is the global leader in aviation and airport services measured both in revenue and in active stations. In accordance to the relationship models introduced in chapter 4.3.2, the company offers services both as a service package and as integrated outsourcing solutions. (Swissport 2013b)

The services offered by Swissport include ground handling, cargo and various special services such as maintenance and executive aviation. Overview of Swissport International services is portrayed in figure 13. (Swissport 2013b)

GROUND HANDLING	CARGO	SPECIAL SERVICES
swissport ground handling • Passenger Services • Ramp Services • Ticketing Services • Lounge Services • Station Management	swissport cargo services • Freight Services • Ramp Services • Warehousing • Trucking Services • Call Centre Services	swissport fueling services swissport maintenance services swissport executive aviation checkport a Swissport Company

Figure 13. Swissport International services overview. (Swissport 2013b)

Turnover for Swissport International was over 1.5 billion euro in 2012. The company operates in 37 different countries and has over 40 000 employees worldwide. In the future the company aims to strengthen its number one position in the market and to achieve profitable growth by progressing in quality and reliability and further refining its working methods. (Swissport 2013b)

Swissport is active on 181 different airports. It handles seven airline hubs in Helsinki, Sao Paolo, Johannesburg, Larnaca, Munich, Toronto and Zürich and has five major cargo bases in Washington, Seoul, Osaka, Los Angeles and San Francisco. In one year the company handles over 2.8 million flights and over 118 million departing passengers, and moves over 3.5 million tonnes of cargo. Major customers include United Airlines, FedEx, Virgin Atlantic, Finnair and Lufthansa. (Swissport 2013b)

6.1.2 Swissport Finland Ltd

Swissport Finland Ltd. operates at Helsinki, Turku and Tampere airports. The company has 730 employees in Finland and it handles 65 000 aircraft per year on Finnish airports. (Swissport 2013a) In 2012 turnover for the company was over 42 million euro over a 13 month accounting period (Kauppalehti 2013).

The services provided by Swissport in Finland are at the moment limited to ground handling and executive aviation services. The customers of Swissport Finland include Air Berlin, DHL, Finnair, Flybe Nordic, Lufthansa, NGA, Nouvelair Tunisie, SAS, TAP Air Portugal, Ukraine International Airlines and Vueling. (Swissport 2013a)

6.2 Operating Environment at Helsinki Airport

Helsinki Airport is a medium-sized international airport that had 14.9 million passengers in year 2012. That same year the airport handled over 173 000 flights. While passenger counts remained on 2011 levels, there is a long-term upwards trend to be noticed. In the end of 2012 there were 29 airlines operating to 82 different route destinations from the airport. (Finavia 2013b, p. 5, 24)

Per criteria laid out in chapter 5.1, Helsinki Airport counts as a hub airport; in 2012, transfer passengers composed 31 % of the customers of the airport. Domestic flights take approximately one seventh of the passengers. Of the international destinations, other European countries have an 80 % share of the passengers the other notable area being Asia with a 15 % share. Asian traffic has a growing trend boosted by Finnair's new routes to the area. (Finavia 2013b, p. 23-25)

The facilities at Helsinki Airport are the responsibility of Finavia, the managing body for Finnish Airports. Finavia perceives itself as a service company, and views stakeholder cooperation as a cornerstone for its success in developing its business. Its stakeholders include airlines, passengers, employees and authorities, but also the companies servicing airlines and passengers. (Finavia 2013b, p. 66) As an example of responding to stakeholders' needs, a new development plan of 900 million euro to raise capacity and improve services at the airport was published in the autumn 2013. (Finavia 2013a)

6.3 Terms and Abbreviations Used in the Airline Industry

As with any industry, there are various terms continuously used in the branch of air travel that are not familiar to a layman. To help understanding the concepts explained in chapters 7 and 8, a glossary of terms is provided in table 4. The terms are also explained when used in the text for the first time.

Term	Definition
airside	The secure area of the airport, as opposed to landside
BRS	Baggage Reconciliation system (explained in chapter 5.2.1)
arrival service	Service responsible for handling irregularity situations on arriving flights
bag tag number	The number a checked baggage is identified with (2 letters, 6 numbers)
baggage handling	The work of sorting, loading and unloading checked baggage
baggage tracing system	A system used for reporting and finding delayed, lost or damaged baggage
checked baggage	Baggage that is transported in the hold of the airplane as opposed to hand baggage
expedite baggage	Delayed baggage that has been delivered to its destination on a later flight
local baggage	Baggage that does not have a connecting flight to another airport (see transfer baggage)
ramp crew	Personnel responsible for loading and unloading the airplane
sortation system	System used to transfer and sort baggage within an airport
transfer baggage	Baggage that is labelled to connect to another airport
ULD	Unit load device, a container or a cart used for transporting baggage

Table 4. A glossary of airport terminology.

7. PROCESS OVERVIEW

7.1 Account on Study Methods and Approach

This chapter concentrates on presenting Swissport's baggage handling and arrival service processes to offer background information for process improvement covered in chapter 8. As the study was made by combining theme interviews and a cursory quantitative study with action research, the method and source material is first described in this chapter with the target of achieving transparency. Further definitions on the scope of the thesis are also covered where necessary.

As mentioned, to obtain the information, theme interviews were used. The exact method for depicting logistics processes was as described in chapter 4.2.1. This means no predetermined questionnaires were used. Instead, a map or a concept of the process in question was created and then used as a basis of the discussion. Thus, the result of the interviews can be seen in the process maps included in the work.

For the cursory study made regarding process cycle times, it was deemed adequate to verify minimum and maximum values during normal operations, as the objective was not to analyse logistics processes in detail, but rather to present an overview of them. The data was obtained by combining statistics from Finavia and the BRS system used by Swissport with manual records of actions that could not otherwise be verified. Distinct outliers were left out of the data.

The main object of the study was to improve the irregularity process in checked baggage service. However, possible irregularities on the process are dependant on the baggage handling process, which is an internal process. Thus, it was deemed that to get a complete picture of the service, the background processes should be mapped first to have adequate information for service mapping. The baggage service blueprint was then composed by using the process maps as background. In the following, these processes are introduced in the order most suitable for presentation.

