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Developing Service Requirements Management as part of Product Development Process in the Case Company

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PREFACE

To Whom It May Concern,

For the reasons unknown to me you have chosen to take this Thesis for a closer look. Perhaps you are now considering if this is something useful for your purposes or if you should skip this and move on to the next one. To help you on deciding if this might be journey worth taken for, I wish to explain what this is and what it is not.

This Thesis was created on the base of identified business challenge in the case company. For this challenge, this thesis offers a proposed solution. Thus, this Thesis is not intended to offer you the final solution, not the final solution to service requirements nor the final solution to the service requirements management. However, at best, I hope that this Thesis may offer food for your thoughts, perhaps an angle that you did not thought of looking into before. Thus, my only recommendation to you is that if you now choose to continue reading this, find your own way. You do not need to read this chapter by chapter. And more importantly, carry your own thoughts along with the reading all the time. Consider alternative solutions. Preferably, combine alternative sources that I did not discover or combine aspects from interdisciplinary sciences.

For me this Thesis study turned to be a journey well worth it. I got a change to get grip on service requirements complexity. For this, I wish to thank everyone who contributed on making this possible, the Case Company, Metropolia, and in particularly the instructors of this Thesis.

And last, but not least;
Thank you my family.

Vesa Ahonen
6 May 2015

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The objective of this Thesis work is to develop service requirements management as part of the product development process in the case company. Efficient management and implementation of both the market and internal service requirements are highly important for the case company in order to be able to design and deliver services that should better respond to the actual needs.

The product development process has been recently updated in the case company. Service Design is one of the new additions in this process. The purpose of Service Design is to further improve the design for services that are to be developed for the new product. However, for this process, definitions for service requirements and practices for managing needed further development.

The research approach applied in this study is action research. Best practices for service requirement management, identified from the basis of literature review are used as the conceptual framework of this Thesis. The data, collected from several stakeholders of the case company, is used for planning, building and further validating the presented final proposal.

As an outcome of this Thesis, practices for defining and managing service requirements in the product development process are presented. Furthermore, the requirements library that is needed for requirement management purposes is created.

The outcome of this Thesis can be seen as an added value and contributor to the case company's strategy. Moreover, the outcome can further help on increasing the customer satisfaction and contribute on improving the customer experience

Keywords	Service Design, Design for Services, Service Requirement, Service Requirements Management,

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Tämän lopputyön tarkoituksena on kehittää palveluvaatimustenhallintaa osana tuotekehitysprosessia kohdeyrityksessä. Niin markkinoiden kuin myös sisäisten palveluvaatimusten tehokas hallinta on ensiarvoisen tärkeää kohdeyritykselle, jotta palveluja voidaan suunnitella ja toteuttaa vastaamaan todellisia tarpeita.

Kohdeyritys on päivittänyt tuotekehitysprosessiaan ja lisännyt yhtenä uutena määriteltynä osana palvelusuunnittelun. Palvelusuunnittelun tarkoituksena on edesauttaa suunnittelua uudelle tuotteelle toteutettavien palveluiden suhteen. Tähän prosessiin liittyen, palveluvaatimusten määrittely sekä niiden hallinnointi, on tunnistettu kehitystarpeeksi, johon tämän työn on tarkoitus vastata.

Tutkimusmenetelmänä työssä sovelletaan toimintatutkimusta. Kirjallisuuden pohjalta tunnistettuja parhaita käytäntöjä liittyen palveluvaatimusten hallintaan, käytetään käsitteellisen viitekehyksen rakentamiseen. Tietoa, jota kerätään kohdeyrityksen sidosryhmiltä, käytetään apuna lopputuloksena esitettävän käytännön suunnittelussa, rakentamisessa sekä validoimisessa

Työn lopputuloksena syntyy kohdeyrityksen tarpeisiin sovellettu käytäntö palveluvaatimusten määrittämiseksi ja hallinnoimiseksi sekä hallinnoimiseen tarvittava vaatimuskirjasto.

Työn lopputulos voidaan nähdä lisäarvona ja panostuksena kohdeyrityksen strategian toteuttamiselle. Tämän voidaan nähdä myös edesauttavan tarjonnan kehittämisessä vastaamaan entistäkin paremmin kohdeyrityksen asiakkaiden tarpeisiin.

Keywords	Service Design, Design for Services, Service Requirement, Service Requirements Management,

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ACRONYMS

CD	Customer-Dominant
CRM	Customer Relationship Management
IHIP	Intangibility, Heterogeneity, Inseparability, Perishability
ITIL	Information Technology Infrastructure Library
KPI	Key Performance Indicator
RE	Requirement Engineering
R&D	Research and Development
SAP	Service Acceptance Criteria
SD	Service-Dominant
SSM	Soft Systems Methodology
SSME	Services Science, Management and Engineering

1 Introduction

This Thesis is done for a case company operating in an environmental and industrial measurement business area. Clear practice how service requirements are defined and managed as part of case company's product development process is an identified business challenge for which further development need is addressed. The research approach in this study is action research combined with considerations from system dynamics. To meet the objective, defined on the basis of the identified business challenge, study follows predefined research design. Key findings from the current state analysis are combined with the conceptual framework for building the proposal that would meet this objective. Data, collected in multiple sources in predefined phases, is used for planning, constructing and further validating the proposal that is presented as an outcome of this Thesis.

1.1 Case Company Background

The case company of this study manufactures and delivers high-technology environmental and industrial measurement systems and instruments as well as services related to the business area. The nature of the sales is business to business. The headquarters of the company are located in Vantaa, Finland. The company currently has around 1500 employees, with offices in 16 countries and customers in over 160 countries.

The company has a strong history in science-based technological innovations. Active research for new technologies is constantly being done; with a significant amount of company revenue spent on research and development activities annually. The company also participates in several co-operation projects with the customers, universities and other worldwide organizations related to its business areas.

The product range that the company offers is extensive and covers over 200 hardware products and some 30 productized service products. The customer base is diverse and globally divided. This business arrangement sets rather complex demands for the requirements that the products and services need to meet.

1.2 Business Challenge

In the past, the case company has been strongly product oriented, with the products having been the main output of the company's offering. As a result, its internal product creation process has been well defined and formalized. In the product creation process, services have been described as part of the capabilities that need to be built in order to be able to execute the service for the product. Therefore, services have been offered with the products without fully recognizing the value and possible benefits of this type of offering.

In recent years, however, significant changes have been made. The case company has recognized the value and benefits that a well-defined and formalized service offering may bring for the company and its customers. Due to this, the company has made significant improvements related to service processes. For instance, the current service offering has been productized. However, a clearly defined link and structure between the product development and the service development was non-existent. Due to this, the service requirements from all relevant stakeholders, both internal and external, have not always being well understood, and thus fulfilling these requirements has been a challenge. This may have caused that the service has not met all the requirements; or for example, the product has not been designed in a way that the service may be executed in an efficient and intended way.

Recently, the process for the new product creation has been re-evaluated and changes have been introduced. Service design is one of the new additions in this process. In other words, service design is now unambiguously defined as part of the new product creation process. The main structure of service design is therefore defined. Furthermore, the current process also specifies the needed deliverables. However, practices for defining service related requirements as well as methods for managing these in this process were yet non-existent.

Since the service design process plays a meaningful role in the overall product design process, the practices for managing service related requirements needs to be further developed in this study. The aim is to ensure that both the market and internal requirements are met, and well defined services can be developed. Furthermore, such a well-defined process is needed to develop services that answer to the actual needs, and thus facilitate value for both the customer and the case company.

1.3 Objective and Scope

The objective of this thesis is to develop the service requirements and their management as part of the product development process.

In the Service Design process, service concept and service design are the first steps in order to be able to further design, develop and execute services that fulfil the actual needs. The outcome of this thesis is a model for defining and managing service requirements. Additionally, the requirements library that is needed for requirement management purposes is created.

A significant part of the main scope in this study is to create a library that could be used for managing the requirements that are set by both the market and the internal stakeholders. *Internal requirements* may mean, for example, the requirements that are set by the product management for a selected service to fulfil. This may mean that a certain selected service from the current service offering should be further developed; or a completely new service might be needed for the product. *Internal requirements* may also mean, for example, the requirements that are needed for each type of services in order to build the service capability. *External requirements* coming from the market may mean the requirements that customers are requiring, for example some specific feature such as remote monitoring capabilities for the types of products the customers buy from the case company. In some cases, it may be for instance, that some service might be needed in the future. Understanding these types of possible future needs is essential in order to be able to consider how the capability could be built for the product or the service in order to meet the future needs as well.

1.4 Structure of the Study

This study is written in 7 sections. At first, the case company background is introduced as well as the identified business challenge with the scope of the study for solving this particular issue. Next, the background for the selected research approach is explained as well as the plan for ensuring the validity and reliability of the study.
The study then moves to the current state analysis. This analysis is done in order to identify the strengths and weaknesses of the case company related to the topic of this

thesis. The key findings are furthermore used for building the proposal for the case company.

The results of the literature review that was done partly in parallel with the current state analysis are presented in Section 4. This is done to identify the best practice for service requirements and management that can be used for building the proposal for case company purposes. The literature review starts from business requirements. This is done to further understand the interconnections of service requirements to the overall offering and value creation. Moreover, it is to understand some of the key elements that need to be considered regarding service requirements as well for the management part of them. Next, in the literature review, the characteristics of service requirements are defined and practices for managing the requirements are discussed. Finally, based on identified best practices from literature, a conceptual framework of the study is presented.

On the basis of the identified key issues of the current state analysis and conceptual framework the study then moves to the next phase which is building the proposal. By combining the results of the previous sections with data collected in this round the initial model is built. As a result, a proposal with three outcomes is presented. As a first outcome, the proposed structure for service requirement, including the issues that are recommended to be taken into consideration when defining or presenting the service requirement is presented. Second outcome, service requirement library, proposes structure that can be used for eliciting the servicing requirements and as well as offer compatibility for the case company product development purposes. A third proposed outcome is the practices for managing service requirements. These include the proposed roles needed for service requirement management as well as methods for capturing the requirements.

The next section, presents the validation of the initial proposal and revising for the proposal before final proposal is presented. Furthermore, proposals for further improvement on the basis of the outcome of this thesis are presented.

Last section presents the summary with managerial and practical .The study ends with the evaluation of this thesis, were the objective set in the first place is compared to the actual outcome. Furthermore, reliability and validity of this study are evaluated.

2 Method and Material

This section presents the research approach of this study. Research design with data collection points as well as validity and reliability plan are presented and further discussed.

2.1 Action Research and System Dynamics

Action research, as a type of qualitative research method is used as a main research approach for this study. This research methodology can be seen as a participatory (Baskerville & Wood-Harper, 1996) and combinatory research approach that integrate theory and action with a goal of addressing important organizational issues. (Coghlan & Brannick, 2014). Furthermore, this research approach can be characterized as a research *in* action, rather than research *about* action (Coghlan & Brannick, 2014).

The term action research, and the methodology was first introduced by Kurt Lewin in 1940's through his recognition of the need for comparative research on the conditions and effects of various forms of social action, and research leading to social action. (Lewin, 1946 (2004)). Lewin furthermore described the process of action research to be a circle consisting of three main phases; *planning*, *executing* and *renaissance* or *fact finding*. In the planning phase, the overall idea is being planned and in the second phase the plan is being executed. Third phase consists of evaluating the executed action showing if what has been achieved is above or below expectation. This step also should give a change to learn and serve as a basis for planning for the next step. This process then proceeds as a spiral of steps composed of the three phased circles. (Lewin, 1946 (2004))

David Coghlan and Teresa Brannick (2014) have applied this research method for the use of action research in the organizations. And although the names of the phases are different and instead of three steps the steps are divided in four steps, the main idea remains the same. However, as a pre-step before starting the actual process they identify that seeking to understand the *context and purpose* of the project is an important aspect. In this phase the researcher should seek to understand on why this project is seen as necessary and what are relevant forces driving the change. Additionally, the purpose in the form of defining the desired future state is considered as a critical pre-

step as well as creating collaborative relationships with relevant persons related to research project. (Coghlan & Brannick, 2014). Figure 1 presents the Action research cycle.

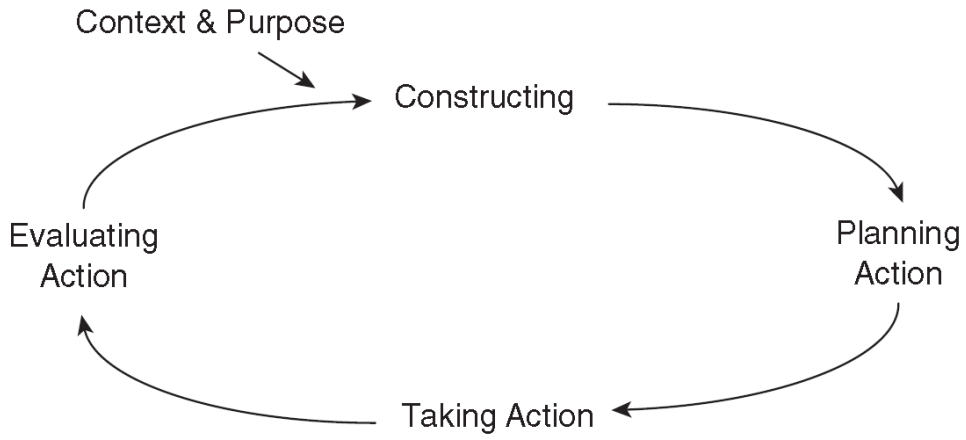

Figure 1. The Action Research Cycle (Coghlan & Brannick, 2014: 9)

The first actual step in the cyclical process is *constructing* the actual research issue. The pre-step and the construction phase are then followed by *planning action* phase. The cycle then proceeds to *taking action* and finally *evaluating action* (Coghlan & Brannick, 2014). And as this process is intended as an iterative learning process where executing these four steps may bring something new to the process or its outcome, the steps need to be re-run. During the research process the new experience from repeated steps is constantly used to further tune the process and finally to come up with the final solution (Coghlan & Brannick, 2014).

Furthermore, one of the main reasons for this approach being selected as the main research approach is the dual role of the writer of this thesis, as a researcher as well as a case company employee. Researcher is working in the case company service organization in an expert role. Main focus in the role is related to technical aspects of delivering the company's product and service offering. Great deal of the work duties are conducted in company-customer interface dealing directly with the customers. Due to the nature of the researcher role in the company and experience, researcher has gained an extensive view in relation to the nature of the customer base as well as in relation to the current service offering in specific fields.

Additionally, the research approach in this study is combined with aspects derived from *systems thinking* and specifically through one of its forms; *system dynamics* (Senge, et al., 1994) (Flood, 1999). Systems thinking and action research can be seen to play complementary roles (Coghlan & Brannick, 2014:114). The action research cycle, although being an iterative process, can also be seen as a static process where step A leads to step B and the interconnections between other parts of the process or issues outside the process may be neglected. However, as typical, the companies have several interrelated process cycles ongoing simultaneously and taking these into consideration is meaningful. Therefore, as the research progresses, tentative insights of the interconnections are formed and it is meaningful to add the consideration of the causal effects of each step to other steps. System dynamics consideres the dynamic relatationships between interrelated issues. Moreover, it considers the cause-and-effect of these relations within the parts of process as well as process as part of other processess. Causal-loop diagram, as presented in Figure 2, derived from system dynamics can be used as an illustration of these cause-and-effect relationships. (Senge, et al., 1994)

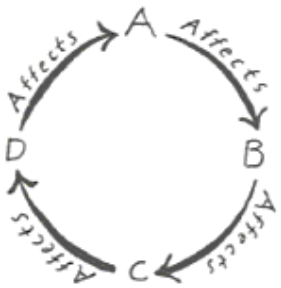

Figure 2. Causal-loop diagram (Senge, et al., 1994:184)

Regarding the study, taking these causal effects into consideration can be considered highly important. By understanding the main drivers and the effects of the issues or processes closely related to the main topic, combined to action research, the study can then reach its final result in the form of the final proposal.

For example,

A: Business requirements affect to the product development requirements.

B: Product development requirements affects to the service requirements.

C: Service requirements affects to customer requirements.

D: Customer requirements affects to the business requirements.

Or similarly, for example value creation, as will be discussed later, can be seen to have an effect on the main topic and needs to be taken into consideration.

Therefore, the combination of action research with a consideration of system dynamics is selected as the research approach for the study.

2.2 Research Design

The research design of this study is shown in Figure 3.

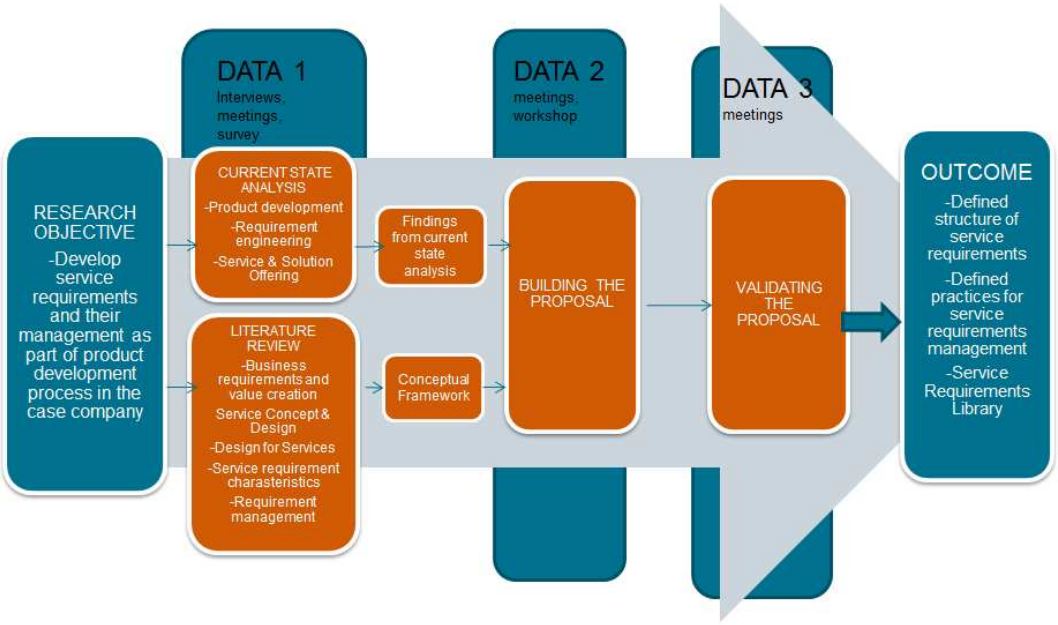

Figure 3. Research Design of the study

Research begins from setting the objective, which is to develop service requirements and their management as part of a product development process. Research is planned to consist of three main data collection points; data 1, data 2 and data 3.

