Defining and measuring service quality in a manufacturing company

Master's thesis in the Master Degree Program Quality and Operations Management

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Abstract

The servitization of the manufacturing industry has created a new demand for understanding service quality and how service quality can be measured. Services are different from products in many ways, not the least in the way quality is evaluated by the customers. For services it is not only what the service delivers that is important but also how it is delivered. Quality must hence be measured both as the outcome of the service and as the customers' perception of the service process. In the 80's researchers begun to develop different tools for measuring perceived service quality such as the survey tools SERVQUAL and SERVPERF. Together with the development of SERVQUAL researchers began to explore what quality dimensions that was relevant for services. While some argue that service quality can be expressed through a fixed set of quality dimensions most researchers agree that different quality dimensions are relevant for different types of services.

In previous research on service quality only limited attention has been given to services offered by manufacturing companies in business to business (B2B) settings. Instead much focus has been directed towards health care, restaurants and other business to consumer settings. Previous research has also tried to see if the same quality dimensions are relevant for similar services by grouping them in different ways. Several researchers have classified services offered by manufacturing firms based on whether they are product related or address the customers' processes and whether they are transaction based or relationship based. This lead to the purpose of this thesis:

This study aims to identify what quality dimensions and quality measures that are relevant for services offered by a manufacturing company in a B2B setting, focusing in particular on the hardware support services. Furthermore this study aims to investigate if there are any differences in between different service classes regarding what quality dimensions and measures that are relevant.

To fulfill the purpose a case study at Ericsson was performed and a literature study undertaken. Service classification, quality dimensions and quality measures was the three areas that were reviewed in the literature study. Ericsson has a wide service portfolio with different types of services which can be classified as product- or process oriented and transaction- or relationship based. Through interviews and secondary data analysis, quality dimensions and measures relevant for the different services was identified, and the purpose could be fulfilled.

The case study identified a set of quality dimensions for the different services. Especially for maintenance services where an in depth study was done was it possible to identify a large set of dimensions influencing the customers' quality perception. The conclusion from the case study is that different quality dimensions are relevant for different services for a manufacturing company in a B2B setting. However, both outcome measures and perception measures were found relevant for all types of services. Different quality dimensions were found for different services within the same service class which implies that it is hard to predict what dimensions that are relevant by simply classifying a service as product or process oriented and transaction based or relationship based.

Except for maintenance services there was limited access to the voice of the customer why it is likely that not all relevant quality dimensions were found for all services. This made it hard to see any consistent differences between the service classes. However, reliability was found relevant for all services and there are some indications that proactivity are more relevant for relationship based services. For maintenance services, where products are used in the service delivery, product quality also becomes relevant.

Nomenclature

BL PRS	Business line Product related services
BUGS	Business Unit Global Services
BURA	Business Unit Radio
CSat	Yearly Customer Satisfaction Survey
CPE	Customer Project Evaluation
CSI	Consulting & Transformation and System Integration
DOA	Dead on arrival
FTR	First Time right
HW	Hardware
HWS	Hardware Services
HWSO	Hardware Services Operations
ICT	Information and Communications Technology
IRP	Independent Repair Provider
LS	Learning Services
KAM	Key Account Manager
MTBF	Mean Time Between Failure
MS	Managed Services
NDO	Network Design and Optimization
NFF	No fault found
NRO	Network Roll-out
PDU	Product Development Unit
SDM	Service Delivery Manager
SLA	Service Level Agreement
SW	Software

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1. Introduction

In this chapter the background to the thesis is presented followed by an introduction of the case company in focus for the study. Furthermore the purpose and research questions are outlined, followed by an introduction of the case company.

1.1 Background

Over the past decades the manufacturing industry has experienced a shift in the product-service continuum moving from pure product offerings to adding services or complete solutions (Johansson, 2012). Vandermerwe and Rada (1988) named this movement "servitization of business". Often the transition starts with adding simpler after-sale or pre-sale services and then moves towards more complex offerings (Paiola et al., 2013). The drivers for this transition is often a combination of global competition, declining profitability, products becoming commodities as well as increased complexity in customer needs and an intention to increase customer loyalty (Gebauer et al., 2012; Johansson & Witell, 2013; Neely et al., 2013). The idea of providing solutions is to combine products and services in a customized solution that together creates a higher value for the customers than if acquired separately (Paiola et al., 2013; Johansson & Witell, 2013).

Different services that evolve during the transition have been classified and grouped by numerous authors (Paiola et al., 2013; Fundin et al., 2012). Some researchers have focused on the type of service such as maintenance, repair, consulting etc. (Kotler, 1994; Neely, 1988). Some have focused on the level of relationship that is needed between supplier and customer (Frambach, 1997) and others have focused on whether the service supports the customer's product or processes (Mathieu, 2001b). Oliva and Kallenberg (2003) classified services by pairing the level of relationship, ongoing or occasional, with the aspect of whether the services support the customer's product or the customer's processes. Services grouped into classes based on common characteristics, such as e.g. after sale services or maintenance services, are referred to service classes or service types throughout this thesis.

Services are in their nature different from products and the corresponding quality dimensions are also different than those for products. Quality dimensions are determinants of perceived service quality (Parasuraman et al., 1985). Services are characterized by intangibility, heterogeneity and simultaneous production and consumption (Parasuraman et al., 1985; Schneider & Chung, 1996). This makes it harder for the consumer to evaluate the quality of services and for the selling company to measure the quality of their services (Parasuraman et al., 1985). A product's quality can more or less be objectively measured and compared to other similar products. Service quality, on the other hand, cannot be measured by only studying the outcome of the service process because the experience during the service delivery also has an influence on the perceived service quality (Parasuraman et al., 1988). Swartz and Brown (1989) clarified this by making a distinction on "what" is delivered and "how" it is delivered. Similar reasoning is also found in Grönroos (1984). How the service is delivered is also called interactive quality since it is affected by all encounters between the service deliverer and the customer (Lehtinen & Lehtinen, 1982). This interactive part of the service process also means that the customer normally is participating in the service production (Schneider & Chung, 1996). Consequently the customer also affects the service process and the outcome of the service.

Closely related to the aspect of participation is the way value is created. In the service-dominant logic the value is created in-use (Gebauer, 2010) and the customer is therefore a co-creator of value (Vargo & Lusch, 2008). This is different from the goods-dominant logic that suggests value-in-exchange and that the value is embedded in the product and transferred by the exchange (Gebauer et al., 2010). From the service-dominant logic the service company offer value propositions, and then the value is realized first when the service is used (Vargo & Lusch, 2008).

Several tools has been developed in attempts to measure service quality, but maybe no tool has received more attention than the survey tool SERVQUAL developed by Parasuraman et al. (1985). The tool initially comprised 10 different dimensions of service quality, which after further quantitative empirical research was reduced into five dimensions; *reliability, assurance, tangibles, empathy* and *responsiveness* (Parasuraman et al., 1988). While the researchers' ambition was to withdraw generic quality dimensions, other researchers such as Carman (1990), Babakus and Boller (1992), and Chowdhary and Prakash (2007) argues that the relevance of different service dimensions depends on the type of service and the industry context. Other researchers such as Ganguli and Roy (2010) also confirm this view, having identified other dimensions for certain services. Akhade et al. (2013) share the same opinion and claim that it is still not possible for researchers to propose generic service quality dimensions which will be applicable for all service sectors. Rosen & Karwan (1994) also provided empirical evidence that the relative importance of service quality dimensions varies between different services.

Most services included in previous studies of service quality have little in common with services typically provided by a business to business (B2B) manufacturing company. For instance Carman (1990) studied pest control, dry cleaning, an acute care hospital, a dental school and a tire store. Rosen and Karwan (1994) included a restaurant, a bookstore, healthcare and lecture teaching at a university. Furthermore, Wiseniewski (2001) studied the public service sector and Kitapci et al. (2013) did research on supermarket customers. Overall few services typically offered by manufacturing companies have been included in the studies. In addition, most previous studies on service quality have been for business to consumer markets and not in a B2B context.

Given that the quality dimensions of services varies between different types of services there is a need for research on what dimensions that are relevant and important for different types of services offered by manufacturing companies and how corresponding measures can capture the performance within the quality dimensions.

1.2 Purpose
This study aims to identify what quality dimensions and quality measures that are relevant for services offered by a manufacturing company in a B2B setting that has been going through the service transition, focusing in particular on the hardware support services. Furthermore this study aims to investigate if there are any differences in between different service classes regarding what quality dimensions and measures that are relevant.

1.3   Limitations

Some limitations in what parts of the service portfolio that is considered in the case study is been made. Regarding the Customer support services this thesis focus on the hardware support and does not consider software support. Further, Hardware Support services consist of four services but due to time limitations the empirical study is limited to one of them i.e. "Secure support". Learning Services include three services areas but the thesis excludes Managed Learning Services since that service has not yet been sold. Furthermore the case study of Managed Services including four different services is limited to two of them, Network Sharing and Network Managed Services.

The study is limited to quality measures that measure aspects that directly impact the customer. Internal quality of for instance processes and decision making will not be considered.

1.4   Problem analysis and research questions

As previously discussed, many researchers acknowledge that there are no generic quality dimensions for all types of services (Carman, 1990; Babakus & Boller, 1992; Chrowdhary & Prakash, 2007; Ganguli & Roy, 2010; Akhade et al., 2013). Does this indicate that every single service must be studied in order to find out what quality dimensions that is important for that specific service? Several researchers have proposed different ways to classify services into different service types by identifying common characteristics for the services (e.g Frambach et al., 2007; Oliva & Kallenberg, 2003; Neely, 2008; Gebauer, 2010; Mathuíeu, 2001a). The question still remains if generic quality dimensions and measures can be found for services within the different service classes?

Even though researchers argue that it is hard to identify a set of generic quality dimensions (Carman, 1990; Babakus & Boller, 1992; Chrowdhary & Prakash, 2007; Ganguli & Roy, 2010; Akhade et al., 2013) applicable for all services in all contexts it has not been ruled out that some quality dimensions and measures could be generic within certain service classes. In fact, Rosen and Karwan (1994) pointed out that the services included in the study of Parasuraman et al., (1988) actually were quite similar regarding the level of customer interaction and degree of customization. Rosen and Karwan (1994) argues that generalization regarding dimensions and their relative importance could be done by grouping services by similarities such as level of customization and interaction between the service provider and the customer.

In a more recent study Chowdary and Prakash (2007) used another two-dimensional classification scheme trying to identify the most important quality determinants for different services. Their framework considered whether the services were intangible or tangible and whether the services were directed at people or possessions.

While previous research on this topic have contributed to the overall understanding of service quality and what dimensions that are important based on different characteristics, neither of the studies have used a classification scheme developed for services typically provided by a manufacturing company in a business to business (B2B) setting. The services considered by Rosen and Karwan (1994) were lecture teaching, a bookstore, a restaurant and a health care clinic, neither of which usually are provided by a manufacturing company. Separating services targeted at people is also not that useful in manufacturing companies since services aimed directly at people rarely are a focus for those companies. Services provided by manufacturing firms usually concern either the customer's products

or the customer's processes (Oliva & Kallenberg, 2003). This leads to the following research questions:

RQ1. What quality dimensions and measures are relevant for services offered by a B2B manufacturing company?

RQ2. Are there any differences in between service classes offered by a B2B manufacturing company regarding what quality dimensions and measures that are relevant?

RQ3. Is it possible to predict what quality dimensions and measures that are relevant by classifying services offered by a B2B manufacturing firm?

1.5   The case company - Ericsson AB

Ericsson AB is one of the many companies that has been going through the service transition and is today world leading in offering Information and Communications Technology (ICT) solutions (Ericsson, 2014). They offer different services like product related after-sales services, such as repair and maintenance, and business consulting as well as managing operations for their customers. A brief presentation of the seven different categories in the service portfolio can be seen in Table 1 (Ericsson, 2015)**.** By 2014 Ericsson's total service portfolio accounted for almost 43 % of the company's total revenues (Ericsson annual report, 2014). While the knowledge and quality initiatives for dealing with product quality are mature the concept of service quality is not yet commonly defined and fully explored within the company[1]. At Ericsson there is not a common definition and understanding of what service quality is and how it can be measured. Also, the process of identifying development opportunities and new services are more ad-hoc compared to the development process of products[2].

Table 1 Service portfolio at Ericsson

Ericsson's service portfolio	
Learning Services	Training programs and competence development.
Customer Support	Proactive and reactive Software- and Hardware maintenance and repair.
Network Roll-Out	Design-, construction-, installation- and integration of telecom sites.
Network Design and Optimization	Transformation and optimization of the customer's network.
Managed Services	Ericsson takes responsibility for customer operations.
Consulting & Transformation and System integration	Business-, Operational- & Technology consulting. Consolidate, integrate or improve the customer's different systems.

One of the service contract Ericsson offer, as a part of the Customer Support services, is Hardware Services (HWS). HWS is a product related service managing the repair and logistics of returns and

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[1] Head of Quality BUGS, interviewed by the authors 2015-02-02
[2] Cost Governance Manager PRS, interviewed by the authors 2015-02-02

replacements of broken components as well as managing material planning and sourcing[3]. When Ericsson signs a deal for HWS the terms and conditions are summarized in a Service Level Agreement document (SLA) that usually cover a two year period[4].

Ericsson's customers can choose to buy their repair and replacements service either from Ericsson or find another supplier, and hence there is a competitive situation for this service business[3]. It is a mature business and customers are believed to become more price sensitive, especially for the simpler repair and replacement services where it is easier for the customer to compare price with competitors[3].

For HWS quality is today measured as delivery precision and contract fulfillment and there are also some questions in the yearly customer satisfaction measure dedicated to support[5]. However there has been no thorough investigation of what aspects that is most critical to the customers and their experienced quality for HWS. There is some doubt whether current measures capture the relevant aspects of service quality and if they can predict customer satisfaction[6].

2   Methodology

In this chapter the methodology of the thesis is described. First the research strategy-, approach-, design and research process are presented. The chapter continues by describing the data collection and analysis, and the methods that were used. Furthermore trustworthiness and ethical considerations are discussed.

2.1   Research strategy

A research strategy is a "general orientation to the conduct of the business research" (Bryman & Bell, 2011, pp.26). A common distinction is made between quantitative and qualitative research strategies. Quantitative research can be constructed as strategy that emphasizes quantification in the collection and analysis of data (Bryman & Bell, 2011). Qualitative research, on the other hand, is a strategy that usually emphasizes words rather than quantifications in collection and analysis of data (Bryman & Bell, 2011). It is possible to combine quantitative and qualitative approaches in one study into a mixed method research (Bryman & Bell, 2011).

Both qualitative and quantitative research focus on understanding a research query and in qualitative research different methods are used in order to understand people's beliefs, experiences, attitudes, and behavior (Pathak et al., 2012). This study is concerned with how customers perceive quality, and the nature of service quality is heterogeneous and there could exist several truths. Since little previous knowledge is available about what is important for the customer perceived service quality a qualitative study grasping the customer perception is suitable. Hence, the research strategy applied in this thesis is mainly qualitative.

Many other studies regarding importance of service quality dimensions have started out directly with a quantitative study, accepting the five service quality dimensions suggested by Parasuraman et al. (1988). Therefore they have from the beginning limited the findings to include input regarding only

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[3] Cost Governance Manager PRS, interviewed by the authors 2015-02-02
[4] Key Account Manager 2, interviewed by the authors 2015-04-16
[5] Business Control & Performance, interviewed by the authors 2015-03-10
[6] Head of Quality BUGS, interviewed by the authors 2015-02-02

those dimensions. As argued earlier, many researchers have provided evidence for that the service quality dimensions differs for different services and context (Carman, 1990; Babakus & Boller, 1992; Chrowdhary & Prakash, 2007; Ganguli & Roy, 2010; Akhade et al., 2013). Therefore, instead of limiting the research in this study to concern a fixed set of quality dimensions the research in this thesis will start by exploring what factors that affects the perceived quality of the customers of the case company, mainly by using qualitative methods as suggested by Asubonteng et al. (1996).

2.2   Research approach and design

Bryman and Bell (2011) distinguish between two research approaches: inductive and deductive. When applying a qualitative research approach the relationship between theory and research is predominantly inductive, this implies a focus on generation of theory. Quantitative studies typically entails a deductive approach is concerned with testing of theory, often with an approach to test hypotheses. It is often difficult to conduct a pure inductive or deductive study and to separate the approaches completely (Bryman and Bell, 2011). Another approach for the connection between theory and empiri is called abductive research. This is a process of generating hypotheses, theories or explanations (Mirza et al., 2014). Ong (2012) describe the abductive research approach as a theory that is developed and tested iteratively.

Dubois and Gadde (2002) call the abductive approach "systematic combining". That is a process where theoretical framework, empirical fieldwork, and case analysis evolve simultaneously. Dubois and Gadde (2002) argue that by combining different research activities such as empirical investigation and theory it is possible to expand the understanding of both. The empirical observations provides input about further activities that should be done such as data collection and interviews, it can also redirect the theoretical framework. Furthermore, based on the findings in the literature insights about the empirical findings can be obtained, and the framework that evolves directs the search for empirical data. This way of working implies a continuously matching, directing and redirecting of the work based on the findings.

In this study an abductive approach was undertaken. Theoretical findings in combination with empirical investigation supported the analysis and conclusion. A literature overview was first made of the studied areas before the empirical investigation started. More literature was gathered and studied as the empirical findings initiated new areas. There was a continuous analysis of the findings during this work and patterns in the data could be identified and conclusions could be drawn throughout the work. An illustration of the systematic combining approach applied at this thesis can be seen in Figure 1.
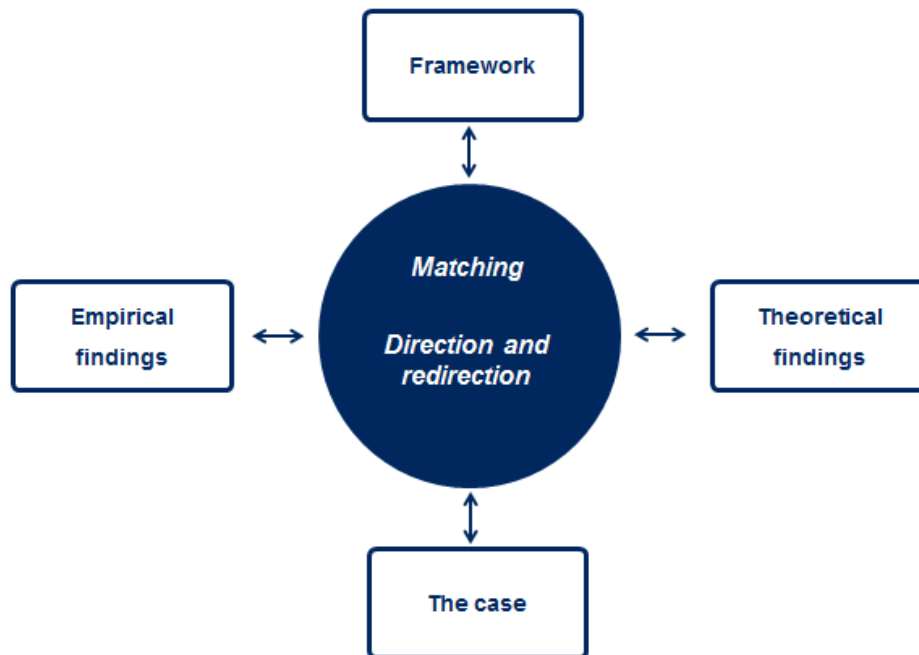
Figure 1 Illustration of systematic combining inspired by Dubois and Gadde (2002)

The research design used in this thesis was case study. A case study is an analysis of a single case such as an organization, location, person or event (Bryman & Bell, 2011). The studied case is the service portfolio at Ericsson where a special focus in this study has been on their repair and replacement services. An important issue to address when conducting a case study is how the results can be generalized beyond the studied object and applied in other contexts (Wallén, 2011; Yin, 2013). To increase the external validity a thick description of the study need to be made in order to enable an understanding of any contextual limitations (Yin, 2013; Bryman & Bell, 2011). This was done by careful and continuous documentation, and an awareness of the contextual characteristics. In addition multiple data sources, referred to as triangulation, has been used as far as possible. This is further discussed later in this chapter.

2.3   Research process

The literature study and the empirical study were conducted in parallel during the project, since the research approach was abductive. Initial meetings between the researchers and the case company revealed the demand for deepening the understanding of service quality and how to measure service quality. The case company's service portfolio includes a variety of services, but it was decided to put an extra focus on HWS due to the lack of measurements and knowledge about what drives customer satisfaction for this service. Initial unstructured interviews were held to understand the HWS process and a SWOT analysis were performed in order to understand the competitive situation. The SWOT was led by the researchers and conducted together with four employees within Business Line Product Related Services (BL PRS) in a 1.5 hour workshop.