In making the process maps and service blueprints, much effort was made to keep them as relevant to the main object of the study as possible as suggested in chapters 2.3.2 and 4.2.1. In the interest of clarity, much information relevant in the processes themselves but secondary for the irregularity process was left out. Thus, the processes are mapped as they should be with little interest on deviations. The service blueprint on the other hand is a concept blueprint (defined in chapter 2.3.2) to achieve the same objective.

In this chapter, the information is not analysed, just exhibited as it is. While the reasons for lost baggage concentrate on baggage handling processes and are in fact the reason the irregularity process is needed, the reasons for baggage delays were left outside the study. A structured approach to the reasons of these delays could very well be seen as beneficial, but it will not eliminate the need for a working irregularity process; many of the reasons for fluctuations in air travel, like weather or other forces of nature, are often outside human control.

7.2 Checked Baggage Service Process: an Overview

From the customer point of view, the baggage service process is very straightforward: if all goes well, the baggage is handed over at check-in counter when departing, and then picked up from the baggage carousel on arrival. The physical evidence the passenger perceives are the check-in and baggage carousel premises and the checked baggage receipt. In some cases, the view from the window of the terminal or the airplane can show baggage handlers in their work, which can affect customer satisfaction if baggage is not duly handled.

Onstage actions for departure include logging and tagging the baggage and entering the baggage to sortation system by the starting the baggage belt. If all goes well, there are no onstage actions on arrival. However, in case of delayed or damaged baggage, the passenger must make a report at the arrival service. The loss or damage is entered to the baggage tracing system by the onstage employee, after which the customer is given a report and possible further instructions depending on the case.

In case of lost baggage (referred to as expedite baggage for the rush to get it to its rightful owner), the process then continues by tracing it. The baggage tracing system contains not only the information on baggage reported missing, but also baggage found without an owner or left behind and already forwarded. When the baggage is received at the arrival station, the back office employee then contacts the customer and arranges a delivery. The delivery is handled by another company and is thus considered a support process, although it does involve a face-to-face customer contact.

At the departing station, there are no backstage actions, but only support processes of baggage sortation (mechanical and manual) and airplane loading. However on arrival, when the support process of unloading the airplane is done, the handover of baggage to the baggage carousel counts as a backstage action. It must be mentioned that undue handling might greatly affect customer satisfaction at this point of the service process as well. The baggage service blueprint is pictured in figure 14.

Not depicted in the service blueprint but still an essential part of the service is priority baggage. A complementary service offered by most airlines, it is based on sorting bags marked as priority so that they are handed over first.

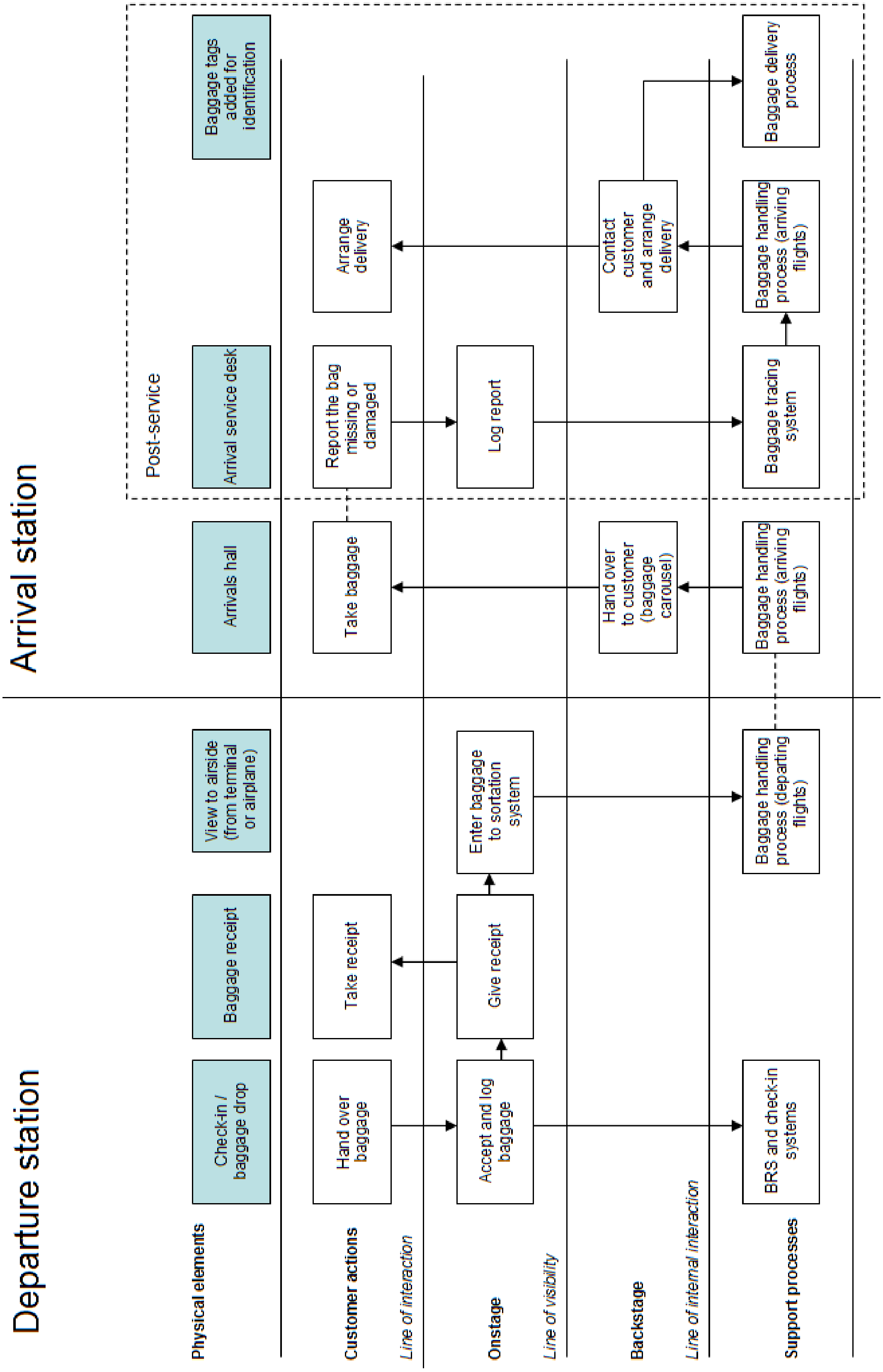

Figure 14. Checked baggage service. Concept blueprint.