The objective is followed by the current state analysis that consists of interviews and an employee survey as the main data collection method (data 1). Additionally, the current

product creation processes as well as the role of services in the case company are studied by examining the internal documentation and the case company's processes.

The literature review is started in parallel with the current state analysis phase. Theory is used as a main grounding point for the outcome of this study. First, knowledge gained from the literature review is used to help form the survey as well as the interview templates for the personnel interviews. Next, literature, related to the topic of this study is evaluated in order to find best practices and to build up a conceptual framework of this thesis.

The research then moves to the next phase which is building up the initial proposal. Data for this round (data 2) is collected through discussion notes collected from meetings with internal stakeholders in order to build initial proposal. Additionally, data for this phase is planned to be collected through product development project which would be used as a case project for piloting the initial proposal. The proposal is further validated by a larger group of stakeholders (data 3). This group consists of many of the key persons that will be involved with the topic in their daily job. Revision is done on the base of the data collected in this round. As an outcome final proposal is being presented and proposed to be taken into use.

2.3 Data Collection and Analysis

Data for this study was gathered from three main data collection rounds. First, it was based on a major survey conducted in the current state analysis and the interviews (data 1). For building the initial proposal, data collected from the survey was partly used and combined with another round of data collection (data 2). This data was mainly collected through discussions. Finally, for validating the proposal, a third data collection round, consisting of workshops and several discussions with the key stakeholders relevant to the study topic were conducted (data 3).

During the whole study process several scheduled meetings were held with the head of service development who was acting as a supervisor of the thesis from the company side. The discussions in these meetings consisted of presentation of the status as well as discussions of the next steps of the study.

Data 1 – Current State Analysis

For the current state analysis data was collected by use of interviews, discussions and large online survey. Group interview using questionnaire was conducted for the service representative consisting of service product managers, service expert and head of service development. The purpose of this meeting was to identify the current status regarding consideration of service requirement as part of the product development process. Moreover, the purpose was to identify which are the key issues needed to be further developed regarding the topic of the study.

Discussion was held with the portfolio analyst, responsible for the overall requirement engineering process and the development. This was done to understand the needs and constrains in the product development requirement engineering process that need to be taken into consideration when building the proposal for the service requirements and service requirements management. In addition, one of the main purposes of this meeting was to collect more information about the available software tool intended for the requirement management.

In addition, discussion was held with hardware testing manager. This was to further understand the interconnections of service requirements and hardware requirements.

Survey

An extensive survey was conducted inside the company (survey details in appendix 2). The purpose for the survey was to collect quantitative data related to the current state on how service requirements are being taken into consideration in product and service design. Additionally, the purpose was to collect data regarding the question whether these types of requirements are seen as important for further development. The survey was conducted as a web survey where the link to participants was sent out through an email. The participants were selected based on the position and the role within the case company. The main groups selected for the survey, where the Service and Product Offering organizations. Regarding the Service organization the link was sent out to most of the personnel working in this organization. Due to the size of the Offering organization the amount of participants was limited to persons working mainly in managerial positions related to product development and product offering. The main reason

for sending the survey with an extensive distribution was to gather information on how the maturity and importance of the presented questions was seen across the case company. However, due to extensive distribution, the response rate was also considered to stay relatively low. Examples of invited survey participants are presented in Table 1.

Table 1. Examples of survey participants by title

Service
Service Product Manager
Service Expert
Field Service Manager
Field Service Engineer
Technical Support Engineer

Product Offering
Business Area Manager
Product Manager
R&D Manager
Application Manager

The survey consisted of 51 statements, divided into five main categories. The main survey categories are presented in Table 2.

Table 2. Survey categories

Main Category	**Explanation**	**Example Statement**
Existing Service Offering	*Familiarity of existing Service Offering*	*Existing service offering fulfills external and internal requirements*
Service Design and Delivery	*Participation to Service Design or Delivery and importance to product quality*	*I am involved with defining which services are to be offered with new product*
		I am familiar with the requirements needed in service design process
Service Requirement Availability	*Availability and need of service requirements*	*Understanding service requirements in general is important for my work*
		Market requirements related to services are easily available
Validating and Verifying Service Requirements	*Effectiveness for requirement management*	*I work in a position where I validate service requirements*
		Requirements from customers are easily understood
Service Requirement follow-up	*Fulfilment of the requirements*	*Fulfillment of service requirements is reviewed after the release*
		Feedback is evaluated effectively

The participants were asked to answer each of the statements by giving their opinion on the *maturity* of the statements and on the i*mportance* of the statements. In addition the participants were able to give open-ended comments after each of the five sections.

Internal documents

The case company's internal documentation related to product creation processes, service development and service offering were analysed. The analysis concentrated on five main aspects on the case company, namely: *Product creation process, Requirement engineering process*, *Service design process*, *Service development* and *Service Offering.*

For textual data, a content analysis method was used to analyze the qualitative data. The purpose of this analysis was to further understand the content of the case company's service offering and the role of the service design as a part of the case company's overall product development process.

Data 2 – Building the proposal

For the initial proposal building phase the data was collected through discussions and discussion note. Discussions were held with the head of service development, quality engineer as well as with project manager of R&D project that was planned to be used as first pilot for the testing and further developing the initial proposal. Additionally, data collected on round 1 was also used as data 2 for building the proposal which would fulfil the needs as identified on the basis of the online survey and group meetings.

Data 3 – Validation

The data collected on the validation round consisted of several discussions where the initial proposal was presented. Discussions where held with the R&D project manager, service product managers, environmental engineer and with the head of service development. Data from these discussions was mainly collected as discussion notes. In addition, a workshop was held, where the structure of the service requirement library was

created by use of the software tool intended for this purpose. On the basis of the iteration rounds, where the proposal was presented and discussed, the final validated proposal was able to be presented.

2.4 Validity and Reliability Plan

In order to evaluate the quality and rigour of the study its validity and reliability must be verified. One of the practices for verifying validity of the study, is evaluating whether what was found as a result response to what was originally asked. (Quinton & Smallbone, 2006). Furthermore, validity can be seen as considering the correctness and credibility of the study. Whereas, *reliability* can be seen as answering to the question if the same results would be obtained if the research were repeated, or done by someone else (Quinton & Smallbone, 2006).

To increase the validity of this study, following measures are planned. First, the study follows research design with detailed descriptions of data collection methods and analysis. Next, in order to consider alternative views and avoid biasness, the data is collected from several stakeholders of the case company. Furthermore, the stakeholders are planned to be involved in building and validating the proposal. Third, the collected data is presented to the informants for verification and further comments. Additionally, the data is reported in detailed level and direct quotes are used when applicable.

The reliability is planned to be increased by collecting the data for this study using alternative data sources and tools. The data is planned to be collected through interviews, discussions and surveys. By triangulation, the study plans to conclude if the data collected from alternative sources will lead up to same conclusions and answers. Additionally, several sources, different authors and researchers, are planned to be used for building the conceptual framework that would offer reliable grounding for the used theories in the final proposal. This may further enable the repeatability and usability of the findings in other contexts outside the study.

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3 Case Company's Current State Analysis

This section presents the process of analysing the current state of the case company in relation to topic of this study.

3.1 Product Creation Process

Product creation process in the case company follows a detailed process description. Typically, in a single product release, the design phase includes electrical, hardware, software and metrology design as well as customer documentation. Additionally, it may also include user experience design. For these design items requirements are evaluated and testing of requirement is established. The product creation phase also includes capability build. Capability build means a function that is needed to be built or established in order to be able to manufacture and deliver the product that is being created. Examples of such capabilities are launch capability, delivery and production testing capability. For instance, regarding production testing capability, production test equipment is needed to be developed. Services have previously been included as parts of capability build. This mainly means that capability for selected services have to be built for the product that is to be developed.

However, in the recently updated product development process, service development has been defined to be partly both design as well as capability build. This means that capability need for selected services remains and those must be fulfilled. Additionally, it also means that services are now included to be part of the overall design already in the early product creation phase. Further, this enables that the product and the service can be created early in a way that they best compensate and support each other.

3.2 Requirement Management

The case company's product development process includes a process for managing requirements during the development process as well as during the product life cycle. Requirement engineering practices have been established and change management is handled according to the process description.
The requirement, which may be market requirement or internal requirement, is firstly evaluated and validated. If the proposed requirement is approved it will be added on the list of the requirements needed to be fulfilled by the product. Additionally, method, such as specific metric, for verifying that the requirement is fulfilled is created.
Later on during product life cycle, when new or changed requirements are received from the market and internally, same process is followed. If the new requirement needs engineering work, engineering change request is created and process described for this is followed. As an outcome, product is able to fulfil the new requirement. An example of this kind of feature is an upgrade to the existing product. Furthermore, this upgrade enables that new requirements are met and may extend the product life-cycle.

The requirement management processes are well developed for taking into account product requirements during product creation phase. Requirements related to services, however, are not been mentioned in this process. Thus, meaning that taking these requirements into consideration has been seen more as part of capability build. Moreover, meaning that the services have been mainly developed for the products. Products have not been developed for services.

Requirement Management Tools

At present, the company is using specific software, JIRA, as a requirement management tool. This software is mainly used to handle engineering change requests during the product life cycle phase. The process is that if the requirements related to the product have changed it will be firstly validated if this has an impact on the product. If changes to the product are needed, an engineering change request will be generated. This request describes the needed actions, reason for the actions, as well as an intended solution. Engineering will then handle the request and perform needed actions in order to fulfil this new requirement.

As mentioned, the tool is mainly used to handle change management related requests based on the changed requirements for existing products. Recently, the software has been started to be used also in the new product development process for defining which requirements are to be fulfilled for the product. For some of the requirements, the validation and verification methods are also presented. At present, practice on how these JIRA projects for new product development are created is diverse. In some cases, also service requirements are defined in this phase, but in many cases this tool is used for mainly concentrating to product specific requirements. Most progress on the use of this tool can be seen in software related development projects as well as in instrument related development projects.

Recently, work has also done to categorize requirements by a type. For instance the product development phase and requirement management includes also design for environment and design for health and safety related requirements. These are also types of requirements that the product to be developed must fulfil. An example of the environmental requirement is the correct use of electronic components selected for the hardware product. For instance, components must fulfil the regulations related to use of hazardous substances and other international directives. Respectively, nature of design for health and safety requirements is related to safety aspects of the products. These types of requirements are needed to be fulfilled in order to be able to design the product in a way that it is for instance safe to use. Requirements belonging to these categories have been part of the overall process already before, however developing them as their own categories enables more holistic view on the overall development and the interconnections between different product types. Furthermore, it enables repeatability in the process.
Additionally, as the service design is now part of product development process it is evident that this tool is to be used also for handling service related requirements.

Another software tool, Confluence, is also in use at the case company. This program is one of the tools used as an internal information sharing tool. The practice for using the tool is still in early phase of development, but at best this it can serve as an effective method for information sharing inside the company. Regarding requirement engineering this tool offers instructions related to requirements and for instance on how to create projects to JIRA. For service related requirements, no content has been added so far, but as the tool is already been used for other purposes and can be combined with

the other tool, JIRA, it is also evident that using this tool for sharing information related to service requirement and service design disciplines must be taken into consideration.

3.3 Services

The case company has separated the service organization as its own business unit. The main units in the service organization are customer services, calibration and repair services, project and maintenance services and international services. The service development operates as an umbrella unit aiming to develop services in these before mentioned categories. Customer services are mainly responsible for giving first hand technical support as well as monitoring the overall customer satisfaction and planning and implementing actions on the basis of this. Calibration and repair services include the offices and functions that are responsible for the titled actions for serviced products. Project and maintenance services are responsible for the service actions related to delivery projects as well to the maintenance and on-site repair type of actions, for instance field services. International services refer to specific international offices which are offering services either locally or domestically.

3.3.1 Service Offering

During recent years the existing offering of the case company services has been productized. Shortly describing, the services are now products that can be offered and sold to customers. Most of these are offered as add-on services complimenting the needs for the case company's hardware and software product offering. However, services that are the main outcome of the offering also exist. As an example most of the information services can be classified into these types of services.

The service offering consists of six main categories. The categories are maintenance, information, calibration and repair, spare part, modernization and project services. Table 3 presents examples of service offering in each category

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Table 3. Examples of service offering in the case company

Service Type	Example of Service Product
Maintenance Services	Preventive On-Site Maintenance
	Technical On-Site Support
	Remote Monitoring
	Priority Technical Support
Information services	Data as a Service
	Forecasting Service
	Lightning Reports
	Traffic Weather Consulting
Calibration and Repair Services	Service Center Calibration
	Service Center Repair
	On-Site Calibration
Spare part Services	Spare Parts Availability Services
	Express Spare Part Delivery
Modernization Services	Software Upgrade
	System Upgrade
Project Services	Site survey
	Installation
	Customer Training

Regarding the above mentioned services information services is a category that is fairly new for the case company where as other service types can be considered as more matured.

3.3.2 Service development and Service Design

Service development is its own unit under service organization lead by the head of service development. The employees working in this unit are mainly service product managers, service experts and service project managers. Service product managers are responsible for developing and managing the service product offering. Service experts, work in close co-operation with the product areas and product development. Their task is mainly to work as a bridge between service and product areas and ensure that se-

lected services for new product are been created. Service project managers are working in several service related projects aiming to furthermore develop services and service offering.

In recent years, a significant proportion of the work in service development has been involved with service productization. The role of the service development in product creation process has been mainly to build capability for the selected services. Recently, as mentioned earlier, the service design phase has been added as a part of new product creation process. Figure 4 presents the service design process as a sub-process of overall product development process.

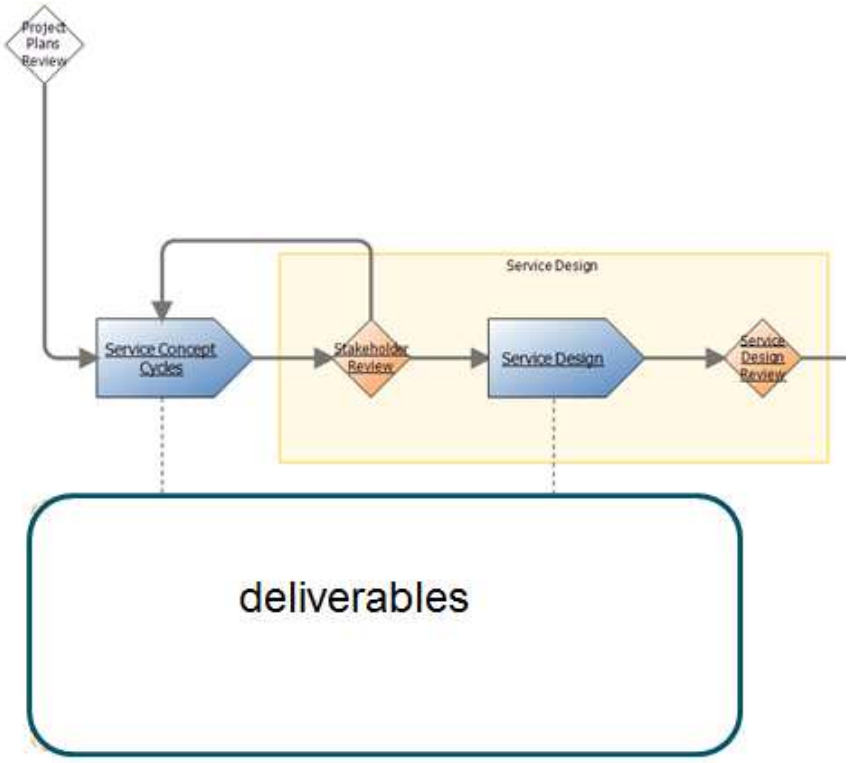

Figure 4. Service Design as part of Manage Offering Process of the Case Company

In the new product development process description, the services to be developed for the new product have been defined through two main phases: service design and service capability. In the service design process, a service concept cycles are being initiated at first. In this phase the main purpose is to define which services are to be designed and furthermore capability is being built. For the service concept cycle some of

the requirements have already been defined as needed deliverables. These are the types of requirements that must be created as an outcome of the service design process. Table 4 presents the list of required deliverables from service concept cycles.

Table 4. Service concept cycle deliverables

Service Concept Cycles	
For each service:	Meaning
Service Description	The main intention of the service
Delivery Teams	Teams responsible for offering and delivering the service
Infrastructure	Infrastructure that is needed in order to be able to develop the service
Estimated cost of Service Delivery	Estimation of the final costs for delivering the service

After these deliverables for each service type have been defined in the service concept phase, they are reviewed. In a case where the information received is not sufficient the process is repeated. The iteration process is repeated until the concept is validated or rejected.

The next phase for the accepted service concept is the service design phase. The service design phase is responsible for designing the service in a way that it can be furthermore transferred for the relevant service team for the capability build. Table 5 presents the needed deliverables.

Table 5. Service Design Deliverables

Service Design	
For each service:	Meaning
Statement of work	Statement on how the service is to be created and offered.
Item Definition	Offered service type must have defined items
End user Price	Price for customer to be defined
Care Process Compatibility	Internal process concentrating on customer experience and customer satisfaction.
Service Performance Criteria	Method for measuring the performance of the service to be offered

After these main deliverables have been created and the design phase has been accepted the transition to capability build can be done. In this phase typically service product managers or for instance the field service manager are responsible for building the capability that is needed in order to be able to deliver the desired service. For example this may mean procedure instructions on how the service is to be executed and training plans on how to train the personnel responsible for offering this service.

Regarding service concept cycles and service design, the main level definitions have been made as described. However, the requirements on how to create these type of deliverables and moreover how to specify and manage all the requirements that are related to service design is work still needed to be done.

3.4 Solutions Offering

Another noteworthy issue to be discussed in this study is the increase of solution business in the case company. Typically, in the case company, this means combined product and service offering. However, it also refers to the offering where the service is the main product that is offered to the customer.

