Designing Services That Deliver

- Service Engineering at Alfa Laval

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Abstract

Title:	Designing Services That Deliver – Service Engineering at Alfa Laval
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Issue:	As most manufacturing companies Alfa Laval needs to find new ways to differentiate by shifting the current product focus towards a more service oriented approach. Many manufacturing companies find it difficult to increase service revenues successfully. High investments in extending the service business do not result in the expected higher returns, providing a service paradox. To overcome the paradox and harvest the profits extracted from increasing service investments, companies can establish a clearly defined service development process, set up a service organization, create a service culture and focus on how the service offers add value to the customer. By combining existing engineering know-how with service development expertise, manufacturing companies can develop services that deliver. It is therefore interesting to investigate: what is service engineering and how can it be utilized for manufacturing companies such as Alfa Laval to develop successful services?
Purpose:	The aim of this master thesis is to discuss the content of service engineering and describe why it is important and how it can be utilized for manufacturing companies to develop successful services.
Methodology:	Studying service development requires an understanding of the subject and Alfa Laval as a whole and cannot be broken down into parts and studied separately. Therefore we base

this master thesis on the systems view. The explorative nature of this thesis, the model creation at Alfa Laval and the lack of existing theories as well as practical suggestions, demand an abductive approach that retains flexibility in the research. Developing a service engineering model adapted to Alfa Laval's needs and wishes, resulted in new theory by combining existing theories with the empirical findings at Alfa Laval. Each chapter is based on a question, which we answer using theoretical and empirical findings interwoven with our own analysis. By using this integrated approach we clearly anchor the analysis in the theoretical and empirical findings.

Conclusions: Designing a service engineering environment will be a prerequisite for manufacturing companies to harvest the increasing returns of service investments. This should be done by anchoring service development as a permanent task in the organization within an existing unit. A central service developer should be appointed, utterly responsible for service development issues. Several local service developers should also be appointed, responsible for local adaptation and adjustments.

Manufacturing companies can use ideas from product development models and design its own service development model based on the company's basic characteristics and type of service offered. We find that it is possible to use service engineering models for high and low contact intense services if used with service development tools such as blueprinting and flowcharting.

Designing services that deliver requires a change of mind, a transition from being a product-focused company to a service company. This transition will come by incrementally focus on servicing the installed base, thereby designing services that deliver.

Key words: Service engineering
Service development
Service Paradox
Blueprinting

Preface

This master thesis has been conducted during the summer and autumn of 2004. During this period we have had the opportunity to spend a lot of time at Alfa Laval that has given us valuable insights in the company. We have met many employees that have been contributing to this thesis in many different ways. We especially wish to thank our tutors Martin Habert and Thomas Möller for believing in us by giving us the freedom to fully explore the subject. Without their motivation and drive for acknowledging the importance of service at Alfa Laval this master thesis would not have been possible.

We would also like to thank all employees at Alfa Laval PPS for their time and effort that led to interesting and fun discussions at the lunch restaurant from which we have learnt a lot.

Carl-Henric Nilsson, our tutor at Lund Institute of Technology, contributed with valuable knowledge and insights building a bridge between the practical and theoretical findings. Jan Persson, School of Economics and Management at Lund University, contributed with an expertise in service management. He also taught us how to write a promoting text with the reader in mind. We are very thankful for their support in our decision to write an integrated master thesis.

Writing this master thesis has been a fun, interesting and challenging experience. It has taught us to work closely as a team, spending time interacting with employees in all parts of the organization but also how to present and promote our ideas and findings. Above all it has given us a confidence to move towards new challenges and opportunities.

We hope that this master thesis lays the foundation for an increased service focus at Alfa Laval.

Lund, November of 2004

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1 Introduction

This chapter contains the background of the thesis and the problem discussion followed by the focus of the thesis including purpose and target audiences. After that, a guide for reading the master thesis is presented followed by a brief description of the case company, Alfa Laval.

1.1 Background

Ours is a service economy and it has been for some time.
- Karl Albrecht and Ron Zemke (2001)

We live in a service economy. As consumers we use services every day. Companies and other organizations are dependent on a wide selection of services, both as buyers and sellers. Still very few companies have developed structured methods for designing new services (Bullinger et al., 2003). This means that even though we live in a service economy, there are very few companies that have an R&D unit for services. This is somewhat surprising. Consider a company producing products, for example cars. Then consider this company developing a new car with new features and functions, without a structured developing method. Without clear guidelines of who will do what and when. Without an established method to gather information about customer demands and market trends. Without a structured method to decide on the best concept, what material to use, what functions the car should have and a proper cost benefit analysis. The development of the new car would be ad hoc, and probably neither what the customer wants nor be profitable to the company. Sound bizarre, does it not? But this is more or less the reality today, for services.

If we compare the development of goods and services historically, we can easily see that there is a great difference in how far the development procedures have evolved. Since the first automobile was introduced, the car industry has worked for more than a century to improve their development processes, from the first standardisations in the beginning of the 20^{th} century, to the platform strategies of today. (Fähnrich et al., 2004) Even though services have been around since the beginning of trade, structured service development has gained little attention, and thereby not developed as much as it could have. In this thesis we will take service development a bit further by presenting service engineering. In the future, when we look back at the beginning of service development, we might see service engineering as one of the first attempts to structure the development process of services.

If you agree that structured service development is important, then the next question is, why study a manufacturing company as Alfa Laval? This is because services have become an increasingly important part of traditional manufacturing companies businesses. During the past few years a lot has happened in the traditional manufacturing markets. Market structures and competitive situations have been facing an ongoing transformation, accompanied by an increasing acceleration of innovation cycles (Scheuing, 1989). In these dynamic competitive environments, cost, quality and technology leadership are no longer sufficient to secure competitive advantages. Instead manufacturing companies must go beyond the product concept to differentiate in a more subtle way to provide added value to the consumer. (Ibid) For that reason, many manufacturing companies have developed a growing interest in expanding into the service business. They do that by integrating services with their traditional core product offerings. Thereby, significant revenues can be extracted from servicing the installed base of products. (Knecht et al., 1993) Another advantage is that services in general have higher margins than products (Anderson et al., 1997) and are considered to be a more stable source of revenue since they are resistant to the economic cycles that drive investment and equipment purchases (Quinn, 1992).

Services, unlike products, are difficult to imitate by being less visible and more labour dependent (Heskett et al., 1997), which may be exactly what manufacturing companies need to enable competitive advantages. Because most manufacturing companies sooner or later will discover the benefits of expanding the service business, the future challenge will be to continuously offer improved and new innovative services to the market in order to stay one step ahead of the competitors. It will be even more critical than today to pinpoint customer needs and expectations. However, many companies today reveal a surprising uncertainty when it comes to translating customer wishes into marketable new services (Ganz et al., 2004). This is because most companies lack service development knowledge. However, by using existing engineering know-how and creating service development know-how, manufacturing companies can finally be able to develop services that deliver.

1.2 Issue

As most manufacturing companies Alfa Laval needs to find new ways to differentiate by shifting the current product focus towards a more service oriented approach. Services represent an important part of Alfa Laval's business today and will be even more important in the future since they can ensure competitive advantage and handling competition by brick walling the customers to Alfa Laval's products (Möller, 041020). It has a huge profit potential, stressing the need for developing new successful services even further (Habert, 040709). However, service development at Alfa Laval today is non-structured and ad hoc. This has had the effect that ideas generated within the organization rarely become something else than just remaining ideas, since there are no clear guidelines of who is responsible for the development of services and no structured procedures to follow. The lack of responsibility, resources and management directives forms obstacles for ideas to be realized and services to be developed (Gebauer & Friedli, 2004). Additionally, most manufacturing companies find it extremely difficult to increase service revenues successfully in reality. High investments in extending the service business do not result in the expected higher returns, providing a service paradox[1]. (Ibid)

[1] When high investments in expanding the service business leads to enhanced service offering and higher cost but does not generate the expected higher returns.

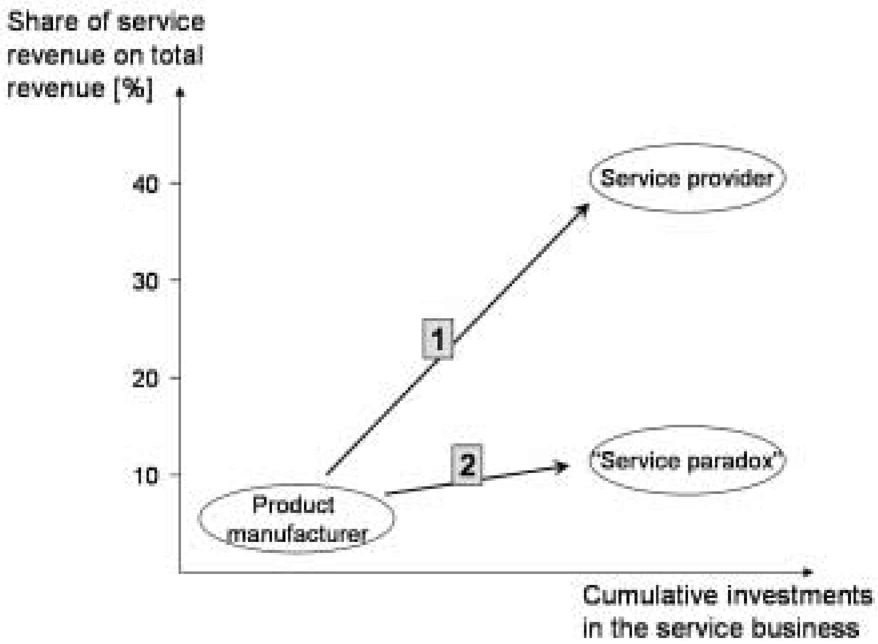

Figure 1.1 – (1) Manufacturing companies profitably exploit the financial potential of an extended service business. (2) Manufacturing companies with difficulties to exploit the financial potential. A Product manufacturer sees services as add ons and the revenues extracted from services such as installation, and spare parts are low, a company is defined as a service provider when a large part of the total revenues stems from service, such as consulting, financial services, maintenance contracts (Gebauer & Friedli, 2004)

This off course is a major hurdle for Alfa Laval and other companies that try to differentiate by providing innovative services. To overcome the paradox and harvest the profits extracted from increasing service investments, companies need to establish a clearly defined service development process, set up a service organization, create a service culture and focus on how the service offers added value to the customer (ibid). The transition from being a product manufacturer to a service provider is not an easy task. We therefore will investigate:

- ❑ **What is service engineering and how can it be utilized for manufacturing companies to develop successful services?**
- ❑ **How can service engineering be utilized at Alfa Laval?**

1.3 Purpose

The aim of this master thesis is to discuss the content of service engineering and describe why it is important and how it can be utilized for manufacturing companies to develop successful services.

1.4 Target audience

There are three main target audiences of this master thesis. The first is employees at Alfa Laval working with service related issues. The second target group is managers responsible for service development questions at manufacturing companies. Finally we target university students with special interest in service development issues.

1.5 Guide for reading the master thesis

The master thesis begins with the introduction and the methodology, followed by a discussion about the increasing importance of service. Service engineering can be divided into two parts that build up the service engineering environment: the organization and the development techniques. First we analyse organizational aspects regarding service development. Thereafter we demonstrate methods, tools and techniques for developing new services, and develop a model adapted for Alfa Laval's needs. In our concluding remarks we demonstrate how service engineering can increase revenues for manufacturing companies by servicing the installed base.

The thesis contains following chapters:

- Chapter 1 contains the background of the thesis and the problem discussion followed by the focus of the thesis including purpose and target audiences.

- Chapter 2 presents the methodology where the research strategy is explained, as well as our method for data collection, interview techniques and data analysis. We describe how the research has been carried out and why we have chosen this strategy. Furthermore we reflect on the implications of the chosen strategy.

- Chapter 3 displays the increasing importance of service in manufacturing companies. After that follows a discussion about the diminishing importance of distinguishing between a service and a product. We also discuss the evolution of service and how it has resulted in productification at Alfa Laval.

- Chapter 4 provides an introduction to the concept of service engineering. Furthermore we demonstrate how service engineering can be utilized in manufacturing companies and what services that is compatible with service engineering.

- Chapter 5 discusses different alternatives when designing a service development organization and what competences are needed. A suggestion is made for Alfa Laval. We also bring up a common hurdle for service development organizations.

- Chapter 6 evaluates different service and product development models and presents suitable service development tools including flowcharting, blueprinting and critical incident technique.

- Chapter 7 contains our Alfa Laval service development model, SERVAL.

- Chapter 8 highlights the factors that manufacturing companies should consider when creating a service engineering environment. The service business system contains service operations, service delivery and service marketing. After this we discuss customer interaction, customers as a source of innovation and pricing strategies. In our concluding remarks we argue that manufacturing companies can increase their revenues by servicing the installed base.

- Chapter 9 presents our conclusions and suggestions for further research.

After the introduction and the methodology, the structure of this master thesis is transformed into an integrated approach where theory, empirical findings and our own analysis are condensed into one discussion. Because of the integrated approach, it is particularly important that the reader is aware of how we refer to different sources and when the discussion is our own. The main structure is that if we refer to a surname and a year (Quinn, 1990), the information is collected from published as well as unpublished literature and articles. When we refer to surname and a date (Habert, 040709), the information is collected from an interview with the person in question. Finally, if neither of the above mentioned alternatives, the findings are our own conclusions, which occasionally are stressed by using phrases like “Our opinion …” and “We find …”.

1.6 Alfa Laval – Company introduction

To optimise the performance of our customers’ processes, time and time again[2].

In 1883, Gustaf de Laval and Oscar Lamm founded AB Separator, the precursor to Alfa Laval. The company’s first products were derived from the separation technology and mainly used for separating fluids from each other and from firm particles. The product portfolio later expanded to include the milk pasteuriser, the milk machine and in the late 1930s the heat exchanger was introduced. Tetra Pak acquired Alfa Laval in 1991 when the liquid food processing activities was integrated with Tetra Pak’s core business. Industri Kapital bought the remaining business 2000, with the explicit aim to yet again list Alfa Laval at Stockholm stock exchange, which was done two years later (www.alfalaval.com 040714).

Alfa Laval is the leading global provider of specialized products and engineering solutions. The products are used to heat, cool, separate and transport products such as oil, water, chemicals, beverage, foodstuff, starch and pharmaceuticals. The company

2 Corporate mission at Alfa Laval (www.alfalaval.com)

is a global market leader within its three key technologies: Separation, Heat Transfer and Fluid Handling (www.alfalaval.com 040714). The product range from separators and decanters, to different heat exchanger, spiral or plate, used for heating, cooling, evaporation and condensation. Alfa Laval also manufactures pumps, valves and fittings to enable efficient transport of different liquids. (Alfa Laval annual report, 2003)

In 1998 Alfa Laval was reorganized and finance, human resources, communications and corporate development were centralized. Concurrently, Capital Sales was organized into two divisions, the Equipment and the Process Technology divisions. The aim was to become a more market driven organization and to be able to target specific customer segments. The Process Technology division offers customized solutions, from components to systems, which help customers optimise their processes. It is further divided into Energy & Environment, Life Science, Process Industries, Food Technology and Parts & Service. The Equipment division offers a wide range of products to customers with well defined and regular needs, and it is also subdivided into areas including Marine & Diesel, Sanitary, Comfort & Refrigeration, OEMs and Parts and Service. Sales channels used are Alfa Laval's own sales companies, distributors, contractors, installers, system builders and OEMs. (www.alround.alfalaval.com 040715)

Today, Alfa Laval is a global company with own sales companies in 50 countries and local presence and sales in more than 100 countries. In 2003 the company had 9 194 employees globally, a turnover of 13,909 MSEK, and more than 20 000 customers including BP, BASF, Bayern, Heineken and Tetra Laval. (Alfa Laval, annual report 2003)

1.7 Alfa Laval Parts & Service

The divisions within Equipment and Process Technology were previously responsible for its own after sales. As an attempt to streamline the focus on service and parts, the Parts & Service unit was established in 2000. Service had become an increasingly important part of the Alfa Laval business and a new service strategy was established. Parts & Service is a central unit divided into PPS (Process Parts & Service) and EPS (Equipment Parts & Service) responsible for the after market sales, supplying spare parts and service. Parts & Service also support the sales companies with its customer contacts (Hornwall, 040721). Despite the increased service focus, services only contribute with approximately 30% of total sales, while parts contribute with the remaining 70%. The service strategy is to augment long-term customer relationships by increasing the number of service agreements. The service offers at Alfa Laval can be explained with a House of service (figure 1.1), with different products from which a customer specific service package can be build.

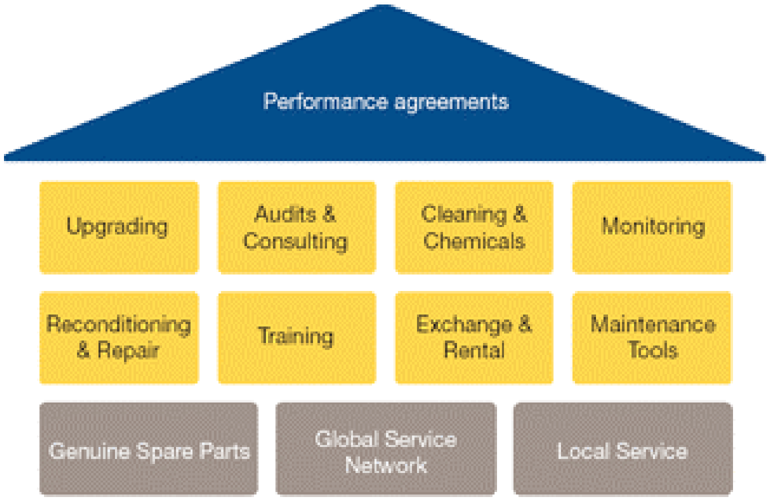

Figure 1.2 – "The House" builds up the service situation at Alfa Laval (www.alround.alfalaval.com 040715, www,alfalaval.com, 041123). The spare parts, the global service network and the local service centres build up the ground of the house. Then the different services create the building blocks of the house, and finally Alfa Laval's Performance agreements form a roof on the house.