7.3 Baggage Handling Processes

As seen in figure 14, baggage handling processes act as support processes for the baggage service. A general view of the baggage handling process also helps in understanding possible causes for baggage delays at other airports. The departing and arriving baggage processes are introduced in brief in the following.

7.3.1 Departing Baggage

The main phases of the departing baggage handling process are pictured in figure 15. The process starts with the automatic sortation system that sorts the baggage in bins that are assigned for specific flights. By using a BRS scanner (introduced in chapter 5.2.1), a baggage handler then sorts the baggage into containers or baggage carts. These are known by the term unit load device (ULD). Normally, priority baggage and transfer baggage (baggage that has a connecting flight from the destination) is sorted to dedicated ULDs.

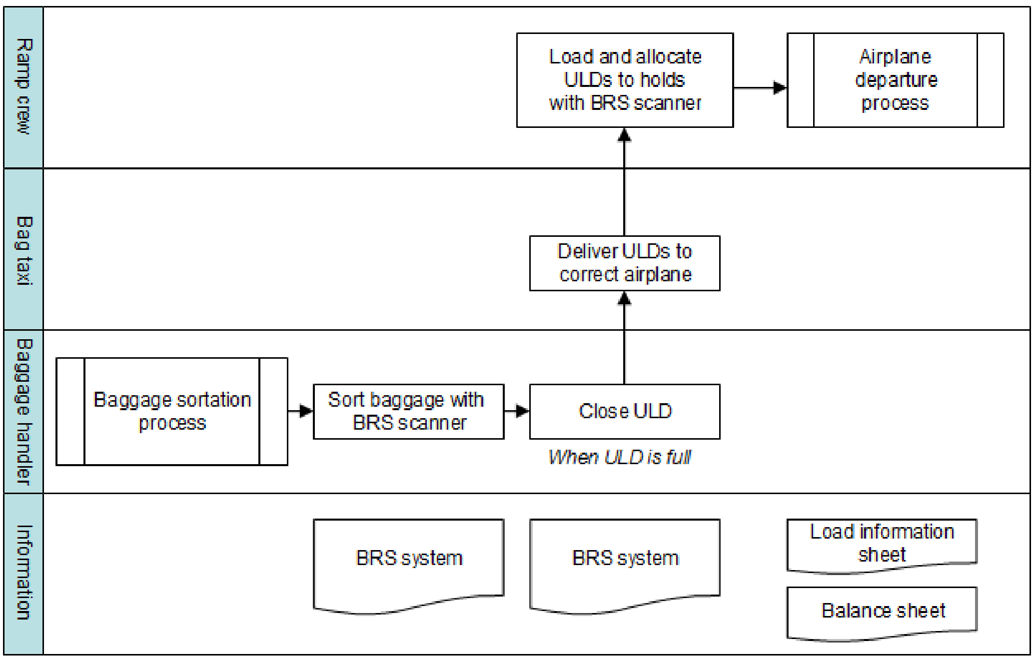

Figure 15. Baggage handling process (departing flights)

When sortation is done, full ULDs are taxied to the airplane. There, ramp crew allocates the ULDs to holds with the BRS scanner and loads the baggage or the containers into the airplane. The ramp crew is also responsible for loading cargo and mail and implementing the desired balance on the airplane.

7.3.2 Arriving Baggage

The arriving baggage process is illustrated in figure 16. It starts from the moment the airplane touches down. The ramp crew will dock and then unload the airplane per load message received from the airport of origin. This message tells the crew how much baggage there is and how is it loaded. This is important knowledge for the next phase, where local baggage (baggage that is at its destination) is taxied to the arrivals hall, whereas transfer baggage goes to the transfer terminal. At Helsinki Airport, the departing baggage is often handled in a separate terminal from the arrivals.

In transfer hall, the baggage is unloaded to the baggage sortation system, which then sorts the baggage according to the departing flight info in the barcode of the baggage tag. Local baggage on the other hand is handed over to the baggage carousel at the arrivals hall.

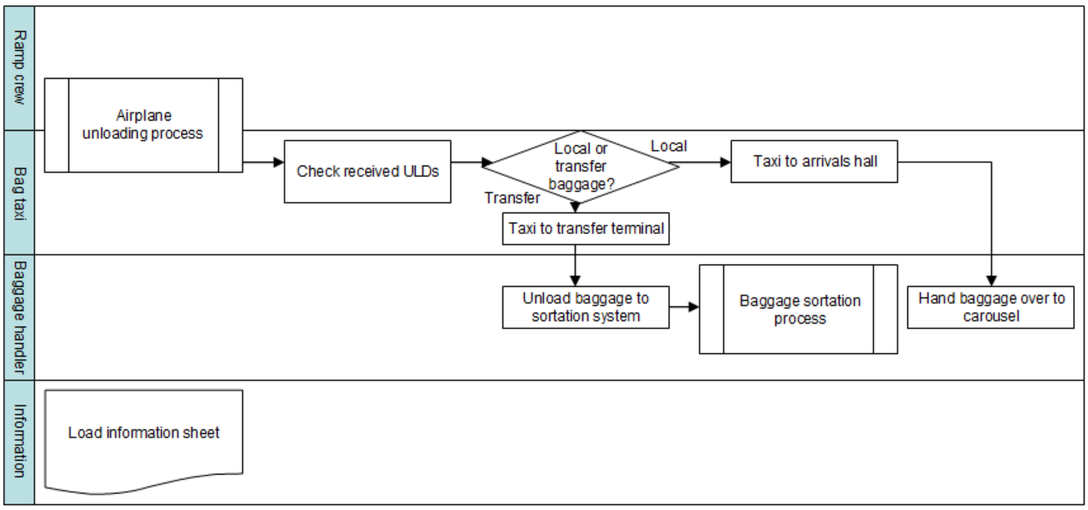

Figure 16. Baggage handling process (arriving flights).

7.3.3 Delivery Cycle Times

As remarked in chapter 5.1, hub airports become very congested on peak hours, while traffic is very moderate on other times. Thus, the processes introduced above might become overstrained. Ramp crew might get be trapped in previous assignments, while arrivals halls can become congested. These kinds of problems are then reflected on baggage service quality if baggage gets left behind from departing flights or baggage from arriving flights is not handed over to the carousel in time. In addition to that, there are fluctuations on how quickly the processes are carried out depending on issues such as which kind of airplane is being handled and how far from the terminals has the airplane been parked.