In recent years, the case company has increased its service offering towards data related services, such as information services. The purpose of this type of service is to provide information which often is weather related. This can be for instance either weather measurement data measured from predefined geographical area from specified period of time. Additionally, the company has also increased its presence in the renewable energy market section by acquisitions made in recent years. Examples of offering related to this are wind and sun energy efficiency forecasts. Customers for these types of forecast products are often energy companies seeking for the most suitable location, as in terms of energy production efficiency, to establish their energy production operations. In addition to this, information improves the ability for these companies to better prepare for the weather changes and its impact on energy production capacity.

Typically, related to this type of service offering the customer is not purchasing any hardware product. It may be that they are purchasing an analyst report or purchasing a service to able to gather their specific data for instance from a remote server maintained by the case company. In many cases, this type of offering also means that instead of selling either service or product a total solution is being offered. This can include for instance, equipment installed in a specific place for a specified period of time and providing periodical data analysis reports for the customer. Thus, offering a total solution for the customer.

Project business is another type of the case company offering, where product and service offering are combined and may form a total solution for the customer. In these types of projects the total solution is however often considering only the delivery of the solution including the actual physical products as well as combined services such installation and training services. Examples of these types of large scale delivery projects are projects where complete airport weather monitoring solutions are to be delivered.

3.5 Survey Results

For the current state analysis a large online survey was created. The survey was sent out to total number of 392 employees and received total of 70 responses, corresponding to a response rate of 17.86 %. Most responses were received from Finland and The United States, which are the two largest locations by personnel of the case company. Considering the fact, that the survey was sent out during the winter holiday season, and the facts that were explained in the survey background section the received response rate can be considered satisfactory. Overall, it can be said that the response rate for the survey was somewhat anticipated. Additionally, as also anticipated, most of the responses were received from personnel working in the service organization.

Existing Service Offering

Answers in this category revealed that employees are well familiar with the existing service offering and the gap between the maturity of the current status and the importance was relatively low. The responses for the questions regarding whether the existing service offering fulfils the requirements gave similar scores across the specific service product types. Fulfilling the requirements was already seen to be at a relatively high level, however room for improvement was still seen. In this category spare part services received the lowest scores and thus most improvement needs were seen for this service type. Overall, this section received the highest scores for the maturity of the current situation.

Service Design and Delivery

In this category highest maturity was seen for the questions asking whether the service requirements may help to improve product installability, maintainability, usability as well as increase customer satisfaction. From the responses it was seen that service requirements are well known to be able to influence these subjects. Regarding if service requirements are needed to be considered already in the product creation phase the answers were almost unanimous. From the results it was seen that they need to be considered and the importance was seen as having a high priority. The lowest results were received for questions regarding the involvement for defining service require-

ments as well as for the questions asking if service design or product design was part of respondents' work. Additionally, familiarity with the needed requirements for the service design process received low scores. Overall, although several respondents' answers indicated that they are not directly part of either the service design or product design processes the importance was seen as relatively high resulting in the conclusion that the respondents felt they should be more involved in these processes.

Service Requirement Availability

In general, the answers in this category revealed that understanding service requirements was considered to be highly important regarding the respondents work. The maturity of the subject was also seen to be already at a high level. the biggest gaps between the maturity and the importance were found through questions regarding effective collection of the requirements as well as the availability of the requirements. Improvement needs were seen regarding the availability and effective collection of the requirements.

Validating and Verifying Service Requirements

Methods for validating and verifying service requirements were also seen as highly important. Likewise, the gaps between the maturity and the importance revealed that improvement needs also exist in this category. The highest improvement needs were seen for the validation of the requirements received from the market. The answers also revealed that the requirements are not always easily understandable and the information regarding these requirements may not be sufficient. Effective revising of the requirements on the basis of the feedback was also seen as an important point for improvement.

Service Requirement Follow-Up

Following-up on the requirements was also considered to be important. the maturity of the current status was seen to be in at average level and thus room for improvement exists. The highest importance was placed on the need for easy access to customer feedback. This was also where the most improvement need was seen to exist.

Open Comments

the survey participants were able to write open-ended comments after each of the five sections. Even though some comments revealed that all the questions were not unambiguously understood, most of the comments revealed that survey questions were well received. On the basis of these comments it was clearly seen that several of the participants felt that service related requirements are seen as a highly important issue and improvement needs regarding to these exist.

Table 6. Service Requirement Development Survey Examples of Open Comments

Existing Service Offering	*Lots of good work done to productize the existing service offering. Information services is newer and therefore less mature.*
Service Design and Delivery	*Not sure how to answer the last question. What I mean is that Service requirements are absolutely needed to be considered in product creation phase and doing this is extremely important for xxx[1] success in the future.* *I hear a lot about designing for manufacturing, which happens once, but I've never heard any mention about designing for service which may happen 60 times during a product's life.*
Service Requirement Availability	*Always service requirements are important.* *I feel that there needs to be more communication between sales and service regarding the type of service contract and maintenance that is being offered to our customers.*
Validating and Verifying Service Requirements	*Service requirements usually seems to be the last priority during new product development projects, and if the project runs over schedule the services are sometimes left out completely, especially the documentation.*
Service Requirement follow-up	*We have good statistics from customer satisfaction surveys but I believe very few actions come of them. Customer comments are not usually acted upon unless the rating is very low, which misses opportunities for avoiding complaints in the future.*

Table 6 presents examples of the received open-ended comments. In total the survey resulted in a 44 open comments, which can be considered an excellent result when compared to the total response rate.

[1] The name of the case company removed from the original comment

3.6 Interview Results

Analysing the interview results revealed that service requirements are seen as an important and needed part of the product creation process as well as for the whole product life cycle. The current status regarding existing service offering and service productization was seen to be on good level. Improvement needs were mainly seen in the phases where service related requirements are evaluated. For example the service product managers commented that regarding the ability to build capability for service products certain predefined requirements must be fulfilled. This has not always been the case, thus making capability build after the product release or close to release difficult.

Improvement recommendations, for instance adding more project workshop type of activities were presented for this phase. Additionally, it was stated that somewhat easy mechanisms, such as emails, for collecting feedback regarding these requirement and how well they are being fulfilled already partly exists. Systematic way of collecting the requirements was however still seen as one of the needs for further developed.

Table 7. Main benefits, challenges and development needs for current service requirement management processes in the case company as identified in the interviews

Current Process	What are the main benefits of the current process considering the service requirements	*Clearly productized services* *Requirements & processes clear for existing/productized services*
	What are the key challenges?	*Service development process as part of R&D process needs development/clarification.*
Development needs	What are the main development needs?	*Actual market/customer feedback needed in order to develop services.* *How to actually deliver the service can be further developed*

Table 7 presents the key issues, based on the service development personnel comments, seen to be in good state regarding service requirements and issues that would need the most improvement.

Besides interviews with service development personnel, interview meetings were held with the hardware testing manager as well as with portfolio analyst working in responsible role in general requirement engineering process. The interview with the hardware testing manager revealed that more co-operation between the service functions, such as field service, and with product development functions such as hardware testing could be further developed. This could be seen as a key issue in order to improve the information flow between departments. Thus, also enabling that requirements needed to be fulfilled both internally and externally could be better taken into account already in product development phase.

The interview with portfolio analyst also revealed that these new requirement engineering processes and tools, such as JIRA, are still in quite young maturity state regarding the use of them in case company. Several improvement actions has been however already done and taken into use. Moreover, interview revealed that other projects such as design for environment and design for health and safety are also ongoing at the case company. From this, further conclusions can be also done that all these improvement projects, and to be more specific, the needs and the requirements related to these, must be taken into account when considering the development of service related requirement. Thus, developing the service requirements and their management should offer compatibility to overall requirement development.

3.7 Summary of Current State Analysis

To summarize the results of the current state analysis, key issues that should be taken into consideration when building the proposal that would meet the objective of this thesis, are discussed. Furthermore, these findings serve as guidance for the literature review. Figure 5 presents the main strengths and weakness of the case company related to the topic of this study.

Figure 5 Main strengths and development needs identified on the basis of the current state analysis.

As strengths, it was identified that the case company has recognized the importance of the services. In recent years, much of the development regarding services has been done, for instance existing service offering has been productized. Recently, service design has also been added as part of the product development process. In addition to this, solution offering, where service, or moreover service product, is considered as part of the solution or as a main output of the solution, is increasing in the case company. Furthermore, as strengths, it was identified that developing the overall requirement management is among the ongoing development projects in the case company. Regarding this, tools for requirements management exists and is being further developed. In addition, service requirements are recognized as an important part of this development process.

As weaknesses, it was identified that services, until recently, has been seen mainly as part of capability build in the product development process. Therefore, service requirements have not been always considered early enough in this process. Furthermore, the service requirements should also be defined in a way that they offer compatibility to the overall product development process. Other identified weaknesses were that service requirements are not always well defined, thus they need to be clarified. In addition, the availability of these requirements was not always seen to meet the needs of internal stakeholders. Furthermore, the processes for service requirements were seen to lack effective methods for collecting, analysing and following the status of the requirements. In addition, clear roles and responsibilities for the management of service requirements were seen as an issue that would need further development.

As a conclusion it can be withdrawn that the importance of the research topic is well acknowledged and accepted in the case company. Additionally, comprehensive results of this thesis project may further help the case company to manage these service related requirements in a way that fulfilment of both internal and external needs is further increased. Next, the study moves to literature review in order to find best practices that would help answering to these needs.

4 Best practice for Service Requirements and their Management

This section discusses the effects of business requirements on service design and further on defining and managing service requirements. Conceptual framework for service requirements and their management, based on the literature review and identified best practices is constructed at the end.

4.1 Business Requirements

Business requirements can be described as strategic requirements that refer to the future direction of the company (Babar & Wong, 2012:446). In addition to these high-level requirements they can also be considered to include more detailed level requirements such as user requirements (Podeswa, 2008:16). Typically business requirements are based on the business model that the company applies. Furthermore, the *business model describes the rationale how organization creates, delivers and captures value* (Osterwalder & Pigneur, 2010).

4.1.1 Business Models and Value Creation

In recent years, the business models and more specifically the view on how value is seen as created has altered. Traditional goods-dominant logic views product as an output of the central component of exchange. (Lusch, et al., 2007; Heinonen, et al., 2010; Vargo & Lusch, 2004). Whereas, relatively new view, service-dominant logic views the service as the base of exchange (Vargo & Lusch, 2004). In this view value is seen as created by customer in use of the service (Value-In-Use; Grönroos & Voima, 2012).

Figure 6 illustrates the value creation spheres as defined by Grönroos and Voima (2012)

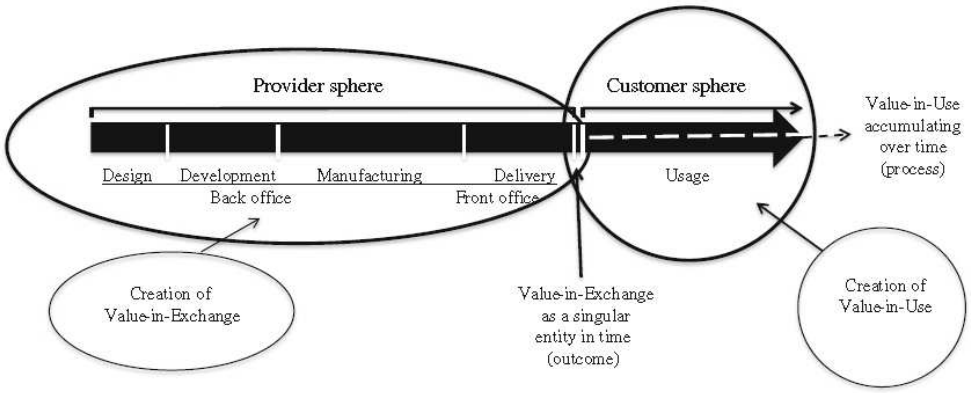

Figure 6. Value-in-use and Value-in-exchange (Grönroos & Voima, 2012)

Recently, this logic has also been criticized for not being truly customer driven. Both the goods-dominant logic (GD) and service-dominant (SD) logic are seen as provider dominant logics, since in service dominant logic, services are viewed as dominated by the service provider (Heinonen, et al., 2010).

In provider dominant logics, customer is involved in co-creation with the product or service provider, whereas, in customer dominant logic the company is involved in customer activities (Grönroos & Voima, 2012). Customer dominant logic (CD) positions the customer in the center instead of the product or the service (Heinonen, et al., 2010). In this logic the customer is seen as value creator and a company only facilitates this value for its customers (Grönroos & Voima, 2012).

Value co-creation can be considered as one of the methods for developing the offering to match the actual needs (Grönroos & Voima, 2012), (Ramaswamy, 2009). Kaj Storbacka (2014) defines value created in co-creation with the customer as a relationship value where the company may seek to capture additional value through this relationship. Additionally, he argues that long term value capture is not possible unless the customers think that relationship has value for them. Therefore, it is stated that value-creation is pre-requisite for value capture. (Storbacka & Pennanen, 2014.)

Figure 7 presents the value creation and value capture as defined by Storbacka and Pennanen (2014).

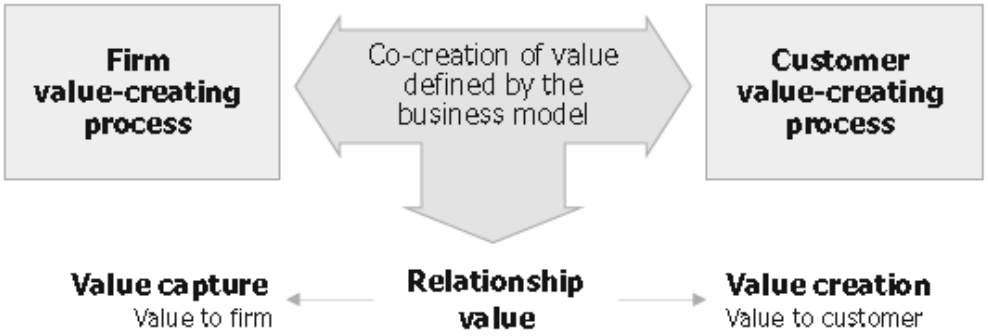

Figure 7. Value creation and value capture (Storbacka & Pennanen, 2014)

4.1.2 From Product Development to Solution Development

Lately also transferring the company's offering towards solution offering has been recognized as a method for increasing value co-creation. (Storbacka & Pennanen, 2014)
Dr. Olli Pekkarinen has researched this transition from product to solution offering. In his dissertation he presents that due to changes in the business logic, services have become the core of the many industrial companies' offerings with long-lasting service agreements over the life-cycles of their products. (Pekkarinen, 2013). Table 8 presents the definitions of industrial solution and industrial solution offering as stated by Pekkarinen (2013).

Table 8. Industrial solutions and Industrial solution offering (Pekkarinen, 2013)

Industrial Solutions
An ongoing relational process to satisfy a customer's particular business or operational requirements.
Industrial Solution Offering
An entity comprising the customized goods, services, collaboration, and finance needed to fulfill the industrial solution.

As a method that may help managing solution based offering, Pekkarinen presents three key findings: collaboration with customer, customer oriented mind set and thirdly service-driven organization (Pekkarinen, 2013).

Furthermore, Storbacka (2014) states that the first step to succeed in the solution business are to identify that solution business is a business model of its own. Additionally, he presents three main areas where companies should focus in order to gain successful transformation into solution business. These areas are: *industrialization*, *commercialization* and *solution platforms*. For these areas he provides methods for building capabilities and practices in order to create scalability, repeatability and efficiency. For instance, regarding customer capability, he mentions that in order to customer participate in the solution creation process they must have capability to bring their insights to the process. (Storbacka & Pennanen, 2014).

Table 9. Commercialization, Industrialization and solution platform (Storbacka & Pennanen, 2014)

Commercialization refers to a firm's ability to understand customers' value creating processes, to create solutions that enable improved value creation for customers, to create demand for these solutions, to sell the solutions to individual customers and to receive compensation based on customers' value-in-use.
Industrialization refers to a firm's ability to standardize and 'productize' the solution in order to create the prerequisites for repeatability and scalability. To support repeatability, firms need to define clear and common processes in such a way that the solutions can be efficiently replicated across regions and time.
A solution platform creates the necessary support for an effective solution business process. The platform consists of subsets of capabilities related to strategy, management systems, infrastructure support and human resources. While investing in solution platform capabilities is necessary, it is also difficult because these elements are not immediately visible to customers.

Before moving into building the capabilities the companies' first need to ensure that solution development innovation process is customer-insight driven instead of purely inside-out or product-driven. Additionally, as stated by Storbacka *integratedness* should be taken into consideration. By this he refers to an offering that consists of a large number of interdependent, integrated elements that create value beyond the sum of its parts. (Storbacka & Pennanen, 2014:7.)

4.1.3 Facilitating Value Creation through Well-Formed Requirements

"Value proposition refers to a set of capabilities and practices employed to determine how the provider's resources and capabilities, expressed as solutions (goods, service, information, and process components, can enable customers to create value" (Storbacka & Pennanen, 2014).

As stated above, by building a persuasive value proposal, companies may demonstrate what is unique in their offering compared to that of competitors. The services in this are connected and coordinated via value propositions. (Wang, et al., 2014). Therefore, the aspect of value or moreover value driver can be considered as essential part of requirements.

In order to contribute to value creation, the business requirements and further service requirements need to be well-formed. Therefore, received raw requirements should be analysed and formulated as well-formed requirements (IEEE Standards Board, 1996).

4.2 Services and Service Requirements as Part of Solution Offering

In industrial companies the role of services is typically seen as add-on services needed to compliment a product. In some cases the service may also be considered as a main output of an offering. Ultimately, the role of services can be considered as part of the solution. Furthermore, it can be stated that services also has to be developed at that same level of scrutiny as that given to product components. (Storbacka & Pennanen, 2014). As a result, service oriented business approach may offer clear advantages against the rival companies (Stevens & Dimitriadis, 2004; Shostack, 1984). Regarding the development of services, customer oriented design process should be followed instead of product oriented as this is often considered too bureaucratic and too slow process (Storbacka & Pennanen, 2014).

4.2.1 Service Concepts

Service concept can be seen as an essential part of the service design process. In order for the design project to succeed the needs and constraints should be well known. Additionally, in service concept phase enough time should be allocated for defining the requirements. (Hempe, 2011). The purpose of the concept phase is to define *what* the service is intended to do and *how,* for the new service to developed (Goldstein, et al., 2002: 121). With a clearly defined service concept the same core service can be developed and marketed to a variety of target customers. Furthermore, well formalized service concepts may improve on facilitating the strategic intent of the firm (Goldstein, et al., 2002).