Today Parts & Service employ 17 % of Alfa Laval's total work force, and contributes with approximately 26% of Alfa Laval's total revenue (Alfa Laval, annual report, 2003). It is Alfa Laval's growth enabler with the strategy to "Protect and Build" including a need both to sell and to expand the service offers by increasing the market coverage (Carleson, PPS Sales meeting Bangkok, 2002).

2 Methodology

In this chapter our research strategy is presented and explained, as well as our method for data collection, interview techniques and data analysis. We describe how the research has been carried out and why we have chosen this strategy.

2.1 Introduction

The subject of service engineering was first raised in a discussion between out tutors Martin Habert and Carl-Henric Nilsson. It was suggested as an appropriate theme for a master thesis and we were fortunate enough to get the opportunity. Since the research objective was not predefined we have had major influence on the course of the thesis. Additionally, service engineering is not a well-known subject at Alfa Laval and therefore we have had to trust our own judgments in how to create a service engineering environment at Alfa Laval. This is the story of how the authors became service engineers.

2.2 Methodological approach

The scientific outlook of this master thesis is based on the systems view, that includes both of the positivistic and hermeneutic research paradigm. It assumes an existence of an objective reality, like the positivistic approach, but also that reality is divided into components dependent of each other that cannot be summarized, like the hermeneutic approach proclaims. We find that the nature of the thesis, as well as our point of view, advocates the use of the systems approach. The reality cannot be broken down into parts and studied separately; instead the reality requires an understanding of the company as a whole. (Arbnor & Bjerke, 2003)

The systems view promotes a qualitative approach, which is the chosen method for collecting information throughout the thesis. All information collected is qualitative and consists of interviews as well as daily communication with employees at Alfa Laval. The way the data has been collected has mainly been explorative because very little have been published about the subject service engineering and therefore there is no well structured way to approach the problem (Arbnor & Bjerke, 2003). The objective with explorative investigations is to gather all information possible about the subject and to fill in the existing gaps (Patel & Tebelius, 2001).

The explorative nature of this thesis, the model creation at Alfa Laval and the lack of existing theories as well as practical suggestions, demands an abductive approach. The abductive approach is a combination of the inductive and deductive approaches. The inductive approach aims at creating hypothes to find matches through empirical studies thereby designing new theories. The deductive approach on the other hand starts out in general principle and existing theories forming hypothesis that are tested empirically. (Wigblad, 1995) By choosing the abductive approach we have retained flexibility in the research, where our theoretical and empirical studies have been alternated in an iterative process. We took our starting point in the existing theories as well as earlier conducted investigations. Thereafter we investigated how these hypotheses matched with the reality at Alfa Laval. Our purpose is to develop a service engineering model adapted to Alfa Laval's needs and wishes, resulting in that we aimed at creating new theory by combining existing theories with our empirical findings at Alfa Laval. Our hope is that these new findings will be a foundation for further research on the subject.

2.3 Practical approach

There are two main sources for collecting data; either through primary sources or by using secondary sources. Primary data consists of information the authors collect in order to fit with their research needs. Secondary data contains data previously collected, for example books and articles. (Arbnor & Bjerke, 2003) In this section we will also explain how we have ensured that the thesis contains a high degree of validity and that our conclusions are trustworthy. The research is said to be valid if the information gathered is accurate, and measures what it is supposed to (Arbnor & Bjerke, 2003).

2.3.1 Primary data collection

We started our primary data collection by conducting two semi-structured interviews with our supervisors at Alfa Laval in order to acquire knowledge of service development at Alfa Laval but also evaluate the validity of our preliminary questionnaire.

Most of the primary data has been collected during interviews with managers at Alfa Laval. The managers were chosen based on recommendations from our supervisors at Alfa Laval. From the interviewee further interview recommendations were received.

Semi structured interviews were used to give the interviewees a chance of comprehensive answers. The same questionnaire was used throughout the interviews but during the interview we focused on the interviewee's specialist area. Prior to the interviews the questionnaire was sent by email or given directly to the interviewee. Hence we could assure the objective with the interview was obtained, as well as the reliability (Arbnor & Bjerke 2003).

All interviews lasted between 60 – 90 minutes. They were conducted with one person asking the questions, the other two taking notes. During all interviews except for the first two, the same group member asked the questions. We find that by using the same person as the interviewer she will master the interview technique, and guarantee continuous eye contact. This is important so that the interviewee does not perceive the interviewer as uninterested and nonchalant. To ensure that the gathered information was truthful and accurate, but also to avoid different interpretations, all three authors have been present during the interviews. We decided not to use a tape recorder as it often can be considered too formal and thereby restrain the interviewee (Lundahl & Skärvard, 1999). We find that the best way to conduct interviews is face to face. Therefore we have tried to conduct all interviews in person to acknowledge change of tones and body language (Holme & Solvang, 1997). When the distance was a problem we used videoconference to ensure a direct contact with the interviewee.

Only in the cases were a personal meeting or video conference was not possible, we used telephone interviews.

Analysis of the interviews has been done in a qualitative way. Immediately after each interview we individually scrutinized and reflected on the answerers. Thereafter we discussed our interpretations as a group. We trust that this has raised the validity of our research.

To ensure a high level of validity, and that we accounted for different perspectives we have tried to study the phenomenon trough different points of view, by interviewing several employees at different levels of the organization, general managers as well as service engineers. The validity is also guaranteed by being physically at Alfa Laval, enabling us to observe things neglected in the interviews (Arbnor & Bjerke, 2003). The management opinions concerning the need for an increased service focus might have influenced the interviewees, by giving answers biased towards this commonly acknowledge opinion. This could have affected the answers negatively from a liability part of view. Finally we have acknowledged the bias of values, norms and perceptions that might appear both from the interviewee and the interviewers. We have constantly evaluated our research with this in mind (Holme &Solvang, 1997).

2.3.2 Secondary data collection

We started our theoretical material search on the topic service engineering in database ELIN, and of books on related areas in database LOVISA. The number of articles and books found was very exclusive; hence we continued our search through reference lists. We also contacted authors of the most relevant articles and received their un-published material. Furthermore we send them email questionnaires to concretize the terminology and gain further knowledge about service. At Alfa Laval, we accessed Alround, Alfa Laval’s intranet, and could extend our empirical information search.

As we see it, service engineering is a part of two acknowledged theoretical areas, service management and engineering (figure 2.1). From engineering we collect product development theory and practice, ideas on how to organize development and to build up teams with diverse competences. From service management we gather theory on service development, service marketing and pricing. In order for companies to create a service engineering environment, all above mentioned aspects must be taken into account. Service engineering constitutes of the overlapping areas where existing theories on how to develop products and services are combined.

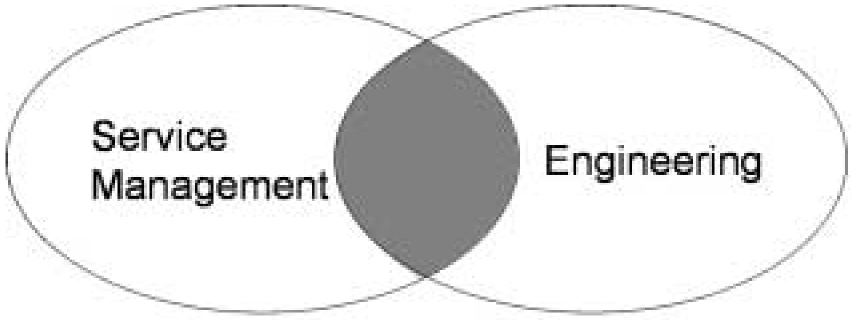

Figure 2.1 – Venn diagram describing the two different theoretical areas we consider service engineering collects ideas from.

To minimize the subjectivity of secondary data several different sources were used. We found it very important to use published as well as un-published material, to ensure a comprehensive gathering of the latest material available. It can be difficult to ensure a high reliability when working with a new and unexplored topic, hence the authors are often found quoting each other and even using the same models, examples and metaphors. Acknowledging this problem, we have had a clear objective to find authors with different points of view.

Service engineering was coined in Israel and in Germany, hence some of the articles are written in German and Hebrew. Our knowledge of these languages is limited, and our literature research has therefore focused on articles and books written in English. To minimize the risk of not extensively scrutinizing the subject, we have had intense contact with one of the founders[3] of service engineering. We have also contacted professors of the most interesting articles and asked them further questions about the subject[4].

2.4 Integrated approach

The most common way to write a master thesis is by dividing it into three distinct parts; namely theory, empirical material, and analysis. In the theory the author summarize the secondary data collected, the empiri is a review over the primary data collected and the findings in these two sections are summarized in the analysis. This is also how we started out when working on our thesis. After a while, we realized that we had mentioned thoughts and ideas both in the empiri and theory that did not add anything meaningful to our thesis. Then we came up with the idea to write the thesis containing the above-mentioned parts interwoven and integrated because it is easier to anchor the analysis in the theoretical and empirical findings. We find that by using this method it is easier to exclude parts that do not add value to the thesis. It raised a lot of valuable questions as; why do we want to mention this? Does this notion add anything to the thesis?

[3] Professor Meiren
[4] Professor Meiren, Professor Tomiyama

Our advice to students interested in writing an integrated thesis is to begin the study with gathering typical empirical and theoretical material to ensure a deep understanding of the investigated subject. This material should be condensed into two distinct parts. Thereafter it is easier to write integrated, analyze and eliminate parts not adding value to the thesis.

2.5 Methodological Reflections

Creating a model is to build a simplified version of reality. It is not an easy task. Many factors influence the service development model created for Alfa Laval and we have tried to identify the most important factors and take them into account. However, there is a risk that we have not identified all factors as well as given the identified factors an unfair impact of the model. Acknowledging this situation, the working process to create the model has been extensive, giving a lot of time for reflection on the theoretical and empirical findings.

To explore how service engineering can be utilized in manufacturing companies we mainly consulted the researchers of service engineering and employees at Alfa Laval. To confirm that our conclusions were in line with opinions on service development in manufacturing industries, we consulted two persons with insight in manufacturing companies where service is an important part of the business. To support that our findings in some cases might be transferable to other manufacturing companies, we could have extended our information search to additional manufacturing companies. We however lacked the time to do so.

3 How has service in manufacturing companies developed?

In this chapter we will start by discussing the diminishing importance of distinguishing between a service and a product, and how service has become more important in manufacturing companies today. We describe the evolution of service and how it has resulted in productification at Alfa Laval.

The literature provides several definitions focusing on different aspects of the service. The frame of reference used in this master thesis is based on following definition highlighting the interaction between the customer and the company.

Grönroos (1990) defines a service as: “an activity or series of activities of more or less intangible nature that normally, but not necessarily, take place in interaction between the customer and service employees and/or systems of the service provider, which are provided as solutions to customer problems” (p.27). What constitutes service in manufacturing firms? Manufactured products are purchased to put to use for their entire functional life and require different kind of services as they advance through their life cycle, for example acquisition, installation, operation, upgrades, decommission etc. These products are associated with a cost of ownership beyond the purchase price, for instance spare parts, consumables, maintenance etc (Oliva & Kallenberg, 2003).

Services can be distinguished as activities that either reactively or proactively provide customers with a solution for their problems or needs. Alfa Laval’s current service offers mainly contains reactive services, for example that Alfa Laval’s service engineers are called up for breakdowns. In the future, we find that the proactive services will take a larger part in the total service offerings, securing and optimising processes. Thereby Alfa Laval can offer the customer peace of mind (Stokkland, 040810). If that offer includes a product, a service or a combination of both, is in fact not interesting.

3.1 Everybody is in service

For many years, there has been an apparent line between product and service companies. We think that when manufacturing companies increase their service focus it is no longer important to distinguish between a service and a product: “Managers need to break out of the mind-set that considers manufacturing (or goods productions) as separate from (and somehow superior to) the services activities that make such productions possible and effective. In fact, most companies - product manufactures alike - are largely service operations.” (Quinn et al., 1990, p.58)

The service content in many products, especially within the manufacturing industry, has increased. For example, ABB and Volvo have redefined their offers from pure product concepts towards selling service concepts. ABB Robotics does not primarily offer industrial robots, but systems for production rationalization or increasing productivity. Volvo does no longer only sell a car, but a whole system where customer quality and value include value decreasing, taxes, parts and service costs, insurance etc. (Edvardsson, 2000) Alfa Laval has also increased the service content, by offering a combined solution of product and service[5].

These examples illustrate the development of service offers in which the product combined with the service builds a service concept, aiming to create added value for the customer. This is a way to differentiate in the increasing competition, by packaging and selling knowledge and experience. It looks like Levitt's famous statement "everybody is in service" has been realized (1972, p.43). Because all companies offer some kind of service, it is no longer sufficient for manufacturing firms to only offer basic service as maintenance in order to ensure competitive advantage. Companies therefore need to deal with service strategy more proactively, by assisting the customer at the same time the product is sold. Manufacturing companies' work concerning the service never ends: "the mission is not just to make the product work, but to help the client maximize all the different processes, actions and strategies that are associated with the supplier's product" (Mathieu, 2001, p.40). Kanter (1991) summarizes this discussion well, "Think of every product you buy or sell as a service. In other words look at what it does, not what it is" (p.22).

3.2 The service evolution

Service is becoming an increasingly important part of business in manufacturing industries (Björk, 040824). The service evolution shows that service focus is an incremental process of the service offers. The service evolution (figure 3.1) demonstrates that companies begin with selling products and giving away services for free. The final objective is to provide a total solution that is sold as a service (Kohler et al., 2001). Intensified service content in products is crucial for the future of manufacturing companies since pre-eminence in production capabilities no longer is enough to create added value (Tomiyama, 2001). This will influence companies to further extend their package deals to include not only products but also customer relevant services such as planning, installation, upgrading, maintenance and recycling. The product becomes a mean to deliver a service, or a service platform where the service is performed. (Ibid) Currently in many manufacturing companies the product is still in focus and services are used as a means to differentiate in its product marketing strategy. However, many manufacturing companies find it very difficult to amplify their revenues by increasing the service content. The high investments in extending service business do not correspond to expected higher returns, providing a service paradox. (Gebauer & Fredli, 2003) To overcome the paradox and harvest the profits extracted from increasing service investments, companies need to establish a clearly defined service development process, set up a service organization, create a service culture and focus on how the service offers create added value to the customer. (Ibid) In other words, creating a service engineering environment.

[5] Aldec G2 is one example.

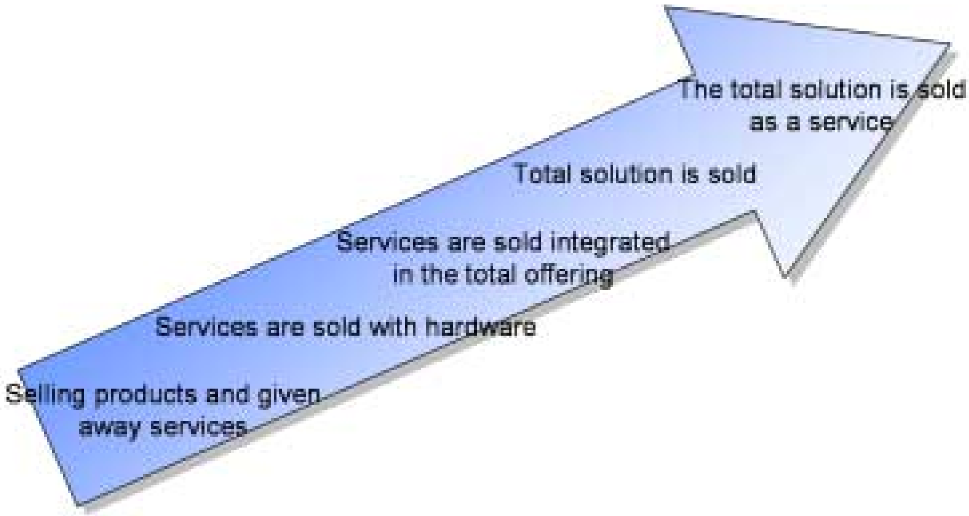

Figure 3.1 – The service evolution, from selling products and giving away services, to offer total customer solutions sold as a service (Kohler et al., 2001).

3.3 Productification

Alfa Laval's current service strategy is to move from selling products and giving away services, to selling services together with hardware (figure 3.1). Productification is a rather novel term used by Alfa Laval since 2001 to describe a package consisting of parts and service (Möller, 041006). It is a way to create a well-defined and limited package of parts and service to a specific customer need. (Persson, 040810) The objective with productification is to clarify the offer so that the customer knows what he is buying, and Alfa Laval knows what they are selling (Stokkland, 040811). Concretely it is a standardization of the service offer, including specification of time used for each service. A fixed package price is used rather than the service engineer charging the total hours spend on the delivering the service. (Möller, 040707) One aim is to create article numbers on the service packages facilitating for the sales companies to increase their sales of services (Habert, 040709). By these actions services are treated as products, and there is a point in doing so. Through productification services are packaged in order to fit in the traditional product environment at Alfa Laval. It will not erase the services characteristics, but hide it to employees and customers not used to working with services.

There is no structured method for developing new service packages. This has had the effect that several different methods, templates and tools are currently used, depending on who is responsible and where he is located (Möller, 040928). Few service packages have yet been realized, but one example is Aldec G2. Aldec G2 is a decanter that has been packaged together with a standardized service package. The price, scope, service plan, and condition are pre determined centrally by PPS, and the sales companies fill in the pre specified spreadsheet with customer specific information. We find that the reason for few packages being realised is that there is no easy, structured, and commonly used way for employees to develop these packages. Creating a service engineering environment will eventually lead to increased number of packages being realised. In the following chapter we discuss the content of service engineering and its function at Alfa Laval.