To offer some understanding on how these problems affect delivery times, figure 17 attempts to combine the departing and arriving baggage handling processes with their fulfilment times. Each activity is paired with the minimum and maximum times they were observed to take. In real life, the times can be evaluated more accurately than it would seem by looking at the picture by taking into account things such as the type and size of the airplane.

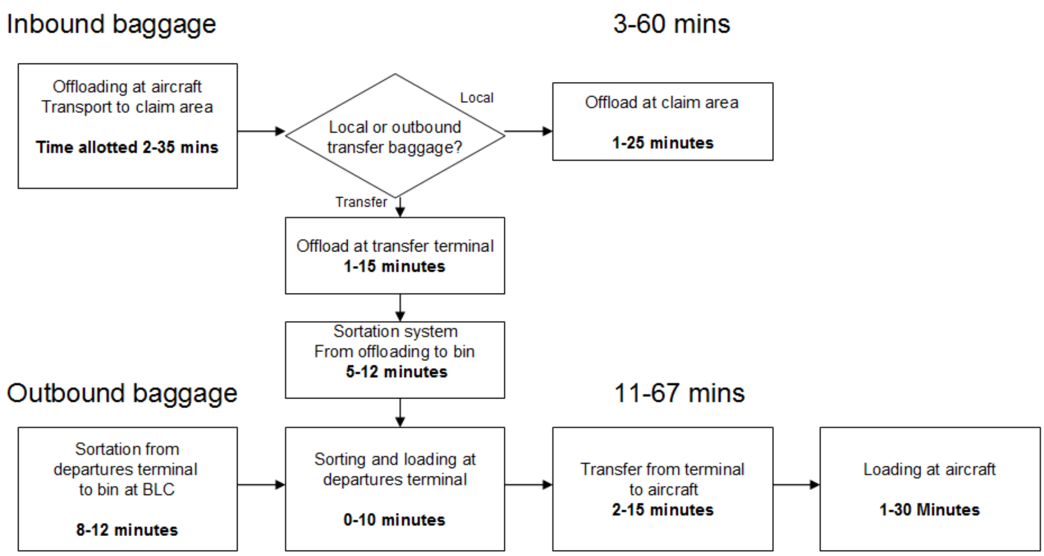

Figure 17. Baggage handling process delivery cycle times per action.

A couple of notable drivers for time allotment should be listed. Some airplanes can be fitted with baggage or cargo containers, whereas others are bulk loaded. Containers are much faster to handle and thus reduce loading times. Also there is a limit on peak flows the baggage sortation systems can operate on. This might lead to congestion on peak hours. A congestion defined as not out of the ordinary was taken into account when collecting the data by means of manual observation.

8. BAGGAGE IRREGULARITY PROCESS IMPROVEMENT

8.1 Starting Point of the Analysis

8.1.1 Background

The ultimate motive for this research was a change in Swissport's baggage service irregularity process. The traditional way of carrying out the process is to use front-office arrival service staff for doing the back-office work of handling the expedite baggage after they have been received. Thus, their duties normally include contacting the customer and arranging a delivery once baggage has arrived and keeping track of the received expedite baggage at the arrivals hall.

Swissport and its stakeholders decided to change this process slightly by rearranging the way back-office work is done. The expedite baggage work was reassigned to baggage handlers, who would now be responsible for contacting customers and arranging deliveries. The gains achieved included moving the lifting of the baggage to those who were trained to do it and keeping the expedite baggage airside until delivery, which is both safer and more pleasing to the eye than storing it in the arrivals hall.

The starting point for this study is deemed to be the initial irregularity process after the change described above was done. This is identified as the process described in chapter 8.2 and is the process for which the analysis for improvement was done.

8.1.2 Choices Made on Scope and Analysis Tools

Chapter 8 concentrates in portraying a service improvement process done by combining service blueprinting and FMEA analysis. The structure of the chapter is constructed as follows: chapter 8.2 is purely descriptive and, combined with the service blueprint, aims to give as clear a view as possible on the process covered. Chapter 8.3 on the other hand concentrates on process analysis and improvement. In chapter 8.4, the prospective process and the improvements made to it are introduced.

In chapters 2.3.3 and 3.2 it was discovered that thorough preparation before these tools are applied is a prerequisite for succeeding in the analysis. This chapter aims to expose the definitions made in applying service blueprinting and FMEA and the reasons behind these selections. Also, some further definitions on the scope of the analysis are validated.

Firstly, all the service blueprints done should be considered concept blueprints. There is some variation in the process depending on the customer organization, but this was not deemed important for process development as the focus is on the back office duties and the variations do not affect parts of the process seen as potential failure points. Also, the standard service blueprinting format was deemed fit for purpose with one addition - alternative and potential actions were marked with a dotted line.

In chapter 3.2, the service blueprint used for FMEA was divided to the parts of service facility, prior-service, in-service and post-service. To connect the process improved to the checked baggage service introduced in chapter 7.2, this method can be used - the improvement work concentrates on the post-service part of the blueprint as illustrated in figure 14. Thus, chapter 8.2 concentrates on depicting the post-service process in greater detail in order to identify potential failure points.

For FMEA it was considered that a lengthy evaluation process for different risk aspects would be excessive for the purpose. Only a risk score from 1 to 5 based on occurrence was given. Instead, the analysis concentrated on trying to find common denominators for the failure modes. The analysis was made as action research by analysing passenger and contact personnel feedback.

As is normal when training employees to new tasks, the new arrangement described in chapter 8.1.1 led to some difficulties in adopting new responsibilities. Especially, the baggage tracing IT system used for the tasks was found problematic. However, this problem has been seen to evaporate quickly as experience grows and thus the tracing system is not a focal point for improvement. While the tracing system is not introduced in detail, features of the system relevant to the process have been explained where needed.

8.2 Baggage Irregularity Process

The irregularity process is pictured in figure 18. The process is initiated when a passenger comes to report their missing baggage. The onstage employee marks down all baggage and customer information and creates a report to the baggage tracing system. The report and contact information are handed to the customer.