An initial literature review was performed in order to understand what already was covered in the research on the topic and identify any research gaps. This literature was also used to guide further data collection and the analysis. The research process then continued by performing a second literature review and collecting empirical data needed to fulfill the purpose of the study. There was continuous

reconciliation with project sponsor at Ericsson and the supervisor at Chalmers throughout the work to discuss direction and focus of the thesis. The research process is illustrated in Figure 2.
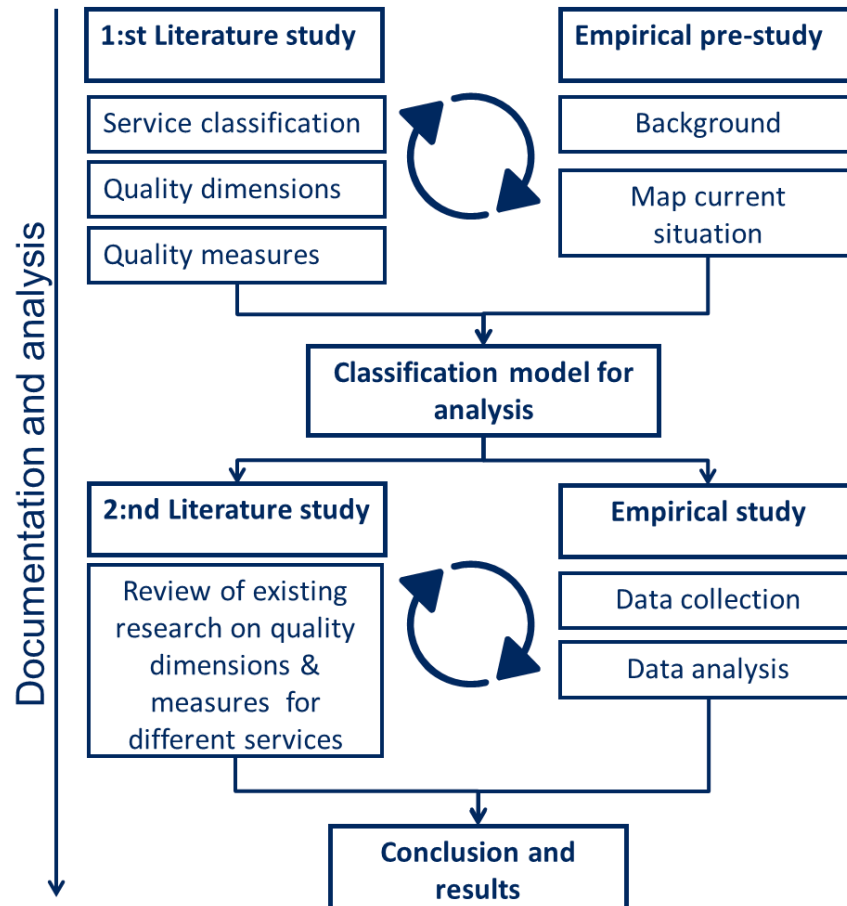
Figure 2 Research process

2.4   Literature study

The first literature study was performed in order to understand what already was covered in research within service classification, service quality dimensions and service quality measures as individual research fields. This literature review was then used as the basis for the theoretical background of the thesis and to form a framework to guide the research process and the analysis.

The second literature study was performed in order to find input about service quality dimensions and measures for different types of services. This was done by a literature review of what was written in the area. As previously discussed the literature search was also guided by the empirical findings in a systematic combining.

Relevant literature was accessed through Chalmers Library catalogue "Summon", Queen's University Library catalogue, and Google Scholar. The most useful keywords used when searching for literature was: *Service quality dimensions*, *Quality dimensions*, *Quality measures*, *Service classification*, *quality determinants*, *service quality measures* and *SERVQUAL*. Another strategy to find papers was to use

the references used in relevant papers, a method called snowball sampling (Bryman & Bell 2011). Input for literature readings was also provided by the supervisor at Chalmers.

A sample of the journals that were used is *Managing Service Quality, Journal of Service Marketing, International Journal of Service, Scandinavian Journal of Management, The Service Industries Journal, Journal of Service Research.*

2.5   Empirical study

The empirical study comprised internal information from the case company and its customers. The major part of the empirical data was primary data, collected for the purpose of this thesis, but secondary data was used as well from previous surveys about customer satisfaction. The secondary data, collected by other people for different purposes, was used and analyzed with caution. Before any analysis was conducted or conclusions drawn from the secondary data, some time was spent on understanding the data collection method and the data handling that was used by the people collecting it (Bryman & Bell, 2011). Internal documents were also used, predominantly in order to get information about the service portfolio and details of measurement procedures.

2.5.1   Secondary quantitative data

Secondary analysis is the analysis of data that others have collected for their own purposes (Bryman & Bell, 2011). Secondary analysis offers the benefit of having access to data for a tiny fraction of the resources needed in collecting data yourself, both time and cost savings can be made (Bryman & Bell, 2011). It is also possible that a reanalysis may offer new interpretations. There are some limitations of secondary analysis that need to be considered. Since the people analyzing the data were not involved in collecting it a period of familiarization with the data is necessary before starting the analysis. Furthermore, since the data is collected for other purposes and by other researchers there might be one or more key variables that is not present in the data and the quality of the data cannot be secured to the same extent due to lack of insight of the data collection process (Bryman & Bell, 2011). For example it is not possible to control how the sampling was done.

Two different secondary datasets was available for analysis. They are both results from customer surveys. In the following sections this data will be presented and then the analysis method will be described.

2.5.1.1   *Project evaluation survey*

Secondary data was studied for the project based services in Ericsson's service portfolio. For these services a survey is used to evaluate customer satisfaction and the perceived performance within different attributes. The attributes that were included in this survey are similar to quality dimensions presented in the research on service quality and therefore the relationship between those dimensions and the overall satisfaction could provide some insight on what affects customer's perception on quality. The idea is to use this data to see if it is possible to identify any attributes that have a high influence on overall satisfaction. There were two main categories of questions, "Project Manager" (PM) and "Project Execution" (PE). These categories were constructed by a subset of different attributes see Table 2 that each was answered on a Likert scale from 1-10 where 1 is "very poor" and 10 is "very good". It should be highlighted that it is the project manager that selects the respondents

without a formal selection process[7]. This could bias the result since the project manager can select respondents based on his or her beliefs on how they will respond.

Table 2 Attributes asked about in the project evaluation survey

Project Manager - Accessibility
Project Manager - Project managing competence
Project Manager - Understanding of your needs
Project Manager - Responsiveness
Project Manager - Commitment
Project Execution - The quality of deliverables in this project
Project Execution - Completes project activities on time
Project Execution - Provides continuous and timely information about project status
Project Execution - Handles change requests

The same survey is used to evaluate several services. In this thesis survey answers for three different services is used. For Network Roll-out projects 4398 responses has been collected during the period 2013-01-01 to 2015-04-30. For Network Design and Optimization projects 197 responses was available from the same period of time. For Consulting & Transformation and System Integration projects 4280 responses collected between 2013-01-01 and 2015-04-30 was available for analysis.

2.5.1.2   Customer satisfaction survey

A customer satisfaction survey that is performed once a year together with an external partner was also studied. In this survey questions are asked on how customers perceive some broad performance areas as well as detailed questions regarding specific functions and businesses. The survey does not provide the possibility to rank how important each item is for the respondent, only how well the performance is within each attribute and the attributes are answered on a likert scale ranging from 1 to 10. Questions regarding overall satisfaction are also included. The respondents are selected by the account managers without a formal selection process which could bias the result. The data used for analysis was responses from the survey sent to customers during 2014. Answers from 5500 customers was available for analysis

For customer support there are eight questions regarding support deliverables of which two are specifically dedicated to HW support, three are dedicated to SW support and three are more general and overlapping both SW and HW, see Table 3. The idea to use this data is the same as for the CPE responses, i.e. to see if any attribute have a high influence on overall satisfaction.

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[7] Business Operations Manager, interviewed by the authors 2015-05-06

Table 3 Questions about HWS in yearly customer satisfaction survey

Questions dedicated to HW Support deliverables
Handling of your hardware service, service request
Hardware service replacement units are delivered on time
Three questions overlapping Hardware and Software support
Service are provided according to contract terms
Ease of working with the support organization
Communication regarding customer support requests
Questions asked for the support contact person questions
Accessibility
Competence
Responsiveness
Commitment
Proactivity
Professionalism

In the survey there are also a few optional free text questions regarding what Ericsson's strengths are and what could be improved which also were studied to find more in-depth feedback from the customers.

2.5.1.3   Analysis method

The same analysis method was used to analyze the datasets from the two different surveys. The methods used to analyze the relationship between the different attributes addressed in the surveys and the overall satisfaction was a correlation analysis and a simple linear regression. The regression analysis was made in two steps, first with each attributes as the only independent variable and then in a model with all attributes as independent variables. The coefficient of determination (R^2) was studied to see how much of the variation the different regressions were able to capture. As suggested by Montgomery and Runger (2007) a p-value of 0,05 was used to decide if the coefficients were significant or not.

All investigated samples suffered from some level of multicollinearity i.e. that the attributes are not completely independent. In other words, if a respondent has answered high on one attribute he is more likely to answer high on other attributes as well and vice versa. The test used for investigating multicollinearity was to study the Variance Inflation factor (VIF). The higher variance inflation the more dependent are the variables and if the variance inflation factor approaches 10 the variables are typically suffering from serious collinearity problems (Montgomery & Runger, 2007). The practical implication of collinearity is that it is hard to identify what attribute really drives the dependent variable, in this case overall satisfaction. See Table 4 for the VIF values for the samples. As seen in the table there is some level of collinearity for all samples, but not enough to completely reject the use of the data for regression analyses.

Table 4 The VIF values for the studied samples.

	CSat	NRO	NDO	CSI
VIF	6,78	3,15	3,49	3,14

The Breusch-Pagan heteroskedasticity test was used to check if the variation was constant and random for the complete range of potential values i.e. not varying for different values which is a basic assumption for a linear regression model. A value near 0 in the Breusch-Pagan heteroskedasticity indicates that the sample suffers from heteroskedasticity. This could affect the standard errors of the coefficient and as a result the significance test of the coefficients but it does not necessarily mean that there is no correlation. In the regression analyses presented later in the thesis all regressions suffered from heteroskedasticity except for NDO. However, there are no intentions to create a linear regression model that will predict satisfaction based on responses in different attributes. It is merely the intentions of the researchers to detect any attribute that has a strong influence on customer satisfaction.

2.5.2 Interviews

Semi-structured and unstructured interviews were an important part of the empirical study. It is a flexible method that can give both in depth- and detailed knowledge (Kvale & Brinkmann, 2009). Semi-structured and unstructured interviews allow the interviewer to ask further questions if the replies triggers other questions (Bryman & Bell, 2011). Being able to ask follow-up questions and have answers further explained and explored also increases the validity of the interview (Esiasson et al., 2012). Despite the many benefits with this form of interviews there are some potential sources of bias to consider. First, it is not possible to be completely objective since the questions asked and interpretations of the answers are based on the pre-knowledge of the interviewer (Bryman & Bell, 2011). Secondly, it is important to be aware of that the interviewer always to some extent influence the respondent and thereby the answers. For instance the respondent might give the answer he or she believes the interviewer want to hear or exaggerate details important for an own agenda (Kvale & Brinkmann, 2009).

The interviewees were mainly identified through discussions with the project sponsor. In some cases the interviewee suggested appropriate people to meet that were contacted and later on interviewed. This method probably affected the sample of interviewees but was considered to be the best option since the researchers did not know the organization and the people in it on beforehand. The help to get in contact with appropriate people and advised to talk to certain employees was especially useful in the beginning of the thesis work when the researchers did not had established their own relationships with people in the organization. In Table 5 there is an overview of the conducted interviews including the topic of each interview, the type of interview and the position of the interviewees. The number of interviews with each person can be seen in brackets. The vast majority of the interviews were one hour.

Table 5 List of interviews

Position	Focus on interview	Type of interview	Strucutre of interview
8 Service Delivery Manager	Critical to customer	Telephone/Video	Semi-structured
3 Key Account Managers	Critical to customer	Face to face	Semi-structured
1 Customer	Quality experieence	Telephone	Semi-structured
Head of Quality BUGS (continuous meetings)	Focus and direction of thesis	Face to face	Unstructured
Business Control & Performance, HWSO (3)	Performance measures	Face to face	Unstructured

Repair Program Manager, GSO	HWS Process	Face to face	Unstructured
Product logistics manager	HWS Process	Face to face	Unstructured
2 Process Managers HWS (2)	HWS Process	Face to face	Unstructured
Cost Governance Manager, PRS (3)	HWS Process	Face to face	Unstructured
Master researcher	Quality measures, cultural differences	Face to face	Unstructured
Principal researchers	Cultural differences in quality perception	Face to face	Unstructured
Regional Head of Quality	Quality work in region	Video	Unstructured
Regional Head of HWS Delivery Management	Find people to interview	Telephone	Unstructured
Service Delivery and Operations Strategy Manager	Focus and direction of thesis	Face to face	Unstructured
Service delivery strategy manager	Focus and direction of thesis	Face to face	Unstructured
Regional Hardware Service Manager	Critical to customer for HWS	Telephone	Semi-structured
Head of Global NRO PMO & ASP Manager	About NRO services	Face to face	Semi-structured
Head of CSI operations	About CSI services	Face to face	Semi-structured
Line manager Learning & Ericsson Academy	About Learning Services	Face to face	Semi-structured
Managed Services Performance Manager	About Managed Services	Face to face	Semi-structured
Head of regional customer unit	Critical to customer for HWS	Face to face	Semi-structured
Functional Lead Repair Solutions	Repair related to HWS	Face to face	Unstructured
PDU HW Quality Manager	PDU related to HWS	Face to face	Unstructured
Developer tools	PDU related to HWS	Face to face	Unstructured
Program Manager	NFF program	Face to face	Unstructured
Business Operations Manager	CPE questionnaire	Face to face	Unstructured
Head of HWS Operations	Quality measures	Face to face	Unstructured

Unstructured interviews were conducted throughout the thesis work. In the beginning of the project the unstructured interviews aimed to provide a basic understanding of the current situation and the context of the thesis. Later on the interviews provided a deeper understanding of different areas related to the thesis through input from knowledgeable people within the organization. It was also a way for the researcher to get in contact with people who further suggested relevant people to get in contact with. The unstructured interviews had a topic or question that the respondents were elaborating upon and the interviewers asked follow up questions for clarification or direction of the interview. These interviews were not recorded, instead notes were collected. All of the interviewees involved in the unstructured interviews were available for clarifying and follow-up questions and any uncertainties could be cleared in retrospect.

A number of semi-structured interviews was conducted in order to get a deeper understanding of what is critical to quality for the customers and also to get knowledge about the complete service portfolio and how quality is measured for the respective services.

The interviews conducted to collect input about the different services, other than HWS, was done with one respondent representing each service and the interviews was organized around the following three questions

- *Could you describe the service and the deliverables?*
- *What quality measures are used for these services today?*
- *Based on your experience, what would you say make the customer satisfied/dissatisfied with the service?*

These interviews were not recorded, instead notes were collected during the interviews and these were compiled immediately after the interview was finished. All four interviews were conducted face to face.

For the specific purpose of HWS one customer was interviewed by telephone. The customer interview was with a person working with hardware support that has regular contact with Ericsson regarding the service. The focus in this semi-structured interview was on what is critical for the customer regarding HWS and what creates satisfaction and dissatisfaction. Example of questions that was asked during the interview:

- *What is most important when you select HWS supplier?*
- *Do you have any examples of situations when you have been especially satisfied/dissatisfied with HWS?*
- *What do you think should be improved?*

Another category of people that was interviewed in a semi-structured setting was Service Delivery Managers (SDM). They are responsible for the delivery of the HWS and have frequent contact with the customer. Eight SDM:s working in six different regions was interviewed and the focus in these interviews was on their experiences working with HWS. All interviews with SDM:s were phone interviews except one which was conducted on video link. A selection of questions asked during the interviews are:

- *Based on your experience, what is most important for the customer when delivering HWS?*
- *What would you say make the customer satisfied/dissatisfied with the service?*
- *What performance measures are the customers interested in?*
- *What is the most challenging part of being an SDM for this customer(s)?*

Three Key Account Managers (KAM) were interviewed as well. They are involved in selling the HWS and negotiating with the customer about the terms and conditions in the contract. All three interviews was conducted face to face. The focus in these interviews was on the contract process and what make the customer satisfied and dissatisfied with HWS. Sample questions from the interviews are:
- *Based on your experience, do you find it easy or hard to sell HWS?*
- *What does the customer consider most important when signing HWS contract?*

- *Have you experienced a customer that did not renew or cancel the HWS contract? If yes, what was the main reason?*

Preferably several customers should have been interviewed in this study, but it turned out to be difficult arrange customer interviews and therefore another approach was undertaken. By interviewing one customer, its SDM and KAM it was found that they shared the same views and opinions about the delivery of HWS to a large extent. Therefore the authors considered that interviewing SDM:s and KAM:s was a reasonable substitute for the customers.

Other people working in close contact with customers, or that have experience from customer contact and quality issues regarding the service, were interviewed as well. The complete interview guides with the questions used during these semi-structured interviews can be found in Appendix B. The reason for conducting many of the interviews on telephone was due to geographical distance.

Notes were collected at the unstructured interviews and these were compiled directly after each interview. All the semi-structured interviews focusing on HWS (one customer, eight SDM, three KAM) were recorded and transcribed. The notes were used to structure the findings from the interviews. It is time consuming to transcribe interviews but that is outweighed by the advantages it offers. First of all, when recording an interview the interviewer can pay full attention on the respondent instead of taking notes at the same time. It enables a more thorough examination of what people say and the results does not need to rely on the interviewer's memory (Bryman & Bell, 2011).

2.6   Data analysis

The data analysis in this study was influenced by the analysis method called grounded theory, which is an iterative approach widely used for analyzing qualitative data (Bryman & Bell, 2011). This framework suggests that data collection, analysis and eventually theory are closely related and data collection and analysis are preceded in tandem.

The findings from the unstructured interviews was continuously processed, the material was organized in a document with a number of categories which were: *Quality measures, Satisfaction, Dissatisfaction, Strengths HWS, Weaknesses HWS, Cost*, and *Other*. After finishing the semi structured interviews all transcripts were read through and interesting parts highlighted. The Affinity diagram approach was used to analyze and organize the data. After reading through the transcripts the next step was to type all the interesting input from the interviews on a great number of post-its who were put on a board before they were grouped into categories. Around 150 post-its were grouped into ten groups. Based on these groups the outline of the chapter with empirical findings was established and the material was organized. Useful quotes from the transcripts were extracted as well.

2.7   Trustworthiness

To ensure the quality of qualitative research four different concepts are often discussed; *Credibility, Transferability, Dependability, Confirmability* (Bryman & Bell, 2011). The first criterion, *credibility*, is concerned with the integrity of the conclusions of the study (Bryman & Bell, 2011). In order to make the findings believable, and the study credible, multiple data collection methods have been used (literature study, interviews, SWOT workshop, and secondary data analysis) and together with literature findings the conclusions were then drawn. This approach to ensure trustworthiness is called triangulation (Bryman & Bell, 2011; Yin, 2013). In order to further ensure trustworthiness the semi-

structured interviews were recorded, which enable to validate findings afterwards and minimize the risk of inaccurate interpretation based on insufficient notes. *Transferability* concerns generalization of the study, how applicable it is to other contexts. By providing a thick description of the research, meaning that it is well documented, described and the empirical data is presented in a transparent way, it enables other to assess the possible transferability of the study (Bryman & Bell, 2011; Yin, 2013).

The third criteria, *dependability,* are concerned with the possibility to repeat the study and replicate the findings which might be difficult to ensure (Bryman & Bell, 2011). Dependability is addressed through a thorough documentation throughout all phases of the work (Bryman & Bell, 2011). To ensure dependability the supervisor at Chalmers and the project sponsor at the case company did continuously feedback on the work and evaluated the process. This could be seen as a way of auditing which will increase the dependability according to Bryman and Bell (2011). Finally, *confirmability* is concerned about the researchers that should not allow personal values or theoretical inclinations to the research and findings that derive from it (Bryman & Bell, 2011). The recording and transcription of the semi-structured interviews enabled to the researchers to have a more objective view on what was said during the interviews.

2.8   Ethical considerations

Ethical considerations in this thesis are mainly relevant for the people involved in the empirical study. The people being interviewed were informed about the purpose and approved their involvement on beforehand in order to avoid issues with informed consent (Bryman & Bell, 2011). In some cases the questions were sent in advance and in other cases a description of the project and the purpose of the interview were provided. The respondents participating in interviews that were recorded were asked for permission before, and also informed about the purpose of the recording and how the material was going to be used and managed afterwards. The respondents were informed about that they were going to be anonymous in the reporting of the thesis work. A proper reference system has been used throughout the report and the researchers of this thesis have not distorted any data or presented other researchers findings as their own.

3   Theoretical framework

This chapter introduces the background to different research areas that will be explored in this thesis. First of all different ways to classify services will be presented and then follows a review of different ways to measure quality. Finally previous research on quality dimensions for different services are reviewed.

3.1   Service classification

Classification provides a way to sort and group things into categories that can be studied and compared based on similarities and differences. Several researchers have proposed different classification schemes for services along the goods and service continuum. In Table 6 there is a summary of different service classifications proposed by different researchers.

Table 6 Different service classifications

The table shows how different researchers have classified different service types	
Frambach et al. (1997)	Maintenance and repair services Business advisory services
Frambach et al. (1997)	Pre-sale services During sale services After sale services
Mathieu (2001a)	Services that support the supplier's product Services that support the client's action in relation to the supplier's product
Oliva and Kallenberg (2003)	Basic installed base services Maintenance services Professional services Operational services
Neely (2008)	Design and development services Systems and solutions Retail and distribution services Maintenance and support services Installation and implementation services Financial services Property and real estate Consulting services Outsourcing and operating services Procurement services
Gebauer (2010)	Customer service Basic services for the installed base Maintenance services R&D oriented services Operational services
Ulaga & Reinartz (2011)	Product life-cycle services Asset efficiency services Process support services Process delegation services

3.1.1 Exploring different ways to classify services

Frambach et al. (1997) proposed a classification that consider if the service is provided pre-sale, during-sale, or after-sale. Services prior the purchase decision are services which aid the buyer in the decision process and help with the adoption of the product for instance by demonstrating usage. Services directly related to the purchase decision, during-sale services, will support the customer to take the product into use like installation and training. Finally, services following the purchase decision, after-sale services, aim to keep the customer satisfied with the purchase by failure handling and maintenance for example.

Further, Frambach et al. (1997) address that services can be classified as either *relationship based services* or *transaction based services*. Relationship-based services are services that support an ongoing relationship between the customer and supplier, while the transaction related services could be acquired without further future exchanges.