3.4 Summary of the chapter

In this chapter we argue that it is no longer important to distinguish between a service and a product because companies strive to offer a solution to a problem or need where service and products are combined. In the future the proactive services will take a larger part in the total service offerings, securing and optimising processes, providing the customer with peace of mind. The intensified service content is crucial for the future of manufacturing companies since pre-eminence in production capabilities no longer is enough to create added value. This will influence companies to further extend their package deals. Alfa Laval uses productification to create well defined and limited packages of parts and service to a specific customer need. However, many manufacturing companies find it very difficult to amplify their revenues by increasing the service content. We find that through creating a service engineering environment, companies can harvest the profits extracted from increasing service investments.

4 What is service engineering?

In this chapter we define service engineering and explore the subject. Furthermore we discuss when and how service engineering can be utilised in manufacturing companies like Alfa Laval.

Service engineering is a novel discipline concerned with the development of new services[6] and was coined in Germany and Israel in the mid-nineties (Bullinger et al., 2003). According to researchers at the Fraunhofer Institute for Industrial Engineering in Germany "Service engineering can be understood as a technical discipline concerned with the systematic development and design of services using suitable procedures, methods and tools" (ibid, p.276). By using existing engineering know how of product development, service engineering adopts a technical – methodological approach to develop innovative services (ibid).

Tomiyama (2004) defines service engineering as "… an engineering method to deal with service" (p.6). Tomiyama sees service as an activity, or a series of activities, that the service provider offers to the service receiver in a service environment generating value for them, meaning that service engineering has to deal with activity and value. Therefore, service engineering does not contend with function, behaviour, state and structure of artifacts, but service as activities focusing on improvement of the value of service and reduction of its cost (ibid).

Mandelbaum (2003) stress that service engineering is comparable to traditional industrial engineering and he believes that "The ultimate goal of Service Engineering is to develop scientifically-based design principles and tools (often culminating in software), that support and balance service quality and efficiency, from likely conflicting perspectives of customers, servers, managers, and often also society" (p.4).

We prefer to condense these three relatively consistent definitions of service engineering to "a structured method to develop new services using existing engineering know-how from product development". The engineering know-how from product development we refer to is mainly product development models, methods and tools as well as knowledge about the supporting organization around the product development processes. This motivates studies of product development in general and more importantly Alfa Laval's product development process.

It is important to evaluate what product development models, methods, tools and different organizational forms that are relevant to use in the context of service development. There are differences between services and products that are relevant to consider in the development process. Products are normally tangible when services

[6] The expression "new services" should be expanded to also include in some way modified, existing services.

are intangible, (Edvardsson, 2000) forcing the product development process to deal with things irrelevant in service development, for example calculating the strength of a specific material. Services are often produced, delivered and consumed in the presence of customers and may require significant interactions with the customer. (de Brentani 1995). The actual outcome of the service and the customer service experience can vary at each purchase occasion, since services frequently depend on company personnel for their production and delivery (Shostack, 1987).

Service engineering can be divided into different areas. Bullinger et al. (2003) subdivide service engineering in two areas, development of new service products and R&D management of services (figure 4.1). Research concentrating on the "development of new service products" level refers principally to the R&D phases in the service development, from the initial idea to its delivery (Meiren, 1999). On the "R&D management of services" level, focus is on how development processes can be managed and how service development can be anchored permanently in organizations (ibid).

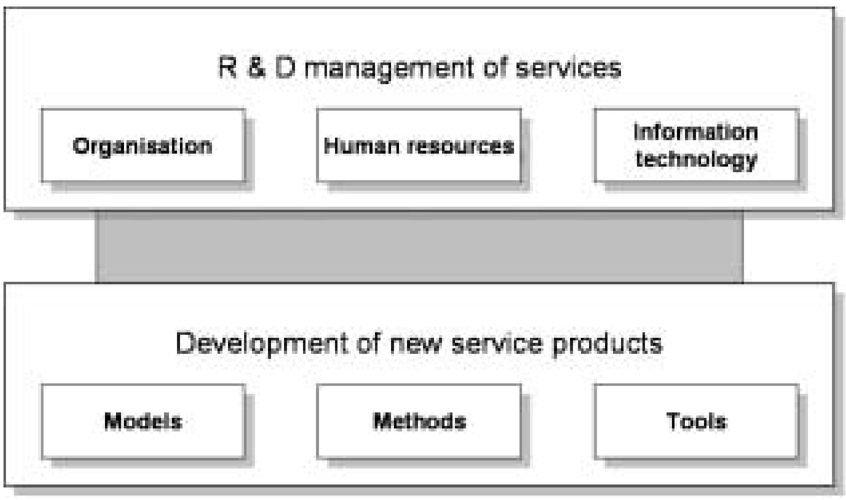

Figure 4.1 – Areas of service engineering according to Bullinger et al. (2003).

Tomiyama (2004) prefers to divide service engineering into *service design engineering*, *service production engineering* and *service development engineering*. In contrast to engineering design of products, service design engineering concerns the designing of services, for example developing supporting tools and methodologies for service designers. Service production engineering is basically a traditional engineering activity and aims at developing engineering tools and methodologies to facilitate and automate service production processes. Similar to product development, service development engineering could be facilitated by engineering tools and methodology. (Ibid) The content of Tomiyama's way of dividing service engineering is the focus on the different tools and methodologies needed to design, produce and develop services. The supporting organization and the human resources behind the service development process are not mentioned. Mandelbaum also leaves out the management part and mainly focus on the methods and tools that could be developed on the basis of queuing theory[7], which is a mathematical approach to how queues can be modelled.

Our opinion about how to subdivide service engineering is comparable to Bullinger et al. We find that service engineering contains both the service development process: models and tools needed to develop new services and how the service development process is supported and anchored in the organization. The key element of service engineering is in the literature the service development process but we prefer to place equally much attention on the development process as well as the supporting organization. We find a well-structured service development process would not be valuable without an organisation that explicitly supports the process. In other words, neither the development process nor the supporting organisation can function without interference of the other.

4.1 When service engineering can be utilized

Manufacturing companies have for quite some time tried to differentiate themselves from their competitors through innovative products. More recently reduction of product development time has become increasingly critical and the product life cycles have shortened which means a decrease in the investment pay off time. (Bullinger et al., 2000) Today, differentiation through innovative services is becoming increasingly important to many companies (Ganz et al., 2004), and our belief is that service development will come across the same progress as new product development. We see this as a natural progress. First companies learn how to develop new innovative services and then, when this is an established knowledge, the development time will be a basis of competition.

The future challenge for many companies will be to continuously offer improved and new innovative services to the market in order to stay one step ahead of the competitors, and it will be critical to pinpoint customer needs and expectations. However, many companies today reveal a surprisingly uncertainty when it comes to translating customer wishes to marketable new services (Ganz et al., 2004). The occurrence of separate R&D departments for service development is a rare exception. To be able to meet the increased demands on service development, a meaningful transfer and application of existing engineering knowledge to the service sector can be vital. (Ibid)

If service engineering is a way to meet these demands, is it then possible to utilize it for all types of services? Four different service types categorized by the degree of contact intensity and variety are demonstrated in figure 4.2. The typology has been developed from an empirical survey of 282 companies[8] where the two dimensions, contact intensity and variety were disclosed in a factorial analysis (Bullinger et al., 2003). Contact intensity is defined as a measure of the interrelationship between

[7] Mandelbaum primarily works with tele-services for example call centres.
[8] The survey was conducted in 1999 and involved 3500 German companies. From the 282 companies that answered (8.1% response rate), 25% where manufacturing companies and 80% had less than 500 employees.

employees and customers, while variety describes the number of predetermined modifications of the service, i.e. a measure of the service customization (ibid).

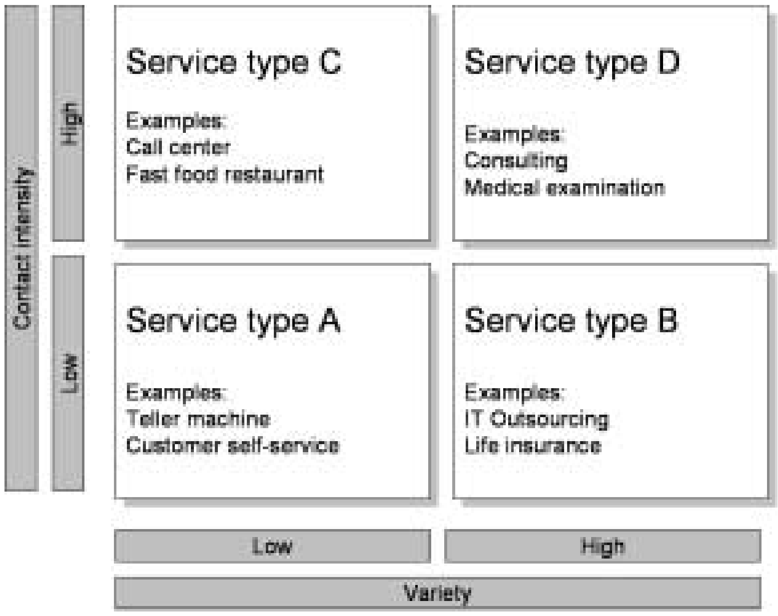

Figure 4.2 – Service typology according to Bullinger et al. (2003). Contact intensity is defined as a measure of the interrelationship between employees and customers, while variety describes the number of predetermined modifications of the service.

- Service type A offers a single standardised service with low contact intensity.
- Service type B offers variants of a low contact intense service to different customer needs.
- Service type C offers a single standardised service that might on the other hand be influenced by the customer to a limited extent.
- Service type D offers a customized service with high contact intensity. (Bullinger et al, 2003)

Bullinger et al. (2003) argues that service engineering methods are most appropriate when developing services with low contact intensity, that is, service type A and B. The characteristics of low contact intensity services are similar to the characteristics of physical goods and could consequently be developed using similar methods. The high contact intense services on the other hand, need methods to qualifying employees and shaping the customer interaction in the encounters between employee and customer. (Ibid)

Even though it seems like high contact intense services might not be the most appropriate to develop with service engineering methods, we consider it possible to develop relatively high contact intense services if using service specific development tools[9] in the development process. These tools will be especially helpful for the service developer when designing the encounters between customer and service staff. High contact intense services involve more encounters, making the service more difficult to foresee and control, much because the service delivery is highly influenced by the customer. Therefore knowledge about the contact intensity can be important for the service developer when deciding how much attention that is needed to identify and design the service encounters. By using these tools to thoroughly design the encounters, we uphold that more or less all types of services are possible to develop using service engineering methods[10].

4.2 Service engineering at Alfa Laval

Alfa Laval is a product orientated manufacturing company. The margins once available for Alfa Laval are no longer possible due to the increased competition. Knowledge based solutions are therefore becoming more important. There is a need to differentiate on knowledge. (Michaelides, 040819) “It is a question of how good we are in getting paid for our knowledge. We have 100 years of knowledge we are not getting paid for” (ibid).

Service development today at Alfa Laval is performed at PPS[11] Market & Sales and mainly concern productification (Möller, 040707). The productification implies a demand to specify the time to perform the service and the spare parts necessary to be able to put a fixed price and an article number on the package (ibid). The services have to be carefully designed to meet these requirements. The possibility to put a fix price and an article number on Alfa Laval’s services might not be equally important in the future. It is the possibility to package Alfa Laval’s competences and embedded knowledge into pure customer benefits that will create their competitive advantages necessary in the future.

Categorizing Alfa Laval’s service types in the service typology matrix of Bullinger et al. (2003), shows that Alfa Laval’s services are mainly low contact intense services (figure 4.3). However, only few of Alfa Laval’s services should be considered as really high or low contact intense. The categorization impedes by the variations of contact intensity within one service. For example, training can be done through sending a training-CD to a customer, but it can also be done face to face between a service engineer and a customer. If looking at the productification projects initiated at Alfa Laval to this date, these have typically concerned type A and B services (Warlin, Productification development, 031023).

[9] We will later, in chapter 6, discuss flowcharting, blueprinting and critical incident analyse as possible service development tools to use when designing the service encounters.
[10] Above all, we believe it is possible to develop all the type of services Alfa Laval offers their customers today.
[11] Process Parts & Service

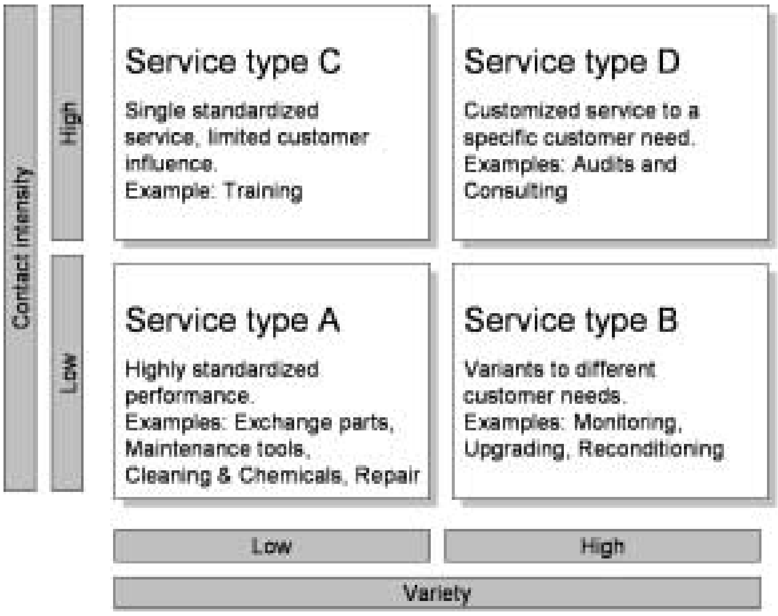

Figure 4.3 – Alfa Laval's services placed in the same typology as in figure 4.2. According to this typology, Alfa Laval's services are predominantly of low contact intense nature.

Service engineering can be a structured method to package Alfa Laval's embedded knowledge into competitive services. In addition it could be a way to package existing services into new, more complete solutions through productification. Today there is no structured way to develop new services at Alfa Laval (Habert, 040709), but we should remember that there is a well-defined product development process and an extensive R&D management unit (Wilhelmsson, 040812) from which Alfa Laval can collect valuable knowledge and experiences.

The product development process at Alfa Laval PTD[12] is based on their project management model, PROMAL, and the manual describing the development process contains recommendations for feasibility studies, payoff calculations, market specifications etcetera (Wilhelmsson, 040812). The manual also describes the different gates and steering committees the project has to go through before closure (Wilhelmsson, 2003). There is a potential amount of already existing tools and methods to collect from this manual. We will therefore go more into detail about Alfa Laval's product development later in this thesis.

4.3 Summary of the chapter

Service engineering can be defined as "a structured method to develop new services using already existing engineering know-how from product development". The concept can be subdivided in two areas, the service development process with models and tools needed to develop new services and the organization supporting this process. It is the contact intensity that limits the possibility to develop new services

[12] Process Technology Division

using service engineering methods and tools. It is therefore important to understand the contact intensity of a service to make sure that the encounters between customer and employee are given enough attention. We find that service engineering can be a structured method to package Alfa Laval's embedded knowledge into competitive services in the future.

5 How should service development be organized?

In this chapter we discuss the different alternatives when designing the service development organization. We analyse how service development at Alfa Laval should be organized in the future and formulate an organizational suggestion. Thereafter we bring up a common hurdle for service development organizations. Finally we discuss the competences necessary for service development at Alfa Laval.

"Successful new services rarely emerge by mere happenstance. Rather they tend to be outgrowth of an appropriately designed structure and a carefully orchestrated process" (Sheuing &Johnson, 1989)

"New services happen! …unfortunately this seems to be the case in too many situations today!" (Rathme, 1974)

The literature presents different opinions on how services should be developed, and are being developed. Development of both products and services are complex processes that cannot be formally planned, given that it is impossible to completely plan and control the creativity and innovation of new ideas. However, in order to develop new services we trust that it is fundamental to combine creativity with structure. Given the different opinions on how to go about developing services, it is by no means strange that the development of services in many companies happens largely because of intuition or luck. As mentioned earlier, the service development at Alfa Laval is non-structured and ad hoc. This has had the effect that ideas generated within the organization rarely become something else than just remaining ideas, since there are no clear guidelines of who is responsible for the development of services ideas. Service development is not included in job specifications, leaving employees with a service idea to develop it on their spare time without dedicated resources (Christersson, 040826). The lack of responsibility for service development, resources and legible directives from management combined, forms obstacles for ideas to be realized and services to be developed. In order to create a structured service development environment at Alfa Laval, we need to establish how service development should be organized and who should have the responsibility for it. Our intention is that other manufacturing companies can benefit from our discussion when establishing a service development organization.

5.1 Organizational alternatives for service development

Regarding the organizational design of service development, our main question of interest concerns the options available today and how manufacturing companies can use them. We find that it is possible to distinguish between service development as a permanent or a temporary task. Establishing service development as a permanent task highlights several organizational aspects, demanding different competences and resources than if it is organized as a temporary task. (Bullinger et al, 2003) Following discussion is based on the findings from an empirical survey of 282 companies[13] and provides a framework for analysing four organizational alternatives for service development. The alternatives are not mutually exclusive. (Ibid)

Figure 5.1 – Basic alternatives when designing the service development organization (Picture adjusted, Bullinger et al., 2003)

An alternative for service development as a temporary task is *external development of new services* (figure 5.1). It can be used to outsource complete development orders or purchase already developed services. This is a beneficial option when service development know how does not exist within the organization or is not considered a part of the core competence (Bullinger et al., 2003). However it can be difficult to find externally developed service concepts that are adaptable to the specific environment of the manufacturing company. In addition, it can be a major hurdle to find a suitable vendor of service development activities, given the novel attention of the subject. This is nevertheless surprising given that traditional product development tasks seldom are outsourced entirely to external firms. The mentioned study by Bullinger et al. (2003) confirms that outsourcing service development only represents a feasible alternative for 7% of the surveys enterprises. (Ibid)

Another alternative for service development as a temporary task, and most common, (Scheuing & Johnson, 1989) is to develop service within *specific project teams* (figure 5.1), demanding minimal organizational changes. The survey shows that 49%

[13] This is the same empirical survey that we refer to in chapter 4.1 and that was conducted in Germany in 1999.

of the companies employ specific project teams in order to develop new services. The team members are often assigned to a case solely based on their competence, but the majority of the team members were representatives from corporate management or organizational units with close customer contact. A disadvantage with this organization is that the know-how accumulated during a project can vanish when it is terminated (Bullinger et al., 2003).

