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Improving Productivity in Software Services

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Abstract

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This Master's Thesis studies the underpinnings of productivity in software services business. The case company of the Thesis is a European software services company that offers mobile web-based publishing solutions, mainly to the news and media industry. The company has grown rapidly over the last five years, and is now facing unsatisfactory productivity – namely, profits from the customer projects are not increasing in line with costs associated with those projects.

The research approach used in this study is action research. Based on literature review, the main tenets of productivity in a services context, and analyzed as for how it differs from traditional manufacturing, are outlined. The data available in the company is then gathered through the company reporting systems and informal interviews with the company mid- and top-level operational management. The gathered data from the interviews is then analyzed to produce an improvement proposal, which is further subjected to scrutiny and review by the case company management, leading to a revised proposal.

The study suggests recommendations and managerial implications to assist the case company in improving their productivity. Included in these recommendations are concrete action points for the case company management to implement. Finally, further considerations and items not addressed by this Thesis, which are recommended to be studied, are presented.

Keywords	software services, productivity, quality management, efficiency, capacity

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Opinnäytetyön tiivistelmä

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Tämä opinnäytetyö tutkii ohjelmistopalveluyrityksen tuottavuuteen liittyviä haasteita. Työn teettäjä on eurooppalainen ohjelmistopalveluja tuottava yritys, jonka asiakkaat toimivat pääosin uutis- ja media-alalla. Tilaajayritys on kasvanut voimakkaasti viimeisten viiden vuoden aikana, ja tällä hetkellä sen suurimmat haasteet liittyvät palveluliiketoiminnan tuottavuuteen. Kasvun myötä yrityksen liiketoiminnan kulut ovat kasvaneet, mutta palveluprojektien tuotot eivät ole nousseet samassa suhteessa.

Tutkimuksessa käytetty lähestymistapa on toimintatutkimus. Tuottavuuteen vaikuttavat osa-alueet, sekä näiden osa-alueiden erot palveluliiketoiminnan ja perinteisen teollisuuden välillä, määritellään kirjallisuuskatsaukseen nojaten. Kirjallisuuskatsauksesta saadun käsitteellisen tiedon perusteella yrityksen nykytilaa analysoidaan yrityksen tietojärjestelmissä saatavilla olevaa tietoa sekä operatiivisen johdon haastatteluja hyödyntäen. Analyysin tulokset esitellään yrityksen keski- ja ylemmälle johdolle, ja saadun palautteen perusteella tehdään esitys parannustoimenpiteistä.

Opinnäytetyön tuloksena esitetään suosituksia ja johdollisia päätelmiä, jotka tähtäävät yrityksen tuottavuuden parantamiseen. Näihin suosituksiin kuuluu konkreettisia, yritysspesifisiä toimenpiteitä. Lopuksi, tutkimuksen ulkopuolelle rajattuja seikkoja listataan suositeltuja jatkotutkimuksia silmällä pitäen.

Avainsanat	palveluliiketoiminnan tuottavuus, ohjelmistopalvelut, laatujohtaminen, palvelujen tuotantokapasiteetti ja tehokkuus

Contents

1 Introduction

This thesis focuses on understanding the underlying causes of unsatisfactory productivity in growing software services companies. These companies have often reached a state where further growth is at risk to become unsustainable, since profits of the company are not in line with costs. Some actions clearly need to be taken to allow a second stage of growth to begin, but it is unclear which efforts provide the highest returns on anything beyond a short timeframe.

1.1 Business Problem

Greiner (1998) argues that small companies that have experienced rapid growth often live through their first crisis in the issues concerning leadership: for example, as appropriate to the requirements of their business environment, founders of the company, being both technically and entrepreneurially oriented, may have run the company in a relatively creative and ad-hoc fashion. Later, as these small companies manage to get off the ground and grow, the existing informal communication methods become increasingly inefficient, while the growing production requires knowledge of more efficient production models. The first crisis for these companies is, thus, a *crisis of leadership*: new business techniques are required, and a strong business manager is needed. If the company survives in this crisis, a more functional organizational structure is often introduced, along with some improved accounting systems. These systems too, in their own turn, will eventually encounter a crisis and need to be replaced by a solution more suitable to the company's current state.