Figure 8 illustrates the service concept as defined by Goldstein et al (2002)

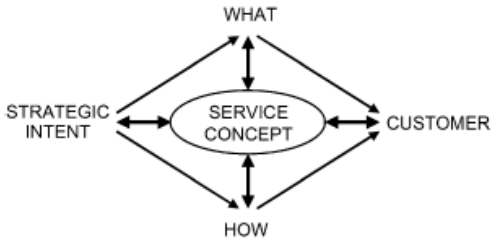

Figure 8. Service concept (Goldstein, et al., 2002)

Complexity of Service Concepts

One of the main reasons for complexity in service concepts is the definition of services itself. (Wang, et al., 2014). In past years the definition has been changing and additionally it depends on what the company is actually offering as a service. For instance Spohrer et al (2008) define service as follows;
"Service is the application of resources (including competencies, skills and knowledge) to make change (that have value for another)" (Spohrer, et al., 2008).
ITIL, in turn, defines service as *"A service is a means of delivering value to customers by facilitating outcomes customers want to achieve without the ownership of specific risk"* (Office of Government Commerce, 2007). As the term service cannot be unambiguously defined it can be seen that this may have an impact on which type of concepts companies should use for developing their services. The definition may thus be dependent regarding the perspective on how the role of services is seen in the compa-

nies. Wang et al argue that even though the definition of service is not mature enough in order to use common description, there can be identified some commonalities fitting all. Namely; *Intangibility, simultaneity, perishability, heterogeneity and complexity.* (Wang, et al., 2014). The commonalities the Wang et al. present can be seen as more detailed description of the common IHIP characteristics. However, also applicability of IHIP characteristics to catch the essence of the service has been criticized. (Lovelock & Gummeson, 2004)

Systemic approach as a method for understanding complexity

Systemic approach is a method where instead of concentrating only into specific part of the process or a system, a holistic approach is applied. Moreover, this approach concentrates on the interconnections between different parts of the system. Due to the very nature of the services, Stevens and Dimitriadis conclude in their research that, studying service production and delivery using systemic approach is widely accepted, (Stevens & Dimitriadis, 2004). Furthermore, Wang et al present in their study that systems theory and systems thinking can be used in order to form a theoretical foundation for Services science, management and engineering (SSME) (Wang, et al., 2014) .

4.2.2 Service Design and Design for Services

The main purpose of the service design can be described as a process for designing new or changed services that can be further introduced into practice. (Office of Government Commerce, 2007). Moreover the service design can be seen as the act of aligning the value with the implementation (Golnam, et al., 2010) Additionally, because of the fact that the context is one of the main elements in service design and this is often different depending on the service type or parameters chosen, it also makes choosing the best practice to follow on service design difficult. (Hempe, 2011).

Chen et al divides the service design according to three perspectives that they identified on the base of their research. Namely, these perspectives are: Strategy perspective, System Perspective and Process perspective. (Chen, et al., 2010).

Table 10. The Service Design Strategy of Manufacturing Service Industry, Comparison of three perspectives of service design (Chen, et al., 2010)

Dimension	Perspective of Service Design		
	Strategy Perspective	System Perspective	Process Perspective
Definition of service	Service is the key resource for the growth of enterprise	Service is a system structured by many components	Service is the process of innovation
Concept of service	Emphasize on content design fitting in with growth strategy, and analyze the influence on business operation	Choose service component, and detail to descript each content and process based on 3-5 levels' objective	Assist service elements go into existing service process
Key questions	• How service assists enterprise to grow up? • What benefits service provides to customer? • How service become to a new competitive advantage on business?	• Which components when building a service? • What's the definition of each level on service components? • What content and process when developing each item? • How service concept works on organization?	• What the service idea, service concept, and service content? • What's the necessary level on service process? • What supplementary resources organizations need to attain each objective?
Elements of service design	Target marketing segmentation, marketing position, service concept, value and cost, operation strategy, the integration of strategy and operation system, service delivery system	Stakeholders (customer), objective, input, outcome, process, human resource, physical environment, information supporting, external environment	Service objective definition, service function, customer demand setting, service characteristic, strategic criteria providing, measure criteria, service detail development
Characteristic	Strong connection with enterprise's strategy, but lacking of implementation	System thinking, but too complex to lose service concept focus	Stronger implementation, but easy to disperse organizational objective
Literatures	Heskett (1987)[14], Langeard et al. (1981)[21], Camian & Langeard (1980)[4],	Goldstein et. al. (2002)[13], Karni et al. (1997)[18], Langeard (1981)[21]	Storey & Easingwood (1998)[31], Johne & Storey (1996)[16], Edgett (1996)[9], Cooper et al. (1994)[5], Scheuing & Johnson (1989)[28], Parasuraman et al. (1988)[27]

For each of the defined perspectives they further define concept and the key questions the perspective is seeking for an answer. Through this, the elements needed for service design are being identified. Additionally, characteristics of the perspective is withdrawn and strong and weak points of the perspective presented.

Furthermore, on the base of this comparison they build up they own proposed framework for service design as presented in Figure 9.

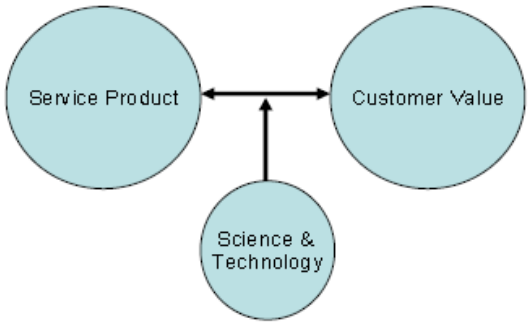

Figure 9. The framework of service design (Chen, et al., 2010).

In this framework they identify three main target dimensions and defining factors for each of them. First dimension is customer value for which defined factors are built from the ideology of what brings value for the customer. Service product factors relate to

service concept, service delivery and differentiation of service to be offered for instance from the competitors. Science & technology related factors describe value-added activity. These factors such as for instance environment means the recognition of technology applications that may bring efficiency or are considered as needed in order to be able to deliver the service. (Chen, et al., 2010.)

Design for Services

Service design mainly describes what a service may offer for the product or the company by combining the service to the product. Thus, offering only a one sided view. Importantly, it lacks the view of what a design can do for the service.

Dr. Anna Meroni and Dr. Daniela Sangiorgi (2011) approach service design with this view. In their book “Design for Services” they acknowledge service design as the disciplinary term, but focus on articulating what design is doing and can do for the services and how this connects to existing fields of knowledge of practice. The reason for selecting this approach, as they inform, is that because of the fundamental inability for design to completely plan and regulate services, it is more meaningful to seek to create suitable conditions for favourable interactions to happen. (Meroni & Sangiorgi, 2011.) As a conclusion they draw up that design for services is a wide area of application with a common denominator: *human-centred approach* (Buchanan, 2001). Meroni and Sangiorgi use this human-centred approach as core discipline to draw up a map of design for services.

Figure 10 presents the Map of Design for Services as defined by Meroni and Sangiorgi (2011).

Figure 10. Map of Design for Services (Meroni & Sangiorgi, 2011)

On the base of this human-centred approach they present that design for services works for four main areas which are; imagining future directions for service systems, exploring new collaborative service models, designing interactions to shape systems and organizations and designing interactions relations and experiences. (Meroni & Sangiorgi, 2011.)

Furthermore, in order to reach these future directions or to understand what customers are dreaming of, dream catching methods as Anu Helkkula states should be estab-

lished (Helkkula & Strandvik, 2014). These methods where customer's future expectations are collected can lead up to future innovations (Helkkula, 2014) and serve as a way to gain competitive advantage for the companies (Helkkula & Strandvik, 2014).

4.2.3 Service Requirements Characteristics

ITIL (Information Technology Infrastructure Library) literature defines requirement as a condition or capability that is needed by a user to solve a problem. (Office of Government Commerce, 2007). Furthermore, the requirements that governs an aspect of a system other than what the system is to do can be expressed as constraints. *(Alexander, 2002:81)*. These types of additional requirements typically direct the way of how a certain system should be designed and which aspects are to be taken into consideration in the design. The constraints can be expressed as a separate requirements, separate requirement after the main capability requirement, or as an attribute for the capability requirement. For instance they can be used to express what user *shall* be able to do with the product. When used as an attribute for capability requirement they can be used to express performance on how fast for example some functions should be able to be performed.*(Alexander, 2002: 85).* These constraints or qualities as often also expressed can be considered as a non-functional requirement. As functional requirements can often be considered as stating what a system or product for instance is supposed to *do*, non-functional requirements can be seen as stating how a system or product is supposed to *be* (Verlaine, et al., 2011).

When thinking of service requirements, it can be seen that these fall into both of these categories. For example when considering a product, non-functional requirements can be that the requirement is installable and maintainable. Furthermore, the constraints can be used to add quality attributes on what should be taken into consideration that the product actually can be installed or maintained. For instance, requirement may be that training for maintenance is provided to the maintenance personnel. However, as mentioned in previous chapters the design for a product should also take the design for services aspect into consideration (Meroni & Sangiorgi, 2011). Regarding this type of functional service requirements is for example a requirement that product shall have a status led. The requirement can be seen as specific functional requirement that relates to maintainability of the product. Constraints can be used as requirement attributes defining for instance how the led should indicate the status.

4.3 Practices for Managing Service Requirements

Requirement engineering is recognized as being critical for the success of any major development projects (Niu, et al., 2011). Additionally, when thinking of the requirements as part of solutions, firms must be able to respond to changing requirements rapidly, while at the same time securing repeatability and scalability of solutions. (Storbacka & Pennanen, 2014). Managing requirements efficiently may offer also tools for building repeatability for the offered solutions. For instance as Storbacka states, the solutions do not need to be fully tailored, as this can be seen to generate excessive costs in solution creation. Rather they should rely on customized standardized solutions. (Storbacka & Pennanen, 2014.)

Agile practices

As software development and lately also hardware development have started more and more to adopt agile development practices, it is worth considering also the requirement engineering practices related to this. In agile development, early delivery is one of the key points and the final solution may change radically between the early versions and the latter ones. Therefore, also the requirements are evolving through this process. Empirical study done by (Balasubramaniam, et al., 2010) based on data collected from 16 software companies, summarizes that although agile requirement engineering may bring some benefits, such as early involvement of the customers and iterative face-to-face communication, it also has some notable challenges. Namely, the identified three main challenges where: *overemphasis of functional requirements, inadequate inspection of requirements and incorporation of design requirements*. Additionally, they state that most important requirement engineering (RE) practice in terms of influence on each of the RE activities is the *intensive communication between the developers and customers.* Conclusion can be thus made, that specifically if agile method is being used in product development, it means that there must be a clear path of communication between the customers and developers of the product as well as developers of the related service in order to have agile response to the changed requirements. (Balasubramaniam, et al., 2010.)

Figure 11 presents the identified agile requirement engineering practices and challenges as identified by (Balasubramaniam, et al., 2010).

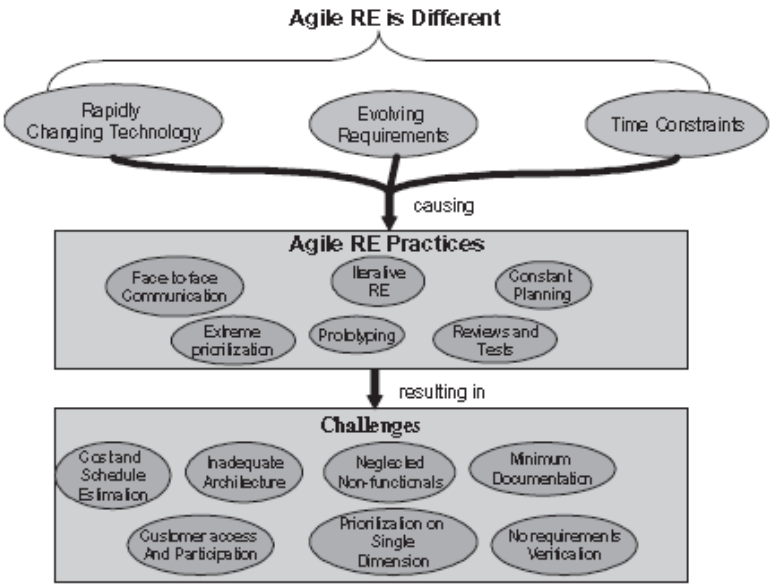

Figure 11. Agile RE practices and challenges (Balasubramaniam, et al., 2010)

Alternatively, Niu et al. have studied possibilities of applying soft systems methodology in order to improve requirements engineering practices. They argue that using soft systems methodology as a holistic approach for requirement engineering, possible flaws in the process could be identified. Additionally, they identify that use of this methodology can have a rich value in scrutinizing and improving the human-centred requirement activities (Niu, et al., 2011). For this, they introduce the potential improvements that this method can achieve through specific requirement engineering areas in order to improve the situation in the development process.

Figure 12 presents the potential changes to improve requirement engineering practices as identified by (Niu, et al., 2011).

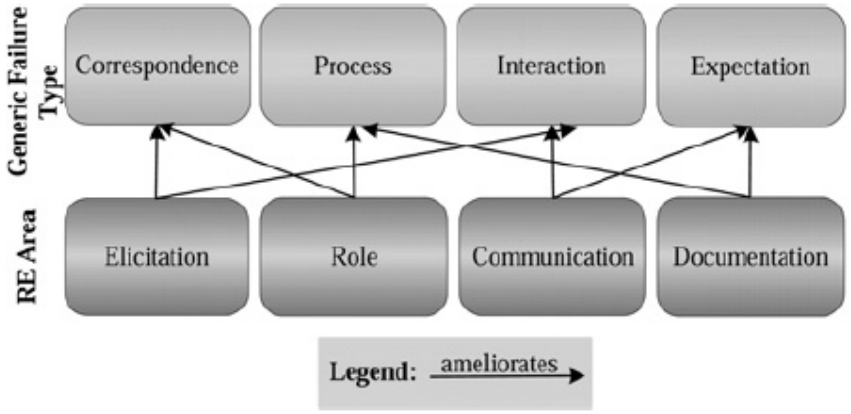

Figure 12. Potential changes to improve the RE practices. (Niu, et al., 2011).

The four areas that they present are *elicitation, role, communication* and *documentation*. As for methods to improve practices in these areas, they present that requirements elicitation should be done by use of multiple sources, explicit requirements analyst role and more direct communication between the users should be established and regarding documentation formal documents for contractual purposes should be maintained.

4.3.1 Eliciting and categorizing requirements

As described in the literature, the service requirements are the key ingredients of service design that should be well considered already before moving into the actual design phase. For effective elicitation of the requirements and furthermore analysing them, they should be categorized. The ITIL categorizes the requirements into three main categories, namely: *Functional requirements, management and operational requirements* and *usability requirements* (Office of Government Commerce, 2007).

Table 11. Requirement categories on the base of ITIL service design, Office of Government Commerce, 2007

Requirement Type	Functional requirements	Management and operational requirements (non -functional requirements	Usability Requirements
Main characteristics	Describe the things a service is intended to do Can be expressed as tasks or functions that the component is required to perform	Serve as basis for early systems and service sizing and estimates of cost Can support the assessment of the viability of the propose service Can be used to prescribe the quality attributes of the application being built	Ensure that service meets the expectations of its users with regard to its ease of use Can be used to prescribe the quality attributes of the application being built
Categories	Functionality	Manageability Efficiency Availability and reliability Capacity and performance Security Installation Continuity Controllability Maintainability Operability Measurability and reportability	Usability

Additionally, Niu et al present a conceptual model based on the soft systems methodology for requirement elicitation. They recognize that requirements should be gathered using multiple elicitation techniques (Alexander, 1999) and they should also be reviewed by all relevant stakeholders. The example methods for eliciting the requirements that they have studied include rapid prototyping (such as agile), feature list (documented required features), card sorting (sorting the requirements in groups having specific domain entity) and repertory grids (crystallizing the concept and meaning of requirements). (Niu, et al., 2011.)

For effective collection and use for development project purposes a requirement catalogue (Office of Government Commerce, 2007) or a requirement library as a centred point for the elicitation requirements to be validated and further verified is meaningful to be established. The selected viewpoint on defining the requirements should be pre-

sented (Kotonya & Sommerville, 1992) and requirements should be categorized (Office of Government Commerce, 2007). Furthermore, the library should also be built in a way that the systemic view is taken into consideration (Niu, et al., 2011) in order to be able to determine the value of the requirements as part of complete offering (Pekkarinen, 2013).

4.3.2 Validating and Verifying the Requirements

As discussed in previous chapter, in order to be able to manage requirements efficiently, a clearly defined place for eliciting the requirements should be established. Furthermore, a requirement library, built for this purpose can offer repeatability for the use of the requirements. Furthermore, this can offer compatibility (integratedness; Storbacka & Pennanen, 2014) when considering the use of requirements as part of overall product development process. However, in order to be able to manage the requirements effectively methods for validating the requirements and verifying whether the requirements have been fulfilled should be established.

The purpose of validating the requirements can be seen as process for evaluating if the requested requirement is firstly valid considering the development project. Furthermore the purpose is to ensure that the requirements are based on the actual needs (Raja, 2009). Alternatively it can be described as process for ensuring that the requirement is correct (Yousuf, et al., 2008). For this purpose the requirements should inform the source where the requirement has been received and also some reasoning why the requested requirement is needed. Value driver can be considered as an effective statement for rationalizing the need prioritising the requirements in order to understand what the value they bring is either for customers or internal stakeholders. Furthermore, the requirement should also be validated after the delivery of the service in order to collect feedback if the requirement thought to be fulfilled actually fulfilled the needs. In some cases for instance the feedback may only be received after the service has been delivered and therefore a clear feedback loop should be established from the customers and stakeholders involved with the delivery of the service all the way back to the persons involved in validating the requirements and designing the services. This information may then be used in order to improve the service to meet the actual needs. Several methods such as prototyping, inspection & reviews can be used for requirements validation (Yousuf, et al., 2008).