In the classification presented by Neely (2008) it is distinguished between different type of services based on their content and type such as repair, consulting and financial services. Furthermore, Gebauer et al. (2010) grouped services into five service classes by five different service strategies. The first class groups *basic customer services* necessary for being able to sell the products such as information or transportation. The second class contains *basic services for the installed base* such as repair and replacement. *Preventive product related services or maintenance contracts* are grouped in the third class. The fourth class contains *R&D oriented services* where the supplier assists the customer with development or other consultative services. The final class includes *operational or outsourcing services* where the supplier takes responsibility for certain operations for the customer.

Mathieu (2001a) distinguish between *services that support the supplier's product* (SSP) and *services that support the client's action in relation to the supplier's product* (SSC). For SSP the direct recipient of the service is a product and both the intensity of the relationship and the level of customization is typically lower. For SSC, on the other hand, the direct recipient is a person and the intensity of the relationship and the level of customization is typically higher (Mathieu, 2001a).

3.1.2 Multidimensional models for service classification

Schmenner (1986) constructed a classification scheme with labor intensity on one axis and with customer interaction and customization on the other. Haywood-Farmer (1988) used a similar classification matrix but distinguished between customer interaction and customization, hence constructed a three-dimensional cube with labor intensity, customer interaction and customization on three different axes. The service classification scheme proposed by Haywood-Farmer (1988) can be seen in Figure 3.
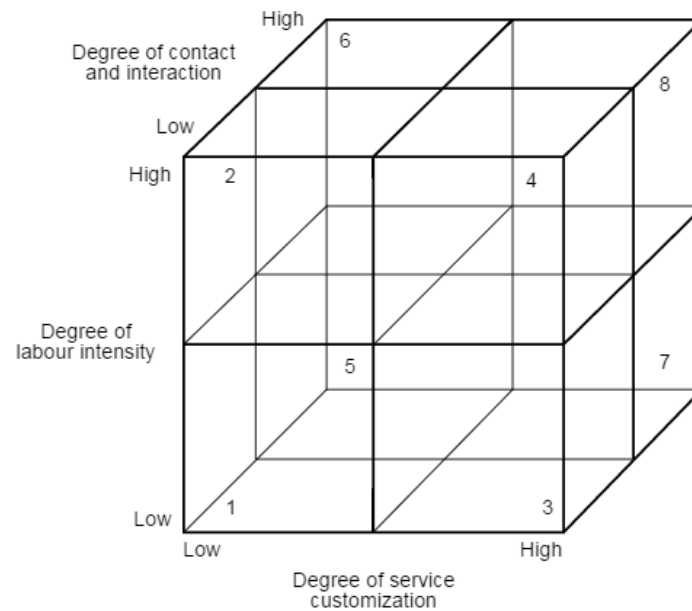
Figure 3 Service classification proposed by Haywood-Farmer (1988)

Oliva and Kallenberg (2003) present a multidimensional framework for service classes with classes similar to the ones proposed by Gebauer et al. (2010). The framework is presented in Figure 4 below. Their framework integrates the aspects presented by Frambach et al. (1997), who distinguishes between transaction- and relationship based services, and Mathieu (2001a) who separates services that support the customer's product or the customer's process. Moving from transaction towards relationship based services the pricing model usually changes from charging every transaction towards a contract covering period of time (Oliva & Kallenberg, 2003). This also means that the supplier assumes the risk of equipment failure or other increased operating expenses.

	Product oriented services	Customer's process oriented services
Transaction based services	**Basic installed base services** *Documentation* *Transport to client* *Installation/Commissioning* *Product-oriented training* *Hot line/help desk* *Inspection/diagnosis* *Repairs/spare parts* *Product updates/upgrades* *Refurbishing* *Recycling/machine brokering*	**Professional services** *Process-oriented engineering (tests, optimization, simulation)* Process-oriented R&D Spare parts management Process-oriented training Business-oriented training Process-oriented consulting Business-oriented consulting
Relationship based services	**Maintenance services** *Preventive maintenance* *Condition monitoring* *Spare parts management* *Full maintenance contracts*	**Operational services** Managing maintenance function Managing operations

Figure 4 Service classification scheme proposed by Oliva and Kallenberg (2003)

The first service class proposed by Oliva and Kallenberg (2003) is *basic installed base services*. These are transaction-based services supporting the customer's products. They are simpler support services like documentation, transportation and help desk. The pricing model for these services is usually based on isolated exchanges and the risk of product failure is owned by the customer.

The second class is relationship-based services supporting the customer's product referred to as *maintenance services* (Oliva & Kallenberg, 2003). These services are usually bought on a contract covering a period of time where the supplier takes responsibility for preventive services, maintenance or inventory and the supplier assumes the risk of product failure.

The third class, *professional services*, is transaction-based services supporting the customer's process (Oliva & Kallenberg, 2003). For these services the customer pays for the supplier's expertise and knowledge for instance business oriented consulting and process-oriented R&D.

The fourth class are *operational services* (Oliva & Kallenberg, 2003)*,* also called outsourcing services by Gebauer et al. (2010). For these services the supplier take full responsibility for operating the customer's process or assets and assumes operating risks. This gives the customers the opportunity to focus on their own core business.

Several other researchers have built on- and created different versions of the classification scheme suggested by Oliva and Kallenberg (2003)**.** One framework proposed by Ulaga and Reinartz (2011) considers the nature of the value proposition and distinguish between if the supplier promises to perform a deed or to achieve a performance. The other parameters in the framework are the same as is

in the framework proposed by Oliva & Kallenberg (2003) and considers if the service is oriented towards the supplier goods or customer process.

Gaiardelli et al. (2013) suggests another framework similar to the one proposed by Oliva & Kallenberg (2003). The main difference is that Gaiardelli et al. (2013) refined the scale moving from product oriented services to process oriented services by dividing it into three different zones. The first zone is product-oriented services such as transportation or installation. The second zone is use-oriented services such as leasing contracts and the third zone includes result-oriented services such as pay-per-use or outsourcing services. The service classification framework proposed by Gaiardelli et al. (2013) is illustrated in Figure 5.
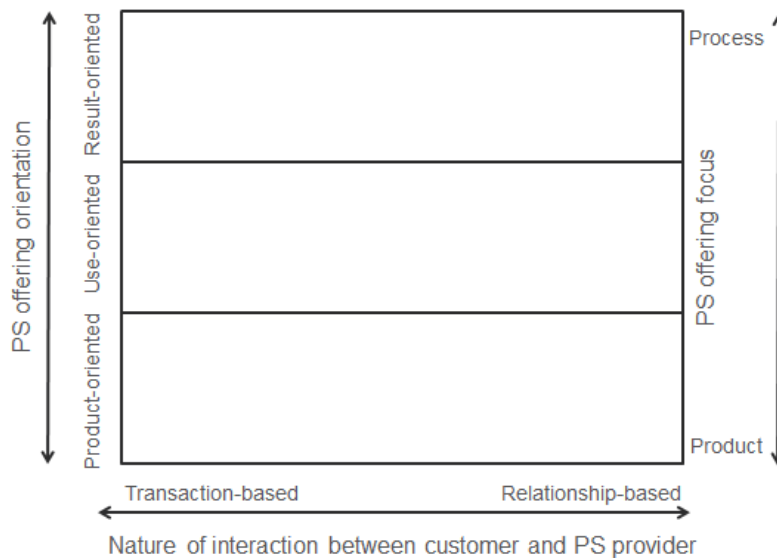
Figure 5 Framework for service classification proposed by Gaiardelli et al. (2013)

3.2   Defining and measuring quality

Even though service quality is hard to measure it is crucial for being able to understand and manage it. As Elliot (1993, p.18) puts it "if you cannot measure it, you cannot manage it". Lee and Kim (2013, p.3761) share the same opinion and argue that "the prerequisite for achieving a high level of service quality is to be able to measure it". How quality is measured will also guide employee behavior and subsequently affect the outcome of the delivered service (Seth et al., 2004).

How quality can be measured depends on how it is defined (Elliot, 1993). Some research on quality focused more on objective or internal quality measures, such as cost of poor quality (Elliot, 1993) and "loss avoidance" (Revees & Bednar, 1994) who that does not necessarily directly affect the customer. Other definitions of quality focus more on the customer's subjective perception of quality, which means that the customer is the ultimate judge of quality (Reeves & Bednar, 1994). To consider the customer as the ultimate judge of quality direct the attention to how well a product or service is able to fulfill the needs and expectations of the customer (Bergman & Klefsjö, 2010).

3.2.1   Service quality vs customer satisfaction and loyalty

Though quality and customers satisfaction are not synonymous they are highly related in the modern definitions of quality. Bergman & Klefsjö (2010, p. 315) argues that "customer satisfaction is the ultimate measurement of quality". Parasuraman et al., (1988) explained the distinction between

service quality and customer satisfaction as "perceived service quality is a global judgment, or attitude, relating to the superiority of the service, whereas satisfaction is related to a specific transaction". Drawing on this work Bolton and Drew (1991) argued that continuous satisfaction over time leads to high perceived quality. However, the causal relationship between service quality and customer satisfaction is debated. Parasuraman et al. (1988) presented several examples of when customers were satisfied but did not experience a service to be of high quality. Also Cronin and Taylor (1992) found strong support for that the direction of the causal relationship actually is the opposite i.e. that perceived service quality leads to satisfaction. This is a view supported by Oh (1999) and Sharma and Negi (2014) as they mean that service quality is one of several antecedents for satisfaction.

In their study of service quality Cronin & Taylor (1992) also found that customer satisfaction has a significant impact on purchase intention, while they could not prove a significant relationship directly between service quality and purchase intention. Hence besides service quality there must be other factors that influence both satisfaction and purchase intention and factors such as price might affect satisfaction without influencing the perceived quality (Cronin & Taylor, 1992). To explain this gap Oh (1999) integrated price and perceived value in his quality model. In his study he confirmed that the price did not significantly affect perceived quality but that it affects perceived value which in turn is an antecedent for satisfaction. Oh (1999) also confirmed the findings of Cronin & Taylor (1992) that satisfaction affects repurchase intentions and also provided evidence for perceived value as an antecedent for repurchase intentions. Even early research on quality also acknowledged the role of value, for instance Garvin (1984) discussed the value perspective of quality i.e. that customers evaluate quality in relation to the price.

3.3   How to measure service quality?

Researchers like Abbot and Feigenbaum in the 1950:s defined quality as "conformance to specifications" (Reeves & Bednar, 1994). From this perspective it seems legit to measure disconformities or defects as suggested by authors such as Elliot (1993). Other researches like Taguchi focused the definition of quality on "loss avoidance" (Reeves & Bednar, 1994) and that it is important to understand the costs of poor quality (COPQ) in order to understand the business value of quality and quality improvements (Defeo, 2001).

Though the definition of quality has evolved over time it would be wrong to say that the earlier definitions are completely out-dated (Reeves & Bednar, 1994). Today most authors agree that service quality should be measured both as an outcome and as a perception of how the service is delivered (Grönroos, (1984); Parasuraman et al., (1988); Swartz & Brown (1989); Lehtinen & Lehtinen (1982)). Some researchers like Klaus and Maklan (2012) even argues that customers' experience begins already before the first service encounter and continues after the last encounter. They state that "Every customer contact, consumption experience and communication creates an experience in the mind of the customer" and that this affects customer satisfaction and loyalty (Klaus & Maklan, 2007, p 119).

The customer centered definitions of quality created new demands on tools for measuring quality. Since the mid 1980:s different survey tools such as SERVQUAL (Parasuraman et al., 1985), SERVPERF (Cronin & Taylor, 1992) and EXQ (Klaus & Maklan, 2012) have been developed in attempts to measure service quality. Parasuraman et al. (1985) defined quality as the gap between customer expectations and perception of performance and made this gap the center of the measurements. Cronin and Taylor (1992) argued that perceived performance together with an

importance ranking is a good predictor of customer satisfaction, without measuring expectation. Nevertheless the effect of expectations on satisfaction gains support from many other researchers such as Carman (1990), Hernon et al. (1999), and Bergman and Klefsjö (2010). Today most companies use a customer satisfaction survey in one way or another (Bergman & Klefsjö, 2010). However Carman (1990) and Brown et al. (1993) means that general survey questions is hard to formulate, due to that different quality dimensions are relevant to different services and since the wording might have to be adjusted to the specific context.

Another potential indicator of poor quality is customer complaints. Complaints can be used for identifying "satisfiers" (attributes or performance leading to satisfaction) and "dissatisfiers" (attributes or performance causing dissatisfaction) (Edvardsson & Friman, 2003). The distinction between satisfiers and dissatisfiers is important in order to understand in what way dimensions affects customer satisfaction. For instance, increased reliability might not lead to increased satisfaction whereas lower reliability might lead to dissatisfaction (Johnston, 1995). However, research suggests caution in using complaints as a measure of quality since it has shown to be a weak predictor of loyalty and repurchase intention (Edvardsson & Roos, 2003) and the fact that only a few dissatisfied customers actually complain makes it a weak predictor of satisfaction as well (Bergman & Klefsjö, 2010). Table 7 provides an overview of different quality measures indicated by researchers in their work.

Table 7 List of quality measures

Overview of different measures mentioned by different researchers	
Parasuraman et al. (1985)	Customer perception (SERVQUAL)
Cronin & Taylor (1992)	Customer perception (SERVPERF)
Klaus & Maklan (2012)	Customer perception (EXQ)
Defeo (2001)	Cost of poor quality
Elliot (1993)	Absence of defects, failure rate, disconformities
Edvardsson & Roos (2003)	Customer complaints

3.4   Service quality dimensions

A clear conception of quality is of great value when striving to improve it (Asubonteng et al., 1996). By breaking down service quality into different dimension it can be operationalized. Identifying the quality determinants is necessary in order to define quality measures and be able to control and improve it (Chowdary & Prakash, 2007). For instance it is more effective to tell employees to "be more responsive" rather than the more vague exhortation to "increase the quality of your work" (Asubonteng et al., 1996; Bergman & Klefsjö, 2010).

As discussed in the background, researchers have not yet derived a definite list of quality dimensions that is applicable for all services. While the five quality dimensions suggested by Parasuraman et al. (1988) still are the most cited, see Table 8 for definitions, Carman (1990) among others argue that different quality dimensions are relevant for different services. Carman (1990) further argues that when one dimension is particularly important to the customers it is suitable to break down that dimension into subdimensions.

Table 8 Definitions of the five quality dimensions proposed by Parasuraman et al. (1988)

Researcher	Quality dimension	Definition
Parasuraman et al. (1988)	Reliability	Ability to perform service dependably and accurately
	Assurance	Knowledge and courtesy of employees and their ability to inspire trust and confidence
	Tangibles	Physical facilities, equipment, and appearance of personnel.
	Empathy	Caring, individualized attention the firm provides its customers.
	Responsiveness	Willingness to help customers and to provide prompt services.

Different researchers suggest everything from two to ten quality dimensions. Chowdary and Prakash (2007) further argue that the importance of different dimensions even could vary for different customers of the same service. Country and culture are factors that can influence customer preferences (Izogo & Ogba, 2014).

Besides the struggle of finding out what quality dimensions that are relevant and most important there also seems to be a struggle with keeping the different dimensions apart as there is an overlap between some dimensions (Asubonteng et al., 1996). Especially there seems to be an overlap for responsiveness, assurance, and empathy (Parasuraman et al., 1991; Asubonteng et al., 1996). For instance the empathy item "operating hours convenient to all customers" could be related to the responsiveness item "giving prompt service". Parasuraman et al. (1994) raised a concern that some dimensions actually could be antecedents for other quality dimensions.

Along with the development of IT and communication technology there has been rise and growth of a new category of services, which can be termed as hybrid services (Ganguli & Roy, 2010). The distinguishing characteristic of this service category is that customers' interactions with a firm are a mix of human and technology interactions. Ganguli and Roy (2010) have identified a set of quality dimensions relevant for hybrid services.

The service transition has also led to a development of new services that together with products create a solution. A firm that provides solutions to their customer can for example promise to provide the customer with services and resources during a period of time agreed in a contract (Johansson & Witell, 2013). When selling a solution the value proposition is more concerned with what the solution delivers than with the individual components (Johansson & Witell, 2013).

The research on quality dimensions regarding solutions have not yet received much empirical support. However, recent research by Johansson and Witell (2013) have identified six different quality dimensions that are relevant for solutions; *reliability*, *flexibility*, *consistency*, *tangibility*, *approachability* and *empathy*. Their research indicates that the quality dimensions for solutions have an overlap between product quality and service quality but also some unique dimensions see Figure 6.

Reliability is a dimension relevant both for products and services as well as for solutions and its meaning is the same i.e. deliver what is promised at the right time (Johansson & Witell, 2013). Empathy and tangibility are dimensions also found for service quality, though while tangibles for services refers to equipment, facilities and appearance of personnel, tangibles for solution refers to the products in the solution (Johansson & Witell, 2013).

Approachability has similarities with the service quality dimensions accessibility and responsiveness and is concerned with how easy the supplier is to get in contact with and the response time in need of assistance. Flexibility is concerned with how well the solutions can be fitted to the customer's initial needs and the extent to which it can be adjusted if the needs change (Johansson & Witell, 2013). When selling a solution the supplying company must also have knowledge of the entire solution and what can be delivered and combined, which Johansson and Witell (2013) refers to as consistency. In Table 9 different service quality dimensions proposed by different researchers are presented. The definitions of each dimension can be found in Appendix B.

Table 9 Quality dimensions suggested by different researchers

Service quality dimensions as suggested by different researchers	
Parasuman et al. (1985)	Reliability Responsiveness Competence Access Courtesy Communication Credibility Security Understanding/Knowing the customer Tangibles
Parasuman et al. (1988)	Reliability Assurance Tangibility Empathy Responsiveness
Carman (1990)	Tangibles Reliability Responsiveness Security Courtesy Personal attention Access/Convenience
Hedvell & Paltschik (1989) in Babakus & Boller (1992)	Willingness & ability to serve Physical & psychological access
Johansson & Witell (2013) **Solution quality dimensions**	Reliability Empathy Tangibility Approachability Consistency Flexibility
Ganguli & Roy (2010) **Hybrid services**	Customer service Staff competence Reputation Price Tangibles Ease of subscription Technology security and information quality Technology convenience Technology usage easiness and reliability

3.5   Previous research on quality dimensions for different services

Many studies trying to identify the relative importance of quality dimensions for different services have applied SERVQUAL or similar tools. Therefore most previous findings regarding the importance of different quality dimensions are limited to the five dimensions suggested by Parasuraman et al. (1988). As discussed in Chapter 1 most services included in these previous studies have little in

common with services typically provided by a B2B manufacturing company (Carman, 1990; Rosen & Karwan, 1994; Wiseniewski, 2001; Kitapci et al., 2013). However, there are some services that resemble or have similar characteristics with services that could be found in the service portfolio of manufacturing companies. For instance repair services were included in two SERVQUAL studies performed by Parasuraman et al. (1988 & 1991). Lee and Kim (2013) made some discoveries on the importance of dimensions regarding transportation and logistics services. Furthermore Chowdary and Prakash (2007) and Lee and Kim (2013) explored some professional services like education and management consulting.

3.5.1   Review of different studies

Despite limited previous research on service quality dimensions and measures has focused on the service portfolio of manufacturing companies in a business to business setting, some insight have been gained from the literature review. When manufacturing firms combine products and services into solutions Johansson and Witell (2013) argue that specific quality dimensions becomes relevant.

The different SERVQUAL studies for repair services found reliability to be the most important quality dimension (Parasuraman et al., 1988; Parasuraman et al., 1991). In the study of the appliance repair service by Parasuraman et al., (1988) reliability was rated highest, followed by assurance was rated as second most important and then responsiveness, tangibles, empathy in descending order of importance. In the study of the telephone repair service by Parasuraman et al., (1991) the results were similar. Reliability, responsiveness and assurance scored high while empathy and tangibles received lower scores. The results regarding reliability are consistent with the survey-study performed by Chowdary and Prakash (2007) where reliability fell out as the most important criterion for services targeted at possessions of the customers. Reliability is also identified as the most important dimension when it comes to delivery and transport (Lee & Kim, 2013). Empathy and tangibles seem to be of less importance for services targeted at possessions.

Chowdary and Prakash (2007) have identified tangibility as a dimension more important for intangible services where the value is created in the physical presence of the customer and when the service is targeted at the individual customer, such as education and training. Tangibles for these services relate to facilities, equipment and material used when providing the service (Chowdary & Prakash, 2007). According to Rosen and Karwan (1994) tangibility becomes increasingly important when the customer is closely involved with the delivery of the service. In addition, empathy are important for the same group of services since they are labor intensive and has a high degree of personal contact (Chowdary & Prakash, 2007). Assurance is also identified as important dimensions for services targeted at customers (Chowdhary & Prakash, 2007). Lee and Kim (2013) also mean that assurance is an important dimension for professional services.

4 Empirical Findings

In this chapter the empirical findings are presented. A description of each service including a presentation of what is perceived important for the customers regarding the service and how quality is measure is provided. A more in depth study has been conducted on Hardware Services and hence service will be elaborated on in an extended section in the end of the chapter.

4.1 Learning Services

Learning services are training programs for competence development addressed both to customers and employees[8]. The services are closely related to the product portfolio and how the products are managed and optimized. Learning services are usually sold in conjunction with the network and products. Two different Learning Services are concerned in this study. *Training programs* which include predefined training packages including a great variety of courses mainly relating to the products and how to operate the networks. *Learning solutions* are competence investigation and investments.

The quality of the different learning services is evaluated in the same way by using a survey that is answered by the participants after each training program[8]. The survey includes seven questions that are rated on a likert scale from 1 to 6 where 1 is "very dissatisfied" and 6 is "very satisfied". There are also free text fields for the course participants to leave additional comments and improvement suggestions. The different questions can be seen in Table 10. However, the importance of the different aspects is not ranked in the survey.