A new services-dominant logic, pioneered by Vargo and Lusch (2004), represents a fundamental shift from existing marketing thought, which has thus far centered on the manufacturing process as imbuing goods with inherent value. This view is now shifting towards one where customers are no longer considered to be purchasing goods for their inherent value, but instead choose to buy for the fulfillment of a want or a need – a process in which the obtained good may assist in. As such, this view no longer needs to distinguish between services and manufactured goods from the point of view of product consumption. However, Grönroos (2001) defines the service firm, as compared

to a manufacturing one, as the company not having a possibility of storing its value generating properties for separate consumption by the customer. Instead, consumption of a service always takes place in interaction with the service company. Therefore, traditional manufacturing-oriented productivity metrics do not correctly reflect the productivity of services processes, and new metrics to measure them are needed.

Growing organically, the case company has gathered a large number of specialist employees, and several big-name customers. Overall, however, a cohesive knowledge of the internal workings of the company is missing. With the introduction of a controller, some metrics are now being gathered, but an overall look on the service process productivity can still be improved. The case company wishes to get deeper insight into several issues that have been identified as affecting its profitability, and preferably flag them in advance. For this reason, this study is launched, and it gathered a set of quantitative data sets available within the company for analysis and development of a proposal for future monitoring.

1.2 Case Company Overview

The case company is a small (<30 employees) European company, working in software development business. The majority of the company's income comes from its customers in the United States. The company is specialized in providing web-based solutions to large customers, and has several Fortune 500 companies as its customer. Founded in 2002, it has grown rapidly in the recent years, and was listed on the Deloitte Technology Fast 500 EMEA list as one of the fastest growing technology companies in the EMEA region.

The case company's value proposition for its customers is the ability for them to cost-effectively adopt an additional publishing outlet for their current content management and creation processes. As part of this process adoption, the company will attempt to create a solution that fits the currently existing business processes of its customers in both technical and business aspects. Although the unit price of this custom solution can be higher than for an off-the-shelf commercial product, overall lifetime costs may

in fact be lower, since there is no need for customers to change their processes to match those of the product.

As is typical to a growing small organization, there is no official vision statement per se. Based on informal discussion with the company CEO, the company is at a cross-roads. Along with its growth, the company has acquired a great number of service contracts with large companies. There is great desire to move from this project-based billing towards a more license-based model, where scaling the business can take place by selling more of a standardized product instead of acquiring more service personnel. However, management also agrees that within its field of business, it may be difficult to create a "shrink-wrapped" software product. Therefore another viable option for scaling the business could be that of a "service product" – packaging of the knowledge that company has attained of its customers' business domain into a set of software components that can be quickly assembled in order to form the custom solution needed for a customer's often specific business problem.

Main customers of the case company are divided across multiple sectors, mostly within, but not limited to, media and telecommunications. Companies in the media sector form the largest single customer group and the main income for the company. Within the media sector, the case company's customers include several top 100 newspapers in the United States, and other top newspapers in several European countries. Within its second biggest customer sector – the telecommunications sector – the case company has provided services to at least one cell phone manufacturer and a carrier network provider – both of which required comprehensive auditing and escrow arrangements to guarantee the technical suitability and reliability of the software provided thus demonstrating the operational readiness and quality of the company's software.

The case company's service offerings are tailored based on the business processes of its customers. Its main offering is web-based mobilization services – custom solutions tailored to suit the customer's needs and compliment their brand. While projects within a business domain are similar, each customer has their own specific requirements – be it in terms of interfaces to integrate into, or business processes to support such as hosting, self-development or management. These projects often are a natural fit for large organizations.

In addition to the tailored solutions, the company's offering includes a framework for extending a print or media experience onto native operating systems. These framework solutions provide a more cost-effective path for organizations, where some limitations are imposed in exchange for a more streamlined process. The end result is more focused, still allowing for some degree of flexibility across different projects.