When developing services as a permanent and additional task, the most widespread alternative is to use an *existing organizational unit* (figure 5.1). As many as 77% of the surveyed companies develop services in an existing organizational unit. The advantage is that service development know-how is restricted to a specific unit, which can be controlled efficiently. But what existing organisational unit should take on the responsibility of developing new services? So far, it has been a task for top management, but because of an increased need for a systematic approach, the responsibility has shifted towards units with close contact with customer, for instance the sales or the marketing unit (Bullinger et al., 2003). One reason for this shift towards sales and marketing units could be the opinion that the customer should be involved in the development of service, to avoid designing services that do not deliver returns to the company or benefits to the customer (Martin & Horne, 1993).

To ensure that service development becomes anchored in the organization as a long-term element, companies need to set up a *separate organizational unit* (figure 5.1), for example a staff position, a group, department or centre. The development activities become distinct from the daily operative business, resulting in systematically building and maintaining service development know-how. Yet it involves significant amount of resources, which is one reason why establishing service development as a main task is still very rare. Only 10 % of the respondents admitted to having a separate unit to develop services and in the majority of cases the unit only consisted of one staff person. (Bullinger et al., 2003) Because companies do not recognize that service development is as important as product development for potential future profits, the need for establishing a separate service R&D unit is neglected. A defined service R&D unit with dedicated resources would lead to a more formalized process, creating mandate in the organization (Stokkland, 040811). However, a service R&D organization demands a well-defined service strategy, explicit service goals, service development resources and capabilities.[14]

The four different service development organization forms can be analysed as a systematic process, where the first step is for manufacturing companies to acknowledge service development and perform it as a temporary task, demanding

[14] A similar survey that Bullinger et al. (2003) did in 1999 was also conducted in the end of 2003 (Fähnrich et al., 2004). The later survey covered 184 German companies that provide technical services. The difference in percentage for the different organisational alternatives are (the percentage from 1999 inside parenthesis):
- External development, 8% (7%)
- Specific project teams, 60% (49%)
- Existing organizational unit, 83% (77%)
- Separate organizational unit, 9% (10%)

minimal resources and competences. Moving from outsourcing the development to conduct the development in project teams within the organization, service development competence is built up enabling services to be developed as a permanent task. When the company has recognized that service development is important enough to be a permanent task, it will earmark resources and further develop the competences needed in existing units. First when service development has reached a certain importance for the company, it will be established as a separate unit.

5.1.1 Organizational alternatives for Alfa Laval

As mentioned in the introduction to this chapter, Alfa Laval has no structure or organizational unit for developing services. Innovative employees develop ideas that could be beneficial for Alfa Laval outside their working hours (Christersson, 040826). But there are examples in the organization implying that there are resources available for service development. Octopus[15] is an example of a new service, developed in a *separate organizational unit* (Möller, 040707). This was done to protect the new service from disappearing in the regular service offerings, avoiding that the service would be given away for free (Habert, 040709). Separate organizational units allow quick decision-making and additional support from the board including resources and strong mandate (Michaelides, 040819). But this is an exclusive example of a service product that is considered to have great potential and the same attention would not be given to a service with less potential. It is a temporary project organized within a separate unit. The project employees will not continue to work with service development questions when Octopus has reached full potential, and therefore the service development knowledge will probably be lost.

We find that service development should take place within a *separate organizational unit*; a service R&D unit, hence the service development know-how will be built up, anchored in the organization and maintained systematically. This should be a long-term strategy for Alfa Laval, given the novelty of the service focus. It is not realistic to establish a separate service R&D organization today because it demands large resources, competences and a board decision. We suggest that service development should be acknowledged as a permanent task, and take place in an *existing organisational unit*, as an additional task. Organised centrally, the importance of service development is further stressed and input from all parts of the organization can be gathered and utilized more efficiently. The service development should moreover reside within a unit that has continuous contact with the customers as well as knowledge about its competitors. This is because many ideas of new services stems from competitors and customers (Edvardsson, 2000). Parts & Service demonstrate highest feasibility, and should have the responsibility for service development. Close connections to Market & Sales is needed because of their established connection to the sales companies facilitates the local adoption of service development. Close contact with Product Managers gives input about for example competitors' new

[15] Octopus is an automated system for continuous optimisation of decanter centrifuges performance. The service includes both, what we later will call an "intelligent tool", and the surrounding activities needed to handle the tool.

services and above all, knowledge about the products different services are connected to.

The organizational alternatives that Bullinger et al. (2003) suggests for service development are not mutually exclusive; therefore we find that service development should reside within the existing organizational unit as an additional task but also be conducted in temporary project teams. An appointed *central service developer* should manage and coordinate the project teams hereby acknowledging service development as a main task. The know-how specific to a project will not vanish due to the service developer being responsible for gathering and saving it. Our research has shown that Cardo AB successfully organizes service development by appointing a service business developer, and also recognizes service development responsibilities to the division managers (Björk, 040824).

At Alfa Laval, the responsibility for identifying customer needs that could result in a new service lies with Market & Sales PPS. Customer input is spread through the local sales companies to Market & Sales where it is evaluated (Persson, 040810). PPS also have the responsibility of generating and implementing new ideas. The implementation responsibility resides with the product manager (Möller, 040707). However, this is not done in a satisfying way today (ibid), leading us to the conclusion that the main service developing responsibility cannot be put on existing employees at PPS because it will continue to be a low prioritised task. It is therefore necessary to create a new staff position, a central service developer, solely and ultimately responsible for developing new services.

In order to generate new ideas and out of the box solutions, input from many different sources is needed (Persson, 040810). A risk with specifying the service development responsibility centrally to Parts & Service is that many of the problems occurring at customer premises will never reach them (Michaelides, 040819). There are few established channels for communicating this type of input throughout the organization (Persson, 040810), amplifying the risk that ideas and input never reach Parts & Service. From this and from the interviews at Alfa Laval we draw the conclusion that ideas from field service engineers or from local sales companies vanish. It is essential to understand the problems that occur when locating the responsibility centrally, but by establishing legible responsibility to Parts & Service and dedicate the main responsibility to a service developer, the transparency will improve and more ideas could be captured and evaluated. It is important to decide how much of the responsibility that should reside centrally at the service developer and what tasks and responsibilities that should reside locally at the sales companies. The proportion of the responsibility depends on the local variation. If the customer need of a certain service varies to a large extent, it is then important that the responsibility for adapting the service to the specific customer needs lies within the sales company. Whatever the proportion, the communication between the units must be clear and Alfa Laval must establish specific communication channels eliminating all insecurity of who to turn to if a question arise. Therefore we suggest that responsibility for service development is appointed to a *local service developer* at each sales company. The appointed employee could be a manager, stressing the importance of service development or a person educated by the service developer with a main responsibility for local adaptation of services, as well as the development of services. The overall strategy for service development should however reside within Parts & Service to create mandate in the organization. The central service developer will have an important task in coordinating all global service development projects and activities.

5.2 A common hurdle for developing service

As mentioned above, it is extremely important that the communication flow between the units is clear and legible. In our research we have found that Cardo and Volvo today have difficulties with the communication between the Capital Sales and After Sales units and with their attempts to integrate them. The aim is to increase the amount of service and service product sold. (Bergman, 040321, Björk, 040824) Service is frequently given away during Capital Sales negotiations to sell the product (Oliva & Kallenberg, 2003). This problem is acknowledged at Alfa Laval for example when telephone support is given away for free as a way to increase the product sales (Stokkland, 040811). We find that the main reason for this is that it is hard to break the mindset that products are superior to services. The problem resides in the belief that:”A product must first be sold in order to sell a service“ (Bergman, 040921). We trust that this product superiority conviction complicates the relation between the two sales units. A common understanding at Capital Sales is that selling a service or a service agreement is more difficult than it is to sell a product. The reasons for this are two fold; the sales force is mainly engineers with large product knowledge and experience in selling products. It is also perceived somewhat more complicated to calculate specific savings or benefits for a service that also demands a different sales technique. (Björk, 040824) One solution could be employing sales people with the competence of selling the product but also introducing the maintenance and after sales service. Another would be overcoming the gap between the units by learning from each other by team building activities. Moreover the existing sales personal should receive training and education in how to sell a service. Whatever solution preferred, it is important that the customer knows what services the after sales market contains, since the future for industrial companies, lies within the after sales (ibid).

If the line between the units is as apparent as our research has demonstrated it will become a major hurdle when dividing the proportion of service development responsibility between the units. How much should be done centrally and how much should be delegated to the local sales companies? This must be taken into account when dividing the responsibility.

We find that using the term after sales is somewhat old fashion. It signifies that there still is a distinct line between a service and a product. The division into Capital Sales and After Sales tends to reinforce the notion that first a product must be sold in order to sell a service. But the service evolution moves towards selling a function or a solution rather than a product with service as an extra add-on. In the future this separation might disappear leading to a condensed unit of Capital Sales and After Sales is responsible for selling the function or solution the customer needs.

5.3 Competences needed for service development

When developing new services or products distinct knowledge is needed. The competences needed when developing new products is to a high extent the same competences that are needed when developing new services. For instance, knowledge about customer needs is essential, how legible documentation about the development process is created and what channels that can generate external and internal ideas to turn them into a service or product (Wilhelmsson, 040812). As this section demonstrates, key success factors for successful service development are, except for the above mentioned; the extent to which the process is formalised, a well compounded team, and a creative innovator.

Recent research of service developing processes in manufacturing companies have stressed the importance of a *creative innovator* that informally can push the developing work from the idea stage to prototyping (Mattson, 1992). Lemvik shares this opinion; Alfa Laval needs people with a PhD in creativity, innovation and brainstorming, forcing people to think out of the box (040811). Today, Alfa Laval has many employees with profound customer value knowledge, even more employees with product knowledge but few with innovative knowledge. The key is to combine the knowledge. For example bring employees with knowledge of the customer or/and the product together with extremely innovative people. This approach is called *systematic innovative thinking* and emphasizes that the innovator does not need to exist within the organization but could be hired externally. (Lemvik, 040811) This exposes how ideas are generated, and to what extent they are taken into account. What channels are needed in order to turn ideas from customers, sales companies or service engineers into potential new services? From our interviews at Alfa Laval we can draw the conclusion that there are no established channels for idea generation. It prevails an uncertainty who to turn to if you have an idea. Each sales company should therefore appoint a person that is responsible for gathering new ideas, a local service developer. This person should submit ideas in a service database whereby they are further evaluated.

A *well compound team* with different competences is a prerequisite when developing products or services. The team should include people with different experiences and knowledge not only technical competence (Wilhelmsson, 040812). A widely recognized study supports the conception that a well-diversified team with active and distinct competences is a key for developing successfully new services (de Bretani, 1989). From our theoretical and empirical studies we draw the conclusion that the core team should include following: a project leader that should be the service developer, a communication expert (PR), a marketing professional, a market analyst, a sales representative, a person with expert knowledge in the new service application area, and also a representative from the service engineers. The extended team could involve the customer and representatives from legal and finance units (figure 5.2).

In cases where a new service idea not directly comes from the customers, it is especially important to ensure that the market needs and wants the new service. This demands extensive marketing research where profound knowledge of the market is vital (Smith &Nagle, 2002). Today Alfa Laval does not have any market analysts and there is no central market research unit (Wilhelmsson, 040812). We believe it is important for Alfa Laval to build up such a function because it is important both when developing products and services. The market unit should focus on new opportunities where the product and service can be developed together, depending on each other in a way that supports the evolution in the manufacturing industry towards selling complete solutions.

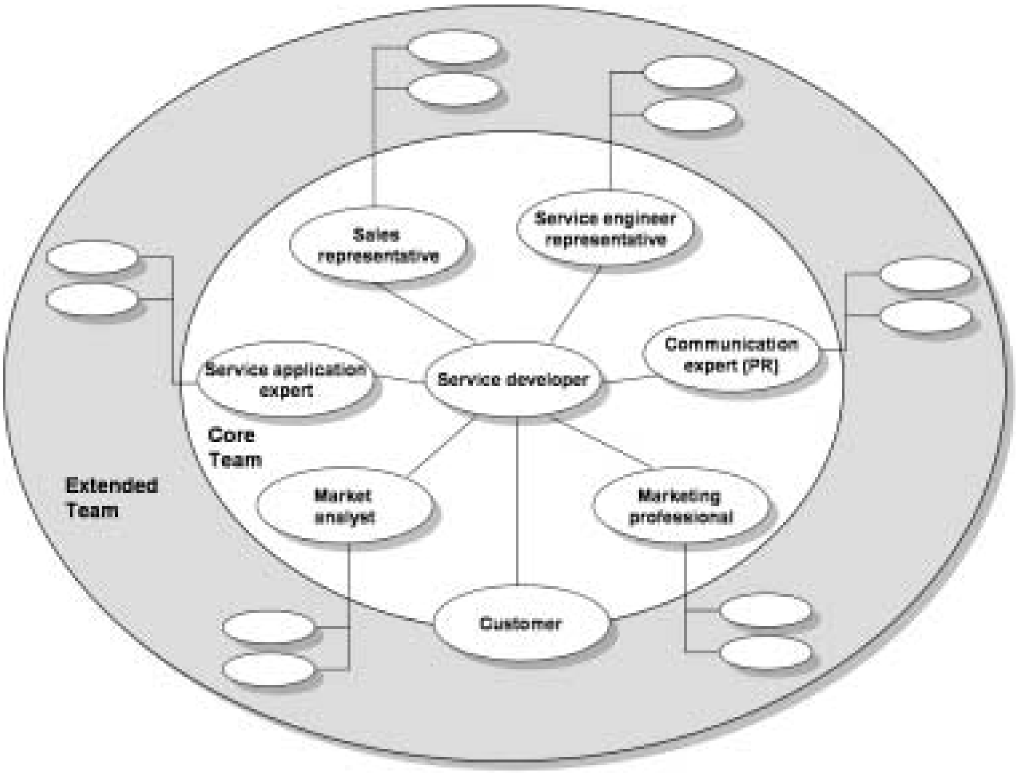

Figure 5.2 – A well compound team with diverse competences to facilitate successful development of new services. The core team consists of persons in direct contact with the service development process. The extended team on the other hand consists of persons that indirect influence the process. The customer is not a full member of the core team, but should have close contact with the development process. (Picture adjusted, Ulrich & Eppinger, 2000)

Many new customer driven service ideas might not be possible to react on without new technology, packaged into "intelligent tools" [16]. Alfa Laval's existing product R&D[17] unit have requested management for resources to expand their product R&D by also developing intelligent tools for service purposes, craving competences in for example sensor techniques and signal-treatment (Wilhelmsson, 040812). To ensure

[16] "Intelligent tools" are tools that for example are built up by sensors and software, where the software can be seen as Alfa Laval's way of compress their knowledge about for example a process.

[17] The R&D unit at PTD (Process Technology Division)

that the intelligent tool is developed mutually with the soft part of the service there must be well-established channels between the two parts. A recommendation is to make both parts involved in each other's development processes, which also will strengthen the connection between service and product development because the development of intelligent tools lies somewhere in between.

A key success factor for future development of services is that the development processes from idea generation to market launch is *well documented and formalised* (Edvardsson et al., 2000), and that the development of services is not dependent on using individually preferred methods and templates. The documentation should be standardized and functional for all employees in the organization accessible through a database. It should include the results, common obstacles and hurdles with solution proposals and of course decisions made. Easily accessible templates, models, etcetera are needed to facilitate this documentation.

5.4 Summary of the chapter

In this chapter we argue that because service development at manufacturing companies today is unstructured and ad hoc, new services are not developed to the extend they could be. There are four different ways of structuring the service development organisation; within existing organizational units, as a separate organizational unit, external development or development by project teams. The service development alternatives are not mutually exclusive. We find that establishing a separative service R&D unit should be a long-term strategy for Alfa Laval, because the development activities becomes distinct from daily operative business, resulting in systematically building and maintaining service development know how. However, given the novelty of the service focus this is not realistic. Instead Alfa Laval should use an existing organizational unit for developing services as an additional but permanent task but even though appoint a service developer with the overall responsibility of service development issues. The service development should take place in project teams led by the service developer, and the service developer should also be responsible to maintain contact between other units that can affect the service development. The competences necessary to develop new services are to a high extent the same competences that are required when developing new products. For instance, knowledge about the customer needs is essential, legible documentation about the development process, channels that can generate external and internal ideas to turn them into a service or product.

6 How should the development of new services proceed?

In this chapter we describe the different service development models from the service engineering literature and discuss their advantages and disadvantages. After this we study Alfa Laval's product development and their working procedure. Finally we demonstrate different tools suitable for service development.

When Albert Einstein was teaching at Princeton, he gave a final exam to a class of graduate students. After reading through the exam, one of the students looked rather confused, raised his hand and said, *"Professor Einstein, these are the same questions you gave us last year."* Einstein smiled back and said, *"Yes, but the answers are different."* – What Einstein meant was that intellectual discovery is not a static exercise. It requires imagination, the ability to see something new in the familiar, and to recognize that different answers sometimes provides better solutions to the same old questions. That is how progress is made, both in business as well as in Einstein's exam.