In addition to validating the requirements they should be also verified. By verifying the requirement provider is able to collect information if the designed product, service or solution actually meets the set requirement. (Office of Government Commerce, 2007) . It can be described as a process of evaluating that the conditions imposed at the start are satisfied. (IEEE Standards Board, 1996) .For verification purposes key performance indicators (KPI) or service acceptance criteria (SAP) should be set. (Office of Government Commerce, 2007) .

4.3.3 Roles and Responsibilities

In order to be able to manage the service design process and the service related requirements, adequate resource must be allocated for this. Additionally, the resources should be linked to the actual process as well as to the customers (Reinoso, et al., 2009). Further, during the service design process the process has gained new knowledge and thus the process should be iterative in order to be able to use this knowledge as an advantage (Spohrer, et al., 2008; Hempe, 2011)

Reisono et al (2009) present in their study a framework for linking resources, process and the customer. In this framework they present three fundamental resources that should be supported by the new service developments models. Resources in this framework include *intellectual, physical* and *organizational resources*. Employees are recognized as a critical intellectual resource and furthermore developing these resources across the organization's boundaries is essential. Organizational structure is another important resource, the structure, such as strategic plans, should support new service development process. Additionally, the interaction between the customers and outside partners must be supported and the information such as customer feedback linked to the development process. The third resource type is the physical resources, which includes tangible technologies that are occupied by the company as a key a factor that drive service development. (Reinoso, et al., 2009.)

Figure 13 presents the framework from linking resources, processes and customer as defined by Reinoso et al (2009)

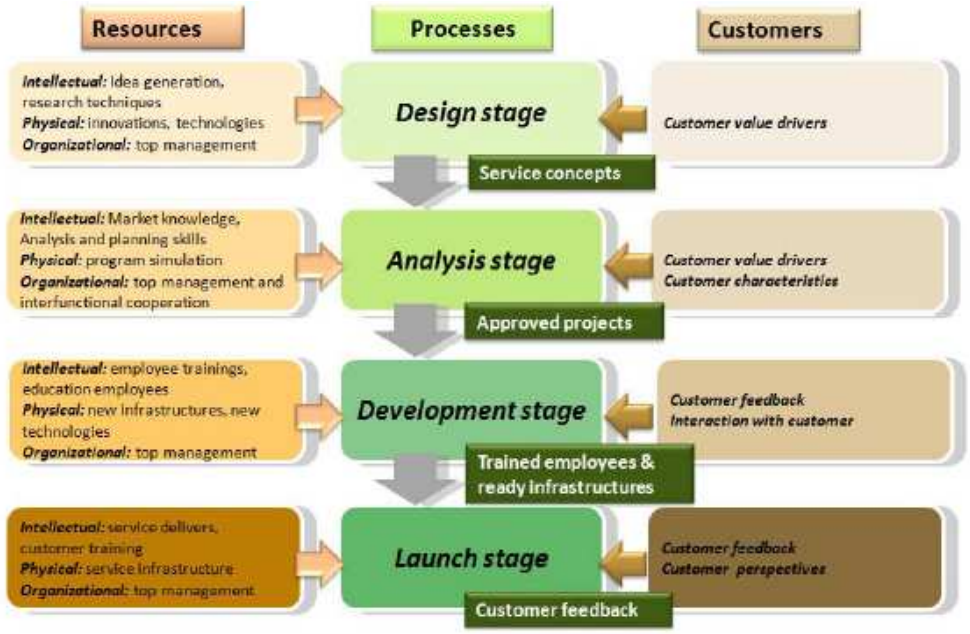

Figure 13. The framework for linking resources, process and customer by (Reinoso, et al., 2009)

ITIL describes specific roles for each step in the service design process as well as for the requirements management (Office of Government Commerce, 2007). Alternatively, Niu et al present in their study that a specific requirements analyst role should be established in order to better communicate the project meetings and to possibly replace the user representative. However, as a result through their case studies this type of role is seen as having negative impact in the companies. Most case companies do not see the specific role of requirement analyst in the projects as necessary. (Niu, et al., 2011.) Additionally, when considering the structure of the fully utilized ITIL service design management process it may be seen as too heavy when considering the case company purposes. Therefore even though clear roles should be defined in relation to requirement management it may not necessarily mean that new positions should be established in order to fulfil the management needs if this can be done by sharing the responsibilities among existing roles. Moreover, as Niu et al recognizes, it is important to involve all stakeholders in the phase of reviewing the requirements (Niu, et al., 2011).

4.4 Conceptual Framework of This Thesis

The strengths and weaknesses of the case company regarding service requirements and their management were identified on the base of the current state analysis. The results further directed on the search of literature in order to identify best practices that would answer to these needs. Alternative views and frameworks were compared and as a result conceptual framework of this thesis was constructed.
Figure 14 presents the conceptual framework of this thesis.

Figure 14. Conceptual Framework of the Thesis

Value drivers refer to the conclusions that services and service requirements are part of facilitating the value for provider and customers. Furthermore, this should be considered also when defining the service requirements. That is, it should be considered if fulfilling the requirements can assist on value creation. Moreover, this can assist on prioritizing the requirements. In addition, compatibility (*integratedness)* should be con-

sidered in the service requirements. The compatibility to other inter-connected parts should be considered when defining service requirement and when considered whether it is to be fulfilled or not. Moreover, meaning that service requirements should be compatible with the overall business and product requirements.

Design for services refers to the conclusions that the development processes should consider also the aspects on what the design can do for service. Furthermore, in addition of fulfilling the current needs, the aspect of future development possibilities should be able to be considered. Moreover, in the context of this study, it means that service requirements should also be able to be presented in a way that they may enable future possibilities for further development of the offered solutions.

Well-formed service requirements refer to the conclusions that in order to be able to effectively analyse and further manage the requirements they need to be well-formed. They should be clearly described and offer a method for validating and verifying them.

Service requirement elicitation, refers to the conclusions that the requirements should be collected using multiple techniques. To truly understand what requirements are to be fulfilled they need to be collected from the customers as well as from all stakeholders. For effective elicitation and management of the requirements there should also be clearly defined place where the requirements are to be collected. That is, for instance, service requirement library. To be able to efficiently manage the service requirements library, the requirements need to be clearly categorized and they need to be identifiable through their specific characteristics.

Linking resources, process and the customer refers to the conclusions that in order to effectively and efficiently manage service requirements these aspects should be well linked together. Thus, clear roles and practices need to be defined for service requirement management. Additionally, also the customer should be linked in this process as often the final validation whether the service requirement actually fulfilled the needs can be concluded only through feedback from the customer.

5 Initial Proposal for the Case Company

This section merges the results of the current state analysis and the conceptual framework towards the building of the proposal for the case company.

5.1 Building the Proposal

Building of the proposal for the case company was started by combining the key findings from the current state analysis with the conceptual framework of this thesis. Data collected on current state analysis phase (data 1) assisted on identifying the issues that should be addressed in the proposal. For the initial proposal building phase the data was collected through meeting notes that were done on the basis of discussions (data 2). At first, discussion with the R&D project manager and the product manager of the case company was held in order to understand what type of service requirements are presented for the product development project that was used as a case project in this study. Discussion with the quality engineer of the case company revealed the constraints of processes that were related to the use of requirement engineering tool. Additionally, discussions were held with the head of service development where the first drafts where presented and feedback on the base of these was collected.

Figure 15 presents results from current state analysis combined with conceptual framework and used for building the initial proposal.

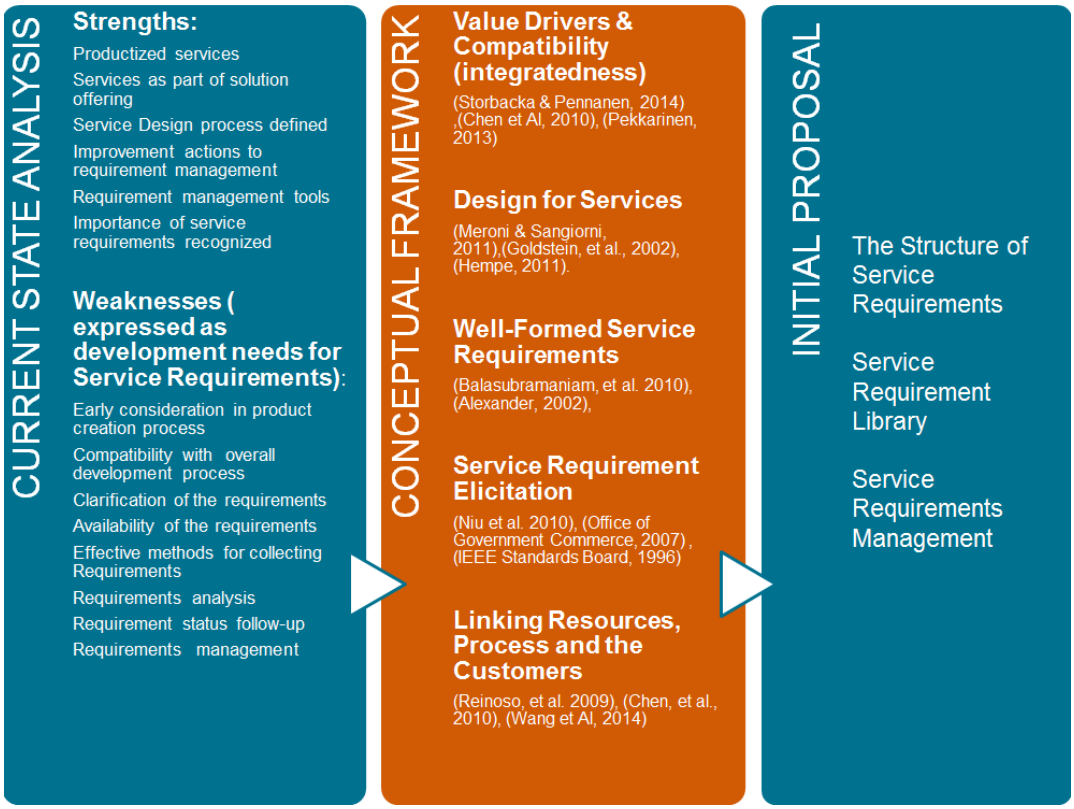

Figure 15. Building the Initial Proposal

The building of the initial proposal was divided into three phases. First, the structure of *well-formed service requirement* was defined. Next, *the structure of the service requirement library* was defined. Third, *practices for managing service requirements* as part of the service design and product development process were defined.

5.1.1 Well-Formed Service Requirement

On the basis of the literature review it was seen that the term service itself cannot be unambiguously explained, therefore defining what a service requirement is or contains cannot be unambiguously explained either. However, several aspects on how to form raw service requirements in to well-formed service requirements were able to be identified through literature.

Regarding the categorizing of the service requirement it was concluded that on high level they are part of the business requirements, in a more detailed level they can be seen as functional and non-functional requirements. As the outcome of the service is often intangible, requirement falls often into category of non-functional requirement. However, as was seen on the base of the current state analysis and literature review; the aspect of design for services is needed to be taken into account. Considering this, the service requirement can be categorized also into functional requirements as some of the requirements can be directly related for instance on what a hardware product should do. Furthermore, the service requirements are part of capability requirements, as well as quality attributes or constraints that impact on more detailed level on the product design.

Analysing the service requirements of the case project

To understand further what type of specific service requirement there are already addressed on the product development phase are, a case project was chosen. The selected case project is a large product development project in the case company, which includes several services that are to be offered as part of the product offering for this coming product. On the basis of the discussion with the R&D project manager of this particular development project it was concluded that only few service requirements exists at the moment. Further analysis of the actual requirements list used to elicit all the requirements related to this project revealed that depending on how to categorize the requirements, there could actually be seen already several service related requirements being presented.

A main finding from the requirements list was however that the level how the requirement had been defined varied. In some cases the requirement was clearly written and expressed what shall be done in order to fulfil the requirement. In several cases, however, the requirement was a very high-level definition and did not give information on what shall be done in order to be able to fulfil the requirement. Some of the requirements could be clearly seen as unmeasurable or a wish type, more directing on which type of things could be considered instead of stating an actual requirement. Additionally, clear categorizing of the service requirements was non-existing and the origin of the requirements was not shown. It was not visible if the requirement originated from the service organization or from the customers, or if it was based on some existing stand-

ard. Furthermore, in all cases, the requirements in the list did not show clear rationalizing on why the presented service requirement should be fulfilled. That is, what would be the value of the requirement.

Finally, it was also seen that even though many of the requirements were written in a way that they refer specifically to this particular project or a product family, the nature of the requirements can be seen as applicable to most of the products that the company is developing.

Improving Service Requirements

When combining the results of the requirements analysis of the case project to the findings from the data collection round 1 and best practice on the basis of the literature review, a combination of what should be included in the service requirement can be stated. Namely the issues that should be considered when defining service requirements are; *value driver*, *origin, priority, description, repeatability, compatibility*, *validation and verification.* Figure 16 presents the 8 key issues that are to be considered when defining service requirements.

Figure 16. Key issues to be considered for service requirements

Regarding business requirements, *value driver* can be seen as the main motive for both the customers to buy the service and provider to sell the service. This can be seen as the main method for rationalizing if the requirement should be fulfilled or not. Therefore, this can be considered as the single most important issue to be shown also on the service requirement. Thus, for all service requirements it should be stated what the value driver of the presented requirement is. That is, what type of value creation fulfilling the requirement may facilitate. For instance it may be stated that based on the market research customers have requested this type of service. It may also be for instance that internal value is achieved if fulfilling the requirement enables more efficient method for delivering the service. Through this, it may also enable additional value for the customer. In addition, value can be defined for instance as a strategic value.

Origin, as for value, it should be shown where the requirement has originated from, for instance if it is an internal requirement or a requirement received from a specific customer.

Priority should also be stated, as this would impact especially the project phase scheduling when defining which of the requirements must be fulfilled in the first place and which can be considered to be fulfilled later on, for instance in the later release phase. This is an important aspect specifically when considering that some of the development projects follow agile development methods where requirements are constantly evolving on the basis of the feedback and all requirements are not intended to be fulfilled in the first phase.

Description should be defined for all requirements. This should be as informative as possible giving the information of what is the actual meaning of the specific requirement or group of requirements.

Repeatability is worth consideration. From the basis of the literature related to solution business it was concluded that one key factor for succeeding in the solution business is to define basic sales items that are scalable and can be integrated into alternating solutions. Therefore, when considering requirements, it is meaningful to seek fulfilling requirements that can be repeated in other development projects or can be added as part of service offering.

Additionally, requirements should also offer *compatibility* as compatibility or moreover integratedness with other requirements as well as with other processes is needed to be taken into account when considering the final output of the product development process.

Validation and validation status are important for all requirements. This should inform if the requirement has been approved. For instance in a requirements review phase where requirements are presented they can be validated if enough information is received and requirements are considered as needed to be fulfilled. Additionally, the main purpose of the validation is to evaluate if the approved and furthermore verified requirement actually fulfils the need. Thus, final validation can be only done after the requirement has been verified.

The *verification method* is also an issue that should be defined for each requirement. As the service related requirements are often intangible, defining the exact verification measure such as KPI can be difficult. However, specific service acceptance criteria's can be applied for verification. Furthermore, regarding verification it can be defined that which phase of the development process the method is to be verified. In some cases the requirement can be defined in the design phase but in some cases it may be so that the requirement can only be verified in the capability build phase or after the actual delivery of the service where the requirement relates to. Verification in this case may base on the feedback from the pilot customers and from the internal stakeholders who have actually delivered the designed service. For this reason, the use of selected pilot customers is crucial in order to be able to verify and furthermore validate all service requirements before making an official commercial launch of the product and the related services.

5.1.2 Service Requirement Library

On the basis of the literature review it was concluded that the requirements should be gathered to a common place. The elicitation of the requirements should be done using multiple techniques. Additionally, the requirements should be clearly categorized by their type or their characteristics.

In the case company, service offering is extensive, covering wide variety of productized services. As the services have already been productized, some of the requirements regarding each service product are already well known. Regarding these requirements it can be concluded that some of the requirements are more of a generic type which apply to most of the services company is offering and some of the requirements are more specific which apply only for a specific service or few services. For instance, the defined deliverables which must be created for all services are examples of generic requirements. This approach offers clear method for categorizing the requirements.

Additionally, as was concluded on the basis of the literature review and the analysis of case project requirements, the requirements can be categorized by their characteristics. For instance some of the service requirements relate to *installability* or *maintainability* of the product.

Hence, the proposed elicitation method for requirements starts by defining main requirement categories. In the case company it is meaningful to establish one category as *generic requirements* and one category for referring to the specific services; that is *service product specific.* Additionally, as some of the requirements may not be actually fulfilled, or they may be considered as wishes, a specific requirement category for this is meaningful to be established. *Dream Catcher,* the name that Anu Helkkula uses for defining the purpose of capturing new innovations (Helkkula & Strandvik, 2014) is proposed as a name for this third category type. This category can act as a pool of requirements that can be considered by the project if fulfilling some of them could be considered to bring additional value. Furthermore, in best cases, they may serve as a source for developing future innovations.

In addition, using specific characteristics, such as for instance *installability, maintainability* or *supportability* the requirements having same characteristics can be identified. These can help in finding the similar requirements even though they would fall into different main categories.

Moreover, this type of categorizing improves also the repeatability and integration of the requirements so that same type of requirements can be duplicated for new projects without needing to define them all over again. Additionally, to be able to consider service requirements systemically, a clear links between the overall requirement management processes should be established. For this purpose the tool that the case

company is utilizing for requirement management is meaningful to be used also for service requirements. Therefore, also the constraints of the tool as compatibility to other requirements should be identified.

The ideas regarding the structure of the service requirement library were firstly presented to the head of service development. On the basis of the feedback received on this discussion the initial proposal for service requirement library structure is built.

Figure 17 presents the initial proposal representing the service requirement library structure with connection to the specific software tool.