Table 10 Questions in customer satisfaction survey for Learning Services

Questions in course evaluation survey for Learning Services
1. *How do you rate the course as a whole?*
2. *How do you rate the quality of the course documentation?*
3. *How do you rate the instructor(s)?*
4. *How valuable is the course to you in your daily work?*
5. *To what extent do you feel that the course objectives have been met?*
6. *How successful were the exercises?*
7. *How do you rate the training environment and facilities?*

There are no tests included at the end of the course assessing the participants acquired knowledge. There has been no demand from the customers to include this[8]. "This is in one way surprising, since they invest time and money in the people taking the course"[9]. However, one of the questions in the survey is a self-assessment of how useful the course was to the participants' daily work. "In order to make the course useful it is important to make sure the content matches the needs of the customer, training programs regarding products must be in line with the products in the customer's network."[9].

A number of things are highlighted as important for the customer when participating in a training program[9]. To get the relevant documentation material in the required format (soft or hard copy) is

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[8] Line manager Learning & Ericsson Academy, interviewed by the authors 2015-05-27
[9] Line manager Learning & Ericsson Academy, interviewed by the authors 2015-05-27

important for the customers and if not available it causes dissatisfaction. To have a competent with good communication skills lecturer is considered important. "A good lecturer can affect the customer's perception of the course a lot"[9]. Exercises included in the training need to work as planned, if not it causes dissatisfaction[9]. "Often courses include exercises in online tools and if they wouldn't work it could ruin the whole impression of the course"[9].

There are also other aspects that affect the customer quality experience that is not a part of the course itself but that the customer relate to it. It can for example be the hotel that the course participants stay at, the food they eat or the transport. Some expect to get a gift and are dissatisfied if there is non-provided. It has been noted that customers from different cultures have different expectations[9].

4.2   Network Roll-out

As the name indicate Network Roll-out (NRO) include services for building telecom sites and integration of networks. The actual installation work can be handled either by Ericsson personnel or outsourced to Authorized Service Providers (ASP). The quality of the installation and workmanship is evaluated using an audit tool called QASIS that is performed on a sample of installations (Quality Assurance System Implementation Services)[10]. The QASIS audits are performed by trained auditors who judge the quality of installations. They use an audit list to check if the installation work is done according to specification and if equipment is working properly such as *Assembly and alignment of cabinet* and *Alarm cables and connection*. Any observed defects should be highlighted and documented (Persson, 2013).

For the customers it is important to get the project delivered on time and to get the required output and effect on the network from the project[11]. There is a perception that good results in the QASIS audit and customer satisfaction is related[11].

For project based services Ericsson uses a web questionnaire called Customer Project Evaluation (CPE) to evaluate customer perception of the projects[12].The CPE questionnaire should be sent to the customer in the end of the project or at least every third month for long-term delivery projects[13]. All customer projects should be measured. The respondents rate their perception of different aspects of the project regarding three areas which each contain a number of attribute questions. The three areas are: Project manager, Project execution, and Overall satisfaction. Each attribute is evaluated on a likert scale between 1-10 where 1 is very poor and 10 is very good. There are also free text areas for further comments in the questionnaire. One potential bias in the data is that the respondents at the customer are selected by the Project Manager without any formal selection criteria[13].

That "complete activities on time" have an impact on "overall satisfaction" can also be seen by studying the scatterplot of those variables based on data from the CPE questionnaire, see Figure 7. However even though the impact is significant, the variation is quite high which implies that predicting satisfaction based on whether the activities are completed on time is hazardous. See Appendix C for statistical references for different attributes and their effect on overall satisfaction.

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[10] Head of Quality BUGS, interviewed by the authors 2015-04-15
[11] Head of Global NRO PMO & ASP Manager, interviewed by the authors 2015-05-05
[12] Head of Quality BUGS, interviewed by the authors 2015-04-15
[13] Business Operations Manager, interviewed by the authors 2015-05-06
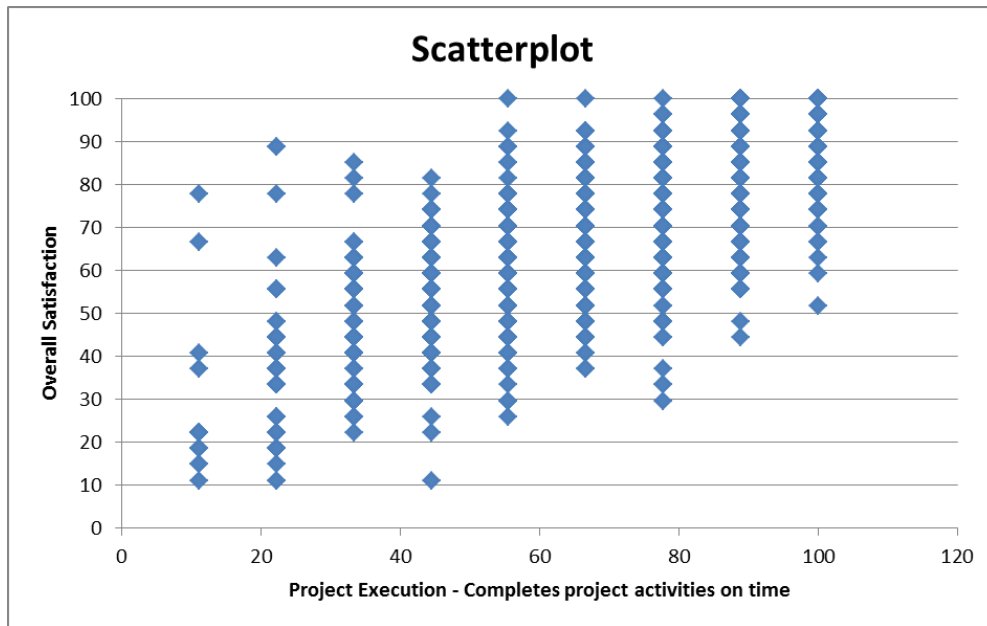
Figure 7 Scatterplot for the effect of Completes project activities on time on Overall Satisfaction

4.3   Network design and optimization

Network design and optimization (NDO) contains a range of services addressing everything from technology deployment, network transformation, and network optimization (Ericsson, 2015). These services are project based and either executed at the customer site or remote, depending on the nature of the project[14]. An example this type of project is to optimize the capacity of the network to achieve as high capacity as possible with the nodes. The performance measure of these services is result oriented and KPI based, meaning that the output and effect is used to evaluate the success of the project[14].

The CPE questionnaire described in the previous section is used to evaluate customer perception of these services as well. The result oriented focus on the evaluation of these project is visible in the CPE responses where the highest impact on overall satisfaction comes from the attributes "*Project Execution - The quality of deliverables in this project*" with a correlation of 0,89 and R^2 of 78,4%, see scatterplot in Figure 8. Second highest impact had "*Project Execution - Completes project activities on time*" with a correlation of 0,85 and a R^2 of 72,0%, see scatterplot in Figure 9.

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[14] Head of Global NRO PMO & ASP Manager, interviewed by the authors 2015-05-05
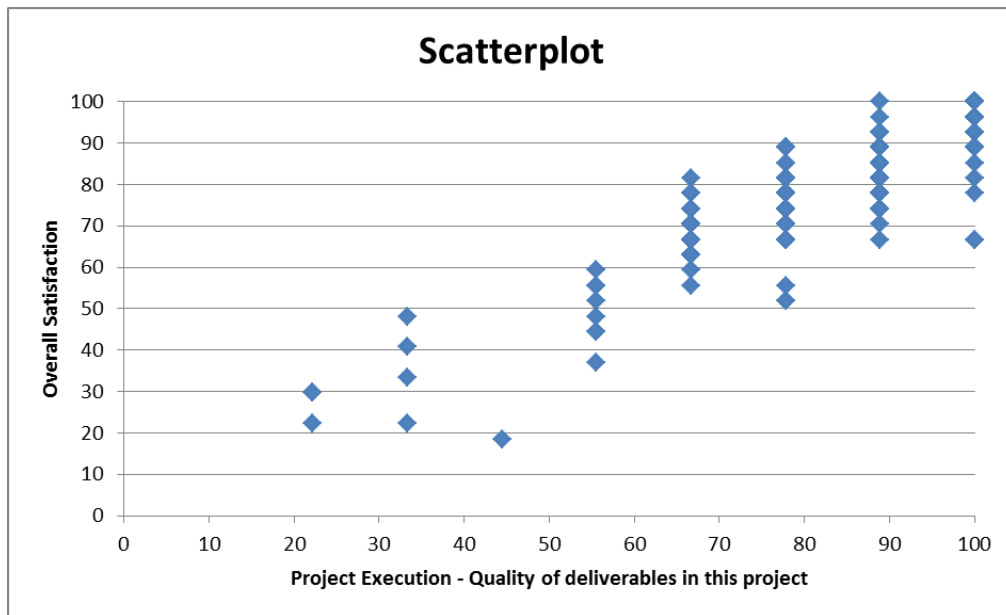
Figure 8 Scatterplot for the effect of Quality of deliverables on Overall Satisfaction
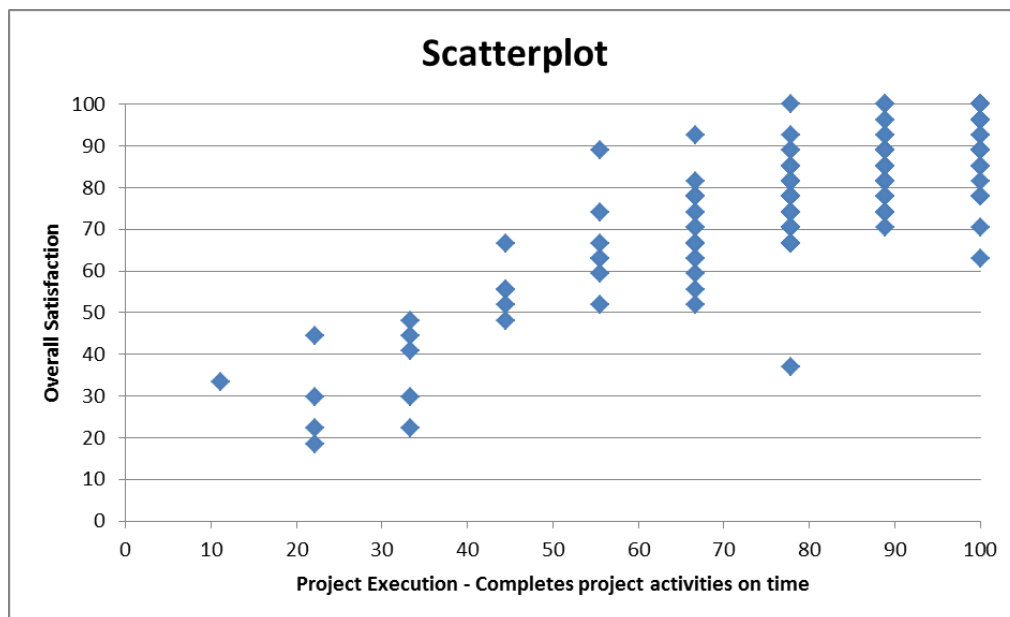
Figure 9 Scatterplot for the effect of Completes project activities on Overall Satisfaction

Putting all attributes in the same regression model only the two above mentioned attributes and the attribute "*Project Execution - Provides continuous and timely information about project status*" have a significant impact on overall satisfaction. In Appendix C the statistical references for the different attributes are presented.

4.4   Consulting & Transformation and System integration

Consulting & transformation and System Integration (CSI) are project based services aimed to simplify, consolidate and streamline the customers systems, processes and tools (Ericsson, 2015). These services provide both guidance for key decisions as well as transformation and implementation (Ericsson, 2015). Typical deliveries are network or it-system transformation including process

updates[15]. The service is often sold as a project consisting of different stages with consulting as a first phase where problems and needs are identified[16]. System integration is basically the execution part[16].

Transformation concern three parts: people, process, and technology but traditionally Ericsson have had a high focus on technology transformations and still have lot to learn regarding people and process transformations[16]."Though almost half of the revenue at Ericsson comes from services today there is still a technology mindset within the company"[16]. The interviewee behind this quote believes that there is need for a more problem based sales approach rather than technology and product focused as it is today. "If the customer have financial problems and want to improve, they don't want us to come running with a product they should pay for to solve their problem. They want us to listen to them and understand their situation"[16].

Some customers think consulting should be included for free since they already have spent money purchasing the systems from Ericsson[16]. They are used to and willing to pay for technology but expect the consulting part to be free. A consequence of this sometimes is that the define phase, which is the consulting part, does not receive enough attention since the monetary initiatives for spending time and resources for this phase partly is lacking[16]. As a result Ericsson sometimes does not completely understand the customer needs and hence the solution does not meet the customer's expectations[16].

During a project there are documents used by Ericsson and the customer to define and agree on the expected outcome. The documents include project requirements and sign off criteria for the delivery of the service[16].

For the customers it is important that the transformation occurs without disrupting the network[16]. If the network goes down it is costly for the customer and it affect their satisfaction and perception of Ericsson negatively[16]. There has been a regional initiative called First Time Right (FTR). FTR is a measure of how many of the projects that is successful at the first try and do not disturb and impact the customer's network. The FTR initiative started about two years ago and similar initiatives have been initiated in two more regions as well[16]. Ericsson share information about performance with customer since their experience is that it helps a lot in the communication with the customer regarding failures. Although every failure is disturbing for the customer, being able to show an overall high success rate can cool down the customer[16].

It is also important for the customers to get the project delivered on time[16]. In some regions Ericsson has a measure for time deviation of the specified delivery time[16]. The CPE questionnaire previously described is used to evaluate the CSI services as well.

With a correlation analysis between satisfaction and the attributes in the CPE measure the highest correlation was found for "The quality of deliverables in this project" with a correlation of 0,82 and R^2 of 66,9% followed by "Completes project activities on time" with a correlation 0,80 and R^2 of 64,0%. See Appendix C for statistical references for all attributes. Accessibility, responsiveness and commitment were the poorest attributes when it comes to predicting satisfaction and did not have a significant impact in a model of all attributes.

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[15] Head of CSI Operations, interviewed by the operators 2015-05-06
[16] Head of CSI Operations, interviewed by the operators 2015-05-06

The customers sometimes expect Ericsson to have even higher knowledge than themselves of their network and expect Ericsson to provide a "mental guiding role" during projects[17]. This could be a challenge since the customer is an operational organization with the same employees working for many years but CSI are delivered on project basis with different people involved in different projects. A new portfolio item called Application Development and Maintenance is now being developed. The idea is that the same people at Ericsson will be in contact with the customer over time and move towards running projects almost on an operational basis[17].

4.5   Managed Services

Managed services are a type of operational service where Ericsson takes full responsibility for the customer operations as an outsourcing partner. Either Ericsson runs the day-to-day operations of a network that the customer owns or Ericsson owns the network and sells the capacity to several operators. The first type is called Network Managed Service (NMS) and the second is called Network Sharing (NS). Regarding NMS, there is first an initial transformation part when Ericsson is taking over the responsibilities from the customer and then there is the day-to-day operation of the network. For both types Ericsson utilizes the existing HW and SW support services within the company to support the network. A NMS contract is usually sold on the length of three to five years and the terms and conditions are regulated in a SLA that contains a range of KPI:s that are reviewed on regular basis. Examples of the KPI:s are availability (uptime), response time, time to restoration/remedy and change management success rate.

Managed services are result oriented and much focus is on the results that are delivered to the customer. For NMS the customer often wants Ericsson to suggest improvements for the customer operations and organization. "Besides running the network the customer wants us to be a good advisor as well"[18]. This is actually a win-win situation since it provides additional business opportunities for Ericsson's other services such as NDO and CSI. Furthermore, being responsive and deliver what is agreed and signed in the contract is important and the relationship between the customer and the contract person is also highlighted as important.

Customer satisfaction for Managed Services is evaluated in the yearly CSat survey containing questions regarding Ericsson as a business partner, the Managed Services personnel and day-to-day service. In addition the contract owners sometime evaluate customer satisfaction by sending out additional surveys, sometimes concerned with a specific situation for instance how an outage situation was handled.

4.6   Hardware Services

In this chapter an in-depth description of the HWS business and process is provided. Current quality measures are discussed and different organizational responsibilities is elaborated upon. Findings regarding what is critical to the customer and what make the customer satisfied and dissatisfied with the service are also presented.

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[17] Head of CSI Operations, interviewed by the operators 2015-05-06
[18] Managed Service Performance Manager, interviewed by the authors 2015-05-18

4.6.1 The HWS business and business environment

Initially a HWS contract is usually sold together with the sales of hardware[19] and then contracts can be renewed or modified over time. Usually the contract covers a period of two years. The terms and conditions of the contract are specified in a Service Level Agreement document (SLA) which contains information about the negotiated lead times, delivery precision and other variables such as locations for delivery. Responsible for the contracting process is the Key Account Manager (KAM). Ericsson offers three different service levels for HWS; basic, advanced and superior[20]. See Figure 10.
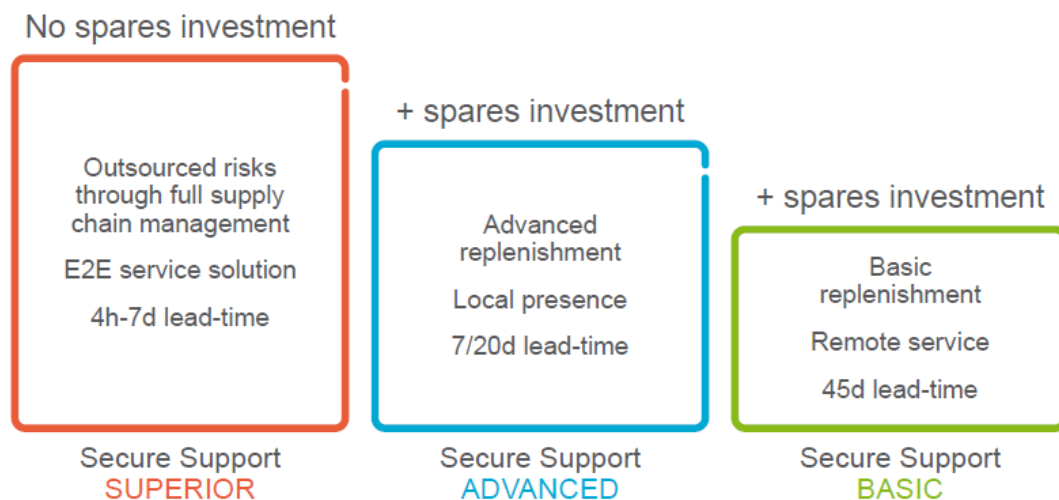
Figure 10 Three service levels of HWS are provided

The main difference between the contracts are the lead time for repair and replacements which then drives how much investments the customers themselves have to make for not risking long outages. For the basic package the set-up is "basic replenishment" which means that the customer send in broken parts that then are returned upon repair. For the advanced service a replacement unit is sent as soon as a request is sent in from the customer, and then the customer returns the broken part to Ericsson independently. For the superior service contracts the customer has no own spare part stock. Instead the customers outsource the risk and maintenance completely to Ericsson and lead times could agree upon as low as four hours. Contracts can also regulate different lead times for different materials. However, the contracts are usually customized to fit the needs of the customers and few contracts are exactly according to standards[21].

The customers know that they need support services but see little value in it which makes it "easy to sell but hard to charge"[22]. It is not about convincing the customer that they need it, instead the negotiations are more commercial i.e. regarding price and other terms[23].

"The customers constantly try to look for cheaper alternatives"[24]. After running an advanced or superior contract for a while customers sometimes decides to do more themselves or try to find an

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[19] KAM 1, interviewed by the authors 2015-04-02
[20] Cost Governance Manager PRS, interviewed by the authors 2015-02-02
[21] Cost Governance Manager PRS, interviewed by the authors 2015-02-02
[22] KAM 2, interviewed by the authors 2015-04-16
[23] KAM 1, interviewed by the authors 2015-04-02

Independant Repair Provider (IRP) or replacement supplier that offer the service to a lower price (KAM1). Customers with big networks can also to some extent become their own spare part providers by using leftover parts from their own network[25].

The increased competition for support services are pressing down prices and the margins[26]. This development is partly driven due to the commoditization of hardware in the industry. If the value of the HW is decreasing the value of repair services is also decreasing[27]. IRP:s have also been taking a step forward from doing repairs for Ericsson as an outsourced service to serving the customers directly[21]. The competition is highest for the basic service level where Ericsson cannot leverage their product knowledge and knowledge about the lifecycle as much as compared with the superior contract. Assisting with repair and replacement can be done by other companies but providing full life cycle management support is harder for other companies that do not have full knowledge about the products and phase outs.

Delivering both HW and SW, and services creates synergies and values for the customers that could be leveraged. The knowledge Ericsson has about the products and the life cycle creates possibilities for proactive support and lifecycle services. Ericsson knows what will no longer be produced in the future and has data about product performance. For superior service contracts Ericsson make sure that necessary HW always is on stock, while if the customer relies on a third party provider the materials might not be available when needed. An additional strength is the scale and access to spare parts. Being able to perform upgrades on embedded SW is another synergy that comes from being the manufacturer and deliverer of the products. To be able to deliver a complete solution with HW, SW and services is an additional strength when the customers prefer to work with a small number of suppliers[28].

4.6.2   Contract Implementation and support setup

Once the contract negotiations are closed and the contract is signed the Customer Contract Implementation process (CCI) starts working to create the setup for the contract by securing material sourcing, logistics set up, trade compliance and other activities necessary in order to implement the contract[29]. If the account managers and contract management do not have full knowledge of what is possible to deliver scenarios might occur when it is hard to implement the contract[29]. Such scenarios could be if the agreed lead times are impossible to achieve due to geographical reasons or if materials included in the contract are not available any longer[29]. This can either create high costs for Ericsson to solve or in worst case a SLA that is hard to fulfill.