We find that service development in general needs a structure where "the same old questions" are asked every time a new service is developed. It will secure that nothing is overlooked and that right persons will be involved in the development process. In this chapter we will therefore discuss how these questions could be formulated and organized. To collect inspiration we will start in the product development. There is most likely no manufacturing company in the world today that develop new products without an R&D unit and a structured approach. And the motivation is simple, companies cannot afford to repeatedly make the same mistakes and ignore existing development know-how. This is also valid for service development.

6.1 Product development models influencing service engineering

The product development model of Booze, Allen and Hamilton (figure 6.1) has influenced several new service development models (Scheuing & Johnson, 1989). Their waterfall model has seven steps and was introduced in 1982 after an improvement of their model from 1968. There are different opinions whether or not this general product development model is applicable in service engineering. Cowell (1984) argues that product and service development follows the same structured steps. "While the terminology of new product development and the range and order of the steps included in the process varies, the underlying notion behind the use of systematic procedures does not. These are first to create as many good ideas as possible, secondly to reduce the number of ideas by careful screening and analysis so ensuring that only those with the best chances to success get into the marketplace". Edvardsson (1996) claims that new service development is more complicated due to the continuous production and consumption, and the customer involvement.

"Innovation of a new service is an extremely complex process. Stages in the service development process overlap and cannot be clearly identified" (p.22).

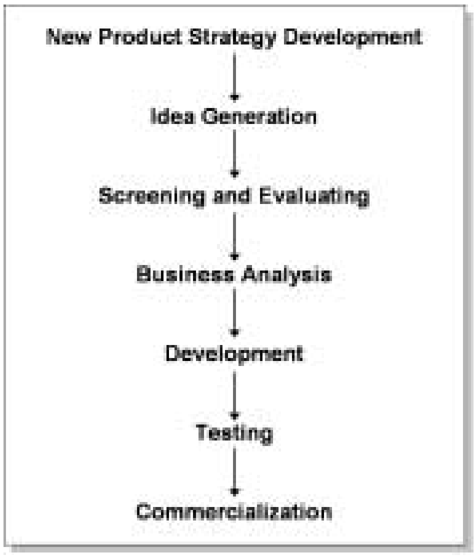

Figure 6.1 – New product development according to the consulting firm of Booze, Allen and Hamilton from 1982. The model is an improvement of their earlier model containing an additional phase; New Product Strategy Development. (Scheuing & Johnson, 1989)

Besides the waterfall model created by Booze et al., software engineering methodologies have influenced service engineering (Dobson, 1994). These models are typically iterative, which means that they have several feedback loops, making them more complex than the waterfall model. The question is what type of model that fits service development at a manufacturing company as Alfa Laval. Answering this question demands a comprehensive description of the service development models suggested in the service engineering literature today.

6.2 Different types of service development models

In the literature about service engineering, especially three different service development models appear; waterfall models, spiral models and prototyping.

The *waterfall model* is characterized by a linear progression of independent phases (figure 6.2). The conversion from one phase to the next depends on the completion of the previous phase and the input in one phase depends on the output from the earlier phase. This makes the waterfall model appropriate to outcome-based planning because the end of each phase provides a perfect milestone in the development process. The waterfall model is also considered as a transparent and straightforward development model, yet it lacks flexibility due to the rigid pattern. The rigid pattern and the dependency of completion between phases also make it difficult to shorten the development time. (Bullinger et al., 2003) Even though waterfall models have some disadvantages, almost all service engineering models are waterfall models (Scheuing

& Johnson, 1989). Because the straightforwardness and transparency, they can be applied for almost any type of service or task (Freitag et al., 2003).

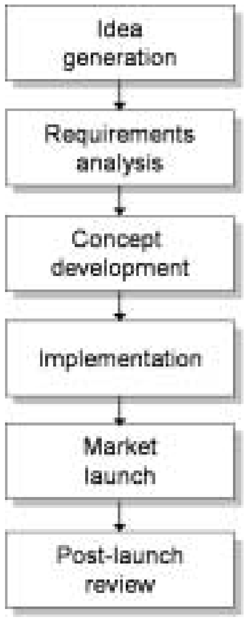

Figure 6.2 – Waterfall model in service development according to Bullinger et al. (2003). Each transition from one phase to another is completely conditional and the input in one phase is the outcome of previous phases.

The major difference between different service development models is the number of phases, where everything between four and fifteen phases have occurred in the literature we have studied (Bullinger et al., 2003, Scheuing & Johnson, 1989, Edvardsson, 1996, Kohler et al., 2001, Freitag et al., 2003, Fähnrich, 2004). An interesting question is how the number of phases influence the service development process. When studying different waterfall models it is quite obvious that all models, independent on the number of phases, have the same overall structure. The development process can roughly be divided into three general phases; (1) identification of market requirements, (2) service development and finally (3) market implementation. Kohler et al. (2001) confirms this observation in a study of five German and Swiss companies[18] service development processes. A possible conclusion is that a service development model with for example four phases, have a higher number of sub-phases than a model with fifteen phases, making the development models analogous even though they look different when comparing the overall structure. Our conclusion is further developed by Bjärnemo (041005) who does not believe that the number of phases in a waterfall model is critical. It is rather the substance and the sub-structure of each phase that affect, for example the

[18] Deutsche Post Fulfilment GmbH, Ericsson Radio System AB, Heidelberger Druckmaschinen AG, SAP AG

flexibility of a waterfall model. The model should be designed acknowledging the service characteristics and the service structure. (Ibid)

There is a dissonance between different researchers regarding the possibility to use a waterfall model with clearly defined phases in service development. The evolved version of the waterfall model that Edvardsson (1996) suggest has four partially overlapped phases (figure 6.3). The model is based on case studies of six Swedish service companies[19], mainly owned by the government, and Edvardsson claims that any precise borders between the phases could not be identified. Even though Edvardsson's observations most certainly are correct, we do not find his observations reveal the optimal way of developing new services. The reason is two folded. First we do not find the companies Edvardsson build his study on have developed services that have been superior to other services in their industries. Secondly we consider that the case studies reveal that the different project teams have run their development process on an ad hoc basis. Our opinion is that it is better to have clearly defined borders between the different phases, creating better opportunities to plan, steer and control the development process.

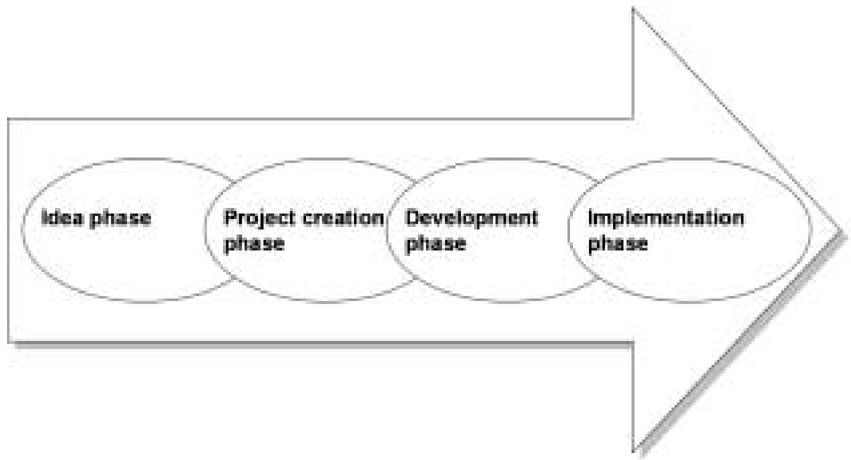

Figure 6.3 – "Arrow model" according to Edvardsson, based on the empirical findings of six Swedish companies. Four general phases have been revealed. The phases are however diffuse and partially overlapped. (Picture adjusted, Edvardsson, 1996)

Spiral models are more advanced, and much more unusual in the service development area than waterfall models. The spiral model is iterative, meaning that a number of phases are repeated several times during the development process (figure 6.4). An advantage of the iterative approach is that it provides an early outcome of the new service which includes several of the specified functionalities. This early outcome can then be gradually refined and customized during several iterative runs. The iterative approach also enables learning effects within a single project and not only between

[19] Arbetsmarknadsverket, Karlstadsbuss, Samhall, SJ , Sparbanken, Telia (two different services)

different projects. The main disadvantage of the spiral model is the complexity, which among other things results in a steering intense development process. (Bullinger et al., 2003)

According to Bullinger et al. (2003) "Spiral models are at present practically unknown as a method for developing services" (p.281). The area where spiral models do exist today is in the development of telecommunication services (Adamopoulos et al., 2001, 2002). Telecommunication services are typically complex and consequently, if the service is developed through a spiral model, each development cycle can tackle a relatively small part of the service specification. The service then grows gradually for every cycle that is completed. (Adamopoulos et al., 2002)

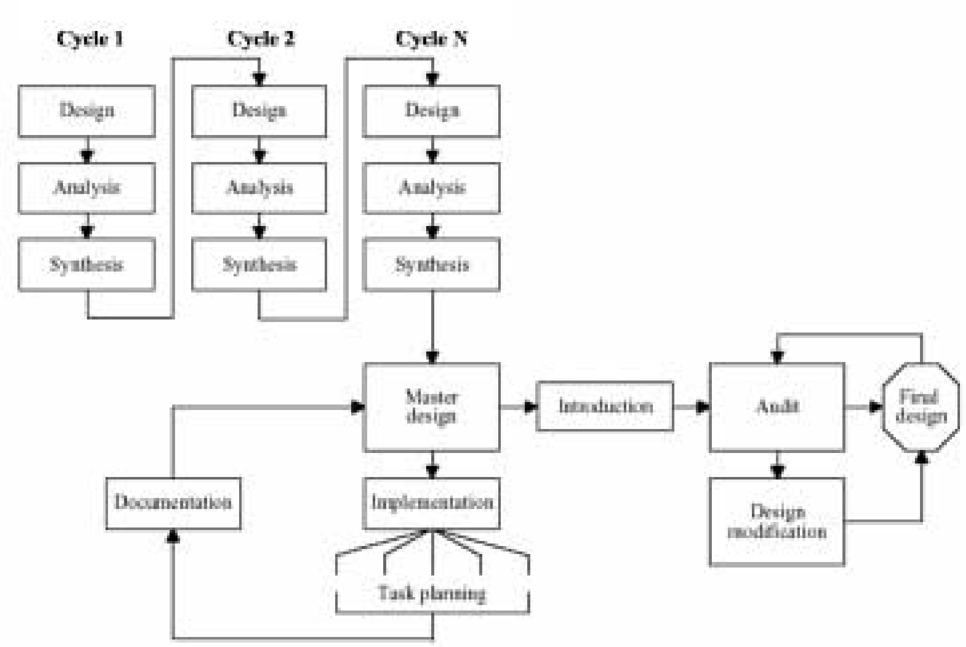

Figure 6.4 - Service development according to Shostack & Kingman-Brundage (1991). The model is referred to as a spiral model that means that a number of phases are repeated several times in an iterative process. (Picture adjusted)

Prototyping is the last category of reference models we will discuss. The development process starts out by building a prototype (a test version) of the new service is. Thereafter follows an examination of the new service prototype together with the customers and the prototype is gradually improved. The advantages are that prototypes support the communication between the service developer and the customers, and they offer quick availability of viable solutions. The drawbacks of prototyping are the difficulty to control and monitor the process because there are no discrete development phases as in the waterfall model. It can also be a complex task to manage the communication and coordination activities necessary between customers and service developer. In service development today there are practically no studies dealing with the use of prototyping in connection with development of new services. (Bullinger et al., 2003)

Considering products, Ulrich & Eppinger (2000) argue that prototypes are constantly created during product development. The purposes of using a prototype in product development are learning, communication, integration and milestones (ibid). During the last decades the possibilities of constructing high-quality and inexpensive prototypes in product development have increased, as well as the use of them as aid in the product development process (ibid). In service development we find that both spiral models and prototyping are mainly beneficial to use when developing complex services that needs to be gradually improved. But at the same time, it can be difficult to build relevant service prototypes when managing complex services. This raises some interesting questions: how can service prototypes be created and for what types of services?

6.2.1 Synthesis of the different service development models

We have identified three noteworthy differences between the different models above. We find these differences necessary to scrutinize before deciding which model to use for service development at Alfa Laval.

- *How frequently the models occur in service development literature and case studies vary significantly*. The waterfall model is the most utilized service development model and it occurs in several case studies of service development. The spiral model occur in articles about developing telecommunication services but is practically unknown when it comes to developing other services. Prototyping is the most anonymous development model. There are basically no studies about prototyping in connection with developing new services.

- *How the complexity varies with the three different models.* The spiral model with its iterative structure is the most complex model of the three. But the iterative structure also makes it possible to gradually develop new services which can be helpful if the service itself is very complex, for example telecommunication services. When using prototyping for service development it is mainly the communication and coordination activities between customers and service developer that makes the process quite complex to manage. Also prototyping makes it possible to gradually develop new service, but it can be difficult to develop high-quality prototypes of complex services. The waterfall model on the other hand is considered as a very straightforward and non-complex development model.

- *How easy the development process is to steer and control varies between the models.* A service development model that consists of a number of phases with clearly defined boarders creates a better opportunity to plan, steer and control the development process than if the phases are diffuse and partially overlapping. Prototyping as described above does not have discrete development phases. Both the waterfall model and the spiral model have distinct phases, but the complexity of the spiral model makes it more steering intensive than the waterfall model.

It is apparent that an optimal service development model for all service types does not exist. It is necessary to relate the choice of model to the conditions for each specific industry and their typical service characteristics. Alfa Laval should adopt the waterfall model. Alfa Laval operates in a traditional manufacturing industry and offers services that are not particularly complex. Since service development has recently received attention at Alfa Laval we also consider simplicity as an important factor. There is a risk that an overly complex model will not be used at Alfa Laval due to its complexity. Using a waterfall model will minimize this risk. We also find it is important to be able to easily steer and control the development process. The waterfall model is the most widespread model because of its easiness and straightforwardness.

Another interesting aspect, not discussed so far, is if the choice of service development model affects the possibility to delegate parts of the service development process to different organisational units. This highlights the distinction between what tasks have to be done by the central organization and the tasks that should be delegated to, for example the local sales companies. This has not been discussed at all in the service engineering literature, but it is a relevant question for companies in general, and Alfa Laval (Habert, 041120) has expressed a high interest for this question. We believe it should be possible to delegate parts of the development process regardless if it is a waterfall, spiral or prototyping model. Therefore this question will not affect our choice of service development model. But we do also find that iterative elements in a development process can be an effective way to facilitate company interaction. For example, when a new service concept is developed, the local units should be involved to support the process. Here it should be favourable to have an iterative process where different concepts are evaluated and refined of both the central unit and the local units. This will secure local modifications of the concepts together with preventing sub optimising.

Our solution will be to introduce what we will term *modification loops* in the sub structure of the waterfall model. That means that only a specific development activity is handed over to for example the sales companies, and not a whole development phase. The outcome from the activity is then handed back to the coordinating central organisation. Depending on the result, this can be done several times. Finally we consider it important that frequent modification loops are located throughout the whole development process. The local adjustments of the new service should not be done as a last action in the development process.

6.3 Product development at Alfa Laval[20,21]

Product development at Alfa Laval follows a project management model, ”PROMAL”[22], widely used at the company. Following the introduction of the product development manual the accuracy of the budget and time-plan has improved tremendously. (Wilhelmsson, 040812) The product development model is a waterfall model, a linear model with independent phases where the inputs in one phase depend on the outputs from the earlier phase. The model includes seven phases, from idea to project review. The overall structure that was discussed in chapter 6.2, the development can be divided into three general phases[23], can also be found here even though it is products and not services that is supposed to be developed. Between every phase there is a well-defined gate with a specified list of documents and results that has to be presented to a definite number of decision makers. The process is carefully documented, with more than 30 compulsory documents to be reviewed in the different gates. To develop a new product normally takes around one year and involves 20 people in the project development team (Wilhelmsson, 040812). The product development process is highly formalized with a severe amount of documentation, demanding plenty of resources.

Tools that do exist in Alfa Laval’s product development today and that we find is possible to reuse in service development are primarily a project positioning and a profit calculation tool. These tools have to be redesigned to fit the service development but the foundation exists. The purpose of the project-positioning tool is to analyze the new product’s strategic fit within Alfa Laval and the profit calculation tool is used to calculate the projects payoff time (Bodelson, Profit Calculation & Project Positioning, 2001). Besides these two tools, a number of existing templates connected to the different phases would also be possible to reuse. The purpose of the different templates is to give the steering committee a concise summary of the project used for decision-making in each gate.

We define service engineering as “a structured method to develop new services using already existing engineering know-how from product development”. Studying Alfa Laval’s product development process has given valuable inputs such as templates, tools and gates that might be appropriate to use when developing services. We think it is vital that our suggestion of a service development model should fit Alfa Laval’s needs and basic conditions. Therefore, our conclusion in this chapter is that a linear development process that builds on Alfa Laval’s project management model PROMAL, would be the most appropriate to use. Alfa Laval employees would recognize the structure and the overall way of working. This also correlates to our

[20] Discussing product development at Alfa Laval, we only refer to product development at Process Technology Division (PTD).

[21] Information about the development process is collected from the PTD Product Screening & Development Manual, (Wilhelmsson, 2003) if nothing else is mentioned. Because some information about Alfa Laval’s product development is too sensitive to publish, we cannot be absolutely specific in all details.

[22] PROMAL, PRoject Management Alfa Laval

[23] (1) identification of market requirements, (2) service (product) development and (3) market implementation

conclusion in chapter 6.2.1, that Alfa Laval should use a straightforward waterfall model for their service development process.