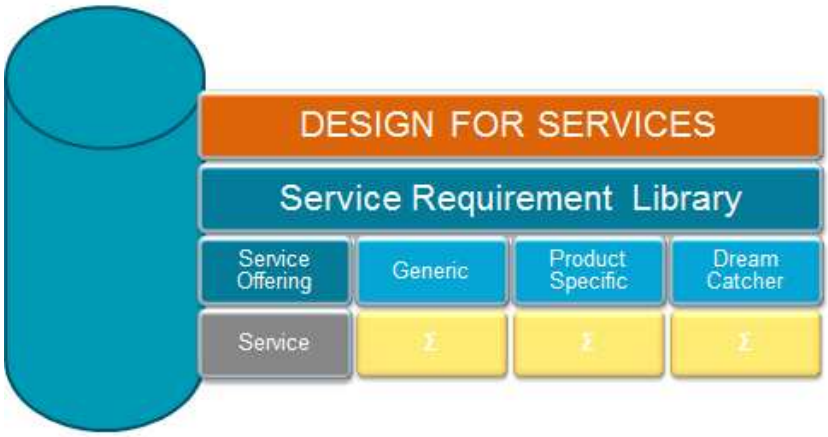

Figure 17. Service Requirement Library Main level hierarchy – Initial Proposal

The initial proposal illustrates the high-level hierarchy with connections to the actual requirement management tool. Design for Services refers to the actual project name to be used in the specific requirement management tool to build up the library. The service requirement library refers to the structure of the library. The library is proposed to have three main categories; generic, product specific, and dream catcher. All three categories contain the specific individual requirements.

5.1.3 Service Requirements Management

The practices for managing the service requirements as part of service design and product development process should offer repeatability and the roles for this should be clearly defined. Furthermore, as the requirements are intended to be fulfilled during the product creation process they should offer compatibility (integratedness) to the overall process. This is taken into consideration in the initial proposal. By use of the service requirement library, as shown in figure 17, the product development project can further identify which requirements should be fulfilled for the selected services intended to be developed for the new product. Furthermore, these requirements can be cloned directly to the project structure if the project is using the requirement management tool for of the development project.

Secondly, by well-formed requirements, which are defined as shown in chapter 5.1.1 the project can identify the purpose of the specific requirement, method for verifying the requirements as well as the value driver as an argument of why it should be fulfilled. The status of the requirement validation and verification can be followed through the software tool.

In a case where specific service requirements for the new project are not included in the library the project may create new requirements using a predefined structure for them. This would offer compatibility to the already existing requirements. Furthermore, if the requirements can be seen as repeatable to other development project purposes, those can be cloned to the requirement library.

Roles and Responsibilities

Next, a proposal for roles and responsibilities regarding service requirement management as part of product development process are presented.

Firstly, a clear *requirement analyst* type of role should be defined. It is to identify who has the overall responsibility of the service requirement library. This role is further responsible on the overall development of this library as well as the process related to it.

Regarding the case company, this role does not necessarily mean a specific position, it may also be considered as part of requirement engineering duties.

Secondly, regarding how these requirements can be used in the service design process and product development process, roles need to be defined. On the basis of the current state analysis it was seen that information regarding these requirements is not always available for all relevant stakeholders. For this reason, as already defined in the process, in the service concept and service design requirement review phases all relevant stakeholders should be involved. For instance in the case company this means that there should be service representative, such as service expert, attending in the meetings.

Customers usually are not part of these types of requirement reviews. However, in order to bring customer insights into the review, the requirements should be collected effectively. These views can then be discussed in the form of requirements in the review meetings. For instance if new requirement under dream catcher category have been collected, these can be presented in the service concept phase. Additionally, pilot customers and co-operation with customers should be used for gathering early feedback and understanding the needs and the requirements more comprehensively.

Requirement availability

Next, regarding the process of verifying the requirements, the status information should be available not only for the development project, but also informed for the persons acting in a relevant roles, for instance persons responsible for the selected service products or delivery of these services.

Additionally, a clear and direct method for requirement availability should be established. The status of the verification should be available for all in need of this information. For instance in a case where the requirement can only be fulfilled in piloting phase or after the official release, there must be a clear path for the persons involved in delivering the product to give feedback on the requirements. Additionally, the fulfilment should also be verified directly from the customers after delivery, for example by use of timely customer satisfaction surveys with specified questions.

For this, it is important to further develop the practices related to this. For instance the person responsible for the overall requirement library management should inform all relevant stakeholders regarding the new or changed requirements. Service product managers should be informed as well as persons involved in delivering the service that relates to the changed requirement. Regarding possible requirement changes with impact on the installability of a product, field service managers whose team members are responsible for installing the products, should be informed of these changes. Additionally, field service managers should inform if changes to the requirements are proposed on the basis of feedback captured in the field.

Capturing the Requirements

As it was seen from the basis of current state analysis the requirements where not considered to be collected effectively all the time. Thus, the recommendation is that requirement collection methods should be utilized using multiple sources.

The most important source for collecting new requirements is clearly the customers. All stakeholders who may receive new requirements from customer should have a possibility to forward these for further evaluation. In the case company these persons are typically the people whose work involves direct customer interaction; this is for instance sales, regional managers, application managers, field service and technical support. Regarding collecting these types of new requirements, a template for the requirement proposal is proposed to be used.

Additionally, one important source for collecting requirements is the customer service group through customer satisfaction surveys. On the basis of the current state analysis it was already seen that this method is being utilized and actions are done on the basis of the survey results. However, it was presented in the open-ended comments that these may be mainly considering on the needs and requirements that are seen critical and based on the low customer satisfaction scores. Moreover, meaning that actions are done accordingly if there is a clear need. In cases where the requirement is more of a proposal type, the possible future opportunity may be missed. Therefore, regarding these types of requirements it is also essential to try to effectively capture them and add them in the requirement library for later validation. This may open new possibilities for new services and innovations in the future.

Guidelines and instructions

The case company is a global organization where several product development projects are constantly ongoing in multiple locations. For this reason, general guidelines and instructions related to service requirements should be established. General guidelines should for instance guide the development project on how to take the service design requirements in to account. For this purpose it is presented that guidelines are generated by use of the internal information sharing tool that offers direct linkage to the requirement management tool. These guidelines should be developed in a way that for example product development project can easily use the requirement library for the benefit of the project. Additionally, the intention of guidelines is to offer repeatability. However, it has to be acknowledged that in all cases, depending on the nature of the development project, guidelines may not be fully utilized for the purpose of the project. Thus the guidelines are more intended to offer main general rules or best practice that is recommended to be followed.

Furthermore, instructions are to be created for defining the requirements. This instruction should be made available for everyone, as mentioned earlier; requirements should be collected from multiple sources. By utilizing clearly defined instructions on how to define requirement, the actual process for analyzing the requirement and furthermore validating may then be improved. Additionally, instructions for requirement management purposes should be established.

Regarding the actual requirement review phases main level instruction documents have already been created. For these documents relevant instruction concerning specifically service related requirements should be added.

5.2 Summary of the Initial Proposal

To summarize the initial proposal, the content of the topics discussed and included in the proposal are presented in figure 18.

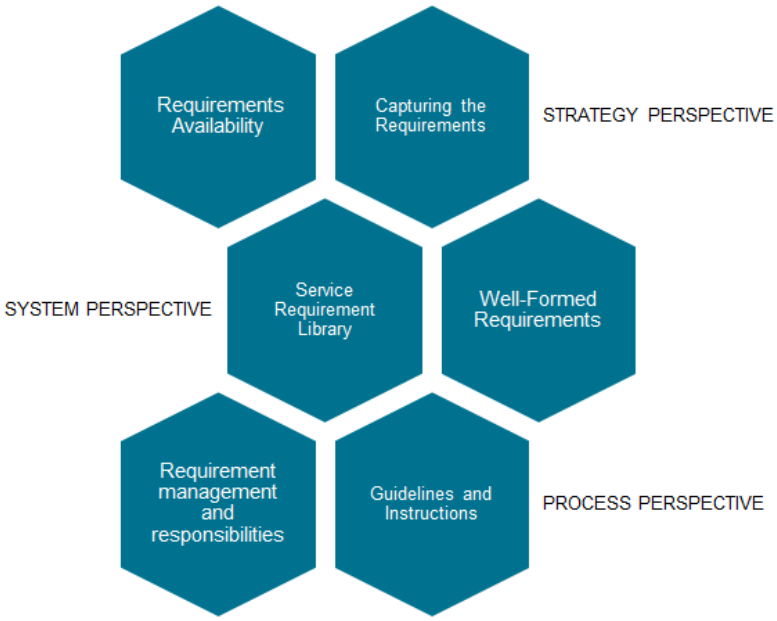

Figure 18. Content of the proposal for the case company

Initial proposal consists of well-formed service requirements, which are presented to be defined as discussed in chapter 5.1.1. Next, the elicitation of service requirements is presented to be done by use of service requirement library, for which the proposed structure is shown in the chapter 5.1.2. These can be considered also as issues that are related to system perspective. Stated proposal should offer integratedness to the existing systems and development projects. Proposal regarding management of service requirements as part of product development process is further divided to four elements. Content of the proposal regarding requirements availability and capturing the requirements can be further considered to be part of strategy perspective, as they are to be aligned with the business model practiced in the case company. Requirement management and responsibilities, when considering the product development process as well as guidelines and instructions, can be considered as related to process perspective. These proposals are further intended to guide product development process regarding the management of service requirements.

6 Validation of the Proposal

This section presents the process for validating the initial proposal and building of the final proposal.

6.1 Revising the Initial Proposal

Validation of the proposal was conducted by presenting the initial proposal to several stakeholders of the case company. Furthermore, the data collected (data 3) on these validation rounds was used for revising the proposal in order to be able to present final validated proposal. Figure 19 presents the validation cycles for the proposal.

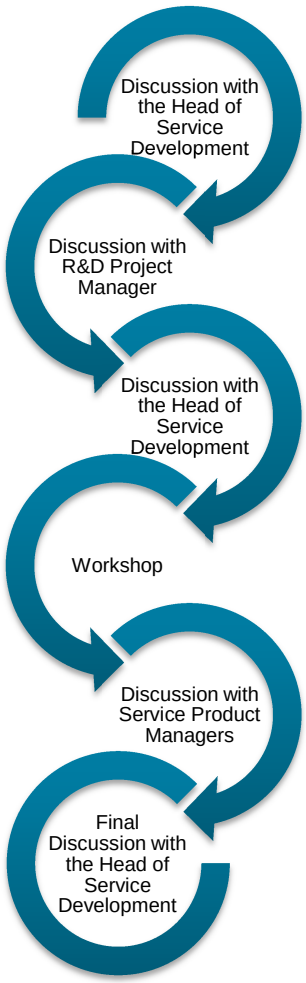

Figure 19. Proposal Validation Cycle

The *First step* for validating the initial proposal was to present it for the head of service development. As a result of this meeting some modifying was requested on the initial main level structure of service requirement library, presented in Figure 18. The structure was then modified on the basis of the feedback.

As a *second step* the proposed structure for the service requirement and the service requirement library were presented to the R&D project manager responsible for the product development project used as case project in this study. The proposed structure for the service requirements, as issues that should be shown in these requirements, were seen as acceptable. Regarding the structure of the library, where requirements would be categorized by each service product type was also seen as clear method for finding the correct requirements and their relation to each service product for product development project purposes. Regarding the generic category, it was presented that this might not be needed as most likely all requirements could be defined directly under the specific product related categories. For instance, the service descriptions including statement of work and end user price for the selected services where seen as mandatory deliverables. Thus, were not considered as needed to be referred in the generic category.

As a *third step*, the supervisor presented the requirement library for the persons responsible for overall requirement management and to the quality engineer involved with quality processes. In the next meeting with the supervisor, feedback from this presentation was discussed. Some more modification to the detailed requirement library model was requested in order to align it further with the overall development processes of the case company. For instance the characteristics, such as installability and maintainability should be clearly seen. Furthermore, these modifications were made to the model.

The *fourth step* was to build the library structure using the specific software tool. This was done in a workshop together with the head of service development and the environmental engineer. Furthermore, the environmental engineer, provided aspects for aligning the service requirement library with other already existing library structures. As an outcome of the workshop, the structure was created by use of the software tool.

Later on, some of the already identified specific requirements where added where the aspects the stated as needed for the requirements were shown, were added to the library.

After the first version of the structure was built the whole model with specific service requirements was presented to the service product managers. This was considered as *fifth step* of validating the proposal. Feedback from service product managers was considered essential as they have the overall responsibility of managing the productized services. Additionally, they are also responsible for fulfilling, as well as for defining some of the requirement. Most discussion in this meeting concentrated to the actual structure of the library. Service product manager stated that it is important that specific requirements related to their field of responsibilities should be able to clearly seen in the structure. For instance if the high level categorizing is used with service offering types, it may be that when the offering changes the categorizing is no longer valid. Also it was uncertain if all R&D project managers would understand this type of categorizing. The categorizing should be clear enough so that everyone would understand what requirements are related to this category.

This categorizing can be further seen as an issue that will evolve during further validation rounds and when the structure is actually tested in several projects. Another issue was related to how specific the requirements stated requirements should be. As presented by the researcher these should be kept in a level that they can be used for all or most of the development projects without need to modify them each time. This was the repeatability and compatibility aspects as discussed previously. If several specific requirements, for instance regarding to calibration and repair type of services would be received, more detailed categorizing can then be applied, but it would not be meaningful to establish these types of categories until enough specific requirements has been collected. Additionally, as the intention of the library is to offer repeatability, it would not be meaningful to specify requirements that apply only to some specific hardware or software product in the library. However, as a proposed action, when this library will be used as part of specific development products, the product specific products will be collected to the exact project used for this in the software tool. After these projects, the requirements may then be transferred as a new category in the library, or then kept in the project module where they can be withdrawn and repeated if a new project from the same product family is developed.

Furthermore, the responsibilities regarding managing the requirement library were also discussed in this meeting. During the discussion, it was agreed that service product managers need the possibility to define requirements related in their responsibilities. Regarding the verification and validation of the requirements it was also agreed that service has to be part of this process. And as presented, the persons responsible for actual delivery of the selected and further developed services shall have a way to state if they see the requirement as fulfilled as not. The final verification status may then be concluded on the basis of this feedback.

As a *final validation step* the final proposal, discussed in the next chapter, was presented again to the Head of Service Development. Additionally, the progress that was done for building the service requirement library after the workshop was presented. The structure of the service requirements and service requirement library was approved to be taken into use.

6.2 Final Proposal

After the modifications were made on the basis of the validation rounds a final proposal was formed. The final proposal for the *service requirement library* high level structure is presented in Figure 20.

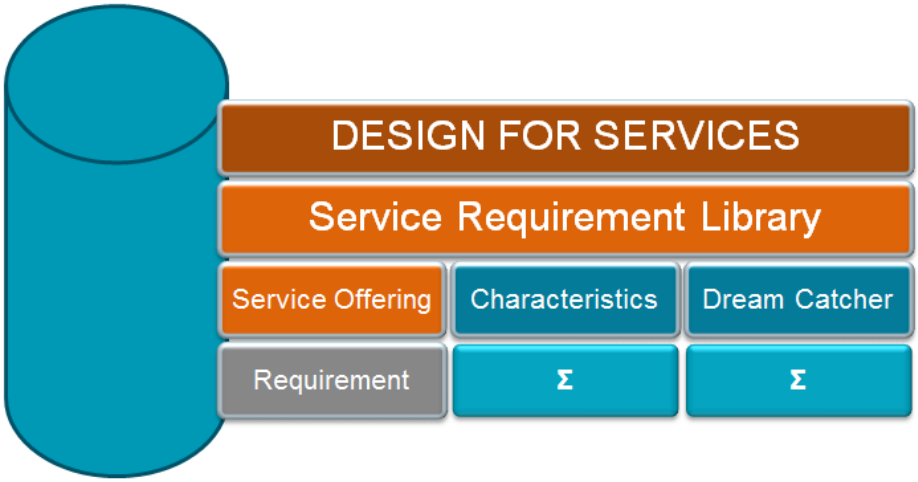

Figure 20. Final proposal for the service requirement library

The requirement library consists of characteristics and dream catcher categories. The generic category is removed. In the structure the generic requirements are combined

under the characteristics requirements. On the high-level these characteristics requirements are further grouped under five main categories of service offering.

Figure 21 presents a snapshot of the requirement library structure that has been built by use of the software tool.

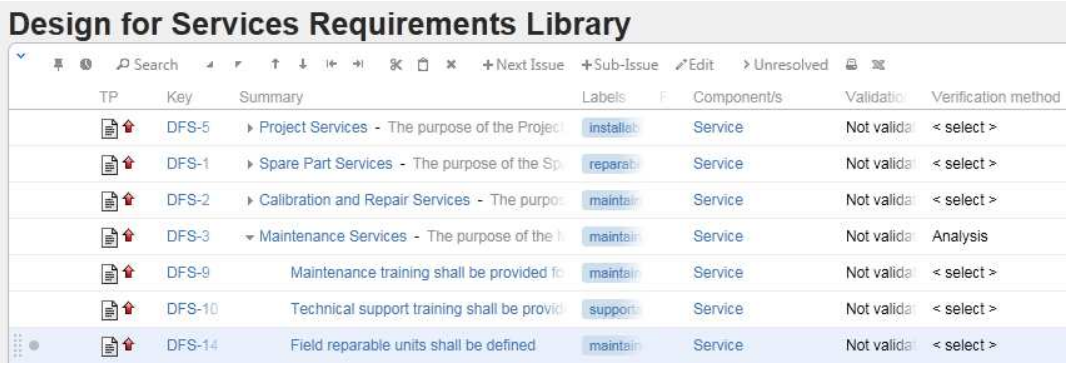

Figure 21. Defined service requirement

As shown in Figure 20, the high-level structure is shown in the summary field. Furthermore each offering type consists of specific requirements. Characteristics labels such as installability and maintainability are used for further categorizing of the requirements. In order to further distinguish the service related requirements when used as part of product creation process, specific component stating that the requirements relates to service is used.

Each of the individual requirements contains the structuring aspects as presented in chapter 5.2.1 which furthermore aligned for the case company use. Figure 22 presents the definition for requirement types and content of specific requirement

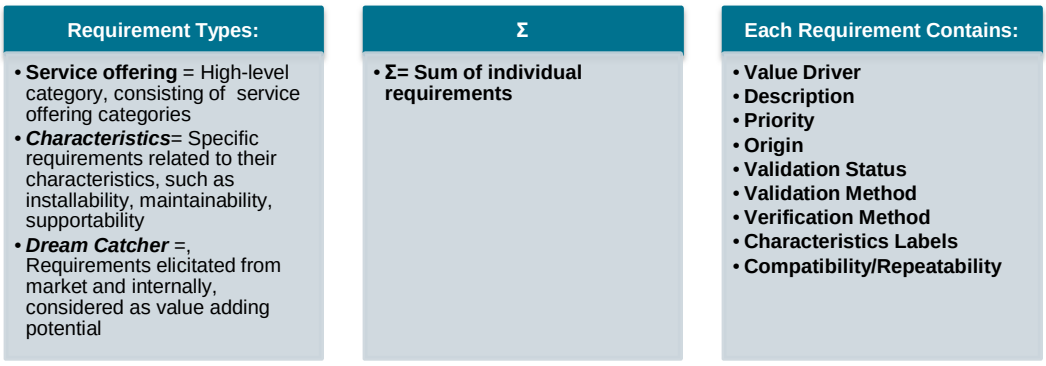

Figure 22. Requirement types and content of requirement

The content of example requirement as defined in the requirement management tool is presented in the Appendix 4.