The most central person in the delivery of HW support, and also SW support, is the Service Delivery Manager[30] [31]. A service delivery manager is first line support and often single point of contact for HW or SW issues[32]. A SDM can either have one customer which gets a hundred percent of attention or a

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[24] SDM 1, interviewed by the authors 2015-04-13
[25] Cost Governance Manager, interviewed by the authors 2015-02-02
[26] KAM 2, interviewed by the authors 2015-04-16
[27] SWOT workshop 2015-02-16
[28] KAM 2, interviewed by the authors 2015-04-16 & Interview with customer 2015-04-09
[29] Process manager HWS, interviewed by the authors 2015-03-16
[30] KAM 2, interviewed by the authors 2015-04-16
[31] KAM 1, interviewed by the authors 2015-04-02
[32] SDM 3, interviewed by the authors 2015-03-30, SDM 4, interviewed 2015-04-28

few customers depending on factors such as size and complexity of customers. The SDM is working both back office to secure that the setup is working well and front office providing support and information to the customer. The SDM and the customer usually have frequent contact and meetings can both be of technical nature such as meetings with engineers or technicians or more business oriented nature with executives at the customer[33]. It is the SDM that reviews performance data and SLA fulfillment with the customer[34]. The SDM also have an educational role and assists in securing that the customer has sufficient knowledge to perform operations in the right way and explain how process works[35].

However, in some cases the relationship is built heavily on personal relationship and trust without reviewing delivery precision[36]. The SDM for this customer explained that "This is something that is built on trust and good cooperation for many years which have resulted in a situation where we do not have to deliver statistics." and furthermore "They trust that we deliver the service with their best interest in mind"[36].

The role as SDM could sometimes be ungrateful since the customer usually contacts you when there is a problem and never to "pat you on the back" when things are good[37]. Another challenge working as an SDM is that you must nurture a good relationship and keep the customer satisfied while still defending Ericsson and Ericsson's business[37]. As one SDM[37] put it "An SDM is the customer friend and the customer entry point into Ericsson, but an SDM also need to defend Ericsson when necessary and it is always a balance in that."

4.6.3 The HWS process and material flows

To manage the logistics of replacements different warehouses are used centrally, regionally and locally[38]. There are three global distribution centers (GDC) in the world and then there are many regional warehouses. Depending on the required delivery time local storage locations are also set up close to the customer sites. The actual repair is either handled by an Ericsson internal repair center or outsourced to an external partner.

The repair or replacement process is triggered by a faulty unit at the customer. Since the process involves both returns and replacements the flow goes in two directions. The logistics are managed in two main loops i.e. between repair center and GDC and between GDC and the customer. Between the GDC and the customer the material could also go through a regional hub or be stored at a regional or local storage location with regards to required delivery times. A simplified illustration of the material flows can be seen in Figure 11.

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[33] SDM 1, interviewed 2015-04-13
[34] SDM 1, interviewed 2015-04-13, SDM 2, interviewed 2015-04-07, SDM 3, interviewed 2015-03-30
[35] SDM 5, interviewed 2015-04-24
[36] SDM 2, interviewed 2015-04-07
[37] SDM 4, interviewed 2015-04-28
[38] Product Logistics Manager, interviewed by the authors 2015-02-27

Depending on the type of contract the broken part is either sent back for repair or another replacement unit is delivered to the customer. For the advanced and superior contract the returned unit is typically not the same as the replacement unit. Instead repair is made upon demand, which means that the broken unit is repaired first if the current stock level falls below a certain level in order to not transport and repair units when there is no need. Until then it is stored as "faulty stock"[38]. That means it can take several months before the repair of a broken unit is performed[39].

The returned units should also be accompanied by a Site Failure Note (SFN) including information about the failure, which just recently was made available as an online version that's currently being rolled out. This will replace the previous setup that was a paper-document that should be attached to the returned unit[40].

4.6.4 Current quality measures

This section provides an overview of current quality measures related to the customers' perception of HWS.

4.6.4.1 Customer Satisfaction Index

Ericsson measures customer satisfaction by a yearly survey. This survey will henceforth be referred to as CSat. In this survey Ericsson ask questions regarding several broad performance areas such as value for money, business partner, delivery, service, and support. Questions regarding overall satisfaction are also included. The survey does not provide the possibility to rank how important each item is for the respondent, only how well the performance is within each attribute and the attributes are answered on a likert scale from 1 to 10. For the broad performance areas value for money and contact persons are identified as important attributes that affects customer loyalty.

There is also a more detailed part with questions regarding specific functions or businesses. For customer support there are eight questions regarding support deliverables of which two are specifically dedicated to HW support, three are dedicated to SW support and three are more general and overlapping both SW and HW. In the survey there are also a few optional free text questions regarding what Ericsson's strengths are and what could be improved.

Some critique has surfaced towards the CSat measure during interviews. There was the perception of one interviewee who believes that customer satisfaction should be measured on a more continuous

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[39] SDM 1, interviewed by the authors 2015-04-13
[40] Program Manager, interviewed by the authors 2015-04-14

basis and captured in the day-to-day operations[41]. The same interviewee also discussed new techniques for measuring satisfaction such as interactive emails with options to select different icons depending on your current satisfaction. Another way could be to use more frequent surveys with a few questions connected to the delivery of replacement units.

4.6.4.2   HWSO quality measures

There are many performance measures within HWSO such as warehouse inventory turnover, repair center performance and financial measures[42] but few of these measures are directly related to the customers' experience of the service[43] .However, one performance area that does impact the customer directly is delivery precision and SLA performance i.e. that the terms and conditions in the SLA is fulfilled. Delivery precision is measured as the percentage of on-time deliveries. The delivery time starts ticking when the customer initiates the request and ends at proof of delivery (POD) at the agreed location. SLA fulfillment is the percentage of all SLA:s for which the terms and conditions were approved during a certain period of time. In the SLA fulfillment measure, only a hundred percent fulfilled contract is considered fulfilled and it is enough to miss one condition to have it classified as un-fulfilled.

A regional initiative in northeast Asia where the customers are very quality oriented has been to start measuring replacements that are dead-on-arrival (DOA) i.e. replacement units that does not work when they are delivered[44]. This could be both units that are repaired or spare parts that have not been used before. That means that the problems were not entirely fixed during the repair process or that there is a malfunction in the unit coming from production. Sometimes DOA are not due to poor product quality but actually due to bad handling at site, in other words that the product was fully functional when coming to the site but that it was destroyed during installation due to lack of relevant tools or competence[45]. Some very quality oriented customers also consider a product to be DOA for appearance flaws such as scratches, even if it is functioning properly[46].

4.6.4.3   Product related measures

Hardware Service Operations (HWSO), which is a part of Business Unit Global Services (BUGS) is the delivery organization for HWS. However, BUGS is not responsible for product design, this responsibility lies within the Product Development Unit (PDU). In other words the quality of the product itself and the product features is not the responsibility of BUGS. The design of the test procedures for the repair center is also the responsibility of the PDU[47].

Since the PDU is responsible for the quality of the products it is also the PDU who measures the quality of the product[48]. One of their quality measures is "Mean Time Between Failure" (MTBF)[48]. As the name implies MTBF is a life expectancy measure based on statistics and how long a product is

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[41] Master researcher, interviewed by the authors 2015-03-30
[42] Head of HWSO, interviewed by the authors 2015-05-12 & Business Control & Performance, interviewed by the authors 2015-05-08
[43] Business Control & Performance, interviewed by the authors 2015-05-08
[44] Regional Head of Quality interviewed by the authors 2015-04-07
[45] Head of HWS Operations interviewed by the authors 2015-05-12
[46] Functional Lead Repair Solutions interviewed by the authors 2015-04-27
[47] PDU HW Quality Manager, interviewed by the authors 2015-04-27
[48] PDU HW Quality Manager interviewed by the authors 2015-04-27

expected to run before failure[49]. Besides MTBF the PDU also measures return rate i.e. how large share of the products put on field that is returned. However, there are many causes of a return that is not necessarily caused by the quality of a product why some voices are raised for a shared responsibility of the return rate between the PDU and BUGS[48]. Often returned products are not really broken and a large share of the returned materials is so called "no fault founds" (NFF:s). There can be many reasons to why a NFF occurs (Ericsson Internal, 2015). One reason is due to the design of the product and the alarm and diagnostic systems. The alarm systems does not always point directly to the error but to a number of potential reasons and if the technician have not received sufficient training the unit will just be removed and a replacement request initiated[50]. For instance sometimes it could be hard to know if it is a HW or SW error[51]. Another reason for NFF:s is lack of relevant tools or instructions, or that the instructions was in the wrong language.

Since NFF:s can be caused by many different reasons and by many different organizations, such as Sales (i.e contract management), HWSO and PDU, no line organization has taken the governance of this measure[52]. Instead the governance is currently within an ongoing global program that is being run by BL PRS to reduce the number of NFF:s. Current quality measures and reporting organization is summarized in Figure 12.
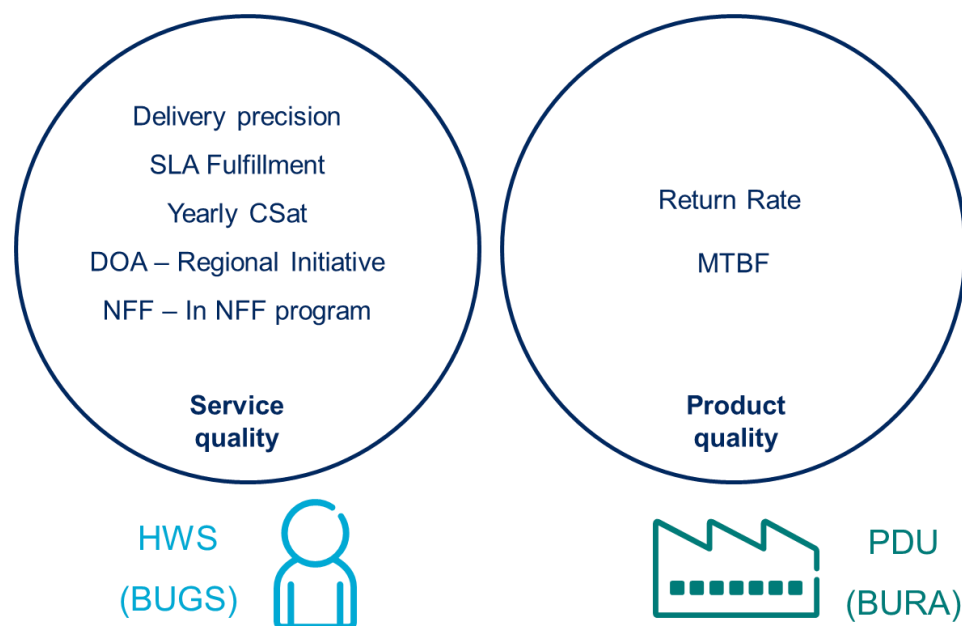

Figure 12 Current quality measures affecting the customers' perception of HWS and their reporting organization

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[49] Developer Tools interviewed by the authors 2015-04-27
[50] Cost Governance Manager interviewed by the authors 2015-04-15
[51] SDM 3 interviewed by the authors 2015-03-30
[52] Program Manager interviewed by the authors 2015-04-14

4.6.5   What is critical for the customer

"What they are really interested in as a customer is to have a stable product from a hardware perspective which not require constant repair"[53]

When the customers have purchased a network their interest is to keep that network up and running with as few and short outages as possible[54]. Outages could be very costly for the operators and might affect affect the perception of their subscribers[55]. In some countries outages are even penalized by the government[55]. What the customer really wants is a stable solution where problems are absent[56]. As one SDM put it "quality of the product is the main focus for every customer. It drives their perception about the overall delivery. What they are really interested in as a customer is to have a stable product from a hardware perspective which not require constant repair"[53].

When units do fail getting the problems fixed as soon as possible is most important[57]. Therefore delivering on time is the major concern for to the customer regarding HWS, especially when there is an outage in the network[58]. However, delivery on time is not equally important when it comes to just replenish stock levels, because then it will not necessarily affect the customer's network if the unit is late. The quality of the replacement units is also critical to the customers. As the interviewed customer puts it "a faulty spare part implies twice as long lead time until the problem is solved".

That a good relationship with the SDM is important for the customers is a notion supported by many interviewees[59]. "It is important that we and the SDM have the same view on things" is a quote from the customer interview. It is also seen in the CSat measure that contact person has high impact on customer loyalty. There have been cases where the SDM has been replaced on the demand of the customer when they experienced that the relationship is not working well[60]. As described in previous chapters the SDM is the first hand contact for the customer. For the customer it is then important to be listened to and as the customer that was interviewed put it "not questioned when we have a problem". Further the customer explained that it is important that the SDM understand the customer's situation and business. However, as one KAM[61] put it "If all KPI:s are set so that we cannot reach them and we continuously delivers red numbers, there is no relation in the world that can retrieve a situation like that"

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[53] SDM 1 interviewed by the authors 2015-04-13

[54] Regional HWS Manager interviewed by the authors 2015-04-20, SDM 6 interviewed by the authors 2015-05-05, Business Control & Performance interviewed by the authors 2015-05-08

[55] Regional HWS Manager interviewed by the authors 2015-04-20

[56] SDM 1 interviewed by the authors 2015-04-13, SDM 6 interviewed by the authors 2015-05-05

[57] SDM 6 interviewed by the authors 2015-05-05

[58] SDM 6 interviewed by the authors 2015-05-05, SDM 7 interviewed by the authors 2015-04-07, SDM 9 email correspondence

[59] SDM 2 interviewed 2015-04-07, SDM 3 interviewed 2015-03-30, SDM 4 interviewed 2015-04-28, interview with customer 2015-04-09, Head of Regional customer unit interviewed 2015-04-16, Master researcher interviewed 2015-03-31.

[60] KAM 1 interviewed by the authors 2015-04-02

[61] SDM 2 interviewed 2015-04-07

It has surfaced during the interviews that the customers expects not only repair and replacement units but also expects various sorts of information. Some customers request root cause analysis on faulty parts that has been replaced and sent to repair[62] [63]. The customers want to reduce their operational expenditures (OPEX) and avoid the problem to occur again and therefore want to know the cause and make sure that any quality problems with Ericsson's products is corrected, not only when there is an epidemic failure i.e. when several units of the same type are failing[62].The service of providing root-causes is not something that is regulated in the contracts and the replacement flows are not optimized for delivering fast root cause analysis since faulty parts are placed in faulty stock waiting for repair which is done on demand[62] For the customer it is hard to understand why repair results might take several months[64] and the long lead time drive negative perception[62]. According to one SDM the customer even thinks Eriksson's processes are inefficient[62].

There is other kind of information that is critical as well for the customer. When parts are approaching end of service, meaning that components will no longer be repaired and support are no longer available, it is affecting their customer who need to find another solution[65]. To get this information in advance is important for the customers who need to prepare for the change[66]. To receive this information as early as possible is especially important for the customers managing their own spares.

The increased competition, especially for the basic service contracts, has led to several contracts being lost to third party service providers. Four out of eight SDM:s interviewed in this study could provide examples of when contracts has been lost to local Independent Repair Providers (IRP:s) [62] [67]. The reason given for this was cost in all cases.

As discussed in previous chapters HWS is not something that the customer wants but something that they need which makes it something they want to spend as little money on as possible[68]. Ericsson's basic service level today often includes more value add than the customer is aware of which means that the customer does not know the full value of the contract. A situation described as "The customers think they are buying Ryanair" but in reality they are getting "SAS"[69].

Several cultural differences, both geo-cultural and organizational differences, could be seen from the interviews. For instance, according to a regional quality manager "Japanese customers are very quality oriented"[70]. One SDM in Japan discussed that 95% delivery precision is not enough and he elaborated as "in Japan that does not work actually, we need 100%. Some customers are so demanding. Both on hardware quality and service quality"[71]. However also within Japan there are differences between customers and one SDM who had worked with different customers said that "They are completely different. They are Japanese but their mentality is different". One customer preferred the superior

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[62] SDM 1 interviewed 2015-04-13
[63] Regional Head of Quality interviewed 2015-04-07, SDM 5 interviewed 2015-04-24
[64] Regional Head of Quality interviewed 2015-04-07
[65] Cost Governance Manager interviewed 2015-04-15
[66] Customer interview 2015-04-09
[67] SDM 7 interviewed 2015-04-28, SDM 8 interviewed 2015-05-07, email correspondence with SDM 9
[68] KAM 2 interviewed 2015-04-16
[69] Cost Governance Manager interviewed 2015-02-02
[70] Regional Head of Quality, interviewed 2015-04-07
[71] SDM 5 interviewed 2015-04-24

service level because "then they don't need to worry about spare parts because you deliver the right spare parts at right time and right place", while another Japanese customer did not see the added value of the superior service level.

The way personal relationship and trust is valued also differs[72]. "Some perceive quality fairly objective while other think relationship is more important"[73]. One KAM[72] who had been working both with Swedish customers and customers in Saudi Arabia described that "if there is 70% work related questions and 30% relationship related matters in Sweden, it is the opposite in the Middle East".

4.6.6   Satisfaction

"When we deliver what we promise the foundation is there" [74]

When problems occurs a quick action and quick response can make the customer more satisfied[75]. What the interviewed customer was most satisfied with was Ericsson's willingness to help when they had problems. The customer said[76] "When we have a problem, Ericsson focus on solving that problem without first checking if it is in the scope of the contract". It is important to listen to the customer and understand their problems and as one SDM put it "you want the customer to think that Ericsson understand what I feel"[77]. This statement was related to an example where Ericsson sent two spares instead of one when the customer had a critical situation, just to show the customer that they really cared about solving the customer issue and that they did what they could to make sure the problem would be fixed.

Other examples of when Ericsson deliver more than what is in the scope of the contract to help the customers have been presented during other interviews as well. For instance, after a storm a great number of units were destroyed and Ericsson really made an effort and met what normally is the demand over several years within just a few weeks[74]."This was by far exceeding the customer's expectation and they remember this kind of efforts for years, they know that if they have problem we will be there and it gives them great comfort"[74]. Another example was presented for a customer that has a basic service contract when they sometimes use advanced replacement anyway to help the customers to get critical components faster[78]. "A slight over delivery is the key" according to one SDM[79]. This is a notion supported by other SDM:s and one described it as "If we strictly follow the contract one can think that we do our job, but if it puts the customer in a bad situation so they are not satisfied, well they cannot say that we did not fulfill our obligations but they can think that we are a bad supplier that does not pay attention to their needs". Similar statements were given by another

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[72] KAM 1 interviewed 2015-04-02
[73] Mater Researcher interviewed 2015-03-31
[74] KAM 3 interviewed 2015-04-02
[75] Email correspondence with SDM 9
[76] Interview with customer 2015-04-09
[77] SDM 6 interviewed 2015-05-05
[78] SDM 7 interviewed 2015-04-28
[79] SDM 5 interviewed 2015-04-24

SDM[80] who described "what makes the customers satisfied is when you go the extra mile despite the clauses to meet their needs".

On the other hand there are also KAM:s and SDM:s that express their worries for decreasing margins that will force Ericsson to start charging for this to a larger extent, and that this will cause dissatisfied customers that expect this over delivery to be for free. However, there are cases when the customer is happy to pay for getting help to solve their problems. One SDM[81] described how a customer had a problem with salty winds at a site that did destroy their equipment and Ericsson saw this as a business opportunity to provide a protection for the site, and the customers was happy with the cooperation and help to solve their problem. In this case the customer was happy to pay for the extra service.

Since the customers want their network uptime to be as high as possible avoiding problems is even better than a fast solution to problems[82]. Proactivity can have several meanings but in the end it is about avoiding problems compared to being reactive and solve problems after they have occurred. For HWS proactivity takes many shapes, for instance the contracts contain clauses saying that components that goes end of support must be notified three months ahead[83]. From the customer interview it was clear that proactive communication on components going end of life as early as possible was appreciated in order to be able to secure spare parts in advance of the change. Also proactive communication and information to the customers before they have to ask can have positive impact on the customer's satisfaction[84]. As one SDM[84] expressed it "Even if we are not able to deliver within the next business day, just give the customer the comfort of knowing that the spare is on its way. Give regular updates and keep the customer assured that the spare is on its way". Getting information ahead of coming process changes is also important for the customer according to the customer interview.

The wish for proactivity can also be seen in the optional free-text fields for improvement suggestions in the yearly CSat measure where proactivity is a frequent comment. Some examples from the CSat measurement are; proactive communication, proactive education, proactive troubleshooting, proactive season planning and proactively seeking out customer needs and deliver solutions based on those needs.

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[80] SDM 6 interviewed 2015-05-05
[81] SDM 5 interviewed 2015-04-24
[82] SDM 1 interviewed 2014-04-13
[83] SDM 2 interviewed 2015-04-07
[84] SDM 7 interviewed 2015-04-28

4.6.7 Dissatisfaction

"What drives dissatisfaction is when a customer needs a component and it is not there and not available"[85]

It is the perception of all eight interviewed SDM:s that failure to deliver on time is what makes the customer most dissatisfied. This includes replacement units that are Dead on arrival (DOA) which is "quite embarrassing in front of the customer" according to one interviewed SDM[86]. Another SDM[87] painted the picture by the statement "If a material is DOA the customer threatens to kill us".

Unnecessary returns like NFF might also impact the customer's perception of the quality of the product and risk future sales[88]. In one case a customer actually stopped buying a product due to a perception of poor quality, when in fact NFF was very high for that customer[89]. As one interviewee stated "quality is when the customer returns, not the product"[90].

Both SDM:s and regional quality managers have received complaints from the customers that the root cause analysis takes very long time[91]. As discussed in previous sections repairs are only made upon demand why root cause analysis could take several months. The customer is frustrated about this and their perception is that Ericsson's processes are inefficient.

Another cause of frustration from the customers is that they sometimes do not understand the processes at Ericsson for handling repair material and information which create a gap between expectation and perception[92]. If a person at the customer does not understand how the processes work or does not know what delivery time that is signed in the contract the expectations might be hard to meet. For instance one customer complained about that the replacement units was not delivered quick enough, then it turned out that the components was not late but the person at the customer did not know what delivery time they had agreed on in their contract[87].