The process then continues with the baggage tracing system checking matches to the report by trying to match the information given to baggage reported found or already forwarded to destination elsewhere as touched upon in chapter 7.2. The system searches for matches for the tag number, name, bag color and type, and flight information just to mention a few. While this is referred to as “baggage tracing system” in this text for clarity reasons, it should actually be seen as an automated support process.

For handling the information in the tracing system there is a background process not directly connected to the service, where an employee checks all the matches the system makes and makes requests or suspends the baggage from tracing depending on it. The same background process is responsible for follow-up in case the baggage can not be found in reasonable time.

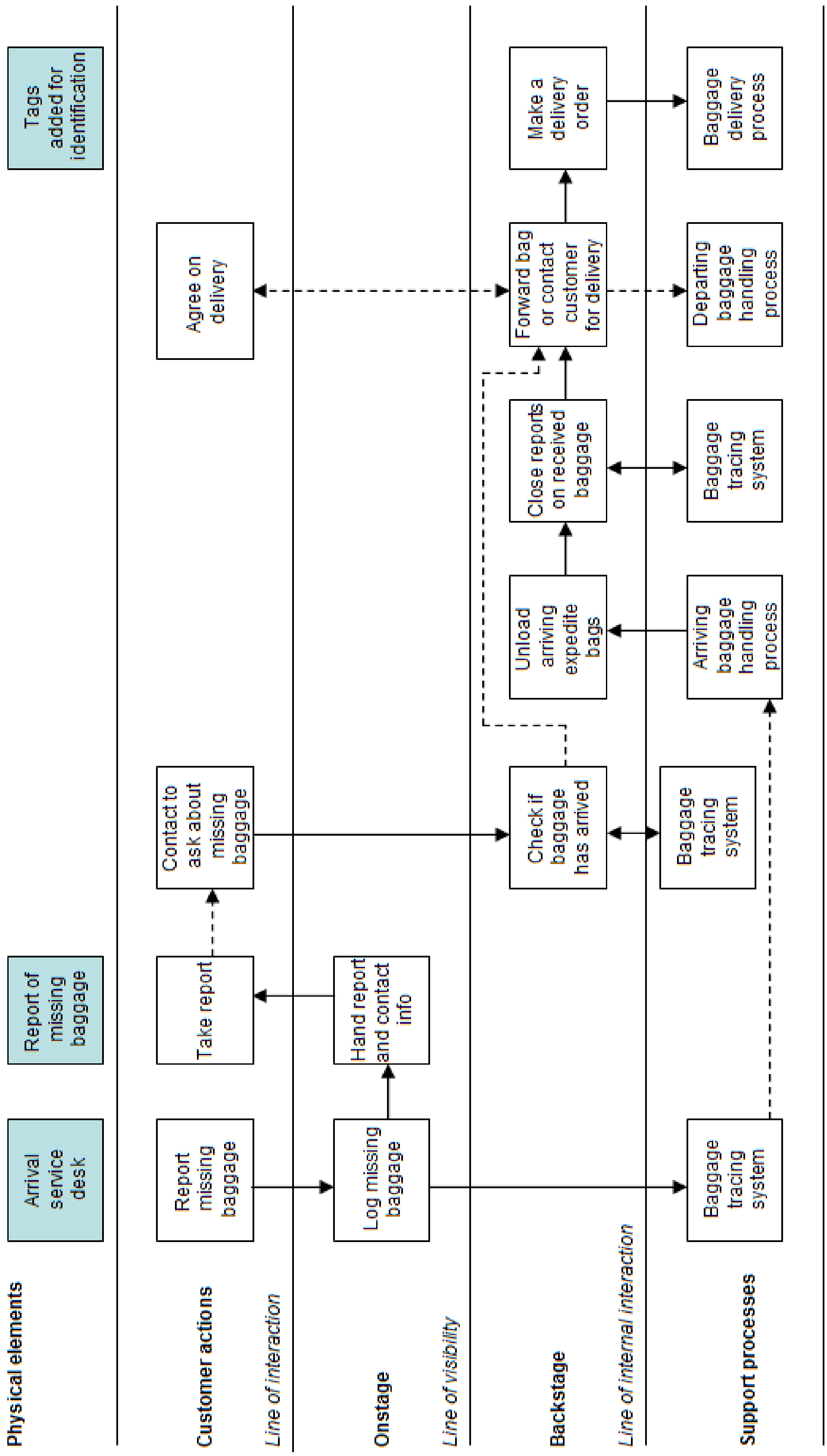

Figure 18. Baggage irregularity process.

It is possible the customer grows impatient and wants information before the baggage is received and reacted to. In this case he contacts a backstage employee either by phone or by email. The employee then checks the tracing system for information. If the baggage is already at the airport, a delivery can be agreed on. Otherwise, the situation is left open.

While the service blueprint does not differentiate between back-office employees, it must be notified that the customer contact person is normally not in the same premises as the expedite baggage. Thus, the customer contact can not physically inspect the premises, but must rely on information on the baggage tracing system. Contact personnel are trained not to call the expedite staff as they should be able to rely on tracing system information.

Expedite baggage is forwarded to its destination on later flights from its origin. Thus, the arriving baggage handling process is again a support process for the service process. The baggage handling staff on back-office duty unloads the baggage to a designated area of the arrivals hall. Subject to other assignments they then go through the expedite baggage, close the report files on tracing system and arrange deliveries. Handled baggage is marked by attaching the report on the baggage tag.

The cavalcade of deliveries available is clearly a driver in customer satisfaction as having to wait for a suitable delivery is a common cause for grief. The delivery system is however largely outside the influence of the handling service company and thus will not be discussed here. There are two main options: either the baggage is delivered by a delivery company or it is forwarded to an airport nearer to the delivery address given by the customer upon reporting.

If the baggage is forwarded to another airport, a message is entered to the tracing system and a new baggage tag is printed. If the baggage is handed over to the delivery company, a paper delivery order is made and attached to the baggage with an identification tag for transport. The tags attached to the baggage act as physical evidence when the customer receives it.

8.3 Process Improvement: Failure Modes and Effects Analysis

It should be noted that in ordinary situations, the initial process was working the way it was intended to. Problems started to arise during times of high travel such as holiday seasons or major irregularities. Thus, the focus of the analysis was on how the process was working during the times of high strain.