The requirements are showing fields for validation and verification and their statuses. Description is stating the purpose of the requirement. Further, value driver is stated to rationalize which type of value fulfilling the specific requirement category requirements or individual requirement may offer. Further, the origin of the requirement is stated. As shown in the Figure 21, the requirements already added to the library have been considered from the repeatability and compatibility aspects. The requirements are built in a way that they can be used and shall be fulfilled for most if not all of the products to be developed.

Service Requirement Management

Figure 23 presents the high level illustration of the processes and phases where service requirements and their management are to be considered. The appendix 5 presents the detailed process flow for service requirement management as part of the existing product creation process. Furthermore, the aspect of value creation, as discussed in section 4, is added to the process picture.

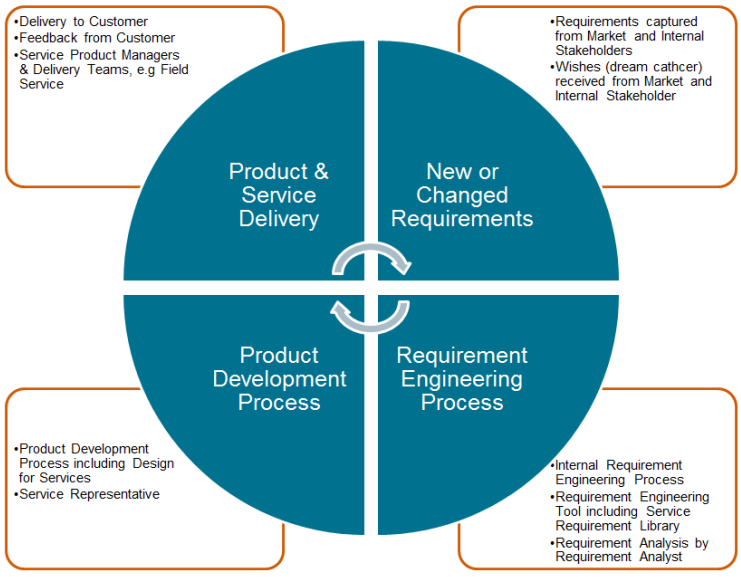

Figure 23. Service Requirement Management

Product Development Process presents the process for developing new product. Service requirement library should be used as part of the overall requirement verification in this process. Specific requirement management tool is used for adding requirements from service requirement library as part of the project module. Specified service representative should be defined and follow this process from the service aspect.

Product & Service Delivery presents the process for delivering the outcome to customers. Service product managers as well as delivery teams are part of this process. Furthermore, the feedback from this process is presented for the product development project. Feedback is used for further verification of the requirement fulfilment status and validating if it was delivered what was actually needed.

New or Changed Requirements Presents the process for capturing new requirements and possible future needs. These are received from the market and from internal stakeholders. Additionally, feedback from the delivered service is received through this.

Requirement Engineering Process follows internal process description and includes the specific tool for requirement management. New of changed service requirements are being analyzed and added as part of the service requirement library for further use.

Furthermore, regarding the overall service requirement management process, the proposal as stated in chapter 5.2.3 is presented to be followed.

6.3 Recommendations for Further Improvement

As a next step these proposed practices should be taken into use and roles for management purposes allocated. In addition, to further develop the practices, information from the first projects using the proposed practice should be actively collected. Regarding eliciting the requirements a template for requirement proposal should be created. This is to ensure that already in the phase when the requirement is proposed it would follow the same guidelines as used for already defined requirements. The first versions for guidelines in this process have already been defined during the thesis project. It is, however, recommended that these should be revised when more information during the actual use has been collected.

Figure 24 presents the aspects considered in this thesis with recommended possibilities for further improvement as next steps.

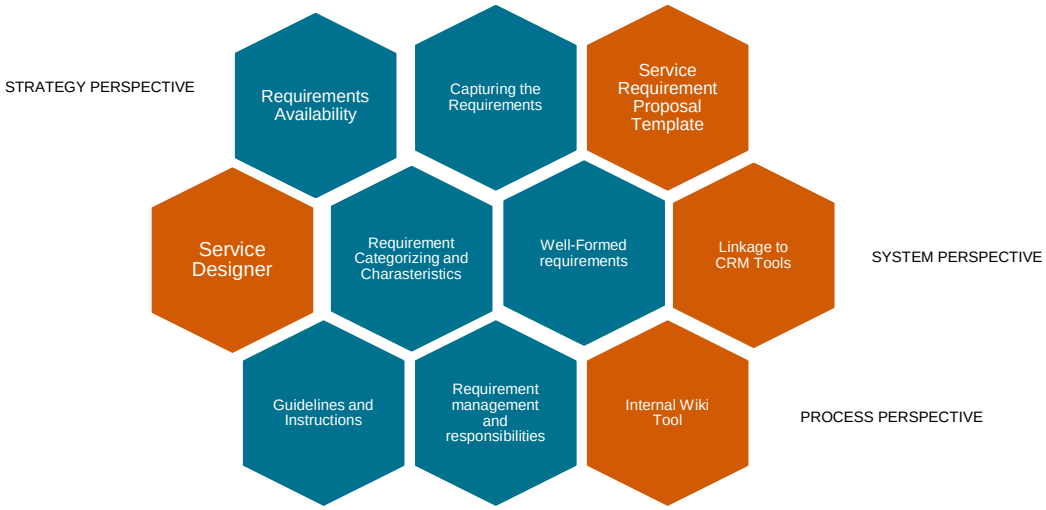

Figure 24. Recommendations for further improvement

The blue colors illustrated the issues that have been taken into consideration in the final proposal of this study. Orange color presents the recommendations that should be taken into consideration as possibilities for further improvement.

As shown in the figure 24, it is proposed that possibilities to link the requirement library to the customer relationship tool that the sales are using should be evaluated. The two software tools already can be combined in higher level but the linkage between the requirement libraries is yet non-existing. This would allow sales to directly feed the received requirements from the market. Furthermore, as the requirements are showing the value driver, the visibility to requirement library for the sales, may offer new ways of building a persuasive customer value proposition.

Proposal template for the service requirements is proposed to be created by using the same structure as defined on the base of the study for the requirements and has also implemented into practice. This template would then offer more effective methods for analyzing the new or changed requirements.

Additionally, regarding the guidelines, a common internal wiki tool used in the case company should be used as a tool for offering guidelines for using the requirement library and defining specific requirements.

Finally, further development of this structure and the above mentioned issues, together with other development processes, may help leading to new service innovations or moreover to new solution innovations. For this purpose it might be meaningful to later on establish a service designer type of position. This position may further assist in studying and implementing alternative service concepts which may lead to these innovations.

7 Discussion and Conclusions

This section presents the summary of this thesis as well as the managerial implications. Furthermore, the section presents an evaluation of the study.

7.1 Summary

This study focused on developing practices for service requirements management as part of product development process in the case company.

For the service design process, that was recently added as part of product development process in the case company, the process description and deliverables as a needed outcome of the process where already defined. However, the practices on how to manage service requirements as part of service design as well as part of the overall product development process, was identified as an business challenge that needed further development in this study.

After the business challenge was identified, the study was started by setting an objective that would result to an outcome which would meet the addressed challenge.

Research design was planned for the study with predefined data collection points. As a first step in the actual study, current state analysis was conducted. Analysis was done by studying case company's internal processes as well as collecting data from several stakeholders of the case company. One of the data collection methods was a large online survey that was send with wide distribution to the case company personnel. The current state analysis resulted in key findings which were seen as main strengths as well as weaknesses of the case company in relation to this study.

The literature review was started in parallel with current state analysis in order to find guidance on which type of questions should be presented in the survey. The results of the current state analysis further guided in the search of best practice from the literature that would further assist on building the proposal that would meet the outcome for the case company. On the base of the literature review it was concluded that services are an important part of value creation for both the providers as well as for the custom-

ers. Furthermore, it was concluded that well-formed service requirements can contribute on facilitating this value. In addition, a well-defined place for eliciting the requirements was seen as an essential part in order to manage these requirements. As the definition of service itself was noted to altering and in addition much depending on what companies are considering as part of their service offering, the literature did not offer direct way on defining best practice for service requirements management. By evaluating several aspects and best practices from multiple well known sources and seeking to find a systemic solution to connect them, a conceptual framework of this thesis was formed. This framework further aided on defining what issues are to be considered when defining service requirements and further managing them.

The building of the proposal was started by combining the results of the current state analysis and the conceptual framework. Building of the proposal was divided in three phases. *First,* the structure of service requirements was defined. This structure includes the key issues that are to be taken into consideration regarding these types of requirements. For instance they should be built in a way that they are repeatable and compatible with the product development process. Additionally, they should offer clear definitions of the purposes of the requirement as well as what can be seen as value driver for the requirement. *Next,* the structure of the service requirement library, a place for eliciting the requirements, was defined. The structure was defined in a way that in can be implemented in the specific requirement management tool that the case company was using. The structure consists of defined categories and labels used for identifying the requirements on the base of their specific characteristics. One of the defined categories in the library was dream catcher, this was defined as it was identified that several service requirements can be considered as more of a wish type and may not be fulfilled in every project. Furthermore, this category may act as a way to catch potential future needs. As a *third* phase, the methods for managing the service requirements and the library as part of the product development process were defined. The proposal regarding these consisted of defined roles and responsibilities in this process as well as proposal on how to capture new requirements. The data collected on this round was used for building these proposals.

As final step, the proposal needed to be validated. The before mentioned three parts of the proposal were presented to several key stakeholders in the case company. As a result of this data collection, the proposal was further revised and final validated proposal was constructed. In addition, the service requirement library was built by use of

the requirement management software and specific service requirements were added to the library.

As a final outcome, the structure for service requirements and service requirement library was defined and taken into use. Furthermore, the practices for managing service requirements as part of product development process were presented.

7.2 Managerial Implications

On the base of this thesis study it can be concluded that service requirement form a meaningful role regarding fulfilment of overall business requirements. Well-defined and elicited service requirements not only reduce the time needed for the actual product development process, but can also help on to ensuring that high quality solutions are delivered on the markets. This can further help on increasing the customer satisfaction and contribute on improving the customer experience. Validating and verifying these related requirements already in the product creation phase should lead up to saving of time in the actual delivery phase. Therefore, having an impact for instance to the delivery projects and recognized revenues in these. In addition, well defined service requirements, showing a clear definition of the origin of the requirements as well as the value driver, may act as a catalyst for building up persuasive customer value proposals. Furthermore, the results of this thesis can be seen as an added value and contributor to the case company's strategy.

As a proposed next step, the outcome of this thesis should be taken into use and resources needed addressed for further development. As the requirement library structure has already been built by use of the software intended, product development programs are to be encouraged to use the library as part of the process.

7.3 Evaluation of the Thesis

The results of this thesis can be evaluated in several ways. Firstly, it can be considered how well the actual outcome answered to the original objective that was set. In addition, it can be evaluated by the means of reliability and validity. How valid the results gained through this study are and how reliable they can be seen.

7.3.1 Outcome vs Objective

The original objective of the study was to develop practice for service requirements and their management as part of the product development process. To reach this objective, service requirement library, the structure for the service requirements, eliciting the requirements and practices for managing the requirements as part of the prescribed process needed to be defined. The outcome of this thesis can be seen to answer to this objective. In addition, the service requirement library was built in practice by use of the software tool intended for requirement management purposes in the case company. Already identified requirements where implemented into this library as an examples for further development.

As a limitation compared to the original research design, the outcome was also planned to be tested with a pilot project. Project that could be used as pilot project for testing the library in practice was selected and data was collected through discussions with the stakeholders of this project. Furthermore, the actual service requirements of this project were used to be able to build the final proposal. However, the final testing of the proposal with this project was not able to be conducted due to time constraints. A smaller product development project might have served the intention better. However, this type of development project was not identified in the research design phase. Furthermore, even though full testing was not yet able to be conducted, the plan is to conduct this testing outside this thesis study.

In overall, however, the objective and the outcome can be considered as fulfilled.

7.3.2 Validity & Reliability

The validity and the reliability of this study, as planned in section 2.4, was ensured through several steps.

The validity was increased by collecting the data through three main data collection rounds. Several stakeholders of the case company were involved in data collection in all rounds as well as for the building and validating of the proposal. The data collected in these rounds was recorded by questionnaires or meeting notes and for instance interview results were presented and discussed with the interviewees. Additionally, direct

quotes were used to present the data in the study were feasible. Example of interview questionnaire as well as the survey results is presented as an appendix of this thesis.

The reliability of this study was ensured by utilizing several data collection sources and tools. These included interviews, discussions, survey and workshop. This further increased the richness of the data and enabled possibility to triangulate the data in order to conclude if findings from alternating sources would lead to same results. Furthermore, through this, the key aspects needed to be considered for this study were identified. For instance the web survey, generated by use of survey tool, enabled efficient data collection from a larger group of stakeholders of the case company. In addition, this increased the transparency of ongoing development actions related to the topic of this Thesis inside the case company. Furthermore, use of selected R&D project for data collection and test purposes increased the validity and reliability of the study.

As a final result, the findings and the actual outcome of this Thesis can be seen to response to the actual addressed challenge that was presented in the design phase. In the case company, the final proposal has been taken already partly in use. The service requirement library has been built by use of the internal requirement engineering software tool and includes service requirements that are defined according to the final proposal. In addition, the final proposed practice for service requirements management has been already presented for several stakeholders in the case company. Furthermore, the outcome of this Thesis can be seen as an added value and contributor to the case company's strategy. Additionally, this outcome can further help case company on increasing the customer satisfaction and contribute on improving the customer experience.

Finally, as the final outcome of this study is intended for the case company purposes, it can be concluded that the proposal is not directly utilizable in other contexts, for instance, purposes of other companies. However, on the basis of the literature review and the data collection, some of the findings can be seen as well applicable for needs of other similar development projects.

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APPENDIX 1 Interviews and Meetings

Example template of interview questionnaires

Research Interview (Discussion)

TOPIC: ___Service Design Requirements_____

Information about the informant

Table 1

Details	
Name (code) of the informant	
Position in the case company	
Date of the interview	
Duration of the interview	
Document	Field notes

Field notes

Table 2

	Topic(s) of the interview	QUESTIONS <Your questions to the informant(s)>	FIELD NOTES <Your brief accounts of their answers>
1	Starting point: describe experiences in view of the topic	*A) Are you involved with the new product creation process?* *B) In what way?*	
2	Requirements	*a) Are you involved in defining the requirements to be fulfilled for new product?* *b) Are you involved in defining which services are to be offered for the new products* *c) Are you involved in defining which requirements the services need to meet?* *d) Describe briefly your role in this process*	
3	Identify strengths/challenges	a) Are the service requirements considered in new product creation phase currently..? b) What are the main strengths in the current process? c) What are the main challenges in the current process?	
3	Key concerns	What are your key concerns related to services for new products?	
4	Development needs		

APPENDIX 2 Survey Questions

Existing Service Offering

I am familiar with the existing service offering (in overall)
I am familiar with the existing service offering related to product area on my field of expertise/business area
Existing service offering fulfills external and internal requirements
Maintenance Services fulfill external and internal requirements
Information Services fulfill external and internal requirements
Calibration and Repair Services fulfill external and internal requirements
Spare Part Services fulfill external and internal requirements
Modernization Services fulfill external and internal requirements
Project Services fulfill external and internal requirements

Service Design and Delivery

I am familiar with service design process
I am involved with defining which services are to be offered with new product
Service design is part of my job
I am familiar with the requirements needed in service design process
Product design is part of my job
Delivering the service is part of my job
Service requirements may help to improve product installability
Service requirements may help to improve product maintainability
Service requirements may help to improve product usability
Service requirements may help improve customer satisfaction
Service requirements are not needed to be considered in product creation phase

Service Requirement Availability

Understanding service requirements in general is important for my work
Understanding requirements for specific service is relevant for my work. (e.g. in order to be able to deliver the service or to be able to design the product or service in a way that it meets the requirements)
Market requirements related to services are easily available
Internal requirements related to services are easily available
Service related requirements from internal stakeholders are collected effectively
Service related requirements from the markets are collected effectively
Service related requirements from external partners are collected effectively
Receiving improvement proposals/ new requirements for services from internal stakeholders is part of my job
Receiving improvement proposals / new requirements for existing services from external stakeholders is part of my job
I can easily find correct person to discuss about service requirements

Validating and Verifying Service Requirements

I work in a position where I validate service requirements
information needed for validating the service requirement is easily available
Information needed for validating the service requirement is sufficient
Requirements from internal stakeholders are reviewed and validated effectively
Requirements from external stakeholders (e.g. customers & partners) are re-viewed and validated effectively
Received information related to requirements is sufficient
Requirements from internal stakeholders are easily understood
Requirements from customers are easily understood

Requirements from external partners are easily understood
Requirements from all stakeholders are reviewed in several phases of the project
Requirements are revised effectively based on the feedback
Validated requirements are verified effectively
Validated requirements are implemented effectively

Service Requirement follow-up
Fulfillment of service requirements is reviewed after the release

Performance regarding fulfilling internal and external requirements is monitored

Feedback regarding fulfillment of the service requirements is collected internally from functions that are responsible for delivering the service
Feedback regarding fulfillment of the service requirements is collected externally from partners that have delivered the service
Feedback regarding fulfillment of the service requirements is collected externally from customers that have received the service
Feedback is evaluated effectively
Actions are done on the base of the feedback
Customer feedback is easily available

Example of the actual survey view

SERVICE REQUIREMENT EVALUATION AND IMPLEMENTATION:

	Current status *					Importance *				
	Totally disagree			Totally agree	N/A	Not important			Highly important	N/A
I am involved with defining requirements for services that are offered with new product	○	○	○	○	○	○	○	○	○	○
I work in a position where I evaluate service requirements	○	○	○	○	○	○	○	○	○	○
I am familiar with different requirements that service for new product has to meet	○	○	○	○	○	○	○	○	○	○
Understanding service requirements is important for my work	○	○	○	○	○	○	○	○	○	○
information needed for evaluating the service requirement is easily available	○	○	○	○	○	○	○	○	○	○
Information needed for evaluating the service requirement is sufficient	○	○	○	○	○	○	○	○	○	○
Requirements from internal stakeholders are reviewed and evaluated efficiently	○	○	○	○	○	○	○	○	○	○
Requirements from external stakeholders (e.g customers & partners) are reviewed and evaluated efficiently	○	○	○	○	○	○	○	○	○	○
Received information related to requirements is sufficient	○	○	○	○	○	○	○	○	○	○
Requirements from internal stakeholders are easily understood	○	○	○	○	○	○	○	○	○	○
Requirements from customers are easily understood	○	○	○	○	○	○	○	○	○	○
Requirements from external partners are easily understood	○	○	○	○	○	○	○	○	○	○
Requirements from all stakeholders are reviewed in several phases of the project during the process	○	○	○	○	○	○	○	○	○	○
Requirements are revised efficiently based on the feedback	○	○	○	○	○	○	○	○	○	○
Requirements are implemented efficiently	○	○	○	○	○	○	○	○	○	○

Open feedback:

APPENDIX 3 Survey, Background & Results

The survey instructed the participants for the meaning of the scales. The scale for the selections was for the maturity 1-4, where 1 meant that participant totally disagreed with the current status of the statement. Selecting 4 meant that participant totally agreed with the current status of the statement.
For the importance the selection was likewise. Selection 1 meant that participant did not see the issue of the statement very important, were as giving 4 meant high importance. For each of the statement it was also possible to select not applicable for the maturity and for the importance of the questions. This was added for the survey as it was known that each of the participants may not have a view on all of the statements due to their role in the case company.