Based on the CEO's vision, the company aims to engage in partnerships with other web development services companies and web development teams in other customer companies, offering its framework tools for them to license. Customarily, in tailored solution delivery projects that are fulfilled by the case company, the customer owns any intellectual property for custom code developed, and the case company retains the rights associated with its framework. In projects that require competencies, which are not considered to be at the core of the company's capabilities, subcontractors are employed – in these cases the case company will itself act as the project owner from the customer's perspective.

1.3 Research Objective and Research Question

Being a small software services company, which has grown rapidly in the past five years, the case company is now facing productivity issues with scaling its services offering to a greater number of customers. Several projects are incurring unexpected costs which, combined with the company's pricing model, creates risk in their cost/profit break-even. At the same time, the size of the employee base in the company is increasing, but this increase is not reflected in a corresponding growth in order fulfillment capacity. For the case company, an increase in productivity, potentially through a set of established processes and metrics is desirable to pave the path for the growth to continue in a sustainable manner.

The main goal of this study is to propose a series of steps to be taken that will help to improve productivity in the case company. According to Grönroos and Ojasalo (2004), services productivity is a three-fold issue where efficiency, capacity and quality play an integral role. Therefore, a set of metrics is examined in this study to gauge the availability of quantitative data from the case company for providing up-to-date feedback to

whether or not any improvement is taking place. These metrics are necessary, since any attempts at improving productivity should take care to ensure that while any one of these three aspects of efficiency, capacity and quality is improved the others are not negatively affected.

Therefore, the research question is formulated as follows:

How can productivity in the case company be improved, while maintaining quality and ensuring that capacity is at an optimum level?

The study focuses on addressing this research question. As an outcome, a set of improvement suggestions is developed for the case company in the form of an implementation plan.

1.4 Research Design and Structure of the Thesis

Being one of the first employees hired to the company, the researcher has full access to relevant personnel and data in the case company. This fact determined the choice of the research approach. To implement this study, action research has been chosen as the research method, which is described in greater detail in Section 2.

Figure 1 presents the outline of research design applied in this study.