6.4 Service development tools

There are several suggestions on tools suitable for service development in the service engineering literature today. However, in many cases there is an insufficient level of details in the descriptions of the tools and many suggestions are only ideas, not ready to use tools. For example, Tomiyama (2003) describes a computer-based tool, a service CAD that builds on the same idea as the common CAD[24] program used in product development. Using the service CAD, the service developer would be able to simulate the relationship between the service provider, the service receiver and how the service environment influences them. This provides a possibility to identify new services and evaluate the efficiency. Even though the idea seems appealing there will probably be extending restrictions on the types of services that could be developed using the service CAD. And here is a saving clause, the tool does not exist today. It is only a possible scenario of the future service development process.

Flowcharting, blueprinting and critical incident technique are service development tools that exist today and that we find interesting. Flowcharting and blueprinting are ways to design and visually describe services[25]. A flowchart is a more basic description whereas a blueprint contains a higher level of details. In a way we can see the visual descriptions as creating service prototypes that can be gradually refined. Critical incident technique is a method to collect and categorize critical incidents that occurs in the service encounters and using it will structure the feedback process.

To be able to understand the value of the tools it is important to remember that services in general are intangible and most of the time produced and delivered at the same time (de Brentani, 1995, Edvardsson, 2000). A service could be seen as a process consisting of parallel and sequential activities whereas the customer and the service company meet and work together. The process can be rather complex and one of the service developer’s responsibilities is to design the service process and describe it to all parts involved in the different activities. The need to describe the process emerges several times during the service development, for example during the market analysis it is important that the customers understand the service idea, when the new service is implemented in the organization it is critical that all involved understand the whole service process and when the advertising and promotion campaigns are being developed.

6.4.1 Flowcharting

A service flowchart is a visual description of the steps involved when delivering a service to a customer (Lovelock & Wright, 2002). There are several different flowcharts to be found where the level of details is the main difference between them.

[24] Computer Aided Design

[25] Other ways to visually describe the service could be to use process mapping. We have however decided to use flowcharts and blueprint due to the fact this method to visualise services frequently appears in service management literature.

We prefer to use a basic and straightforward flowchart that only describe the front stage activities, that is, activities the customer experience in the service process. This distinction is made based on the different levels of detail between the flowchart and the blueprint. If a simple version of flowchart is chosen, it can be complemented with a more detailed blueprint preventing unnecessary work.

The visual description starts in defining the process boundaries through precise start and end points, visualized by ellipsoids. After this follows a description of the entire process visualized as a sequence of boxes, going from left to right, where the boxes represent activities and the arrows describe the connection between the activities and also the direction. If customers have the possibility to influence the service process through decisions, these decision points are symbolized with trapezoids. In figure 6.5 we have developed a flowchart for a basic monitoring service. The starting point of the flowchart is when the new monitoring system is implemented on the customer's product. As long as the customer is pleased regarding the monitoring service there is no end point, it is a continuously process. The monitoring service itself is based up on the service company's knowledge about their products.

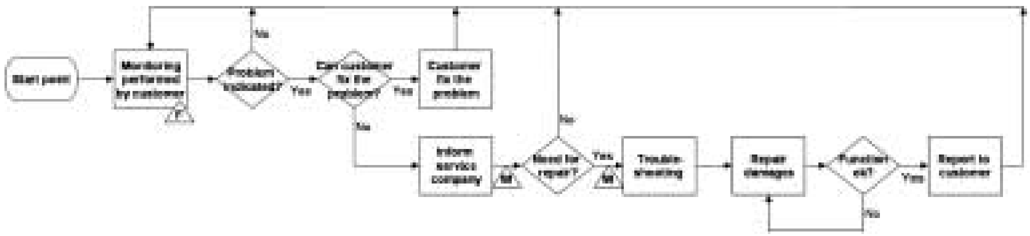

Figure 6.5 – Flowchart for a basic monitoring service. The customer watch signals on a computer screen that indicates the condition of a machine. As long as no problem has occurred, the customer keeps looking at the screen. If a problem occurs, the customer fixes the problem or informs the service company that identify and repair the damages. Possible fail point and waiting point are indicated with an F respectively a W.

Following the development of the flowchart the service developer can use it to analyze possible fail points in the process, indicated with the letter F. A fail point can be defined as a point in the service process where there is a significant risk of problems that can damage the service quality (Lovelock & Wright, 2002). Awareness of these fail points enables the service developer to make a risk analysis and come up with strategies on how to handle the problems. The service developer should also identify possible waiting points, indicated with letter W. The waiting points can occur of several reasons and will most likely influence the customer's experience of the service quality.

The flowchart in figure 6.5 could have been the start proposal when Alfa Laval developed their monitoring service Cosmos[26]. There is however important to evaluate in this service proposal. If the purpose of a monitoring service is to guarantee machine uptime, it is critical to not rely on the customers monitoring activity, i.e. the company selling the service must also participate in the monitoring activity. The way the service is developed now there is a risk that the customer will fail to identify problems in the machine that is monitored, with machine stoppage and most likely more severe damages as a consequence. The point is that the service design must correlate with the service purpose. Flowcharting is a useful tool to highlight the importance of this correlation.

Flowcharting is an effective tool to identify the encounters between customers and service staff and to realize what back stage activities that are needed in order to deliver the service (Lovelock & Wright, 2002). Flowcharting should be seen as the first step to visually describe the new service and can be used as a foundation for more detailed descriptions such as blueprinting. Through adding or removing new activities, or exchange existing activities, the service can be optimized to fit the customers' needs. It can also be necessary to divide some of the activities to clarify the service process and make it easier to comprehend. Visually describing the service process facilitates for the service developer to observe new possibilities to expand the service offer or combine it with other service offers.

6.4.2 Blueprinting

"A service blueprint is a picture or map that accurately portrays the service system so that the different people involved in providing it can understand and deal with it objectively regardless of their roles or their individual point of view." (Zeithaml and Bitner, 2000) The tool was originally invented by Shostack in 1982 but has since then gone through several adjustments where new elements has been added to the original service blueprint idea (ibid). We have adopted a version developed by Kingman-Brundage (1992) because it divides the service activities into sufficient number organizational areas (figure 6.6) that will fit Alfa Laval's situation. Kingman-Brundage actually uses the term service system blueprint that then is divided into concept blueprint and detailed blueprint. The *concept blueprint* describes the macro-level of the service system showing how each job or department function is linked to the service as a whole. The *detailed blueprint* describes the micro-level of the service system that shows the details not visible in the concept blueprint, and is primarily a simple flowchart that describes a small part of the whole service system. (Ibid) We focus on the concept blueprint because blueprinting should be used to demonstrate the "big picture" of the service. Hence we only use the term blueprint from here on, but actually refer to what Kingman-Brundage identifies as a concept blueprint.

[26] Cosmos is developed for monitoring the condition of separators and decanters. The "hardware" of the service is sensors that register vibrations, and a computer with software that automatically evaluates the data from the sensors. The purpose of the service is to maximize uptime and minimize operating cost for separators of decanters and to change from time based maintenance to condition based maintenance.

Blueprinting identifies all activities that need to be done in the service process in the same way as in flowcharting. If a flowchart has been created, this can be used as a starting point for the blueprint. But a flowchart only describes the front stage activities whereas a blueprint besides the front stage activities also identifies the activities that have to be conducted back stage, that is, activities the customer cannot see in the service process. Figure 6.6 illustrates a blueprint that we have developed for the same monitoring service as the flowchart in figure 6.5. The front- and back stage activities are separated through, what is called, the *line of visibility*. The front stage activities are then divided in customer and service staff activities through the *line of interaction*. Within the back stage field the front stage service staff are carrying out setting-up actions prior to the service provision, as well as following-up actions afterwards. The *line of internal interaction* is dividing the service staff's back stage actions from the supporting staff, which contributes for example parts required in the service process. Finally, the *line of internal implementation* separates support activities from management activities such as planning, controlling and decision-making. (Kingman-Brundage, 1992)

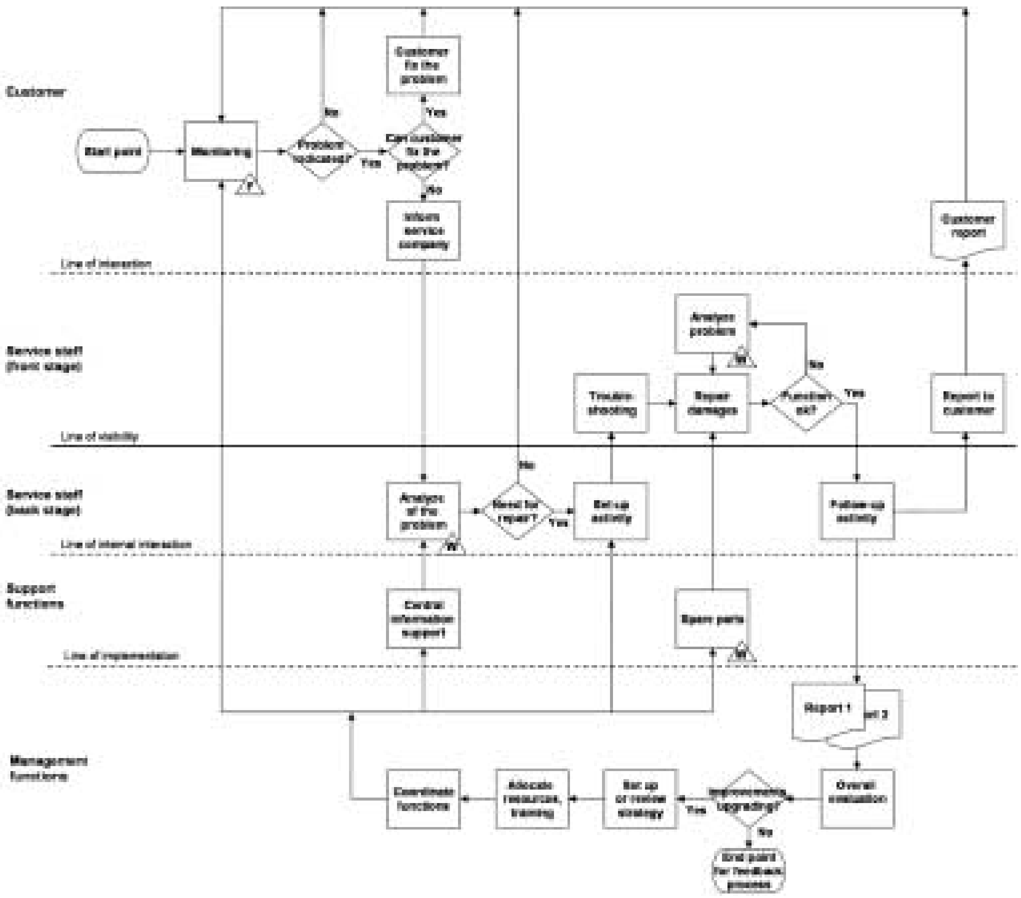

Figure 6.6 – Blueprint for the same monitoring service as in figure 6.5. The waiting points have now been more precisely identified to specific activities. It is also possible to understand how activities behind the line of visibility are linked to the different front line activities. (See Appendix A for blueprint development instructions)

The exceptional characteristic of a blueprint, such as in figure 6.6, is that it prints both process and structure in a two-dimensional picture. On the horizontal axis we can find the service process, from left to right, reminds of a flowchart. On the vertical axis on the other hand, the structure of the service organization is charted, and it is primarily this dimension that makes the blueprint useful as a tool when communicating the “big picture” to all service employees. (Kingman-Brundage, 1992)

When a new service has been described in a blueprint the service developer can choose to move activities between the different zones and thereby change the customers’ service experience. This is useful for complex, work intense and highly specialized services, expensive to the customer. For example, if the customer receives a detailed audit from the service engineer, which describes all measurements and actions that have been performed and that normally only would have been used in the internal communication in the service company, the customer will probably experience a higher service value. In other words, the service developer moves a back stage activity into the front stage, resulting in an experienced higher service value. Depending on the service culture in different countries local adjustments of the service offering can be made by moving either front stage activities back stage or back stage activities in front. These adjustments should be prepared centrally, but further developed together with the local service developer to assure that the new service is designed to fit the local variations.

A flowchart is a more basic description of a service whereas a blueprint contains a higher level of details and is more time consuming to develop (see Appendix A for detailed blueprint development instructions). The blueprint clarifies the interactions in the service process and can be used to facilitate the integration of marketing, operations and human resource management within a company (Lovelock & Wirtz, 2004). Hence the blueprint is valuable when the new service process is implemented in the organization. Blueprinting is furthermore an important tool when evaluating the service after the market release. The service developer can compare the originally designed service idea with the customers’ and the service staffs’ real experiences to be able to define a possible gap and to redesign parts of the service process if necessary.

6.4.3 Critical incident technique

The critical incident technique can be used as a structured way of collecting and analyzing information from the encounters between the customers and the service organization, making the service evaluation possible. Encounters between customers and service staff that are particularly satisfying or dissatisfying for one or both parts can be defined as critical incidents (Lovelock & Wright, 2002). The critical incident technique (CIT) is a methodology for collecting and classifying these incidents that have occurred (ibid). It is important to identify the cause of the critical incident to be able to improve the service design, especially if the customer is dissatisfied. Instead of changing the service design it might also be possible to create an explicit “recovery process” strategy for the service staff to use when a critical incident occurs (Edvardsson, 1996).

Depending on the type of service, the service encounters will differ (Lovelock & Wright, 2002). The critical incidents can occur either between the customer and the service staff or between the customer and a technological service system, for example a computer based solution for a self service. When the encounters are between customer and service staff the solution of a problem can be to develop a recovery process strategy where the service staff turns the dissatisfied customer to a satisfied customer without changing the initial service offer. When dealing with encounters between customer and a technological service system it is more difficult to make this transformation because there is no service staff present, making a redesign of the new service more crucial. (ibid)

Critical incidents can be analyzed through finding answers to following questions (Lovelock & Wright, 2002):

For encounters between customer and service staff:

- When did the incident occur?
- What specific circumstances caused this situation?
- Exactly what did the employee say or do?
- What caused the interaction to be satisfying / dissatisfying?

For encounters between customer and technological service system:

- What self-service technology is the customer focusing on?
- Was this a satisfying or dissatisfying experience?
- Describe what happened during the incident, what specific details made the experience memorable?

The answers are categorized in different groups for example employees' response to a specific situation or different types of technology failures. When comparing the customers' experience of the service with the service blueprint it is possible to identify the problem's location. Is the new service incorrectly designed or is the service staff not acting right, that is, not following the service blueprint? Problems that occur in the encounter could also be ascribed to the customer behavior. A critical incident analysis from the service staffs' perspective allows analysis of the customer's behavior in the encounters. Thereby the company can find out how to change their customers' behavior.

6.5 Summary of the chapter

Product development has influenced service engineering and there are primarily three different development models existing in the service engineering literature: waterfall models, spiral models and prototyping. None of the models can be considered as an optimal service development model for all situations. However, service development literature has pointed out that waterfall models are the most commonly used in manufacturing companies like Alfa Laval and therefore we have proposed this model type for Alfa Laval's service development. To be able to handle the intangible nature of services and to create a platform in how services are described, we introduce two service development tools, flowcharting and blueprinting. When flowcharting helps us to get an overview of the activities the customer experience in the service process, blueprinting enables us to visualize the whole services system in two dimensions, process and structure. Finally we present the critical incident technique (CIT) as a methodology for collecting and classifying critical incidents that have occurred in the service delivery process.

7 How should the service development model be designed?

In this chapter we present the service development model we recommend Alfa Laval to use in the future. The presentation of the model will distinguish between the tasks done centrally respectively locally. We also demonstrate when flowcharts, blueprinting and critical incident technique discussed in previous chapter should be used in the service development process.

We have determined that a straightforward waterfall model is suitable for Alfa Laval’s needs. The product development unit uses a uses such a model successfully today. We have also discussed that user recognition for the Alfa Laval employees is an important factor. The templates in Alfa Laval’s service development model will be based on already existing templates from the product development manual. To be able to steer and control the development process it is important to define precise gates. The product development manual is a starting point when defining the gates for the service development process. This is the idea of service engineering, to use already existing know-how from product development in the service development.

Alfa Laval’s service development should be organized through project teams, with a full-time appointed service developer at Parts & Service as project manager. Local service developers should complement the central service developer. To facilitate communication in the development process we advocate the use of flowchart and blueprint throughout the process. In our service development model, the division between central and local activities allow modification loops, for example when a flowchart is developed centrally, the local units adapt, redesign and suggest improvements to the central service developer. Finally, the extent to which the customer is involved in each development phase increases in conjunction with the contact intensity. A high contact intense service demands customer interaction early in the development process.

Our model provides a framework for developing services. What tasks that should reside centrally or locally needs to be evaluated and refined depending on the service characteristics and service scope. To facilitate organisational learning and refinement of the service development process, we suggest that a service development database is created where all service ideas are submitted and the projects’ templates and reports are saved. The database should contain best practice procedures, team constellations, latest updates on ongoing projects and reviews of terminated projects. It should be a dynamic database, searchable and a main working tool for the service developers.

7.1 The origin of Alfa Laval’s service development model

The starting point of Alfa Laval’s service development model is the three general phases that can be found in all waterfall models: identify the market requirements, develop the new service, and finally implement the service on the market (left side in figure 7.1).