One SDM had also received complaints from the customers that were frustrated about the instructions and process documentations that were too extensive and the SDM had to create a simplified and compressed version of it[93]. Another customer has complained about the structure of the SFN or at least the old version of it in the paper form. They did not understand the structure and did not think it was up to date to have a paper solution. This particular customer actually had got an approval from the PDU to modify it according to their needs, but then during the operational business the HWS personnel did not accept those modified notes, even though it was approved by the PDU. Some

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[85] SDM 4 interviewed 2015-04-28
[86] SDM 3 interviewed 2015-03-30
[87] SDM 8 interviewed 2015-05-07
[88] SDM 1 interviewed 2015-04-13
[89] KAM 2 interviewed 2015-04-16
[90] Developer Tools interviewed 2015-04-27
[91] Regional Head of Quality interviewed 2015-04-07, SDM 7 interviewed 2015-04-28
[92] SDM 6 interviewed 2015-05-05
[93] SDM 4 interviewed 2015-04-28

customers have also expressed that they find troubleshooting hard and that it is hard to understand and detect if the problem is HW or SW related[86].

5 Analysis

The empirical findings regarding factors affecting customer satisfaction will be analyzed for all studied services and mapped into corresponding quality dimensions. Furthermore, different ways of measuring quality for the different services will be analyzed and discussed.

5.1 Service classification model for analysis

To answer the research questions whether there are any differences regarding the relevance of different quality dimensions- and measures for different service types a classification scheme must be used.

For the analysis in this study the matrix for service classification proposed by Oliva and Kallenberg (2003) will be applied. The framework by Oliva and Kallenberg (2003) is developed for manufacturing companies and the services offered by a manufacturing company would typically fit in one of these classes. Their paper is well-cited and referred to by many researchers. In addition the classification parameters used in the matrix are proposed by several researchers. For example Mathieu (2001a) also propose to distinguish between product oriented and customer process oriented services, Frambach et al. (1997) propose to classify services as relationship - or transaction based. Furthermore Gebauer et al. (2010) have proposed a service classification scheme including five classes where four of them are the same as those proposed by Oliva and Kallenberg (2003). Moreover Gaiardelli et al. (2013) have proposed a multidimensional classification model similar to that one by Oliva and Kallenberg (2003) which further confirm the relevance to classify services in this way. Therefore presenting any findings regarding differences between the classes would be useful for further understanding the differences between these classes.

Furthermore the classification scheme proposed by Oliva and Kallenberg (2003) consist of four fixed classes where services can be positioned independently of each other. The frameworks proposed by Haywood-Farmer (1988) and Gaiardelli et al. (2013) is made up of continuous axes where services could be placed anywhere along the scales. This makes it harder to accurately position the services in the classification scheme and they must be considered in relation to each other. Furthermore, it would also be hard to answer research question three whether it is possible to predict what quality dimensions and measures that are relevant for different classes if there are no fixed classes.

The classification model proposed by Oliva and Kallenberg (2003) will hence be used to answer the research questions. By studying the service portfolio at Ericsson and identify their relevant quality dimensions and position in the matrix any differences between the service classes could be identified. In Figure 13 the services included in the case study is positioned in the Oliva and Kallenberg (2003) matrix.

	Product oriented services	Customer's process oriented services
Transaction based services	**Basic installed base services** Network Roll-out Learning services -*(Training programs)*	**Professional services** Consulting & transformation and System integration Learning services -*(Learning solutions,)* Network design & optimization
Relationship based services	**Maintenance services** Hardware Services	**Operational services** Managed services

Figure 13 The services included in the scope of this thesis positioned in the conceptual model

The different services were classified in the classification scheme together with people from the respective business lines. These people have also contributed by providing information on how quality is measured for those services and shared their experiences on what affects the customers' quality perception for the services. Placing Network design and Optimization in the classification matrix was not completely straightforward because it could both address how to optimize the products but also the usage of the products which puts it somewhere in between product related services and process related services. It was however classified as a Professional Service since that was considered the best option if a decision had to be made. Since learning services both can be directly product related and more business oriented they are represented in both basic installed base services and professional services.

5.2   Relevant quality dimensions and measures for different services

In this section the factors that in the empirical study were identified as important for customer satisfaction will be interpreted into quality dimensions. Furthermore relevant quality measures grasping the respective dimensions will be discussed. The services included in the scope of this thesis are addressed one by one. In Table 11 the identified quality dimensions for respective service is presented.

Table 11 Quality dimensions identified for all studied services

Service	Quality dimension
Hardware Services	Reliability
	Tangibles (as for solutions)
	Willingness to serve
	Approachability
	Empathy
	Flexibility
	Proactivity
	Consistency
	Tangibles (as for services)
Learning Services	Competence
	Tangibles (as for services)
	Communication
	Use for customer
	Empathy
	Reliability
Consulting & Transformation and System integration	Reliability
	Quality of deliverables
	Assurance
	Empathy
Network design & Optimization	Reliability
	Quality of deliverables
	Assurance
Network Roll-out	Reliability
	Assurance
Managed Services	Reliability
	Responsiveness
	Proactivity

5.2.1   Hardware Services

From the interviews with the SDM:s it was clear that delivery on time is the key concern of the customers. Delivery on time for HWS is the contextual interpretation of reliability which is identified as a service quality dimension by Parasuraman (1985;1988). The importance of reliability for this service type is consistent with previous research where Chowdary and Prakesh (2007) and Parasuraman (1988;1991) found reliability to be the most important quality dimension for services targeted at the customers' possessions and with Lee and Kim (2013) who found reliability to be the most important dimension for delivery and transportation services.

Why delivery precision is so important for HWS can also be understood from a solution quality perspective. As discussed in the theoretical background Johansson and Witell (2013) defined reliability for solutions as "the extent to which the solution can be relied on to provide what is needed at the right time". To make sure that the solution that the customer has bought from Ericsson will deliver the demanded capacity and uptime they are dependent on reliable HW support. Figure 14 illustrates HWS as part of the overall network solution.
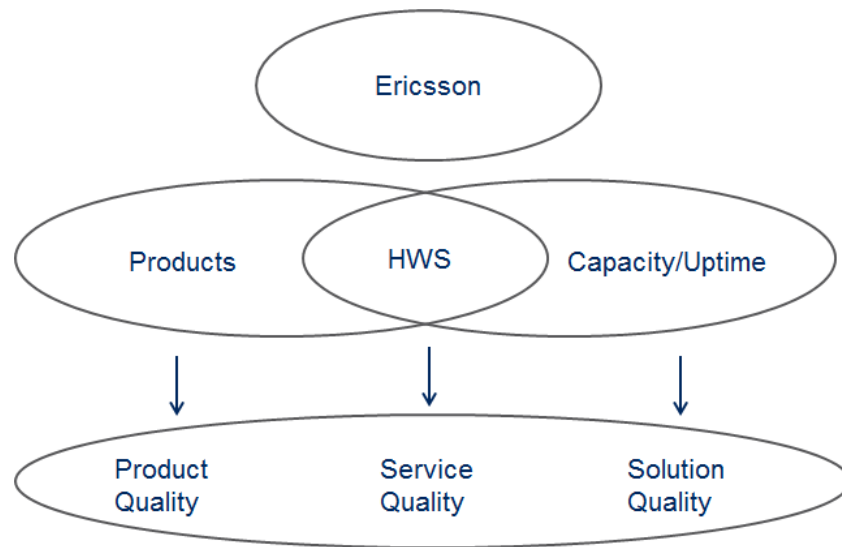
Figure 14 HWS as a part of an overall solution inspired by Johansson and Witell (2013)

However, as well as being a part in the overall network solution each replacement is also by definition a solution in itself when it involves a replacement unit since it then involves both products and services (Paiola et al., 2013; Johansson & Witell, 2013). Johansson and Witell (2013) identified *tangibles* as a quality dimension for solutions. As discussed in the empirical chapter a product that is DOA leads to a bad perception of the service. Alarm and diagnostics functionality and how these make it hard or easy to troubleshoot are other product features that also affect the perception of HWS. Therefore tangibles i.e. the products are relevant as a quality dimension.

The quality dimension responsiveness was defined as "willingness to help customers and provide prompt service" by Parasuraman et al. (1985; 1988). Quick action and response was mentioned from SDM:s as something that could make the customer more satisfied and the later part of this definition concerning the response time was mentioned in the interview with the customer as Ericsson's "willingness to help and solve problems" which was the attribute that created most satisfaction. Responsiveness is certainly important for the customers and as Carman (1990) argue, when a quality dimension is very important it might have to be split into sub dimensions. Therefore it is more relevant to address this by two stand-alone dimensions: Approachability, which is a dimension by Johansson and Witell (2013) for the importance of a fast response and how easily and convenient the customer can contact the supplying company, and "willingness to serve" by Hedvall and Paltschik (1989).

The willingness to help the customer was often found to be expressed through going outside of the contract in order to help and solve problems. Johansson & Witell (2013) identified flexibility as a quality dimension which concerns the ability to meet customers' changing needs but also the extent to which the solution offering can be adjusted to fit the customer's initial needs. However, it was also seen in the case study that only a few contracts were exactly according to standard which indicates that there often is a need to adjust the contracts to meet different customers' varying needs. Flexibility can therefore be seen as a quality dimension grasping these customer requirements for HWS.

Previous research suggest that tangibles (as defined for services) is increasingly important for service performed in the presence of the customer (Rosen & Karwan,1994) which is not the scenario for

HWS. Though from the empirical study, tangibility did drive some complaints for the customers such as the structure and format of the repair tags and regarding extensive documentation.

From the customer interview it was also highlighted that it is important to be listened to and not questioned when there is a problem. Similar reasoning was done by SDM:s who discussed that it is important for the customer to feel that Ericsson understand their situation, needs and feelings. These more soft values are similar to the quality dimension empathy that was identified by Parasuraman et al. (1985;1988). That empathy emerged as important for HWS are a bit contradicting to previous research for product related services where empathy was ranked low (Parasuraman et al., 1988 & 1991). One potential explanation for this could be the setup with the SDM:s and the level of relationship between the supplier and the customer which might not be the same in a business to consumer setting as in previous studies. The SDM and the customer have frequent contact and according Chowdary and Prakash (2007) and Lee and Kim (2013) empathy is an important dimension in those scenarios. It might also be explained due to the stress the customer feel in the interaction since they usually contacts the SDM when they have a problem which sometimes are very critical.

The SDM:s and the customer described that having Ericsson as HWS provider is reassuring and comforting since it provides security and they get ensured and can trust that Ericsson will help when they have a problem. While assurance in previous research mainly concerns personal attributes and the service provider's ability to inspire trust and confidence in the customer (Parasuraman et al., 1988) the assurance discussed by the customer in this case study is more concerned with the width of Ericsson's offering, capability to deliver and overall approach to solve the customer's problems. Therefore assurance could be seen as parts of the quality dimensions willingness to serve and reliability and not as a stand-alone dimension.

Consistency is a solution quality dimension identified by Johansson and Witell (2013). As previously discussed consistency is concerned with how knowledgeable employees are of the entire solution so that no promises are made to the customer that cannot be fulfilled (Johansson & Witell, 2013). During the case study examples of this scenario was found where the contract responsible had signed contracts and set expectations for the customers that in the end could not be met. However, even if this lack of consistency would affect the customer they wouldn't necessarily know the reason why this alone does not motivate consistency as a quality dimension. On the other hand Johansson and Witell (2013) also mean that consistency is concerned with the ability to answer customer questions regarding the entire solution. For HWS this would mainly concern the competence and knowledge of the SDM:s but whether this is important for the customers could not be either confirmed or rejected by the findings in the case study. However as previously discussed there was a scenario when the PDU had approved the customer to modify the repair tag, which later was rejected by HWS. This inconsistency was visible to the customer and caused complaints from the customer.

One frequent comment in the CSat measure was proactivity, which also was mentioned as important for customer satisfaction during interviews. As previously discussed proactivity could concern several areas such as proactively seeking improvements, providing root-cause analyses, proactive troubleshooting and proactive communication- and education. Proactivity has not been identified as a quality dimension in previous research. However, several researchers such as Carman (1990), Babakus and Boller (1992), Chowdhary and Prakash (2007) means that there is no general list of quality dimensions that are equally important for all services. HWS is a problem solving service and no matter

how fast or effective the problems are solved it is preferable to prevent problems from occurring at all why proactivity might be more important for this type of service. As discussed in the Introduction limited attention is given to this type of service in previous research on service quality. This could explain why proactivity has not yet been identified as a quality dimension for maintenance services in other research.

To summarize, quality dimensions identified in the case study to be important for the customer satisfaction regarding HWS are presented in Table12.

Table 12 Quality dimensions identified for HWS and their explanation

Dimension	Explanation
Reliability	Ability to perform service dependably and according to contract
Tangibles (as for solutions)	Product quality, especially diagnostics and reliability
Willingness to serve	The willingness to assist the customer and solve the customer's problems
Approachability	How easily the customer can contact the supplying company and how fast the supplying company solve problems
Empathy	How keen employees are to pay attention to the customer's needs
Flexibility	The extent to which the solution meets the initial needs stated by the customer
Proactivity	The extent to which the supplying company actively seeks to avoid problems, seek improvements and keeping the customer informed of actions taken
Consistency	How consistent the supplying company is in information provided to the customer
Tangibles (as for services)	Instructions, documentation and tools.

Previous research suggests that both the outcome of the service and the perception of how the service is delivered should be measured (Parasuraman et al., 1988; Swartz & Brown, 1989; Grönroos, 1984; Lehtinen & Lehtinen, 1982). For HWS it seems that some dimensions could be measured as outcomes while other only could be measured as customers' perceptions.

Reliability for HWS is mainly concerned with the outcome of the service, which is repair/deliver a replacement unit on time and it is measured through delivery precision and SLA fulfillment. These outcome measures are also a sort of success/failure rate measures which are useful for measuring quality according to Elliot (1993). However in some cases the lead time of replacement units have a direct impact on the downtime of a network while some deliveries are only replenishment of stock levels. Since not all deliveries are equally critical to the customers the importance to deliver on time varies from case to case. Consequently, a high overall delivery precision will not necessarily compensate for missing one critical delivery. Therefore predicting satisfaction based on average delivery precision should be made with caution. Reeves and Bednar (1994) suggest that the customer is the ultimate judge of quality why the customers' perception is maybe more important than the actual performance. For instance Parasuraman et al. (1988) includes questions on reliability in the SERVQUAL tool such as "provides services at the time that is promised". While reliability for HWS indeed could be measured as delivery precision, there might still be a gap between actual performance and perceived performance.

Tangibles for HWS concern the product and can also be measured in numbers such as Return Rate, NFF and DOA. However there is a subjective side to tangibles as well regarding alarm and diagnostic systems and how easy the customer finds troubleshooting. This side of tangibles and also the other identified quality dimensions for HWS is more concerned with the customers' perception of the service process which makes the use of perception measures relevant as well. For measuring perceived performance previous research suggests the use of different survey tools like SERVQUAL as designed by Parasuraman et al. (1988) or SERVPERF as designed by Cronin and Taylor (1992).

Furthermore, the in depth study of HWS provides additional empirical evidence for the notion that perceived value affects repurchase intentions as suggested by Cronin & Taylor (1991) and Oh (1999). It was found that several HWS contracts have been lost due to cost and low perceived value. While cost/price and perceived value are identified to have an impact on repurchase intention there are few researchers who see this as a quality dimension, but instead highlights that it is important to understand that quality is evaluated in relation to cost (Garvin, 1984; Cronin & Taylor, 1992; Oh, 1999). The authors of this thesis have found no evidence to reject this view. See Figure 15 for an illustration of the connection between quality, value, satisfaction and loyalty.

Figure 15 Connection between service quality, customer satisfaction, loyalty, and repurchase intention inspired by Oh (1999)

The case study also confirms the notion that different customers have different preferences for quality, as suggested by (Chowdary & Prakash, 2007). For instance how trust and personal relationship are valued seem to differ between different customers. The case study also supports the idea that there are cultural and geographical differences in preferences, as suggested by researchers such as Izogo and Ogba (2014), which is seen for instance regarding quality orientation and the expectations of performance regarding delivery precision for HWS in Japan.

5.2.2   Learning Services

Learning Services are as previously discussed represented both for product related services and for process oriented services. During the case study no difference was highlighted between what is important for the customers for the two types, why the identified dimensions are seen as applicable both for basic installed base services and professional services.

Education and lecture teaching have received some attention in previous research on service quality. Both Rosen & Karwan (1994) and Chowdary & Prakash (2007) have identified tangibles as important for education. They argue that tangibles are more important for services performed in the presence of the customer. The importance of tangibility is also seen for Learning Services in this case study where several examples have been presented such as the quality and format of documentation and the quality of exercises. Even other tangibles that are not really a part of the service itself such as food, hotel and

giveaways have been noticed to have an impact on the perceived quality of the course. Related to the quality of exercises is also the fact that any online exercise must be available and function as planned and in one sense this is a reliability issue. However reliability can also be thought of as an innate part of the tangible dimension in this example and not as a stand-alone dimension.

The lecturer has also been highlighted as important for the customers' quality perception especially regarding competence and communication skills. It is a fair assumption that these attributes also have a strong impact on the outcome of the course i.e. reaching the learning goals. Competence and communication were included in the first list of quality dimensions identified by Parasuraman et al. (1985) though in their revised list these attributes were no longer presented as individual constructs (Parasuraman et al., 1988). Instead competence was embedded in the assurance dimension which they defined as "Knowledge and courtesy of employees and their ability to inspire trust and confidence" (Parasuraman et al. 1988). In the revised list communication is not present as a –stand-alone dimension or found embedded in any of the other quality dimensions neither. From the definition of assurance and other quality dimensions it could be interpreted that communication skills is a mean for achieving performance within these attributes. On the other hand Carman (1990) argues that when an attribute is particularly important for a service they are likely to break down into sub dimensions. For Learning Services communication both affects the perception of the course and as discussed above it is also likely to have direct impact on outcome of the course. Therefore communication is proposed as a stand-alone dimension for Learning Services.

One dimension that has been identified as important for services targeted directly at the customer is assurance (Chowdary & Prakash, 2007; Lee & Kim, 2013). As discussed previously, assurance concerns both the knowledge of the personnel but also their ability to inflict trust and confidence in the customer. The case study provides support for the part of this dimension that concerns the competence of the lecturer but not on ability to inspire trust and confidence. Participating in a course does not present any immediate risks for the participants compared to other services targeted at the customer such as surgery, which could be one explanation to why the ability to inflict trust and confidence was not highlighted as important. The assurance dimension should be divided in subdimensions where the focus for this dimension for this type of service concerns the competence construct.

"Understanding/Knowing the customer" was identified as a quality dimension by Parasuraman et al. (1985) in their first set of quality dimension. As discussed in the empirical chapter the usefulness of Learning Services is dependent on understanding the customer needs. Parasuraman et al.(1994) presented the idea that some quality dimensions actually could be antecedents for other dimensions which seems to be the case for understanding/knowing the customer for Learning Services. Therefore for Learning Services it seems more relevant to consider the usefulness of the course as the quality dimension and instead consider understanding the customer as an antecedent for achieving this.

Chowdary and Prakash (2007) further argues that empathy is important for the customers' quality perception for this type of service since it has a high degree of personal contact such as education. The case study has found no reason to doubt the relevance of this.

Though reliability was not mentioned during the interview regarding Learning Services, Rosen and Karwan (1994) have identified reliability as a relevant quality dimension for educational services. Chowdary and Prakash (2007) found reliability to be significant and influencing overall satisfaction

for services targeted at people even if it was rated among the least important dimensions. Rosen and Karwan (1994) argue that reliability does not necessarily lead to a competitive advantage but it is often taken for granted why the lack of it can lead to dissatisfaction. For Learning Services the identified service quality dimensions can be seen in Table 13.

Table 13 Quality dimensions identified for Learning Services

Dimension	Explanation
Competence	The lecturers competence of the area and ability to answer questions
Communication	The lecturers ability to transfer knowledge to the course participants
Tangibles (as defined for services)	The extent to which the documentation meets the expectations and how well exercises works and fulfill their purpose
Use for customer	The extent to which the course is useful to the participants
Empathy	How keen employees are to pay attention to the individual customer
Reliability	The ability to perform service dependably and on time

The goal with these services is to increase the knowledge of the course participants. Traditionally exams are often used to measure the outcome of the course as the students' acquired knowledge of the course content. This is not applied for Learning Services since the customers does not demands it, though from a measurement perspective an exam could be one way to measure if the course objectives were met.

However, besides reaching the course objectives the objectives must also be relevant for the customer i.e. the content of the course must be useful for the customer. As done for Learning Services today, this could be done with a self-assessment of how useful the course was to the participant's daily work.

Besides the impact on the outcome, quality dimensions identified for Learning Services such as competence and communication also affects how the course participants perceives the quality why also perception measures are relevant (e.g. Grönroos, 1984).

5.2.3   Consulting & Transformation and System Integration

To get the results delivered on time was highlighted as important for CSI services. In addition, not disrupting the customer network and perform the service right the first time was also described as important for the customer. This is closely related to the dimension of reliability which is quality dimension proposed by Parasuraman et al. (1985).

In addition, understanding the customer needs was underlined as important for CSI services. There are two aspects of understanding the customer needs that are relevant for CSI. First, it was explained in the case study that it is important for the customer to feel that they are listened to which makes it an empathy item. Empathy is also in previous research identified as important for services where the customer is closely involved (Chowdary & Prakash, 2007), which is the case of this service. Secondly, it is important to understand the customer need in order to design and deliver a solution that will solve the customer problems and meet the customer requirements. As for Learning Services, understanding customer's needs could be seen as an antecedent for achieving the intended outcome. For Learning

Service "use for the customer " was identified as a quality dimension, similarly quality of deliverables can then be seen as a quality dimension for CSI.