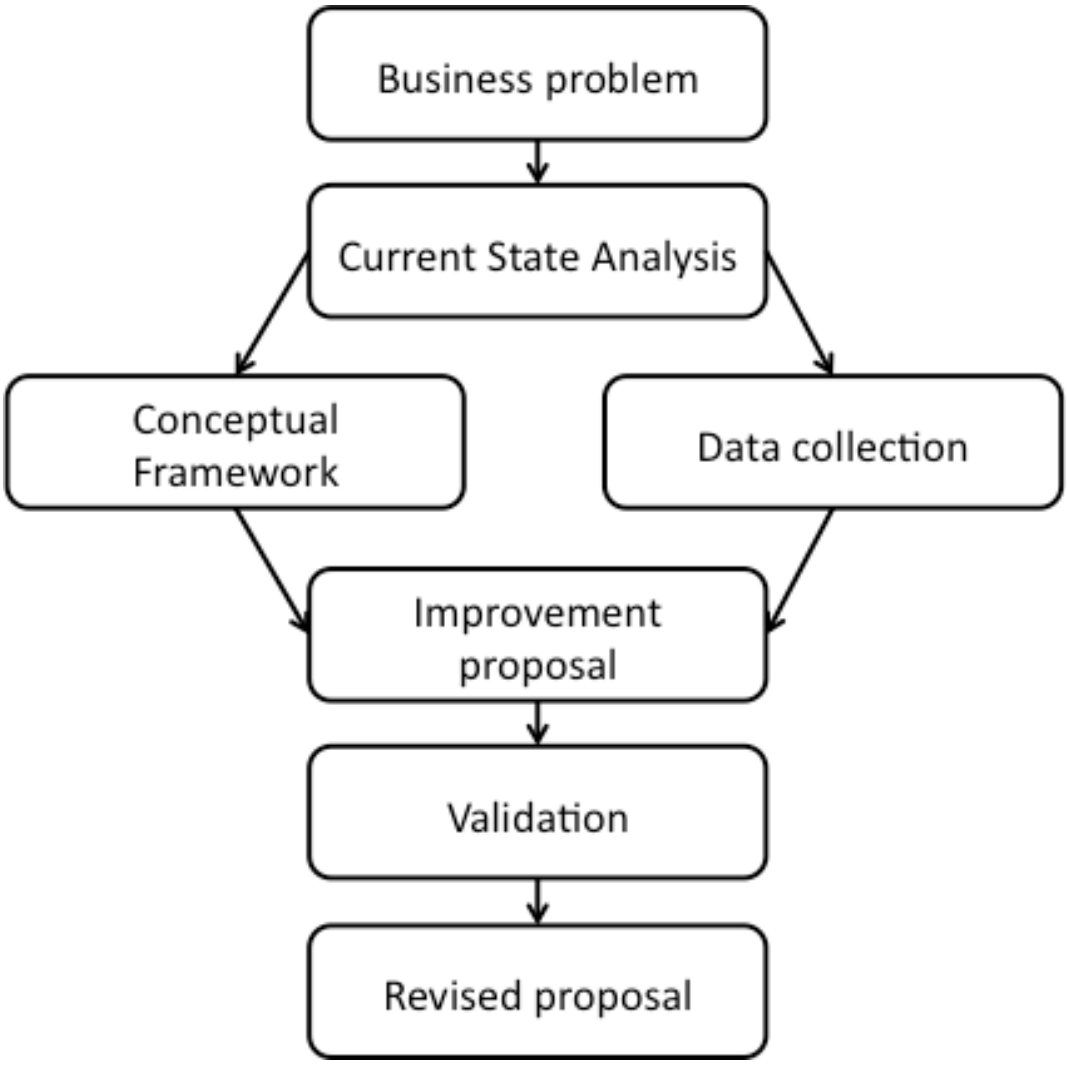

Figure 1. Research design.

First, the business problem is identified and described. Next, relevant literary is examined to understand the concept of productivity in a services context, and the meaning and interlinkedness of underlying causes in the scope of the business problem. Based on this understanding, a current-state analysis using quantitative and qualitative data within the company, grounded on services productivity theory, is presented. The results of the data analysis are discussed with the case company employees, which are invited to provide validation and feedback to the analysis results. The data selected for analysis is presented to the employees in a series of unstructured interviews, which are again analyzed using the content analysis method against the theoretical background. Conclusions from the content analysis are subsequently used as a foundation for improvement suggestions.

It should be noted that two subsequent phases of Action Research that follow the action plan, namely *implementation* and *evaluation*, lie beyond the scope of this Thesis. They were left unattended because their timeframe extends beyond what is feasible to address in this study. Therefore, conclusions and managerial implications will focus on the implementation plan and its intended effects.

This report is written in six sections. Section 1 describes the business problem and outlines the scope and objectives of this Thesis. Section 2 introduces the applied research approach, data collection and analysis methods. Section 3 examines the concept of productivity within a service context, and what are its constituents. Section 4 analyzes currently available data within the case company and its processes in order to determine factors that affect productivity within the company. Section 5 validates the results of analysis and proposes actions to be taken to improve productivity. Section 6 summarizes the results of the study.

As its outcome, the study presents a set of improvement suggestions, which are outlined for the company management in an implementation plan.

2 Research Method

This section will overviews the research approach and the data collection and analysis methods implemented in the study. The study is implemented as an action research and uses both quantitative data gathered from the case company, as well as qualitative interviews.

2.1 Research Approach

Action research is a research approach, which specifically takes a real-life, practical business problem as its research question, and embeds the researcher to be a part of the business unit – collaborating together to solve the problem. The research process can be thought of as an operationing model, where the purpose of the researcher is not as much to identify and correct a problem, but instead encourage introspection, foster communication and facilitate collaboration within the company, to incite a change to take place. (Eriksson and Kovalainen 2008: 193-195) Coughlan and Coghlan (2002: 222-223) underline that action research is research *in* action, instead of research *about* action. In contrast to other research methods, the researcher in action research is not an external observer of the business entity, but rather an involved and active participant in the community, building a body of knowledge simultaneously with a concrete action taking place. As such, the role of researcher in action research is not unlike that of a consultant offering their knowledge for the company to incite change inside itself.