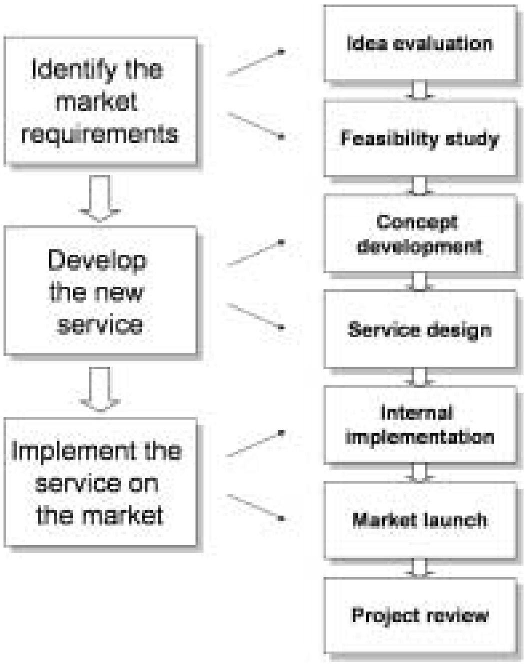

Figure 7.1 – Alfa Laval's service development model has its origin in the three general phases to the left. Every phase to the left are then divided in two and at the end a project review phase is added to facilitate organisational learning from the project.

Based on our interviews, the literature and our own experience at Alfa Laval we have come to the conclusion that each one of the three general phases should be divided in two, giving us totally six phases. In addition to these six phases we propose a seventh phase where the whole project is reviewed (figure 7.1). *Identification of market requirements* is done in the first two phases, idea evaluation and feasibility study. Using two phases will ensure local influences and decisions being thoroughly evaluated. The *development of the new service* is done through generating and selecting the most promising concept(s) and designing the service and its business system in the service design phase. In the first phase flowcharts are developed to describe the concept and in the design phase the blueprint forms a foundation for designing the service. *Implementation on the market* have to start with a thoroughly implementation in the internal organisation. Here for example training and internal market are important to be able to deliver a high quality service to the market. Follow up activities are also very important when the new service have been launched. Critical incident technique is used to evaluate the market launch and to ensure learning in throughout the organisation.

7.2 SERVAL - Alfa Laval's service development model

Alfa Laval's service development model is visually described in figure 7.2. Between every phase, well-defined gates facilitate decision-making about continuing the project. Three different decisions are possible in every gate[27]; to go, hold or kill the project.

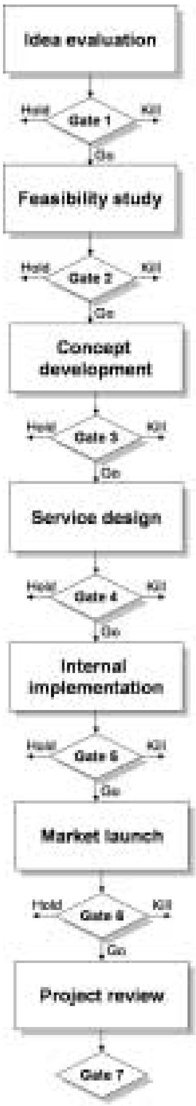

Figure 7.2 – SERVAL, Alfa Laval's service development model. Between every phase the development process is evaluated in a well defined gate. The decision is either to hold the project if it has potential but is not realizable, kill if it does not have any potential or go to next phase if it does.

[27] Gate 7 should be excluded. This gate is supposed to officially close the project and verify that the project is reviewed. The service release decision is already taken in gate 6.

If the decision is *go*, the project continues to the next development phase. The gate committee[28] can however formulate special recommendations that the development team has to follow in the next phase. If the decision is to *hold*, the project is temporarily stopped. The gate committee defines what needs to be done before the project can continue. Finally, if the decision is to *kill*, the project is instantly closed. Depending on the reason for closure, the gate committee can formulate different recommendations. For example, the gate committee can advocate a new development project based on the project that is closed.

To facilitate decision-making in the different gates, the project team has to deliver a pre-specified list of documents to the gate committee. These documents are defined as the deliverables of the phase and represent tasks conducted in the specific phase. The number of documents is accumulated up until gate four and returning documents have to be evaluated and refined in every phase if necessary. In the last three gates the decision-making is based on how well the development process meets the demands that have been specified in the documents from phase four.

7.2.1 Idea evaluation

Inspiration for a new service can be generated for example from a service engineer or from a customer. Customer needs and wishes should be forwarded to the local sales company and described in service terms. Integrating the customer in this phase can help to ensure that service developed fit the customers' desire (chapter 8.2). One way to formalize the idea generation process is to create a service development database where anyone within the organization can submit ideas, using an Idea Evaluation Form (PROMAL/our modification) containing:

1. Background/ Problem description
2. Objectives/Goals
3. Limitations

The central service developer is responsible for evaluating all service ideas submitted to the service development database against Alfa Laval's corporate service strategy. Furthermore he is responsible for scanning the local markets for profitable service ideas, or services that have potential for global application. The local service developer is responsible for evaluating the customers' requirements and submits proposals to the central service developer on how to satisfy them.

7.2.1.1 Gate 1

Gate 1 is a first rough screening to evaluate if the idea should be further developed in the next phase, Feasibility Study. The service developer and the manager within the related service field are responsible for evaluating the idea and make a decision. The decision is either to hold the project if it has potential but is not realizable, kill if it does not have any potential or go to next phase if it does. The decision should be documented in a Tollgate Decision Report[29]

[28] The configuration of the gate committee varies in different gates

[29] Adopted from PROMAL, www.alround.alfalaval.com

7.2.2 Feasibility study

The idea has been approved and is now studied from a broad perspective. The market requirements are investigated comprehensively. Essential indications are customer satisfaction, market potential and competition. (Kohler et al 2001) A centrally located market analyst is responsible for identifying market requirements and analyzing customer satisfaction and market potential (Chapter 5.3). The mindset of the market analyst should be to answer the question: how can this new service idea create value for the customer? The market analyst reports to the central service developer. The central service developer coordinates the different service projects making sure that the same idea is not developed within more than one project at the same time. The service developer also has a supporting role, giving valuable inputs about the development process to the local service developer. The deliverable from this phase is a Feasibility Study Report, an extended version of the Idea Evaluation Form, made by the idea submitter with assistance from the local service developer. The Feasibility Study Report should include following sections:

1. *Background or Problem description*[30]
2. *Objectives/Goals*
3. *Limitations*
4. Strategic fit
5. Customer needs analysis
6. Market analysis
7. Potential profitability, market share targets
8. Cost-benefit analysis
9. Resource analysis
10. Time framework including start and stop dates and major milestones.

7.2.2.1 Gate 2

The permanent steering committee consisting of the central service developer, a manager of service operations and a manager of market & sales, analyse the service idea's probability for commercial success. In central projects where the central service developer is the project leader, he is excluded from permanent steering committee, to avoid partial situations. The decision to go, hold or kill should be documented in a Tollgate Decision Report. If the decision is to go, a project team is appointed. Depending on the service scope, the project leader should either be the local or the central service developer. If the developed service should be applied globally it is important that the project leader is located centrally and the local service developer is responsible for all local adaptation. The core team could consist of a sales representative, a communication expert (PR), a marketing professional, a market analyst, and a person with expert knowledge in the new service application area as well as a representative from the service engineers. The extended team could involve a key customer and should involve representatives for legal and finance units. This project team is now responsible for the development of the service (figure 5.2).

[30] Italic text represents tasks conducted in previous report that needs to be evaluated and refined if necessary.

7.2.3 Concept development

This phase contains several important steps: concept generation, concept selection and concept evaluation. The goal with *concept generation* is to thoroughly explore the whole spectrum of available service concepts that could address the customer needs. Concept generation should contain a mix of creative problem solving within the appointed project team, external search, and methodical exploration of the various concept fragments the team generates. The extent to which the customer is involved in this phase increases in conjunction with the contact intensity. High contact intense service, such as training (Service type C) and consulting (Service type D) demands customer interaction in the concept development phase (see figure 4.3). This brainstorming session should result in approximately 10-20 viable concepts (Ulrich & Eppinger, 2000) briefly described or demonstrated in a text or in a "quick and dirty" flowchart. After this follows *concept selection*, an activity in which the various concepts are analysed and eliminated one by one to identify the most promising concept or concepts. This process should be conducted using several iterations and might result in additional concepts being generated that have not been identified earlier. (Ibid) The central service developer has regular contact with the local service developer, acting as a support for service concepts development. Based on the concepts' costs, the customer needs and wishes and also the concepts' viability, the project team should end up with one promising concept. The chosen concept should be designed and described using a flowchart. The flowchart could be developed centrally if the service has global range and modified locally by the service developer. This allows several iterations resulting in a refined flowchart that is modified according to input from local units. Deliverables from this phase should be a Concept Selection Report including:

1. *Background or Problem description*[31]
2. *Objectives/Goals*
3. *Limitations*
4. *Strategic fit*
5. *Customer needs analysis*
6. *Market analysis*
7. *Potential profitability, market share targets*
8. *Cost-benefit analysis*
9. *Resource analysis*
10. *Time framework including start and stop dates and major milestones*
11. Description of the service through a flowchart
12. Define project team's responsibilities and reporting lines
13. Project Budget
14. Establishing a pricing model for the concept
15. Risk analysis

[31] Italic text represents tasks conducted in previous report that needs to be evaluated and refined if necessary.

7.2.3.1 Gate 3

Depending on the total size of the service development project, different levels of management are authorized to make the decision to go, hold or kill. The total size of the project includes costs from developing the service, marketing activities and costs from establishing the business system such as delivery, training and support. Investment costs related to the service should also be taken into account. The decision is documented in a Tollgate Decision Report.

- Project size > 1 MEUR, Alfa Laval Board
- Project size > 0.5 MEUR, Steering Committee
- Project size < 0.5 MEUR, Service Developer is responsible for projects within his service development budget.

7.2.4 Service design

This phase contains two parts, designing the chosen service concept and designing the business system. The business system contains the service operations processes, the service delivery and service marketing elaborated in the following chapter (8.1). The business system is mainly designed centrally and could contain following tasks:

- Creating a marketing campaign (internal / external)
- Deciding on a PR strategy
- Packaging of the service (for example in a Performance Agreement)
- Deciding on what delivery channel to use (could be done locally)
- Creating the IT support for the service
- Creating a training plan for service engineers and sales companies (could be done locally)
- Designing manuals needed for internal and external use
- Setting the service price

The service is designed locally using a blueprint based on the flowchart made in the previous phase. The blueprint design process should contain several iterations in which the local and central service developer has continuous contact. This ensures that both local and central aspects are granted for. The blueprint visualizes all back and front activities that should be conducted when executing the service. Thereby necessary roles can be identified and job descriptions established. For high contact intense services the customer should be involved in designing the blueprint ensuring that the service is developed accordingly to the customer's specific needs. There is however a trade off between the customer potential profitability and the cost for customisation. A complete Service Specification Report should be written to facilitate competence transfer within the company, both for the present and the future including:

1. *Background or Problem description*[32]
2. *Objectives/Goals*

[32] Italic text represents tasks conducted in previous report that needs to be evaluated and refined if necessary.

3. *Limitations*
4. *Strategic fit*
5. *Customer needs analysis*
6. *Market analysis*
7. *Potential profitability, market share targets*
8. *Cost-benefit analysis*
9. *Resource analysis*
10. *Time framework including start and stop dates and major milestones*
11. *Description of the service through a flowchart*
12. *Definition of project team's responsibilities and reporting lines*
13. *Project Budget*
14. *Establishing a pricing model for the concepts*
15. *Risk analysis*
16. Description of the service through a blueprint
17. Locally adjusted blueprints
18. Role descriptions
19. Job descriptions
20. Specifications of the business system

7.2.4.1 Gate 4

The steering committee confirm that the decisions made in the service design phase are accurate and in line with the overall objective with the project. The local blueprints are evaluated and if approved the implementation start. The decision should be documented in a Tollgate Decision Report.

7.2.5 Internal implementation

In this phase the service design and business system is implemented throughout the organization. All parts included in the service specification are implemented both centrally and locally. The implementation includes for example:

- ❑ Internal local testing of the service (can involve key customer)
- ❑ Redesign according to testing results
- ❑ Training of service engineers
- ❑ Training of employees at sales companies
- ❑ Internal marketing

7.2.5.1 Gate 5

All aspects of the service offer must be ready for launch before the project gets a go from the steering committee. The decision is based on comparison with the service specification and should be documented in a Tollgate Decision Report.

7.2.6 Market launch

The service can be pre launched locally to a chosen key customer enabling early detections of fail points before the full market launch. Critical incident technique is used to follow up satisfying and dissatisfying incidents during the market launch ensuring learning throughout the organization. To anchor the work tasks connected to the service, all concerned units should be involved in the market launch. The project team supervises the launch and supports the units involved. All tasks must be delegated to the line organization before the service development project is terminated to ensure that the service business system functions as specified.

7.2.6.1 Gate 6

In this gate the steering committee decides on the utilisation of the service offer. The deliverables of the service is compared to the service specification. If there is a go-decision, the service is included in Alfa Laval's service offers, the House. The decision should be documented in a Tollgate Decision Report.

7.2.7 Project review

The entire project is reviewed and the project team members are involved in writing the Review Report. The Review Report is submitted to the service development database enabling continuous learning from other projects throughout the organization. Best practice working procedures, functions, and team constellations should also be submitted.

7.2.7.1 Gate 7

The steering committee formally decides to close the service development project.

7.3 Summary of the chapter

Alfa Laval's service development model SERVAL has its origin in the three general phases; identify the market requirements, develop the new service, implement the service on the market. SERVAL has seven phases totally and between every phase a well-defined gate is defined. Three different decisions are possible in every gate; to go, to hold or to kill the project. To facilitate decision-making in every gate, the project team has to deliver a pre-specified list of documents to the gate committee. The number of documents is accumulated up until gate four, and thereafter the decision-making is based on how well the development project is able to meet the demands specified in the gate four documents. To facilitate organizational learning from the project, the last phase is a pure review phase where the project is evaluated before closure.

8 What factors should be considered when designing the service engineering environment?

Following chapter provides a frame of reference based on the notion that the service business system contains operations, delivery and marketing. These three elements are overlapping and should be integrated with the customer in mind. We will also discuss pricing and quality, two important factors that a company designing a service engineering environment should bear in mind. Finally we argue that manufacturing companies can increase their revenues by servicing the installed base.

Developing services requires a holistic company perspective because the internal processes need to be integrated with each other and are often overlapping. When developing a product there is generally an R&D unit that develops the idea, a manufacturing unit that produces the product and finally the market unit sells it. When developing a service it is difficult to distinguish between the production and consumption since they are performed simultaneously (Fähnrich et al., 2003), or are dependent of each other (Edvardsson, 2000). The customer is an experienced co-producer in many of the service activities and therefore companies could benefit by including the customer in activities where they traditionally are not included, such as the service development process and the creation of the service supporting system. We find that it is very important with customer interaction throughout the value chain. This is, as you will see throughout this section, somewhat controversial.

8.1 Customer interaction in the service business system

A service business system can be viewed as a system that is made up by following three overlapping elements: service operations, service delivery and service marketing (Lovelock & Wirtz 2004). Below we discuss how and why the service business system should be designed with the customer in mind.

The service operation processes the inputs and creates and designs the fundamentals of the service. The proportion of the overall service operation visible to the customer depends on the level of customer contact. (Lovelock & Wirtz 2004) Low contact intense services companies, such as Alfa Laval, strive to standardize the customer contact. Most service operation elements are confined either at the customer's premises or by a service centre. The system that supports the service operation not visible to the customer should be designed to facilitate for the customer to take part and contribute in the process. An example is by designing the administrative routines accordingly to their need (Edvardsson, 1997). Let the customer become a co producer, for example, design the invoices and the information material to suit his needs, and make sure he is treated the way he wants on the phone. An important aspect of the support system is that the administrative routines are updated according to the customer feedback including complains and dissatisfaction (Edvardsson, 1997).

The service delivery assembles the fundamental elements of the service product and delivers it to the customer. When delivering the service the customer is an inevitable part of the process. (Lovelock & Wirtz 2004) The service staff has major implications of the service outcome. “To the customer people are inseparable parts of many services. The presence of people, however, brings a high risk that the service quality will vary. At the design stage, the developer must plan and consider every encounter between consumer and provider. The good manner, attentiveness customers associate with good personal service must be part of the hiring, training and performance standard of the company. Indifferent or surely execution can devalue the service.” (Shostack, 1984). A large part of the customer’s contact with Alfa Laval is through the service engineers, but also with the sales companies when ordering new products, parts or service. When developing new services the need for thoroughly training is apparent for the service engineers. Even with profound training the newly required knowledge seems to disappear quickly, if the new service seldom is performed (Funck, 040722; Nordström, 040813). There should be explicit descriptions of the service easily accessible for the engineers. Continuous training could be a more expensive option to ensure knowledge does not vanish.

Service marketing is the third part contributing to the customers’ general view of the service business system. If a company wants to keep its customers the interactive marketing[33] must be excellent. Employees engaged in the service system are very important part-time marketers, typically outnumbering the marketing professionals in the marketing and sales units. (Grönroos, 1998) The service engineers are Alfa Laval’s most important marketing professionals and sales persons. Customer focus in the entire service process is critical. If it fails, no traditional external marketing efforts or not even a good service outcome will make the customer stay in the long run (Grönroos, 1998). To gain customers’ perception of high quality it is not enough to have the best service outcome (technical quality) on the market since the service process (functional quality) has as much impact on the perceived quality (Grönroos, 1998). This offcourse puts high pressure on all employees in the service system to know how to perform during the service process to ensure customer satisfaction. Service engineers at Alfa Laval should be trained in marketing new services. Their relationship with the customer is vital for the perceived quality.

The service business system should be designed with the customer in mind. It is very important for companies that are expanding their service offering towards integrating service with its core offering. For services to develop the business system must be designed to facilitate customer interaction in the service operation, the service delivery and service marketing.