8.3.1 Failure Modes and Effects Analysis

For FMEA, the framework in appendix 1 was partially utilized. All the actions identified in the process blueprint were transferred to the spreadsheet and then looked through for identified failure modes. As specified in chapter 8.1.2, the emphasis was on qualitative approach with the goal of finding common reasons for the failure modes while scoring the modes only on occurrence with the most common failure mode getting the score of five. The resulting table is shown as table 5.

For the 11 process steps, 15 different failure modes were identified. The most occurring failure was that of lack of space to unload expedite baggage. Other recurring problems were that there was not enough time to go through the expedite baggage received and that on the other hand, the pace of work in that process was slow.

Process step	Potential failure modes	Potential causes	Score
Report missing baggage	Inadequate information given	*Language barrier, bad communication by employee*	2
	Report can not be made	*Lack of front-office staff*	2
Log missing baggage	Data incorrectly entered	*Inadequate training*	3
	Report made for baggage already at the airport	*Bad flow of information, inadequate training*	2
Hand report and contact info			
Take report	Report lost	*Forgetfulness*	1
Contact to ask about missing baggage	Incorrect information given	*Bad flow of information*	3
Check if baggage has arrived	Bag not marked as received although promised	*Bad flow of information, incorrect message from station of origin*	3
Unload arriving expedite bags	Lack of space to unload	*Back-office congested, lack of organization, lack of staff*	5
Close reports on received baggage	Not enough time to close reports	*Back-office congested, lack of back-office staff, slow IT system*	4
	Slow pace of work	*Back-office congested, lack of organization*	4
Forward bag or contact customer for delivery	Wrong bag delivered	*Bad flow of information, lack of organization*	2
	Cannot find baggage	*Bad flow of information, lack of organization*	2
Agree on delivery	No suitable deliveries	*Inadequate delivery system, unreasonable demands*	2
Make a delivery order	Wrong bag delivered	*Bad flow of information, lack of organization*	2
	Cannot find baggage	*Bad flow of information, lack of organization*	2

Table 5. Failure Modes and Effects Analysis for baggage irregularity service.

The occurrence score of three was given to incorrect data entrance in logging the missing baggage to tracing system, incorrect information for customer on contact, and contradicting information when checking if baggage had arrived. Eye-catching failure modes with the occurrence score of two included a report made for baggage that was already at the airport, and problems in finding the right baggage that was repeated in two steps of the process.

There were several recurring potential causes. Bad flow of information was mentioned seven times, while lack of organization had five mentions. Other mentionable problem was that of back-office congestion. It is remarkable that most of the problems concentrated on expedite baggage handling in the back-office.

8.3.2 Corrective Actions

The biggest potential causes for problems identified in FMEA were those of bad flow of information and lack of organization in back-office. The lack of organization is also related to the congestion problem identified in the FMEA analysis. The bad flow of information is a problem especially because it leads to poor communication with the end customer and thus gives a poor picture of the service.

The bad flow of information stems from the fact that the tracing system is not kept up to speed on expedite baggage movements. While it could be argued that the lack of organization is the culprit, there will always be situations where the baggage handlers on back-office duty can not go through the expedite baggage at once during fluctuations or peak traffic. Thus, another solution should be thought about.

One such answer is found in the BRS system used by Swissport. The BRS scanner is compatible with the baggage tracing system and can be used to make an entry of surplus baggage by scanning the bag tag barcode. By doing this, an inventory of the expedite baggage received can be created.

The information can also be utilized by the contact employee responsible for customer contacts. Thus, there is less pressure in going through the expedite baggage at once.

The baggage tag can be made use of in getting the back-office more organized as well. When the area is arranged so that the baggage is in rows by the last number of the tag, the amount of searching should be reduced to one tenth of what it was. In addition to that, it should be thought if the area could be better used by reorganizing it.

A curious problem identified in the FMEA is that of a report made for baggage that is already at the airport. This is odd because there are corrective processes in place for it - the tracing system notifies the employee about the whereabouts of the baggage being reported if it has already been found. A clear reason or remedy for this problem has not been found.

8.4 Proposed Baggage Irregularity Process

The proposed baggage irregularity process can be found on figure 19. While the changes are not very visible in terms of the blueprint, the changes made should answer to the biggest problems identified in the FMEA analysis.

By better defining the tasks made by the baggage handlers in back-office duty, the congestion and lack of organization should evaporate. As the time wasted on tasks as pointless as looking around for baggage and moving them around decreases, the staffing problems perceived should ease at the same time.

To achieve this, the process with expedite baggage is now defined so that the arriving baggage is immediately scanned and organized if it can not be processed right away. This should keep the back-office area from congesting and reduce mistakes such as the delivery of wrong baggage.