As an iterative research method, the research process in Action research is performed in repeating cycles. After an initial cycle of data gathering, analysis and planning, an action is taken. The action is then observed and finally reflected upon. Based on this self-reflection on the consequences of the action taken, a second cycle of planning, action, observation and reflection begins, and the cycle is repeated again and again as deemed necessary. (Coughlan and Coghlan 2002: 231) Owing mainly to its context-dependency, the validity and reliability of an action research study does not necessarily directly correlate with the methods of validation in more traditional scientific research. Being a collaborative problem-solving approach that aims to produce results that are

directly useful to the community under study, the validity of an action research study is analyzable more by how well it manages to describe the phenomena inside the community, and how well it can empower and take input from the domain-specific knowledge of this group in creating a suitable reaction to the problem. For this reason, Eriksson and Kovalainen (2008: 207-208) maintain that knowledge created in action research is highly context-dependent, and as such it is important to clearly demarcate the context in which this knowledge has been obtained, as it greatly affects the transferability of this knowledge to a different context.

The implementation of this research is illustrated in Figure 2.

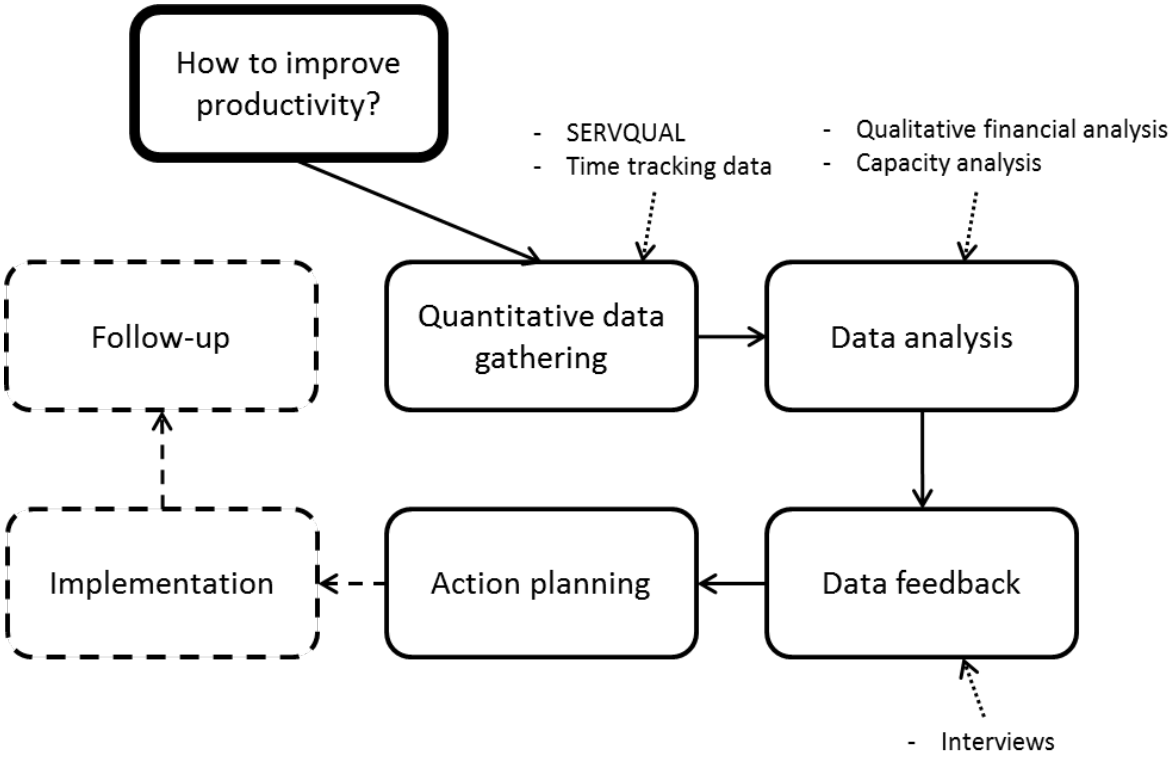

Figure 2. Action research in this study.