Survey results background information

Below table presents basic information related to response rate and division responses by the geographical location.

Results Background		
Total number of survey request sent	392	
Total number of responses	70	
Total Response rate	17.86	%

Responses by location	Responses	Percentage (%)
Finland	30	42.86
United States	26	37.14
Japan	5	7.14
United Kingdom	3	4.29
Canada	2	2.86
France	1	1.43
Germany	1	1.43
Australia	2	2.86
Total	70	100.00

Responses by Business Area	Respons-	Percentage (%)

	es	
Service	50	71.43
Product Area	20	28.57
Total	70	100.00

Table 1 Survey results background

For analysing the survey results, researcher used several methods. In order to gain overall view of the maturity of the related questions as well as the importance seen by the respondents heat map was firstly created. Colour coding was used in the heat map to point out clearly the absolute highest and lowest scores. Additionally, the results were studied using the five question categories. From each of the category the main issues were identified using gap method. Results were mainly calculated using absolute scores from all the participants. After analysing all categories the main findings were summarized. Below table presents the explanation for the used survey analysis methods. Main findings of each category are presented separately and then the main summary of the survey is presented. Additionally, for visualizing the results illustrated charts are presented.

Analysis method	Purpose
Heat map	Identifying the main issues from the total survey (low and high scores)
Absolute highest and lowest scores	Identifying the main issues of each category and from the total survey
Biggest and least gap	Identifying the variation between maturity and the importance of the questioned issue.

Table 2 Survey analysis method

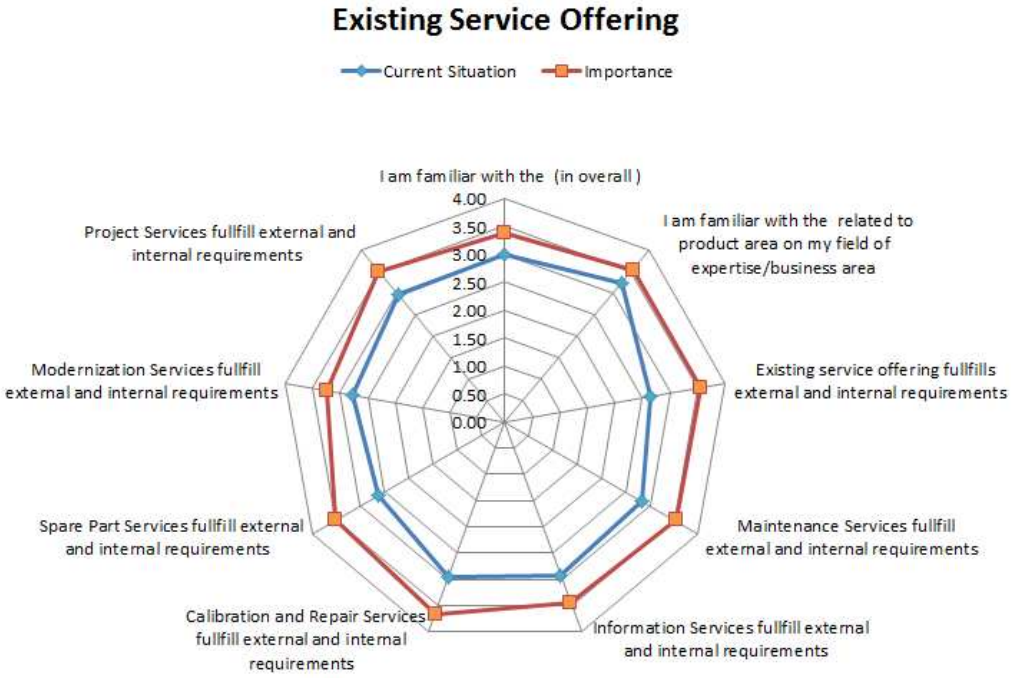


Figure 1. Results for questions related to existing service offering

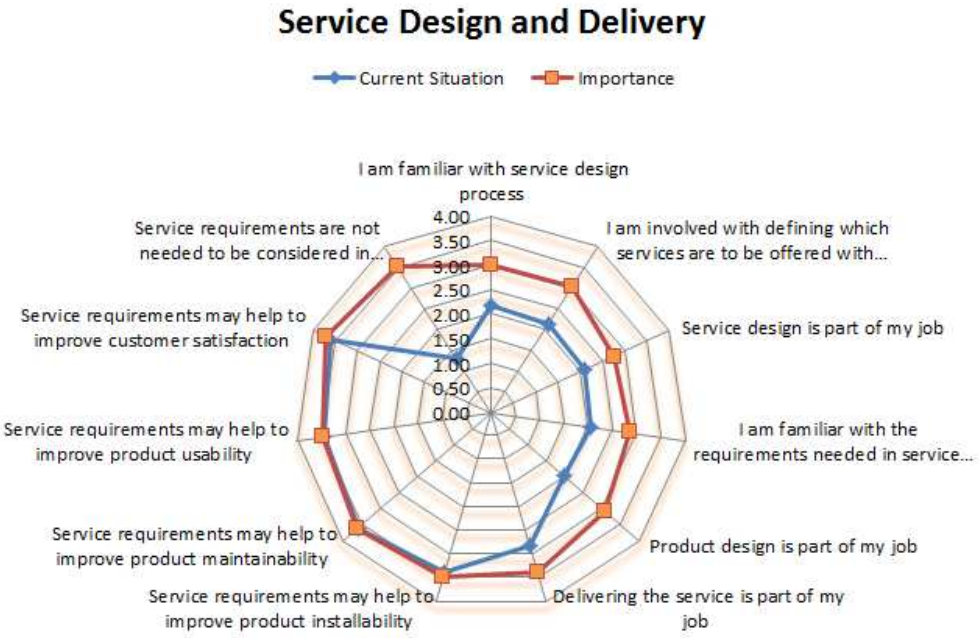


Figure 2. Results for questions related to service design and delivery

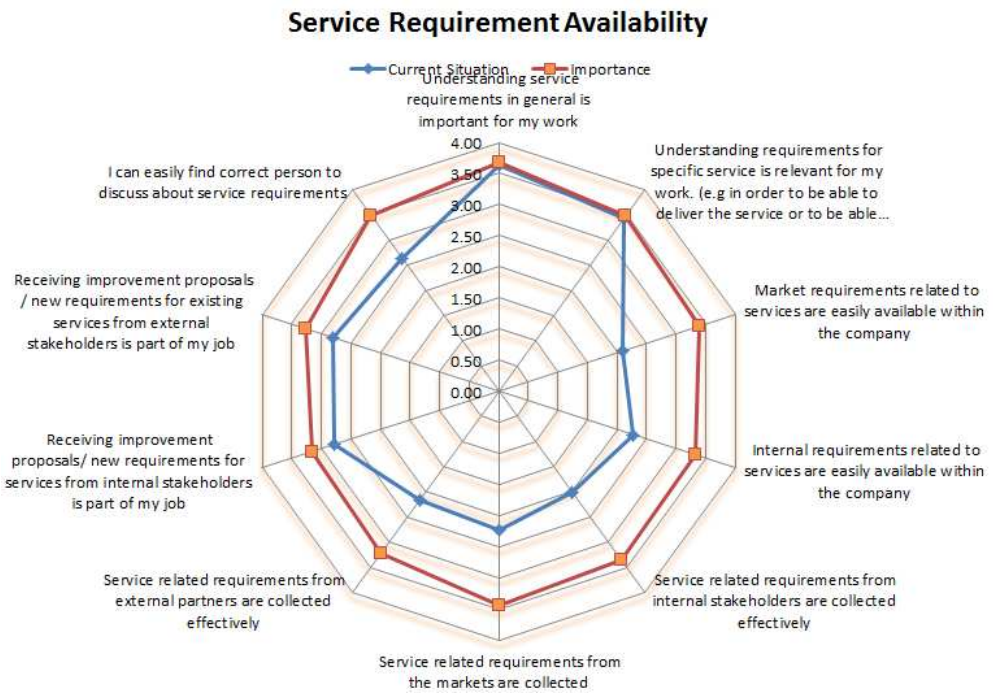


Figure 3. Results for questions related to requirement availability

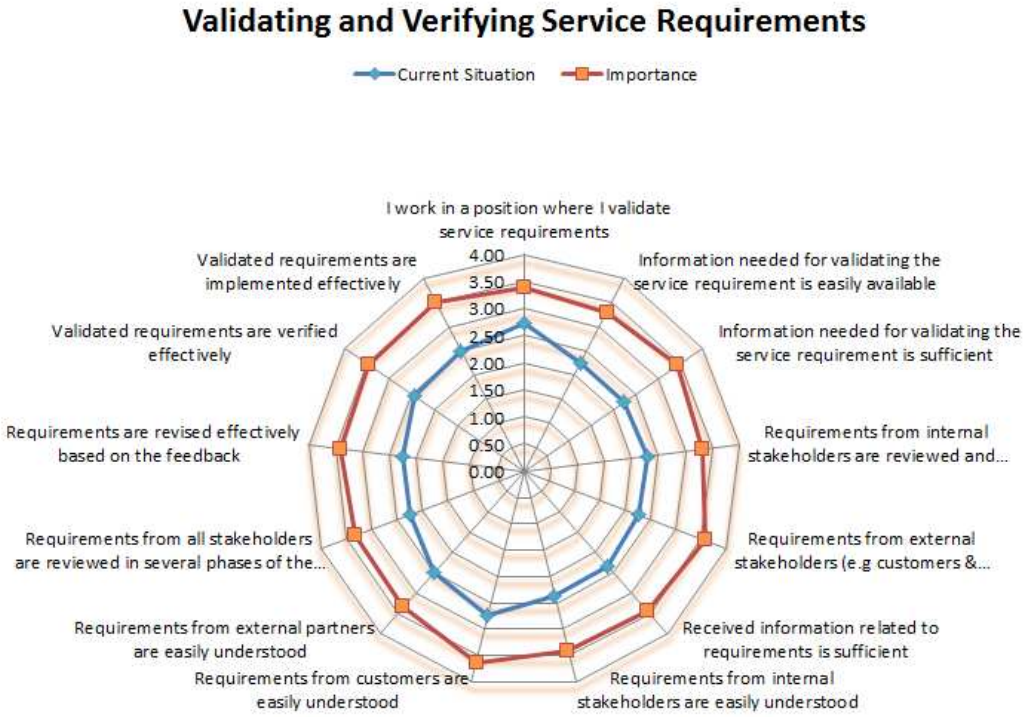


Figure 4. Results for questions related to validating and verifying service requirements

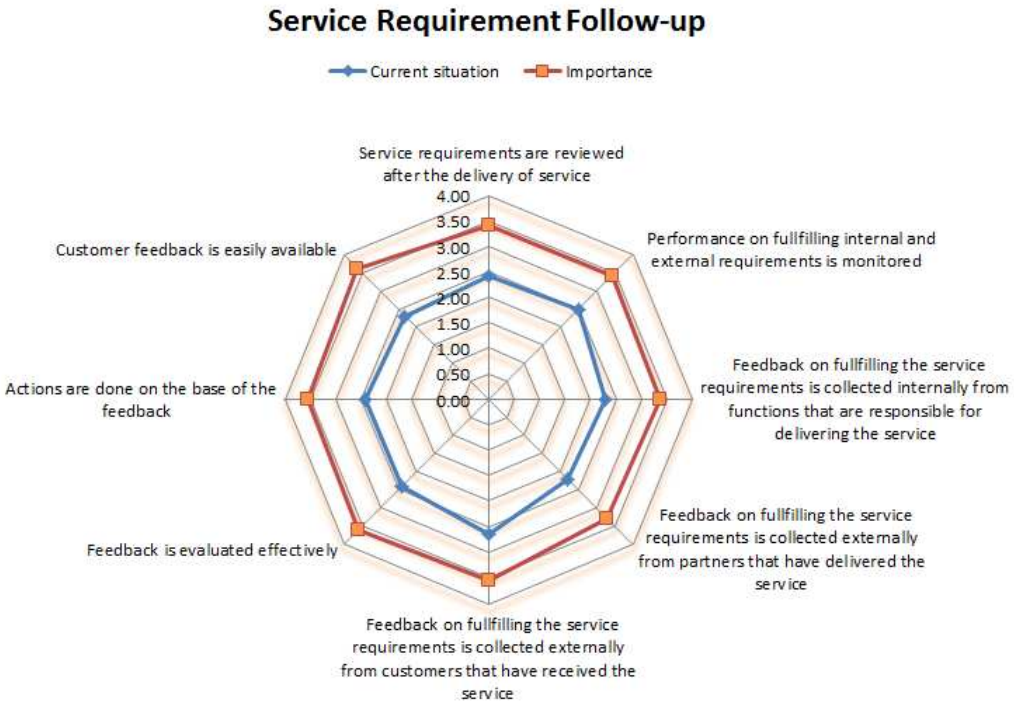
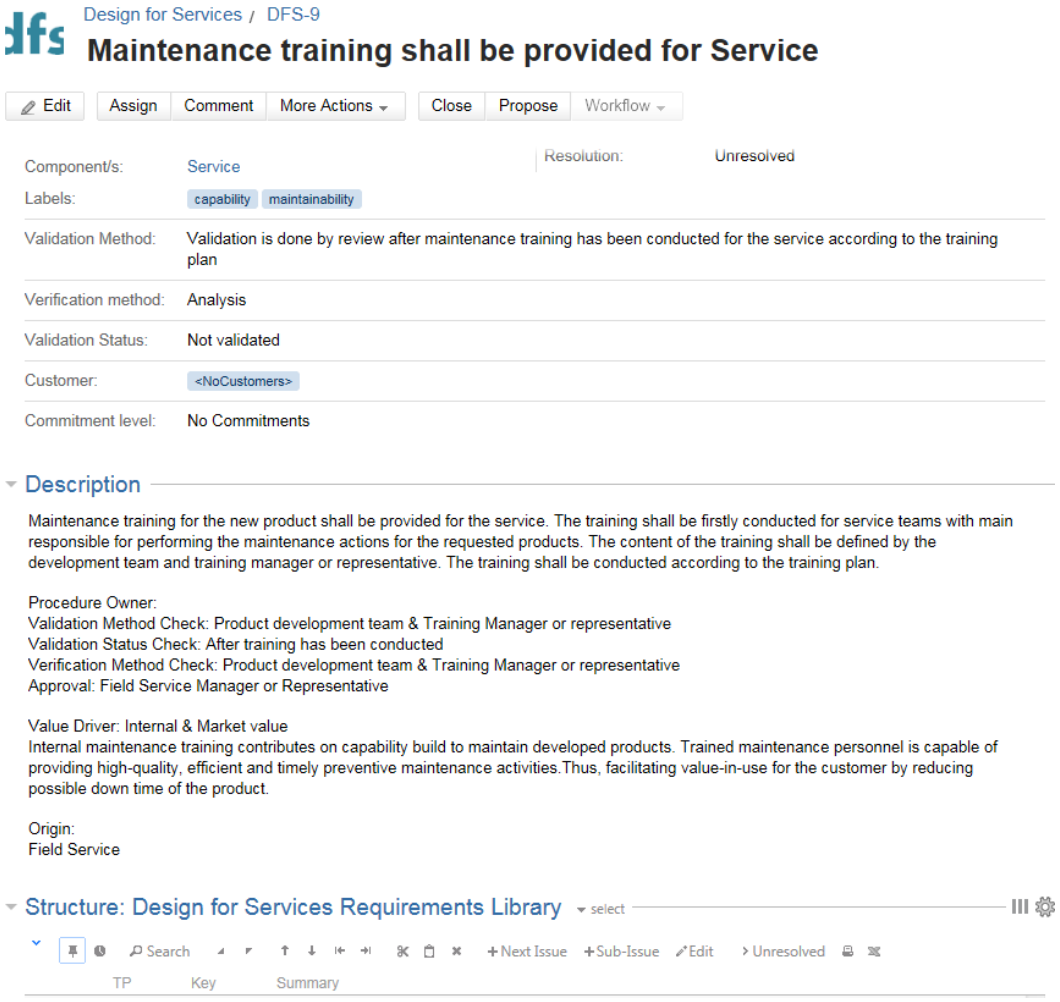


Figure 5. Results for questions related to service requirement follow-up

APPENDIX 4 Example of Service Requirement Using the Requirement Management Tool



APPENDIX 5 Service Requirements Management Process