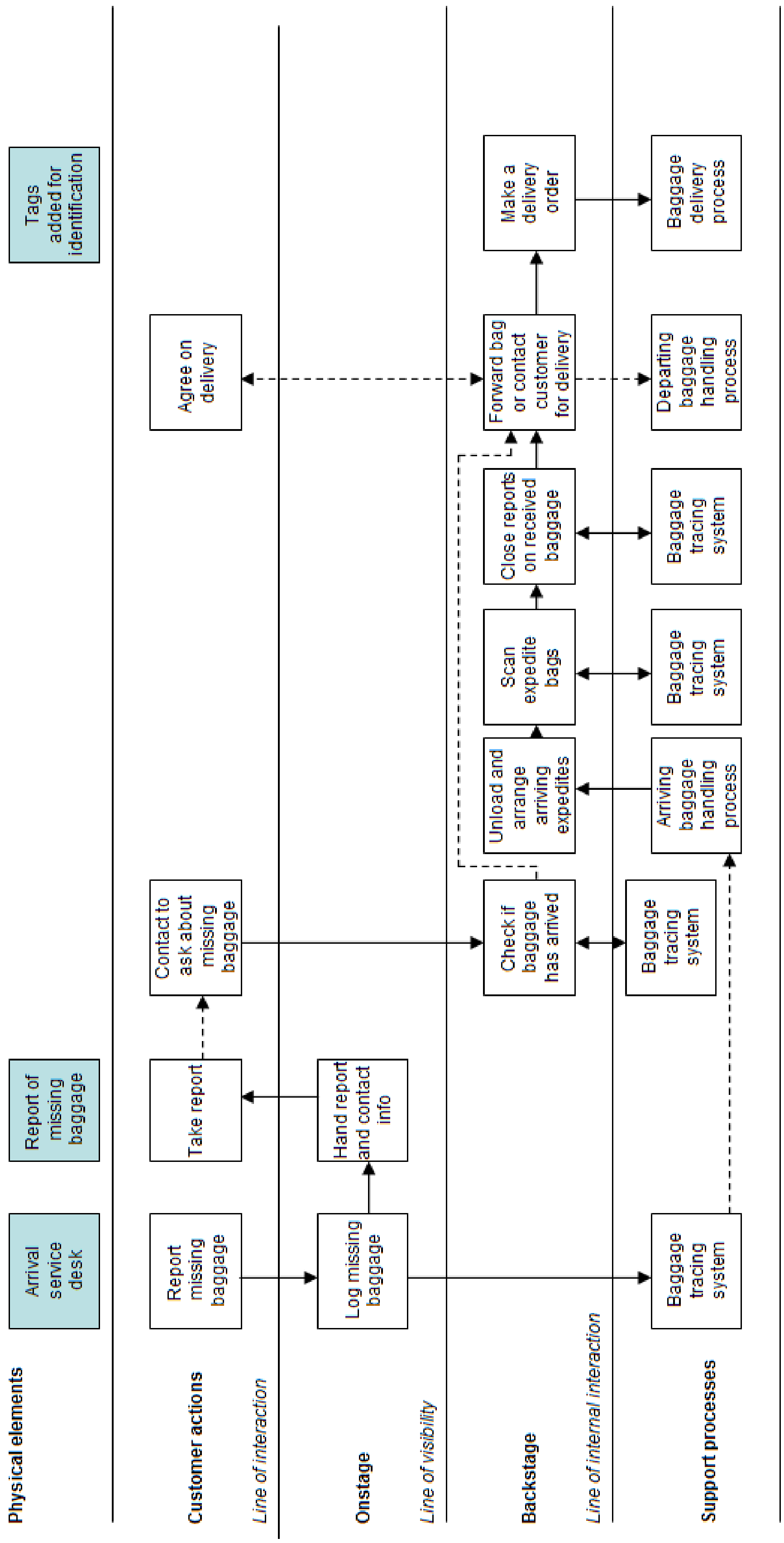

Figure 19. Proposed irregularity process

In practice, the gains would be achieved by two changes in the back-office actions. Firstly, the baggage would be instantly organized during the unloading to a predefined area where the order the baggage should be in is clearly marked. Secondly, the baggage tags are immediately scanned in order to notify the baggage tracing system.

The biggest improvement should be had by the introduction of the BRS scanner. While it might even not be needed on normal days, in trickier situations the possibility of having an inventory of the expedite bags is very handy as it will save time on all parts of the process. In fact the biggest gain with the changes proposed would be that the automated support process of baggage tracing runs as it is intended to.

The arrangement regarding baggage tracing system should have a knock-on effect on possible requests for assistance from customers. Problems in the irregularity process are instantly noticed in the amount of customer contacts, which make it a good indicator on if the new process works or not.

8.4.1 Implementation

The changes proposed in chapter 8.4 have been put into use gradually during the end of the year 2013. Generally, the improvements have been found to work in the way they were supposed to decreasing congestion, improving the flow of information and improving customer contact work.

Better organization of the back-office area was carried out as aligned in chapter 8.4. This was somewhat straightforward as the staff was easy to motivate to follow a procedure that had clear benefits. The change has not only decreased congestion, but has speeded up the pace of work and reduced the number of mistakes as well.

Implementing the use of BRS scanner when organizing expedite baggage was somewhat harder as this demanded some coordination work between different stakeholders, but was in the end done successfully. The benefits were just as hoped, although some intricacies of the baggage tracing system demanded some additional training to be done.

All in all, the change has been found a success with the modified process running as intended with far fewer problems. Some doubts have been raised about using the BRS scanner as this is not done as a matter of course, but only when there is lots of expedite baggage to process. While making the scanning obligatory all the time would perhaps make a sudden irregularity easier to handle, on the other hand this slows down the work on normal operations and has no self-evident benefits for the expedite staff.

9. CONCLUSIONS

The main object of this thesis was developing the irregularity service process in checked baggage service at Swissport Finland Ltd. To achieve this target, it was deemed that three research problems should be determined. The first research problem was shaped so that the answer would form a basis for understanding the concept of service not only from the point of view of the end customer, but also the participants of a business-to-business service contract. The desirable response to the second research problem was a systematic method describing and analysing these services. Regarding the third research problem, the aim was to gain a sufficient understanding of the operational environment in question to take these into account where needed in the research process.

In carrying out the research, qualitative and quantitative research methods were combined. The qualitative study was executed as theme interviews and by applying the method of action research. The research process can be divided into two parts, where the first part was about receiving background knowledge needed to carry out the analysis. In this, a cursory quantitative study and theme interviews were used. The second part on the other hand was carried out as an action research combined with a follow-up interview.

The results of the research include descriptions of the background logistics processes needed to form an adequate basis of information as well as an illustration of the checked baggage service. With this as a background, a description of the irregularity service process that was developed was mapped and then analysed by the means of FMEA analysis. The main result of the study is a proposed irregularity service process combined with observations about implementing the process to practise.

9.1 Research Results

In the first part of the empirical study, processes relevant in understanding the intricacies of the baggage irregularity process were identified and then mapped. Three distinct processes were described:

- Checked baggage service process
- Baggage handling process (arriving baggage)
- Baggage handling process (departing baggage)

To gain an understanding on the process cycle times, the baggage handling processes were then combined in an illustration of times allotted to different actions in the processes. While this was only intended as a cursory look to gain an understanding, it can be said that the fluctuations in the process were explicated by this illustration.

The concept used to blueprint the checked baggage service process was then utilized again to depict the initial irregularity service process. This was then analysed action by action by the means of FMEA analysis. Some 15 different failure modes were identified, the underlying reasons of which were then attempted to be recognized. The analysis found three recurring reasons for failure modes: bad flow of information, lack of organization and congestion of the work premises.