As illustrated in Figure 2, the four main steps taken in this research are as follows:

First, *Data Gathering* is performed to obtain a view of what quantitative data the company has relating to the business problem. The Data Gathering stage includes two distinct actions: a) a SERVQUAL survey is sent for case company key customers to an-

swer. The purpose of this questionnaire is to establish a measurement of both perceived and expected quality of service; and b) collecting *the company working time records* to obtain an assessment on capacity and internal efficiency.

Capacity efficiency is measured based on the observed patterns from the working time information related to the projects. Specifically, overtimes and the number of simultaneous projects per employee, and the amount of employees involved in a project (i.e. scatter factor) are examined. In addition to the quantitative data gathered in Step 1, qualitative data of phenomena relating to financial performance of projects is obtained through interviews with the company controller. Once the Data Gathering phase is completed, the research proceeds to the next, second stage of *Data Analysis*.

The purpose of data analysis in this study is to link the gathered data, collected from several data sources, with relevant literature, thus ensuring a *triangulation* of theory (Patton 1999: 1196-1197) to improve the validity of the gathered data. Employees of the case company are engaged in the analysis and later on feedback of the obtained data, and also take part in creating recommendations based on the data and their own subjective view of the business problem.

Thirdly, *Data Validation and Feedback* are implemented as the next step in the research process. Data feedback is obtained from representatives of the case company, based on the interpreted results of the gathered data. The goal of this analysis is to continue with the *triangulation* (Patton 1999: 1195-1196) on the gathered data, as employees and management provide their own view of the phenomena in the company and how the analyzed data relates to those phenomena.

Fourth, *Action Planning* continues the research cycle. An action plan is created in collaboration with the research subjects to respond to the business problem, culminating in an Implementation Plan that lists actions to be taken by the company. The intended effects of the planned action are enumerated, and managerial implications are described.

Finally, the developed action plan *Implementation* and *Follow-up* would take place. As important as these further steps are for learning to take place in the process of action research, as discussed earlier in the Introduction, these two phases lie beyond the scope of this Thesis owing to their timeframe extending beyond what is feasible to address in this study. Therefore, the conclusions and managerial implications presented in Section 6 will focus on the implementation and its intended effects.

2.2 Data Sources and Analysis Techniques

To tackle the research question, three main sources of field data are being drawn from in this study: a) company time tracking data, b) service quality questionnaire, and c) internal stakeholder interviews. These three sources are detailed in greater detail later in this sub-section. To complement these data source, the researcher uses his *participant observations*, being one the most senior employees in the case company. Although these observational data are not included in the main data collection, they provide important background and eventually help justify the suggested recommendations and their feasibility.

First, the *case company time tracking data*, comprising of the work time records in the case company, are gathered using a web-based tool. Each employee is expected to work 7.5 hours per each workday, excluding holidays and sick leave. Work time is divided across each project, and employees have some freedom on choosing their own schedule to fill in the hours, but all time must be entered by the end of each week.

The working hour reports data is available starting from the beginning of 2011, but has not been extensively collected before week 41 of 2011, when a new policy was enforced to improve the time tracking data. As such, this data should be considered to be increasingly unreliable before this date. Nevertheless, after this date the records have significantly improved and patterns can be detected. The tracking data is stored in a centralized database, where it was exported as a batch file and analyzed using statistical methods to visualize patterns in the data.

The second source of data, *a service quality questionnaire*, is a quality questionnaire that was sent out to 10 key customers. The SERVQUAL framework, which was used as a basis for the questionnaire, is detailed in Section 3.3.1. Of all the 20 persons, to whom the questionnaire was sent to, only a single person responded. Owing to the very low number of respondents, the data from the service quality questionnaire cannot thus be used to generalize on the quality of service in the company. However, the results were analyzed within the context of the single respondent, and the usefulness of the tool was assessed.