8.2 The customer as a source of innovation

The discussion above has been limited to customer interaction in the service business system. If we take this discussion a bit further, bearing in mind that customer input through market research is an evitable part of designing new service, can he then be a source of innovation? Integrating customers within the fold of the organisation is the

[33] Marketing in the encounters between the company and its customers

new exhortation in the academic and corporate word (Lundkvist & Yakhlef 2004). However, the research has focused more on customer involvement as a mere information task, transferring information between customer and firms. Involving customers in idea generation is believed only to lead to imitative and unimaginative solutions (Ulwick, 2002), which have limited value for radical innovations (O'Connor, 1998, Christensen, 1997). Engaging the customers about the company's services, quality, delivery terms and timeliness through several discussions will eventually lead to new ideas, and we base this notion on an interesting case study of the Swedish Post Office[34]. Following conclusions has been drawn: improved existing services, development of a brand new service, but maybe most importantly succeeded in building a bridge between its internal routines and system and the customer's needs and wishes, by not only listening to their opinions but also acting upon their suggestions (Lundkvist & Yakhlef, 2004). Developing routines of how to converse with customers – to build up a structure that engage the customers in a productive way is a crucial step to ensure that services developed fit the customers' needs and wishes. Today this is a main obstacle for Alfa Laval that has few structured channels for gathering ideas generated within the organization, and none for gathering them externally. Alfa Laval can create a competitive advantage, by listening to their largest customers and building a long lasting relationship by taking their ideas in to account. Having said all this, the concluding remark is that not only Alfa Laval will benefit by involving the customer in the whole process from service development to service delivery.

8.3 Pricing strategies for services

What is a cynic? A man who knows the price of everything but the value of nothing.
- Oscar Wilde

Oscar Wilde was centuries ahead when he formulated this phrase that lays the foundation for our pricing discussion. Following discussion will focus on value, and not the price per se. We find it important to mention pricing and provide some guidelines of how to develop an effective pricing strategy, for new services. Much can be said about pricing but we will only discuss pricing as an important part of the service business system. The holistic perspective of service environment is once again important to bear in mind.

How do you set an appropriate price for a service? Since no customer will pay more for a service than he think its worth, management needs to understand how customer perceives value. This requires extensive marketing research, especially for business-to-business markets (Smith &Nagle, 2002). Research by Zeithhaml advocates that the perceived value for a customer is very personal and idiosyncratic (Zeithaml, 1988). She divides value into four broad categories: (1) value is low price, (2) value is

[34] In 2001 the Swedish Post Office's public account managers initiated a study aiming to involve their customers in developing new public services. The study was conducted with several face-to-face customer interactions concerning the Swedish Post Office's service, quality, delivery terms and timeliness. The study resulted in developed routines on how to engage customers early in the development process.

whatever I want in a product, (3) value is the quality I get for the price I give, and (4) value is what I get for what I give. (Ibid) We condense these broad expressions and define the *value for a service* as the *perceived benefits* less the *perceived costs*. Greater the difference, greater the value. Because each definition of customer value is personal, companies must provide different levels of service, with the option to pay more in exchange for added services.

Many service-pricing strategies are unsuccessful because they lack any clear association between price and value (Simon, 1992). We will present the three most important pricing strategies that aim at clarifying this association. Pricing strategies that reduce uncertainty, relationship pricing and low-cost leadership. First there are two pricing strategies that reduce uncertainty: *Flat rate pricing* is a strategy common in industries in which service prices are unpredictable and suppliers are poor at controlling their cost and speed at which they work. It involves quoiting a fixed price in advance of service delivery, transferring the risks from the customer to the supplier in the event that the delivery is more time consuming than estimated, or involves more costs than anticipated. (Lovelock & Wirtz, 2004) Another pricing strategy that reduces uncertainty is *benefit-driven pricing*, which involves pricing that aspect of the service that directly benefits customers. This offcourse puts high pressure on market researchers to know what aspects the customer values the most and the least. Flat rate and benefit-driven pricing can be used individually or in combination but aims both at reducing the uncertainty. (Ibid)

Second, there is a pricing strategy that aims to develop and maintain long-term customer relationships, labelled *relationship pricing*. It focuses on giving customers both price and non-price incentives to consolidate their business to a single provider, (Lovelock & Wirtz, 2004) for example giving discounts for large purchases, or rebates when the customer purchases two or more services. Closer the relationship, better the learning effects facilitating the service customisation.

Third, *low cost leadership* aims at providing price-conscious customers with the cheapest service. The challenge is to convince them that the cheap price does not imply bad quality. The focus should be on the value it provides the customer.

What pricing strategy should Alfa Laval use? Commissioning has historically been charged by the hour. The advantage is that the company always get paid, and there is no or little risk (Lemvik, 040811). We advocate that Alfa Laval should use a pricing strategy based on what the service, per se does for the customer. It is a prolongation of the benefit-driven strategy that does not place a value of some aspect of the service but place a value of the benefit the service does for the customer. It could be said to be a part of a relationship pricing because it aims at brick-walling the customer to the company for quite some time. Alfa Laval should base the price on what benefits it gives to the customer, and decide the objective with the service: is it to increase the efficiency or reduce the potential for production break and how much is that worth for the customer? For instance, if a customer wants to increase the efficiency in his Plate Heat Exchanger it does not matter what type of service Alfa Laval uses to ensure this efficiency. What does matter is the value the customer place on the increased efficiency. The price is not based on the services that increase the efficiency but the amount that the customer saves on the increased efficiency. Octopus is a realised example of the above suggested price strategy, where it is sold as a function, saving money for the customer that is divided between the customer and Alfa Laval according to a pre-specified percentage (Michaelides 040819).

This pricing strategy contains high risk. As Lemvik arguments: "If you sell a package for example to take care of a machine for three years you can make a lot of money, but if details are neglected it can cost you dearly." However creating a service engineering environment will keep the risk at an acceptable level, by structuring the service.

The last aspect of pricing we wish to discuss is *bundling of prices*. It can be difficult to define a unit of service, and decide on what the service price should constitute of. Since services provided by manufacturing companies often unite a core product with a variety of supplementary services an often-utilized way of pricing is to bundle the service with the product, and sell them as complete service package[35]. This is a way to overcome the service paradox, by bundling a service with a product the company can ensure that the package will be profitable. Bundled pricing is simpler to administrate, and it provides the customers with a clear idea of how much they will be charged for the service (Lovelock & Wirtz, 2004). It also provides the company with certain guaranteed revenue from each customer, and it complicates price comparisons. *Unbundled pricing* on the other hand provides the customer with flexibility in what they choose to acquire and get paid for (Ibid). We will in the following chapter, further discuss how Alfa Laval uses bundling of services in its performance agreements.

8.4 Servicing the installed base; service offers at Alfa Laval

How should companies go about expanding their service offering? It is not an easy task, especially in an industry where expanding services is by all means motivated in the belief "better service to sell more products" (Oliva & Kallenberg, 2003). A strategy advocated by Oliva & Kallenberg is that manufacturing firms should shift the focus towards the installed base [36]. By doing so they could provide product- and/or process-related services that are required by the customer over the useful life of a product in order to run it effectively in the context of its operation process (ibid). This section demonstrates servicing the installed base with Performance Agreements thereby leveraging on their existing product knowledge and installed base, delivering higher returns with fewer resources and overcoming the service paradox.

Alfa Laval provides its installed base with a "House" of services (figure 1.1) with different services from which a customized service package can be built (Lillkvist, 040803). For manufacturing firms in the beginning of the service evolution, service is often thought of as add ons, and initial services for example installation and

[35] Productification at Alfa Laval is a good example of how price bundling is used in practice.
[36] A company's installed base (IB) is the total number of products currently under use by existing and new customers.

commissioning are frequently given away during the negotiations to sell the product (Oliva & Kallenberg 2003). This has been apparent at Alfa Laval when the Capital Sales unit use free services as an argument to sell new products (Habert, 040709).

When a company decides to expand its service offer, two distinct transformations are required. The first transition is to change the customer interactions from *transaction* to *relationship* based (Grönroos, 1998). Within this transition the service prices changes, from a mark-up for labour and parts every time a service is provided, to a fixed price covering all services over an agreed period. The trigger for moving towards fixed priced maintenance contracts is the desire to better utilize the installed service organisation. The service organization becomes a fixed cost, and the main driver of profitability is capacity utilization. Signing service contracts reduce the variability and unpredictability of the demand thus allowing a higher average capacity utilization (Oliva & Kallenberg, 2003). When establishing a customer relationship including a fixed price that covers all services within a certain time frame, the company takes the risk of equipment failure.

As a part of the productification strategy Alfa Laval offers Performance Agreements to its customers. It is a concept that provides the customer with four different level of service, with the option to pay extra in exchange for added services. Each level builds on the previous - One Star being the most basic, Two Star is a planned service program for each customer, Three Star involve optimising the customer's process and Four Star offers the customer's maximum service, at a fixed price. (Möller, 040707) The Four Star Performance Agreement is a total solution sold to a customer offering him peace of mind. This represents the second highest level at the service evolution arrow. However, a majority of the Performance Agreements sold are the basic One and Two Star, due to the fact that they are easier to sell (ibid). The Performance Agreements is said to be a mean to increase the service hours, but the true objective is to increase the parts sales. For instance, the Three and Four star agreements are seen as a way to brick-wall the customer to the high margin Alfa Laval's parts, rather than buying the parts from low cost competitors (Möller 040826). This is a good example of when the service becomes a mean to deliver the product.

The potential customers for Four-star agreements are few and represents large companies with non-stop performance that have critical applications, exposed to high wear and tear where security is crucial (Persson, 040810). Another reason for the low customer availability could be the customer and company risk aversion. Risk aversion is a basic characteristic of human decision-making (Kahneman et al, 1982). The company's risk aversion resides in that the risk for equipment failure lies within the company when signing a fixed price maintenance agreement. Higher the number of stars higher the risk; the customer pay a fixed price that could be less than the cost for repairing or optimising the machines or processes (Möller, 040826). Research by Gebauer and Friedeli (2004) has shown that manufacturing companies prefer the less risky outcomes of investing resources in products, to the more uncertain outcome of investing in extending services. The risks from extending the service business come from two different sources, internal and external. *Internal risk* derive from that services often are customised and require a high intensity of customer relationship, hereby demanding a different set of capabilities. It is considered too risky investing resources in an unfamiliar area. *External risks* rises because services often support core activities and help to maximise all processes associated with the supplier product, implying that the company gains intimate knowledge of the customer's service operation. (Ibid) Alfa Laval has to take all above mentioned risks into account. The risks stem from different sources, and it is important to bear in mind that risk lies not only within the company but also within customers. How should Alfa Laval assure their customers that the knowledge it gains within their processes will benefit both of the companies by delivering higher returns or saving divided between each other?

Traditionally Alfa Laval's parts have been sold to a higher price in comparison to its competitors, but the price has included the service. The customer has been used to pay a higher price but receiving the service for free. It is however harder to maintain the higher price today when the competition has intensified. This demands a transparent price strategy in which the customer should see exactly what he is offered, parts and service. The customer should be debited for the service that is sold separately. This change of mindset has been called "From Free to Fee" (Habert 040709). One example of this transition has been sending invoices to customer of performed services, consulting etc, to highlight the extent of the service offered for free. The aim is for the customer to comprehend what is included in the service as well as strengthen the price negotiations. (Ibid) This emphasize that the customer needs to be enlightened that the company is transforming itself to become a service provider, or a solution provider rather than selling a product.

Alfa Laval is facing two big challenges with its Performance Agreements. On one hand, increasing service quality and scope might extend the product's useful life hence reducing its replacement sales. On the other hand, increasing the quality and durability of product might reduce future service revenues.

Designing services that deliver is not an easy task. It requires a lot from the company, its managers and employees. It requires a change of mind, a transition from being a product-focused company to a service company. This transition will not come fast, but incrementally start focusing on service will eventually shift the focus. We trust that by starting with servicing the installed base companies will incrementally start the transition and designing services that deliver.

8.5 Summary of the chapter

In this chapter we describe the service business system that contains of operation, delivery and marketing. We argue that designing a service engineering environment requires a holistic company perspective because the internal process needed to design new services are overlapping and dependent on each other. This has implication on how a company should interact with its customers. The administrative routines should be designed accordingly to their needs; the service staff should rigorously receive training about new services but also how to market new services. What pricing models that are used also have implication of how the customer perceives the company. An effective pricing strategy should be based on how the customer perceives the value of the service. This is not an easy task but requires extensive marketing research. The most commonly used pricing strategies are flat rate, benefit-driven, low cost leadership and relationship pricing. We argue that Alfa Laval should use a combination of benefit driven pricing and relationship pricing. We stress the fact that the customer should be integrated in all stages of the development process, from idea generation to market launch. This is to avoid designing services that does not deliver, not to the customer or the company. Another way to design service that does deliver, per se, is to service the installed base. Then companies could leverage on existing competences, knowledge and installed base, providing a service engineering environment with fewer resources.

9 Conclusions

In this chapter we present the conclusions of our master thesis. Due to the integrated approach of this master thesis, many concluding remarks have already been presented. Here, we will highlight the findings that have the greatest impact on designing services that deliver. Finally, we bring up aspects and areas that are interesting for further research.

- We live in a service economy, which has resulted in that service is becoming an increasingly important part of manufacturing companies' businesses. However, high investments in extending the service business do not correspond to expected higher returns, providing a service paradox. Hence we find that designing a service engineering environment will be a prerequisite for manufacturing companies to harvest the increasing returns of the service investments.

- Manufacturing companies need to organize service development so that it becomes a permanent task within the organization. The companies should aim at creating a service R&D unit, but an adequate start is to guarantee that service development questions are anchored in the organization within an existing unit. A central service developer should be appointed, utterly responsible for service development issues within the organization as well as several local service developers, responsible for all local adaptations and adjustments of the new service.

- Manufacturing companies should use ideas from product development models and design its own service development model based on the company's basic characteristics and type of service offered. Each service development model should be designed with the specific company's features in mind. Alfa Laval should use our proposed model: SERVAL, based on Alfa Laval's product development model and project manual as well as the company's specific characteristics.

- Meiren & Fähnrich argue that service engineering models can be used for services that are low contact intense. We find that it is possible to use service engineering models for all different types of services if used with service development tools such as blueprinting and flowcharting.

- A service engineering environment is not designed instantly. It requires a lot of time, effort and resources to progress from perceiving services as an add-on, to become a service company. This progress should be looked upon as an incremental process, which commence in servicing the installed base, hereby overcoming the service paradox and design services that deliver.

9.1 Further research

- We suggest that a service development database is created where all service ideas are submitted and the projects' templates and reports are saved. The database should contain best practice procedures, team constellations, latest updates on ongoing projects and reviews of terminated projects. It should be a dynamic database, searchable and a main working tool for the service developers.

- The use of prototypes in product development have increased in pace with the possibilities to constructing high-quality and inexpensive prototypes (Ulrich & Eppinger, 2000). There are yet no established ways of constructing valuable service prototypes. We find this is a drawback for service development and suggest that further research on the topic service prototypes is performed, for example by studying the Computer-Aided Service Engineering Tool (CASET) that currently is developed at the Fraunhofer IAO (Fähnrich, 2004), and investigate how this tool can be utilized in Alfa Laval's service development.

- The new exhortation in new service development theory is engaging the customer in the idea generation phase. Few studies have been conducted and there is insufficient material on the implications of customer engagement, hence it provides possibilities for further research. For example, how do you design the elements that enhance the continuity of the customer conversation, and reframe customer's role in the R&D team. Another interesting aspect suitable for further research is how motivated the customers' are to share their views and collaborating with the firms in developing new services.

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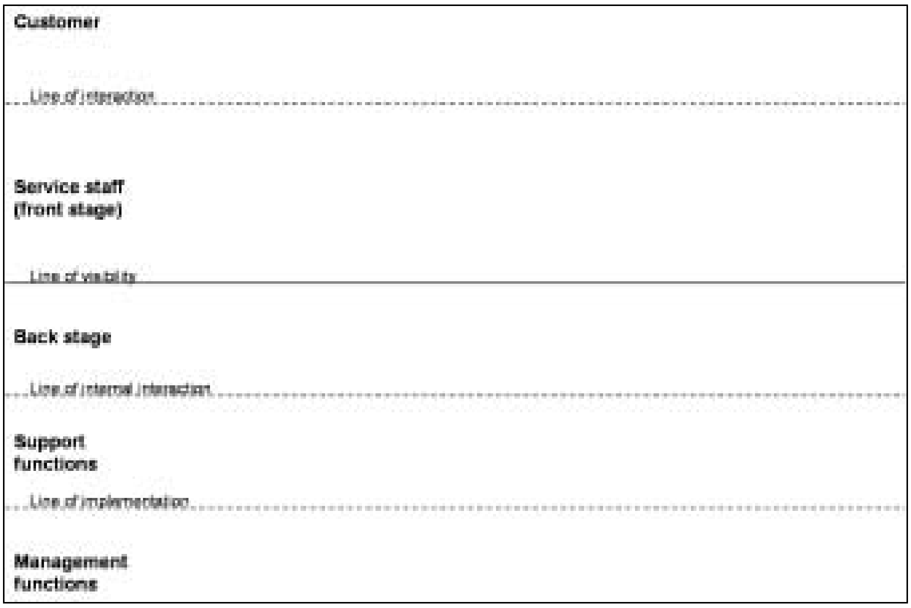
Appendix A – Blueprint development[37]

1. Start with an empty blueprint chart.



2. Define the symbols that are needed for the specific blueprint.

3. Define start and end point, as well as other necessary boundaries.

4. Make an inventory of the activities necessary and decide which activities occur on the front respectively back stage.

5. Flowchart the process above the line of visibility, separating customer and service staff at the line of interaction.

6. Identify the end outcome and possible repeat participation.

7. Identify and flowchart the back stage activities and functions.

8. Link the back and front stage activities together.

9. Identify any feedback lines between the front and back stage activities.

[37] Inspiration from Kingman-Brundage, (1992)

10. Check for possible fail points in the service process.