Possible corrective actions were then contemplated, the most promising of which were a reorganization of the work premises to achieve more disciplined working methods and creating an inventory of expedite baggage by using a barcode scanner. These improvements were then presented in the form of a new service blueprint that illustrated the desired irregularity process.

Finally, the implementation of the improvements found was pondered in brief. It was found that the new process had greatly reduced the worst problems in the process after it had been put to use.

9.2 Evaluation of the Results

Generally, it can be said that the results of the study match the objectives laid out in the beginning of the research process. The layout of the research problems can thus be seen as successful for the purpose outlined and the research itself achieved everything that it was supposed to achieve.

To start with the positives, the structure of the theoretical part can be identified as a success. Although it runs through a wide variety of topics, the framework created supports the empirical part of the study very well and it can be said that all topics relevant to the subject were discussed in a thorough enough scale. This forms a good basis for service improvement work for a third-party service provider.

Moreover, the analysis tool of combining FMEA with service blueprinting that was used as the backbone of the analysis work can be commended as the empirical research accomplished its objectives and the tool was both usable and easily utilized in reporting the findings and improvements made. The illustrations were found a useful tool during the research process as opposed to recording traditional interviews.

On the other hand, service blueprinting does have some limitations that were highlighted during the process. While the process step itself could go through quite a significant change, the blueprint itself could not change very much at all. This does make it more difficult to illustrate the changes made or to show their importance in developing the service as the real benefit might concern a support process for example.

Some other problems identified include the fact that a service blueprint is always a simplification of the true situation and can not show all details however important they are. For example, a possibility of depicting the location of a back-office employee in each process step would have been beneficial in the research. Moreover, an extra component for depicting background processes would have been beneficial for the illustration, but this was noticed too late in the process to implement it. However, the blueprinting method used can be seen as having been adequate for the object.

9.3 Suggestions for Further Research

The object of this thesis does lend itself to a wide variety of possible further research. The framework created for this thesis could be utilized again in the interest of improving a different process or using a different viewpoint. In addition to that, some other subjects brought up in the thesis could be of interest for research.

Firstly, the processes already illustrated in this thesis could be picked up for improvement work. For example, the reason for delayed baggage in departing baggage handling process could be researched by first creating utilizing a more elaborate process map and then utilizing the FMEA analysis to find possible failure modes. The FMEA framework could also be used to improve the checked baggage service as a whole to the service blueprint already created.

One interesting subject would be to try to improve the irregularity process from the point of view of the end customer, as this thesis does limit itself to a viewpoint that does not take customer satisfaction fully into account. This could be done for example by using walk-through audits to identify points of the irregularity process that the customer finds unpleasing or otherwise difficult to grasp or to carry out.

A possibility that would need lots of more groundwork but would be a valid topic for research would be to rethink the whole checked baggage process by the means of value chain analysis. This would mean the whole process would be thought through by analysing which actions in the process provide value to the customer, and getting rid of anything else.

As lack of organization was found a problem in the working premises in back-office, one research topic could be a more thorough reorganization of the work in the baggage handling. One possible way of doing this would be to use the concepts of lean management to revolutionize the working methods used.

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FMEA analysis template

Failure modes and effects analysis (FMEA)

Project:

Date:

FMEA Team:

Prepared by:

SEV = How severe is effect on the customer?
OCC = How frequent is the cause likely to occur?
DET = How probable is detection of cause?
RPN = Risk priority number in order to rank concerns; calculated as SEV x OCC x DET

Process step	Potential failure mode	Potential failure effects	SEV	Potential causes	OCC	Current process controls	DET	RPN	Actions recommended	Responsibility (target date)	Actions taken	New SEV	New OCC	New DET	New RPN
What is the step?	In what ways can the step go wrong?	What is the impact on the customer if the failure mode is not prevented or corrected?	10	What causes the step to go wrong? (i.e., How could the failure mode occur?)	10	What are the existing controls that either prevent the failure mode from occurring or detect it should it occur?	10	1000	What are the actions for reducing the occurrence of the cause or for improving its detection? You should provide actions on all high RPNs and on severity ratings of 9 or 10.	Who is responsible for the recommended action? What date should it be completed by?	What were the actions implemented? Include completion month/year (then recalculate resulting RPN).	10	10	10	1000
								0							0

FMEA analysis template

RATING	DEGREE OF SEVERITY	PROBABILITY OF OCCURRENCE		ABILITY TO DETECT	
			Frequency (1 in ...)		Detection certainty
1	Customer will not notice the adverse effect or it is insignificant	Likelihood of occurrence is remote	1,000,000	Sure that the potential failure will be found or prevented before reaching the next customer	100%
2	Customer will probably experience slight annoyance	Low failure rate with supporting documentation	20,000	Almost certain that the potential failure will be found or prevented before reaching the next customer	99%
3	Customer will experience annoyance due to the slight degradation of performance	Low failure rate without supporting documentation	5,000	Low likelihood that the potential failure will reach the next customer undetected	95
4	Customer dissatisfaction due to reduced performance	Occasional failures	2,000	Controls may detect or prevent the potential failure from reaching the next customer	90
5	Customer is made uncomfortable or their productivity is reduced by the continued degradation of the effect	Relatively moderate failure rate with supporting documentation	500	Moderate likelihood that the potential failure will reach the next customer	85
6	Warranty repair or significant manufacturing or assembly complaint	Moderate failure rate without supporting documentation	100	Controls are unlikely to detect or prevent the potential failure from reaching the next customer	80
7	High degree of customer dissatisfaction due to component failure without complete loss of function. Productivity impacted by high scrap or rework levels.	Relatively high failure rate with supporting documentation	50	Poor likelihood that the potential failure will be detected or prevented before reaching the next customer	70
8	Very high degree of dissatisfaction due to the loss of function without a negative impact on safety or governmental regulations	High failure rate without supporting documentation	20	Very poor likelihood that the potential failure will be detected or prevented before reaching the next customer	60
9	Customer endangered due to the adverse effect on safe system performance with warning before failure or violation of governmental regulations	Failure is almost certain based on warranty data or significant DV testing	10	Current controls probably will not even detect the potential failure	50
10	Customer endangered due to the adverse effect on safe system performance without warning before failure or violation of governmental regulations	Assured of failure based on warranty data or significant DV testing	2	Absolute certainty that the current controls will not detect the potential failure	< 50