The third sources of data, *internal stakeholder interviews* are conducted to obtain a better view of the phenomena inside the company. The interviews were held according to schedule in Table 1.

Table 1. Interview schedule

	Informant	**Data**	**Date**	**Duration**	**Documentation**
Semi-Structured Interviews at Company HQ					
Interview 1	Controller	Project financial data	21/3/2012	60min	Notes
Interview 2	CEO	Company Vision	21/3/2012	30min	Notes
Observation 1	Controller, Sales Director, Project Manager	Observations of a meeting regarding effort overruns in a project	21/3/2012	30min	Notes

Group Interviews at Company HQ					
Group Interview 1	CEO, Controller, Sales Director, Project Managers	Data analysis feedback	12/04/2012	1h30min	Audio recording
Group Interview 2	CEO, Controller, Director of Product, Project Managers	Implementation plan	17/04/2012	1h	Audio recording
Other discussions					
Informal web-based chat	Two former employees	Service blueprint experiences from previous companies	19/04/2012	30min	Chat logs

Two group interviews were held at the company headquarters, where the research data and relevant literature was presented. The group was then allowed to freely assess their experience of the phenomena in relation to other data obtained and the literature review. The interviews were recorded using a smartphone, and analysis was performed using conceptual mapping techniques.

Conceptual mapping is a technique developed by Novak in 1972. The technique entails first identifying a set of core concepts that are seen as relevant to a focus question, which are then placed on a map and linked together by linking words according to their relevance. (Novak 1998: loc. 5111) In this analysis, instead of using core concepts, core statements made by the interview group were used instead.

Finally, *participant observations*, made by the researcher are used to complement the main data sources and provide wider background for the study. The researcher, who has worked within the company for seven years, was one of the first employees hired after the company founders. As one of the key employees in the company, the researcher has access both to internal documents and key management personnel. Observations made by the researcher served as talking points during unstructured interviews.

2.3 Validity and Reliability

Considering the differences between a work of research conducted in the field of natural sciences, and a study, which examines social phenomena, there is a great difference in the repeatability of the research process and its results. Due to the ambiguous and irregular nature the social phenomena, Checkland and Holwell (1998: 20) argue that researchers implementing action research or other similar approaches in order to understand social realities, cannot make as solid claims of their studies' validity as characterize study of e.g. natural sciences. While this complete *replicability* of results cannot be guaranteed to be homogenous through time, an action research study must nevertheless aim for a *recoverable* process, by reporting the set of ideas and the process in which they are used in a way that interested outsiders will be able to make sense of the research.

Another paradox of qualitative research is that presented by Patton (1999: 1204): due to the nature of action research, often the best way for the researcher to observe the community under study, is to embed themselves to experience the situations firsthand. This allows the researcher to truly generate personal insights, but at the same time makes their objectivity suspect. To solve this paradox, the researcher needs to embrace an "emphatically neutral" stance, being perceived as interested and caring towards the research subjects, but at the same time appearing impartial. In other words, the researcher is neutral and has no preset stance in the matter, instead of being completely invisible to the subjects.

In this thesis, *recoverability* is maintained by first listing the data sources. Secondly, the data analysis is subjected to feedback from the research community, allowing the research subjects to contribute to the construct validity. Thirdly, a *theory triangulation* is maintained by basing the analysis of data on the theoretical framework obtained from literature review. Together, these three factors form a *chain of evidence* (Yin 2003), making the research process recoverable.

3 Productivity in Services Processes

This section draws upon existing literature to introduce the main theoretical concepts behind the phenomena examined in later sections of the Thesis. The concept of *productivity* is explored and broken down to its constituent sub-theories. Evolution of services-dominant logic is discussed, and also how it affects the measurement of efficiency and quality of businesses. Existing frameworks for measuring these aspects quantitatively are then examined, and eventually research data gathered will be analyzed using the approach developed in this section.