What the customer pays for is in the end the competence Ericsson possesses and previous research supports the importance of assurance for competence services such as management consulting (Chowdary & Prakash, 2007; Lee & Kim, 2013). This motivates the proposal of assurance as a relevant quality dimension for CSI.

Furthermore knowledge about the customer's network was described as a factor affecting the satisfaction since the customers sometimes expects Ericsson to have higher knowledge than themselves of their network. This is related to the consistency dimension of a solution, where the supplier should be knowledgeable of all parts of the solution. It seems that even though the CSI service is more a stand-alone service in the overall network solution, compared with for instance HWS, being a part of Ericsson's service portfolio creates certain expectations from the customer which as discussed in the theoretical framework affects their quality evaluation (Parasuraman et al., 1985). However, this is not necessarily a stand-alone dimension but a part of the assurance dimension for CSI. All the identified quality dimensions for CSI are presented in Table 14.

Table 14 Quality dimensions identified for CSI

Dimension	Explanation
Reliability	The extent to which results are delivered on time and does not disrupt the network
Empathy	How keen employees are to pay attention to the individual customer
Quality of deliverables	The extent to which the results meet or exceed the customer needs and expectations
Assurance	The knowledge of the employees and the extent to which the project team can inflict trust and confidence in the customer

Reliability for CSI can be measured as an outcome, which can be on time delivery or First Time Right (FTR). However it can also be measured as a perception. In fact, one of the reliability questions in SERVQUAL actually concerns doing right the first time (Parasuraman et al., 1988).

Empathy and consistency are concerned with the customer's perception of quality why measures grasping those aspects are relevant as well. Regarding quality of deliverables it is possible that this sometimes could be measured in numbers, but the success of system integration also have a subjective side to it and also requires measures of customers' perception.

5.2.4 Network Design and Optimization

As discussed, this type of service is highly result oriented. Previous research on service quality dimensions has tried to include the result perspective in the reliability dimension. In the first set of quality dimensions Parasuraman et al. (1985) defined reliability as "Perform the service right the first time and honor the promises. " and later as "Ability to perform service dependably and accurately". The notions "Honor the promises" and "accurately" indicates that the deliverables are defined in the beginning of the service and then the customer evaluates the extent to which he perceives the result meets the initial agreements. However in all cases there are not possible to know

in advance how much the result will be improved. The scatterplot for the impact of "quality of deliverables" on overall satisfaction showed a clear linear pattern which indicates that the higher the quality of deliverables the higher is the satisfaction of the customer. This motivates quality of deliverables as a quality dimension separately from reliability. However reliability is still relevant for NDO since it was highlighted that deliver results on time was considered important for the customer.

To provide the customer with timely and continuous information during the NDO project was highlighted as reassuring and important for the customers. However, this does not motivate communication as a quality dimension since it is does not have the same direct impact on the outcome as for Learning Services. Rather communication is a way inform and reassure the customer of progress which can be related to the definition of assurance proposed by Parasuraman et al., (1988) which concerns the service personnel's knowledge and their ability to inflict trust and confidence in the customer. Support for the relevance of assurance for competence services like NDO can also be found in previous research where Chowdary and Prakesh (2007) and Lee and Kim (2013) identified assurance as an important quality dimension for professional services.

Furthermore, NDO is a labor intensive service for which Chowdary and Prakash (2007) proposes empathy as an important item. However this service is sometimes performed remotely with limited interaction and therefore it is hard to say that empathy always is a relevant quality dimension. To summarize, the quality dimensions identified as important for NDO in this case study can be seen in Table 15.

Table 15 Quality dimensions identified for NDO

Dimension	Explanation
Reliability	The extent to which results are delivered on time
Quality of deliverables	The extent to which the results meets or exceeds the customer's needs and expectations
Assurance	The knowledge of the project team and the extent to which they can inflict trust and confidence in the customer

Reliability for NDO can be measured as an outcome through delivering on time. The quality of deliverables can be measured as the effect it has for the customer such as the increase of capacity or coverage. Assurance on the other hand is more concerned with how the customer perceives the service process, why also process measures grasping these aspects are relevant.

5.2.5 Network Roll-out

Complete installation on time and correctly is highlighted as important for NRO which makes reliability a key concern for this type of service. This notion is supported from previous research where reliability is found to be important for services targeted at possessions (Chowdary & Prakash, 2007) and for delivery and transport (Lee & Kim, 2013) which both are applicable for NRO. Since the service does not closely involve the customer and the customer is not necessarily present the importance of dimensions such as tangibles and empathy is less obvious (Chowdary & Prakash, 2007).

To provide the customer with continuous and timely information during the NRO project is also important for the customer satisfaction. To inform the customer about the progress of the project is as

previously discussed related to the dimension of assurance. The two quality dimensions identified for NRO are presented in Table 16.

Table 16 Quality dimensions identified for NRO

Dimension	Explanation
Reliability	The extent to which installation is done correctly and on time
Assurance	The extent to which the project team can inflict trust and confidence in the customer

Reliability concerns the outcome of the services which can be measured as delivery precision and quality of deliverables. Assurance on the other hand is more a perception of the service process, which indicates the need for measures grasping the customer perception as well.

5.2.6   Managed Services

For managed services the outcome of the service is directly connected to the effect the service has for the customer for instance regarding uptime of the network. This implies that reliability of the service is important. Since it is Ericsson that detects any errors the focus is more on how fast the problem is solved than how easy the customer can contact Ericsson when there is a problem. The expected time from a failure to contacting the customer and solving the problem is even regulated in the SLA which implies that this is a key concern to the customer. This presents the arguments for proposing, responsiveness as defined by Parasuraman et al. (1988) as a relevant quality dimension for Managed Services.

The relationship between the customer and the contact person was described as important, though it was not clear from the case study what personal attributes that were considered important for the customer.

Often the customer wants Ericsson to actively seek improvement areas for the network and operations. As for HWS it seems that proactivity is a relevant quality dimension for Managed Services. However this is more likely to be relevant for managed networks where the customer owns the network than for the network sharing where Ericsson owns the networks. If Ericsson owns the networks any improvements are more likely to have a direct effect for Ericsson rather than for the customer.

For managed network services the quality of the products would seem to be a key concern to the customer, and according to Johansson and Witell (2013) tangibles i.e. the products is a quality dimension for solutions. However, since the amount of Ericsson produced products in the network sometimes are low or non-existing, tangibles cannot be said to always be relevant for Managed Services. For network sharing customers the customers cannot know whether any problems are related to the products or services why tangibles are not a direct dimension for NS either. The quality dimensions identified for Managed Services can be seen in Table 17.

Table 17 Quality dimensions identified for Managed Services

Dimension	Explanation
Reliability	The extent to which the results are delivered according to the contract
Responsiveness	The extent to which the supplying company gives a fast response and solution to problems
Proactivity	The extent to which the supplying company actively seeks to avoid problems and seek improvements

These quality dimensions are identified for the day-to-day operations, and there might be others that are relevant during the transition and implementation phase. Anyhow, reliability can for instance be measured as uptime of the network. Proactivity is more concerned with an approach rather than the outcome of the service which motivates process measures as well. Responsiveness could be measured in numbers by response time and time to remedy, though it could be useful to measure responsiveness as a perception of the willingness to assist according to Parasuraman et al., (1988).

5.3 Relevant dimensions from the service classification perspective

In Figure 16 the service classification matrix including the different services and the identified quality dimensions can be seen.

Figure 16 Quality dimensions identified for the different services

By studying the service classification matrix it can be noted that there are many dimensions found for HWS while fewer are found for the other services. This does not necessarily mean that more dimensions are relevant for HWS than for the other services, instead it is more likely that due to the lack of access to the voice of the customer not all relevant quality dimensions have been found for the other services.

Anyhow, results presented in Figure 16 indicate that different quality dimensions are relevant for different services within the same service class, which means that their location in the matrix does not directly predict what quality dimensions that is relevant. Reliability is the only dimension that is identified for all services. Since it is likely that not all dimensions are yet identified for all services it is harder to identify any consistent differences between the service classes. However proactivity was only identified as quality dimensions for the relationship based services. Due to the lack of customer input it is not possible to rule out that proactivity also is relevant for transaction based services. However it is likely that relationship based services, where the supplying company works over time with the customer, present more opportunities for being proactive why this dimension might be more relevant for relationship based services. Tangibility as represented by the product was only found relevant for HWS since it also involves products in the delivery of the service.

5.4   Relevant measures from the service classification perspective

According to previous research both the outcome of services and the perception of the service process should be measured since both affect the customer's quality experience (Grönroos, 1984; Parasuraman et al., 1988; Swartz & Brown, 1989; Lehtinen & Lehtinen, 1982). That perception measures are relevant for all services are confirmed by the findings in the case study since dimensions were found for all services that could only be measured as perceptions of the service process. See Table 18.

Table 18 Quality dimensions that can only be measured as customers' perceptions

HWS	LS	CSI	NDO	NRO	MS
Willingness to serve Approachability Empathy Flexibility Proactivity Consistency Tangibles (as for services)	Competence Tangibles (as for services) Communication Empathy	Assurance Empathy	Assurance	Assurance	Assurance

In order to measure customer perceived quality of the service process previous research suggest the use of different survey tools such as SERVQUAL, as suggested by Parasuraman et al., (1985) or SERVPERF as suggested by (Cronin & Taylor, 1991). While Parasuraman et al. (1988) designed SERVQUAL based on a fixed set of quality dimensions other researchers like Asubonteng et al. (1996) means that the SERVQUAL or other survey tools for measuring service quality should be adjusted according to context since the quality dimensions varies between different services. This case study supports the view that different dimensions are relevant for different services and that quality

measures hence should be designed accordingly. Instead of starting out with a fixed set of dimensions it seems reasonable to start by identifying what affects the customers' perception of quality and then measure the customers' perception of performance of those dimensions. Besides, if starting out with a fixed set of dimensions a survey might ask questions on attributes that are not relevant for the customers. In the end the idea of measuring quality is to be able to improve it (Elliot, 1993; Kim, 2013) and since it is the customer that is the judge of quality (Reeves & Bednar, 1994) there is no point in trying to improve within dimensions that are not important for the customers.

Other dimensions identified for the different services could be measured as outcomes, see the example in Figure 17 below.

Service	Dimension	Measureable outcome
HWS Intended outcome: Deliver repair and replacements Effect: Uptime for customers' network	Reliability ⟶ Tangibles ⟶	Delivery Precision/ SLA fulfillment DOA
NDO Intended outcome: Increase performance for customer Effect: Capacity/Coverage increase	Reliability ⟶ Quality of deliverables ⟶	On time delivery of results Capacity/Coverage increase

Figure 17 Examples of dimensions that also could be measured as outcomes

While the outcome of different services indeed is concerned with what the customer gets from purchasing the service, and should be addressed in quality measures (Grönroos, 1984; Swartz & Brown, 1989; Lehtinen & Lehtinen, 1982), the possibility to measure the actual effect the service has for the customer often seems to be limited from what is seen in the case study. For instance it is hard for Ericsson to estimate the effect HWS has for the customer and for Learning Services it is hard to measure the effect the customer gets from participating in a course. However, for NDO the actual increase in capacity or coverage could be measured. While the effect the service has for the customer of course is relevant for the customers for all kinds of services it seems that it is easier for the supplying company to measure this for some services.

Even though some dimensions like reliability often could be measured objectively in numbers Parasuraman et al. (1985) include questions on reliability in the SERVQUAL tool for measuring customer's perception as well. By including questions on dimensions in a survey, any gap between actual performance and customer's perception of performance could be identified.
As seen for HWS an overall high delivery precision would not necessarily compensate for a miss on a critical delivery why the perceived performance might not correlate with the actual performance.
If agreeing with researchers such as Reeves and Bednar (1994) that the customer is the ultimate judge of quality, then the actual performance is in a sense subordinated the perceived performance. However, being able to measure quality in terms of failure rate or level of achievement is still relevant in order to find areas for improvement. To show actual performance to the customer is also a way to

close the gap between actual and perceived performance and make the quality judgment more objective.

This study has not focused on internal quality measures and therefore not on COPQ as proposed as a quality measure by for instance Defeo (2001). However, failure to deliver on time for instance could lead to costs also for the customers, in other words be seen as a QOPQ for the customer. These costs for the customer caused by bad quality of the service would though be very hard for the supplying company to measure. On the other hand Bergman and Klefsjö (2010) argue that customer satisfaction is the ultimate measure of quality and it is a fair assumption that if poor service quality leads to costs for the customer this would be reflected in a customer satisfaction measurement.

As discussed in chapter 3.3 customer complaints is a weak predictor of customer satisfaction (Edvardsson & Roos, 2003; Bergman & Klefsjö, 2010) but useful to identify attributes affecting customers' perception of the service (Edvardsson & Friman, 2003). As seen for instance for HWS it contributed to identify proactivity as a quality dimension. However studying complaints for this purpose is relevant not only for HWS but for other services as well

To summarize, based on the findings from the case study it cannot be concluded that different quality measures like, SERVQUAL as proposed by Parasuraman et al., (1985) or SERVPERF as proposed by (Cronin & Taylor, 1992) or outcome measures are more relevant for some services than other. Instead the usage of them should be adapted according to what the service tries to accomplish and according to the relevant quality dimensions.

6 Discussion

In this chapter the discussion is presented. In the first section, theoretical implications, the contribution to research is discussed. The next section, managerial implications, summarizes the practical implications from a managerial perspective. In the final section proposals for future research are discussed.

6.1 Theoretical implications

The purpose of this thesis was to identify what quality dimensions and quality measures that are relevant for services offered by a manufacturing company in a B2B setting, focusing in particular on the hardware support services. Furthermore this study aimed to investigate if there are any differences in between different service classes regarding what quality dimensions and measures that are relevant. Even though there exist different opinions it is quite well established that different quality dimensions and their relative importance varies between different services (Rosen & Karwan, 1994; Carman, 1990; Chowdhary & Prakash, 2007; Ganguli & Roy, 2010; Akhade et al., 2013). On the other hand Rosen & Karwan (1994) and Chowdary and Prakash (2007) argues that some generalizations can be made upon different parameters describing the services. Little previous research, on what quality dimensions that is relevant for different service types provided by a manufacturing company in a B2B setting has been found. Therefore that was identified as a research gap. This gap was addressed in this thesis.

First of all, this case study supports that different quality dimensions are relevant for different services. To be able to see if any generalizations could be made for different service classes the service classification matrix proposed by Oliva and Kallenberg (2003) was used. This matrix consider if the services are aimed at the customers possessions or process, and if the services are transaction based or relationship based. However, the case study found differences in what quality dimensions that is relevant for different services within the same service class. This implies that the predictive power of using this classification to identify quality dimensions for different services based only on their position in the matrix is weak. It is important to highlight that the input and voice of the customer was limited for all studied services except HWS. Besides, one challenge with the classification scheme applied in this thesis was that some services like Learning Services are covered in more than one class. According to Oliva and Kallenberg (2003) product-oriented training should be classified as a Basic installed base service which influenced the decision to classify the Learning Services regarding usage of products as product related services. Whether this is suitable or not can be discussed. Even though the training is product oriented it is maybe more concerned with ways of working which would imply that even product related training should be classified as process oriented. Another challenge was that NDO is somewhere in between product- and process related services.

Anyhow, the case study has contributed by identifying a set of relevant quality dimensions for different services. Especially dimensions regarding maintenance services have been identified through the in depth case study of HWS. A new quality dimension, proactivity, not identified in previous research has also been identified. Proactivity was found relevant for Maintenance services and Operational Services. That proactivity was found only for these services might indicate that this dimension is more relevant for relationship based services rather than transaction based. However, due to the lack of customer input for the transaction based services there is also a chance that proactivity are relevant for those services as well but that it was not highlighted in this case study. Furthermore "use for customer" was identified as a new quality dimension for educational services, and "quality of deliverables" was identified as a new quality dimension for different consulting services. Reliability is the only dimension that was found relevant for all services.

The case study has also provided additional empirical support for the relevance of the solution quality dimensions proposed by Johansson and Witell (2013). The case study also suggests that the solution quality dimension flexibility is not only relevant for solution but for services as well. Johansson and Witell (2013) define flexibility as "the extent to which the solution meets the initial needs stated by the customer and changes the customer's changing needs". For HWS flexibility concerned the extent to which the initial contractual terms could be adjusted for different customers and the willingness to go outside the contract in order to solve customers' issues. For HWS the need for flexibility does not seem to be driven due to HWS being a solution. Rather it is driven due to that different customers have different needs and since the service is ongoing over a period of time there is a need to also be flexible and be able to meet changing demands. Hence flexibility does seem to apply not only for solutions but also for services as well.

Empathy has in previous research been seen to be less relevant for services targeted at customer's products (Chowdary & Prakash, 2007). However for relationship based product related services, empathy has been identified as important in the in depth study of HWS. One explanation is that this study concerned a B2B setting where the relationship between the supplying company and the

customers typically is strong and involves frequent contact whereas previous studies mainly have concerned business to consumer settings.

Carman (1990) argued that when a quality dimension is important for a service it might have to be divided into sub dimensions. Responsiveness as proposed by Parasuraman et al. (1988) concerns both the speed of assistance and the willingness to serve. For HWS these are both two key concerns but not necessarily together. Willingness to serve was expressed as going the extra mile and helps the customer out even if they were not contractually bound to do it. Speed of assisting was more concerned with how fast repair and spare parts are delivered. Hence the case study supports Carman's (1990) arguments.

6.2   Managerial implications

From a managerial perspective the conclusion that different quality dimensions are important for different services implies that it is necessary to identify what quality dimensions that is relevant for the business they are in charge of. That different customers have different preferences means that the supplying company also needs to understand those differences in order to be able to meet all customer's needs.

Manufacturing firms must also understand that being the supplier of both products and services creates certain expectations from the customers. For instances a service like CSI that on the surface seems like a stand-alone service "suffers" from expectations from the customers regarding the knowledge of the customer's network. Furthermore, services that involve products, like HWS, will also be evaluated on the product quality even if the product quality is not the responsibility of the service organization.

The design and choice of quality measures should be guided by the relevant quality dimensions for the service. Both outcome measures and measures of the customer's perception should be applied since they are both relevant, at least for the services studied in this thesis. Regarding survey measures it is useful to not only ask about the customers' perception of performance but also to ask questions regarding customer's expectations or perception of importance of the different dimensions (Parasuraman et al., 1985; Cronin & Taylor, 1992). This, in order to be able to understand the relative importance of the dimensions and to understand if there are any gap between expectations and perceived performance or between actual performance and perceived performance. Since different customers also have different preferences including questions on importance or expectations can also help to identify what each individual customer considers important.

Delivering solutions can also drive some managerial challenges when one organization is responsible for the product and another delivers services that includes products. There are some measures like return rate that is both affected by service quality and product quality and the company needs both organizations attention to reduce the return rate. Finally, managers must understand the role of perceived value and how this affects satisfaction and purchase intentions since quality always is evaluated in the relation to price and cost (Garvin, 1984).

6.3   Future research

Since the voice of the customer was limited for other services than HWS it is likely that not all relevant dimensions were found in this study why it is suggested to conduct in-depth investigations of

those services as well. The services from the portfolio at Ericsson that was not included in the study should be investigated as well in order to get the complete picture of all services. This study has been limited to quality measures that directly impact the customer experience or perception. Further research could address internal quality measures as well.

Proactivity was identified as a new service dimension for HWS. Future research should use quantitative methods to confirm proactivity as a quality dimension. The validity of the other proposed quality dimensions could also benefit from further quantitative research. Furthermore, future research should investigate whether proactivity only is a relevant quality dimension for relationship based services, as the findings did indicate.

Other ways of classifying services could also be tested, in order to find a classification that better predicts what quality dimensions that are relevant for different types of services since it seems like the parameters relationship based/transaction based and product/process are weak in predicting what dimensions that are relevant for the services studied in this thesis. It is possible that a classification scheme with parameters grasping aspects relevant for project based services could be useful since NRO, NDO and CSI are project based services and for which the identified quality dimensions are similar.

With the methods applied in this thesis it has not been possible to identify the relative importance of the identified dimensions why further research, collecting customers opinions of the importance of different dimensions, could be useful. Some input was found regarding if the way different dimensions affect satisfaction for HWS i.e. whether they affected satisfaction as satisfiers or dissatisfiers. However, future research could study this in a more focused way and classify the dimensions as satisfiers and dissatisfiers.

Alternative techniques for collecting input from the customers about their experiences and perceptions were briefly discussed. To further explore new techniques for measuring satisfaction other than surveys could be an area for future research.

The approach to first identify the relevant quality dimensions and then let these guide the quality measures should be applicable for all organizations and businesses. However, since the identified quality dimensions in this thesis work are based on a single case study any generalizations regarding the relevance of these dimensions in another context must be made with caution. Further quantitative research is needed to confirm these as relevant for services offered by other companies and in other industries.

7 Conclusion

The purpose of this thesis was to identify what quality dimensions and quality measures that are relevant for services offered by a manufacturing company in a B2B setting, focusing in particular on the hardware support services. Furthermore this study aimed to investigate if there are any differences in between different service classes regarding what quality dimensions and measures that are relevant. To fulfill the purpose a literature study was undertaken investigating previous research of service classification, quality dimensions, and quality measures. Furthermore the purpose was addressed by a case study where an interview study in combination with secondary data analysis provided input on

what is important for customer satisfaction and what affect customer perception of quality for different services offered by a manufacturing firm. The case study focused in particular on one service, replacement and repair of hardware.

RQ1. What quality dimensions and measures are relevant for services offered by a B2B manufacturing company?

This study has identified a number of quality dimensions that are relevant for services offered by a manufacturing firm in a B2B setting, see Figure 18. A total of fifteen different dimensions were found relevant for services offered by Ericsson. Most dimensions were found for HWS and least was found for NRO. However due to the lack of access to the voice of the customer for other services than HWS, it is likely that not all relevant dimensions were found. However, from the identified dimensions it seems like there is not a fixed set of dimensions that are generic for all types of services.

	Product oriented services	Customer's process oriented services
Transaction based services	**Basic installed base services** Network roll-out Reliability Assurance Learning services -(Training programs) Competence Tangibles (services) Communication Use for customer Empathy Reliability	**Professional services** Consulting & transformation and System integration Reliability Quality of deliverables Assurance Empathy Learning services -(Learning solutions) Competence Tangibles (as for services) Communication Use for customer Empathy Reliability Network design & optimization Reliability Quality of deliverables Assurance
Relationship based services	**Maintenance services** Hardware Service Reliability Tangibles (the products) Willingness to serve Approachability Empathy Flexibility Proactivity Consistency Tangibles (instructions, documentations, tools)	**Operational services** Managed services Reliability Responsiveness Proactivity

Figure 18 The identified quality dimensions for the different services

Both outcome measures and measures of customers' perception of quality were found relevant for all services in all four service classes. The outcome could either be measured as a success/failure rate or as the level of achievement or the effect the service has for the customer. Customer's perception of quality could be measured through different survey tools. The conclusion from this thesis is that

companies should clearly understand what the service aims to accomplish for the customer and measure how well the service fulfills its intended purpose, and that the relevant quality dimensions should guide the design of measurements. This must be done before proposing concrete measures. An example of how the quality dimensions should guide the design of quality measures is shown in Figure 19.

Figure 19 Illustration of how intended outcome and quality dimensions can guide the design of quality measures

RQ2. Are there any differences in between service classes offered by a B2B manufacturing company regarding what quality dimensions and measures that are relevant?

Since it is likely that not all relevant dimensions for all studied services were found it is hazardous to say that some dimensions are not relevant for some services. Anyhow, there are some indications that some dimensions are more relevant for some types of services. Proactivity was only found for relationship-based services. It might be that the recurring service delivery presents more opportunities for being proactive than for transaction based services. Tangibles, as defined for solutions i.e. the product was found relevant only for maintenance services that uses products in the delivery of the service. However it is possible that more patterns would emerge if all quality dimensions were identified for all services.

From this study it cannot be said that any specific quality measures, proposed by previous research, are more relevant for some services than for others, but both outcome and perception measures were found relevant for all services. However regarding outcome measures is seems like measuring the actual effect a service has for the customer, such as increase in capacity, is only possible for some services.

RQ3. Is it possible to predict what quality dimensions and measures that are relevant by classifying services offered by a B2B manufacturing firm?

Reliability was found relevant for all services. Overall it seems like delivery on time is important for all studied services. As discussed earlier, proactivity was found for both relationship based services which could indicate that this is relevant for recurring services. However, the overall conclusion is that

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since different dimensions were found for different services within the same service class it is hard to predict what quality dimensions and measures that is relevant by simply identifying their position in the classification matrix used in this thesis.

8 References

Akhade, G.N., Jaju, S.B., & Lakhe, R.R., (2013), *A review on healthcare service quality dimensions.* 2013 Sixth International Conference on Emerging Trends in Engineering and Technology.

Babakus, E., & Boller, G.W., (1992), *An Empirical Assessment of the SERVQUAL Scale*. Journal of Business Research, (1992:24), pp. 253-268.

Bergman, B., & Klefsjö B., (2010), Quality from customer need to customer satisfaction, Edition 3:6, Lund: Studentlitteratur AB.

Bolton, R.N., & Drew, J.H., (1991), *A Multistage Model of Customers' Assessments of Service Quality and Value*. Journal of Consumer Research, 17(4) pp. 375-384.

Brown, S.W., & Swartz T.A., (1989), *A Gap Analysis Of Professional Service Qualit*y. Journal of Marketing, 53(2), pp. 92- 98.

Carman, J.M., (1990), *Consumer Perceptions of Service Quality: An Assessment of the SERVQUAL Dimensions,* Journal of Retailing, 66(1), pp. 33-55.

Chowdhary, N., & Prakash, M., (2007), *Prioritizing service quality dimensions*. Managing Service Quality: An International Journal, 17(5), pp. 493 - 509.

Cronin, J.J,Jr.. & Taylor, S.A., (1992) *Measuring Service Quality: A Reexamination and Extension*. Journal of Marketing 56(3), pp. 55- 68.

Defeo, J.A., (2001), *The Tip of the Iceberg*, Quality Progress, 24(5), pp. 29-37.

Dubois, A., & Gadde, L.E., (2002). Systematic combining: an abductive approach to case research. *Journal of Business Research,* 55(7), pp. 553-560.

Edvardsson, B., & Friman, M., (2003), *A content analysis of complaints and compliments*, Managing service quality, 13(1), pp. 20-26.

Edvardsson & Roos (2003) *Customer Complaints and Switching Behavior—A Study of Relationship Dynamics in a Telecommunication Company.* Journal of Relationship Marketing, 2(½), pp. 43-68.

Elliot, V., (1993), *Measuring quality*. Journal of Property Management; Sep/Oct 1993; 58(5), pp. 16-18.

Ericsson (2015), *Our Services.* Available at:
http://www.ericsson.com/ourportfolio/services *(*Accessed: 2015-02- 26).

Ericsson (2014), *Ericsson Annual Report 2014.* Available at:
http://www.ericsson.com/thecompany/investors/financial_reports/2014/annual14/sv/#
(Accessed: 2015-03-26).

Ericsson Internal (2015), NFF Communication Package, [Ericsson Internal document].

Frambach, R.T., Wels-Lips,I., & Gtindlach, A. (1997), *Proactive Product Service Strategies.* Industrial Marketing Management, 26, pp. 341-352.

Esaiasson, P., Gilljam, M., Oscarsson, H. & Wängnerud, L (2012), *Metodpraktikan – konsten att studera samhälle, individ och marknad*, 4th edition, Stockholm: Nordstedts Juridik.

Ganguli, S., & Roy,S.K., (2010),*Service quality dimensions of hybrid services*, Managing Service Quality: An International Journal, 20(5), pp. 404 - 424.

Garvin, D.A., (1984), *What Does "Product Quality" Really Mean?, Sloan Management Review* 26(1), pp. 25-43.

Gebauer, H., Edvardsson, B., Gustafsson, A., & Witell, L., (2010), *Match or Mismatch: Strategy-Structure Configurations in the Service Business of Manufacturing Companies.* Journal of Service Research, 13(2), pp.198 –215.

Gebauer, H., & Paiola, M., & Edvardsson, B., (2012), *A capability perspective on service business development in small and medium-sized suppliers.* Scandinavian Journal of Management, 28, pp. 321-339.

Grönroos, C., (1984), *A Service Quality Model and its Marketing Implications*. European Journal of Marketing, 18(4) pp. 36 – 44

Haywood-Farmer, J., (1988), *A Conceptual Model of Service Quality*, International Journal of Operations & Production Management, 8(6), pp. 19 – 29

Hernon, P., Nitecki, D.A., Altman, E., (1999), *Service Quality and Customer Satisfaction: An Assessment and Future Directions*, The Journal of Academic Librarianship, 25(1), pp. 9-17

Izogo, E.E., & Ogba, I.E., (2015), *Service quality, customer satisfaction and loyalty in automobile repair services sector*, International Journal of Quality & Reliability Management, 32(3), pp. 250 – 269

Johansson, E., & Witell, L., (2013), *What is quality in a manufacturing firm? Understanding the quality of products, services and solutions,* [Unpublished Working paper].

Khan, S.N., (2014) *Qualitative Research Method - Phenomenology,* Asian Social Science, 10(21), pp. 298 - 310.

Klaus, P., & Maklan, S., (2007), *The role of brands in a service-dominated world*, Brand Management 15(2), pp. 115–122.

Klaus, P., & Maklan, S., (2012), *Towards a better measure of customer experience*. International Journal of Market Research, 55(2), pp. 227-246.

Kitapci, O., Dortyo, l.T., Yaman, X., & Gulmez, M., (2013), *The paths from service quality dimensions to customer loyalty.* Management Research Review, 36(3), pp. 239-255.

Kvale, S. & Brinkmann, S (2009), *Den kvalitativa forskningsintervjun*, 2nd edition, Lund: Studentlitteratur.

Lehtinen, U., & Lehtinen, J.R., (1991) *Two Approaches to Service Quality Dimension,* The Service Industries Journal, 11(3), pp.287-303.

Mathieu, V. (2001), *Service strategies within the manufacturing sector: benefits, costs and partnership*. International Journal of Service Industry Management, 12(5), pp. 451 – 475.

Mathieu, V. (2001b), *Product services: from a service supporting the product to a service supporting the client*. Journal of Business & Industrial Marketing, 16(1), pp. 39 - 61.

Martin, C.R., & Horne, D.A., (1992), *Restructuring towards a Service Orientation: The Strategic Challenges*. International Journal of Service Industry Management, 3(1), pp. 25 - 38.

Montgomery, D.S., & Runger, G.C. (2007) *Applied Statistics and Probability for Engineers,* Fourth Edition, Hoboken: John Wiley & Sons.

Neely, A., (2008), *Exploring the financial consequences of the servitization of manufacturing.* Springer Science, 1, pp. 103-118.

Neely, A., Kastalli, I.V., Looy, B.V., (2013), *Steering Manufacturing Firms Towards Service Business Model Innovation*, University of California, Berkeley,56(1), pp.100-123.

Oh, H., (1999), *Service quality, customer satisfaction, and customer value: A holistic perspective*, Hospitality Management,18, pp. 67-82.

Oliva, R., & Kallenberg, R., (2003) *Managing the transition from products to services*, International Journal of Service Industry Management, 14(2) pp. 160 – 172.

Paiola, M., & Saccani, N., & Perona, M., & Gebauer, H., 2013, *Moving from products to solutions: Strategic approaches for developing capabilities.* European Management Journal, 31, pp. 390-409.

Parasuraman, A., Zeithaml, V.A., Berry, L.L.,(1985), *A conceptual model of service quality and its implications for future research*. Journal of Marketing, (1985:49), pp. 41- 50.

Parasuraman, A., Zeithaml, V.A., Berry, L.L., (1988), *SERVQUAL: A Multiple-item scale for measuring consumer perceptions of service quality*, Journal of Retailing, 64(1), pp. 12- 40.

Parasuraman, A., Zeithaml, V.A., Berry, L.L., (1991), *Refinement and Reassessment of the SERVQUAL Scale*, Journal of Retailing, 67(4), pp. 420-450.

Persson, A., (2013) Radio Site Quality Audit List. [Ericsson internal document].

Reeves, C.A., & Bednar D.A., (1994), *Defining Quality: Alternatives and Implications*, The Academy of Management Review, 19(3), pp. 419-445.

Rosen, L.D., & Karwan, K.R., (1994), *Prioritizing the Dimensions of Service Quality*, International Journal of Service Industry Management, 5(4), pp. 39 – 52.

Sachdev, S.B., & Verma, H.V., (2004), *Relative importance of service quality dimensions: A multisectoral study*, Journal of Services Research, 4(1), pp. 94-116.

Schmenner, R.W., (1986), *How Can Service Businesses Survive and Prosper?*, Sloan Management Review, 27(3), pp. 21- 32.

Schneider, B., & Chung, B.,(1996), *Service Quality*. Journal of Organizational Behavior, (1996:3) pp. 65- 86.

Sharma,S., & Negi, J., (2014) *Customer importance rating of service quality dimensions for automobile service.* International Journal of Engineering Science and Technology, 6(12), pp. 822-826.

Seth, N., Deshmukh, S.G., & Vrat, p., (2014), *Service quality models: a review*. International Journal of Quality & Reliability Management, 22(9), pp. 913-949.

Thomas, P.R., (1993), *Measuring quality*. Executive Excellence, 10(5), pp.18-19.

Ulaga, W., & Reinart, W.J., (2011), *Hybrid Offerings: How Manufacturing Firms Combine Goods and Services Successfully.* American Marketing Association, 75(Nov), pp. 5–23.

Vandermerwe, S., & Rada, J., (1988) *Servitization of Business: Adding Value by Adding Services*. European Management Journal, 6(40), pp. 314-324.

Vargo, S.L., & Lusch, R.F., (2008), *Service-dominant logic: continuing the evolution,* Journal of the Academic Marketing, 36, pp.1–10.

Wallén, G (1996), *Vetenskapsteori och Forskningsmetodik*. 2nd edition, Lund:Studentlitteratur.

Wisniewski,M., (2001),*Using SERVQUAL to assess customer satisfaction with public sector services*, Managing Service Quality: An International Journal, 11(6), pp. 380 - 388.

Yin, R.K.,(2013) ,*Validity and generalization in future case study research*, Sage publications,19(3), pp. 321–332.

9 Appendix

9.1 Appendix A – Interview guides

List of questions used as interview guideline for semi-structured interviews with the customer:

- How satisfied are you with the HWS provided by Ericsson in general?
- What is your perception of Ericsson as a HWS provider?
- Are you satisfied with Ericsson in general?
- What do you associate Ericsson with?
- What is most important when you select HWS supplier?
- What was the major reason for you to choose Ericsson as HWS supplier?
- Do you have any examples of situations when you have been especially satisfied/dissatisfied with HWS?
- Do you look at data on delivery precision together with Ericsson? Would you like to see any other performance measures?
- Is Ericsson eager to assist you upon request?
- Do Ericsson's offers fit your needs?
- Have Ericsson made any process changes? How did that change go?
- Do you consider HWS from Ericsson as good value for money?
- Do you consider Ericsson to be proactive enough regarding services?
- If you wish to change something in your contract, how flexible and accommodating do you experience Ericsson to be then?
- In what way could HWS from Ericsson be improved?
- Are Ericsson personnel easy to get in contact with upon request? Do you get the support that you want when there is a problem?

List of questions used as interview guideline for semi-structured interviews with Key Account Managers:

- Based on your experience, do you find it easy or hard to sell HWS?
- Is it difficult to explain the full value of HWS for the customer?
- What does the customer consider most important when signing HWS contract? How does the customer discuss and reason?
- What aspects are most argued when discussing a HWS contract?
- Do you receive feedback from the customer on the services? What do they say?
- What is the most challenging part of signing a contract for HWS?
- Do you find the service levels for HWS appropriate? Is it flexible enough?
- Have you experienced a customer that did not renew or cancel a HWS contract? OR changed the service level? If yes, what was the reason?
- Who is involved in the contract process?

- What requirements from the customer are most difficult to accommodate? Do you experience that you can meet the customer requirements when you create and agree about a contract?
- What is the most challenging part when negotiating about a contract for HWS with a customer?

List of questions used as interview guideline for semi-structured interviews with Service Delivery Managers:

- First of all, what customer(s) are you SDM for? For how long have you worked with this customer(s)?
- What kind of HWS contract do they have?
- Based on your experience, what's most important for the customer when delivering HWS?
- What make the customers satisfied with the service? What make the customer dissatisfied? Any examples.
- What's the most common complaint from the customer, regarding HWS?
- Does the customer escalate often, why?
- What's the most challenging part of being an SDM for this customer?
- Have you ever experienced a customer that did not renew or cancel the HWS contract? What was the reason?
- Do you and your customers measure and analyze performance together? What measures are the customer most interested in?
- What kind of discussions do you and the customer have before a contract is signed or renewed?
- Do you have problems with components that are faulty after they have been on repair? Dead on arrival.

9.2 Appendix B – Definitions of quality dimensions

Researcher	Quality dimension	Definition
Parasuraman et al. (1985)	Reliability	Perform the service right the first time and honor the promises.
	Responsiveness	Willingness or readiness of employees to provide service.
	Competence	Possess required skills and knowledge to perform the service.
	Access	Approachability and ease of contact.
	Courtsey	Politeness, respect, consideration, and friendliness of contact personnel.
	Communication	Keep the customer informed in a language they understand and listen to them.
	Credibility	Trustworthiness, believability, honesty. Have the customer's best interest at heart.
	Security	Absence of danger, risk and doubt.
	Understanding/Knowing the customer	Make the effort to understand the customer's need.
	Tangibles	Include the physical evidence of a service like the physical facilities and appearance of the personnel.
Parasuraman et al. (1988)	Reliability	Ability to perform service dependably and accurately
	Assurance	Knowledge and courtesy of employees and their ability to inspire trust and confidence
	Tangibles	Physical facilities, equipment, and appearance of personnel.
	Empathy	Caring, individualized attention the firm provides its customers.
	Responsiveness	Willingness to help customers and to provide prompt services.
Carman (1990)	Tangibles	Include the physical evidence of a service like the physical facilities and appearance of the personnel.
	Reliability	Perform the service right the first time and honor the promises.
	Responsiveness	Willingness to help customer's and provide prompt service
	Security	Absence of danger, risk and doubt.

	Courtesy	Politeness, respect, consideration, and friendliness of contact personnel.
	Personal attention	The customer is getting personal attention.
	Access/Convenience	Approachability and ease of contact.
Hedvell & Paltschik (1989) in Babakus & Boller (1992)	Wilingness and ability to serve	-
	Physical & psychological access	-
Johansson & Witell (2013)	Reliability	The extent to which the solution can be relied on to provide what is needed at the right time.
	Empathy	How keen a firm's employees are to paying attention to and helping each individual customer and, thereby, building a long-term relationship.
	Tangiability	The extent to which the physical resource lives up to what the manufacturing firm promised for its solution and how well the solution works.
	Approachability	How easily a customer can contact the manufacturing firm and how quickly the firm repairs anything that is broken or that has gone wrong.
	Consistency	How well informed and knowledgeable firm employees are of the entire solution and how well they know what content of the solution the firm is able to deliver.
	Flexibility	The extent to which the solution meets the initial needs stated by the customer and changes the customer's changing needs.
Ganguli and Roy (2010)	Staff competence	The expertise and nature of employees.
	Reputation	Image of the service provider through different actions and options.
	Price	Easy to understand, reasonable and competitive pricing.
	Tangibles	Physical facilities, materials and appearance of employees.
	Ease of subscription	Convenience and ease of subscribing to a service.
	Technology security and information quality	Safety in using technology, proper handling of information and quality of information.
	Technology convenience	Convenience of using technology over the employees as well as speed and time of using technology.
	Technology usage easiness and reliability	How reliable and easy to use the technology is.

9.3 Appendix C - Statistical References

NDO - statistical references	p-value	coefficient	R^2	Correlation	p-value all in one model	coefficient all in one model
Accessibility	0,000	0,879	42,29%	0,650	0,415	-0,058
Project managing competence	0,000	0,828	46,31%	0,681	0,990	-0,001
Understanding of your needs	0,000	0,765	50,84%	0,713	0,933	0,005
Responsiveness	0,000	0,771	54,35%	0,737	0,090	0,123
Commitment	0,000	0,797	49,91%	0,706	0,624	-0,034
The quality of deliverables in this project	0,000	0,898	78,38%	0,885	0,000	0,471
Completes project activities on time	0,000	0,754	71,99%	0,848	0,000	0,256
Provides continuous and timely information about project status	0,000	0,778	61,72%	0,786	0,030	0,118
Handles change requests	0,000	0,662	59,59%	0,773	0,122	0,067

CSI - statistical references	p-value	coefficient	R^2	Correlation	p-value all in one model	coefficient all in one model
Accessibility	0,000	0,761	39,07%	0,625	0,950	0,001
Project managing competence	0,000	0,789	47,38%	0,688	0,005	0,049
Understanding of your needs	0,000	0,735	49,73%	0,705	0,000	0,107
Responsiveness	0,000	0,740	46,74%	0,684	0,425	-0,014
Commitment	0,000	0,776	44,54%	0,667	0,319	0,017
The quality of deliverables in this project	0,000	0,809	66,93%	0,818	0,000	0,346
Completes project activities on time	0,000	0,703	64,05%	0,800	0,000	0,257
Provides continuous and timely information about project status	0,000	0,754	56,45%	0,751	0,000	0,061
Handles change requests	0,000	0,701	55,28%	0,744	0,000	0,146

NRO - statistical references	p-value	coefficient	R^2	Correlation	p-value all in one model	coefficient all in one model
Accessibility	0,000	0,791	42,95%	0,655	0,574	-0,008
Project managing competence	0,000	0,835	54,03%	0,735	0,000	0,088
Understanding of your needs	0,000	0,790	53,62%	0,732	0,000	0,069
Responsiveness	0,000	0,794	53,27%	0,730	0,132	0,023
Commitment	0,000	0,792	48,94%	0,700	0,027	0,033
The quality of deliverables in this project	0,000	0,855	71,01%	0,843	0,000	0,309
Completes project activities on time	0,000	0,752	69,96%	0,836	0,000	0,273
Provides continuous and timely information about project status	0,000	0,782	62,76%	0,792	0,000	0,097
Handles change requests	0,000	0,774	61,51%	0,784	0,000	0,124

CSat - statistical references	p-value	coefficient	R^2	Correlation	p-value all in one model	coefficient all in one model
Commitment	0,000	0,756	50,34%	0,709	0,004	0,090
Service is provided according to contract terms	0,000	0,793	55,56%	0,745	0,000	0,238
Communication regarding the Customer Support Requests	0,000	0,696	52,13%	0,722	0,000	0,092
Handling of your hardware service, service requests	0,000	0,703	51,12%	0,715	0,000	0,107
Ease of working with the Support organization	0,000	0,755	56,92%	0,754	0,000	0,188
Hardware Service replacement units are delivered on time	0,000	0,616	42,06%	0,649	0,006	0,052
Accessibility	0,000	0,726	39,73%	0,630	0,002	-0,081
Competence	0,000	0,771	47,12%	0,686	0,300	0,032
Proactivity	0,000	0,678	51,59%	0,718	0,000	0,209
Proffesionalism	0,000	0,780	46,54%	0,682	0,626	0,014
Responsiveness	0,000	0,706	45,98%	0,678	0,336	-0,027