3.1 Services-dominant Logic and Productivity

As stated in Section 1, Vargo and Lusch's (2004) theory of services-dominant logic represents a fundamental conceptual change in the services industry. One of its direct consequences is the shift in roles of who actually is the value creating party. Grönroos (2008) suggests that existing conceptions of value-in-exchange are being challenged by a more customer-oriented concept of *value-in-use*. According to this notion (Grönroos 2008: 301), from a value creation perspective, there would not be any fundamental differences between goods and services – either one is purchased by the customer in order to assist them in a service that creates value for them.

Irrespective of whether or not the customer purchases a goods or service, to a varying degree further operand or operant resources are needed to create value out of this transaction. Grönroos (2008) calls this setting the customer's *value foundation*. Due to this value-creating process it cannot be the firm that pre-creates the value and embeds it in physical goods – the value is always realized through a consumption process (Grönroos 2008: 302-304). As such, it can be logically concluded that any functions that are present in a service which do not match the customer's value foundation, or that the customer cannot apply their own operand and operant resources upon to create more value, are functions that the customer does not consider to contribute any value, and likely will not pay a higher price for.

Echoing Vargo and Lusch's sentiments, according to Grönroos (2001) "a service firm has no products, only interactive processes" – that is, a service firm cannot by itself create and store need-satisfying product-equivalents for customer consumption at a later time. Instead, the consumption of a service takes place at least partially in interaction with the service process. Grönroos and Ojasalo (2004) view that if this notion holds true, then traditional manufacturing-oriented productivity models, which measure the value added during the production process against costs associated in the same process, are not applicable for a services company. Instead Grönroos and Ojasalo see that new productivity measures for quantifying productivity in a services context need to be developed.

In Grönroos and Ojasalo's (2004) *service productivity model*, the productivity of a service process is seen as a function of: 1) How efficiently input resources into the service (production) process are transformed to outputs in the form of services (*internal efficiency*); 2) How well the quality of the service process and its outcome is perceived (*external efficiency* or *effectiveness*); and finally, 3) How effectively the capacity of the service process is utilized (*capacity efficiency*).

While traditional manufacturing productivity increases mainly focus on the first axis, changes in the service process can affect these three axes of the service. Increases in internal efficiency may lead to lower perceived service process quality (external efficiency) or lower utilization of the service capacity, in which case overall service productivity may remain the same, or even decrease. In the same manner, sudden increases in demand may bring the service production over capacity, leading to deterioration of quality. A physical goods' production process can instead take advantage of warehousing to even out peaks in demand.

Due to the interactivity of the service delivery process, Grönroos and Ojasalo (2004) also highlight the importance of having the customer engage in consumption process with a set of appropriate inputs. Appropriate inputs in this case are such, as enabling high efficiency and quality from the provider's side. As the service process unfolds in coordination with the customer, and not through the customer interacting with a manufactured product to fulfill their value foundation, failure in providing these inputs prevents or delays the service provider's process, having an effect on the provider's efficiency and capacity (Grönroos and Ojasalo 2004: 418-419). This interaction is a learn-

ing relationship for both the customer and the firm. When both parties continue to engage with each other, they may attempt to affect the behavior of one another or modify their own behavior, leading to higher productivity.

3.1.1 Swift, Even Flow

An alternative framework for assessing a service firms' productivity that of swift, even flow. This framework views a service process as a pipeline, where eliminating waiting times increases process throughput. As originally envisioned by Schmenner (1986), in most cases service firms can be divided into two axes in a *service process matrix*, according to their degree of interaction and customization with and for a customer, and the degree of labor intensity in their service process. In this matrix, the top-left corner of the matrix would then be associated with an increase in productivity. Later, upon further research, Schmenner (2004) revised the two axes to represent variation and relative throughput time. In this context, variation shall mean variation in the process of providing the service, not the amount of service options (or service products) available. In this iteration of the service process matrix, Schmenner concludes that the matrix now measures purely productivity, and not necessarily profitability - profitability can take place at any position in the matrix, and moving towards the top-left corner increases productivity only. This diagram is displayed in Figure 3.

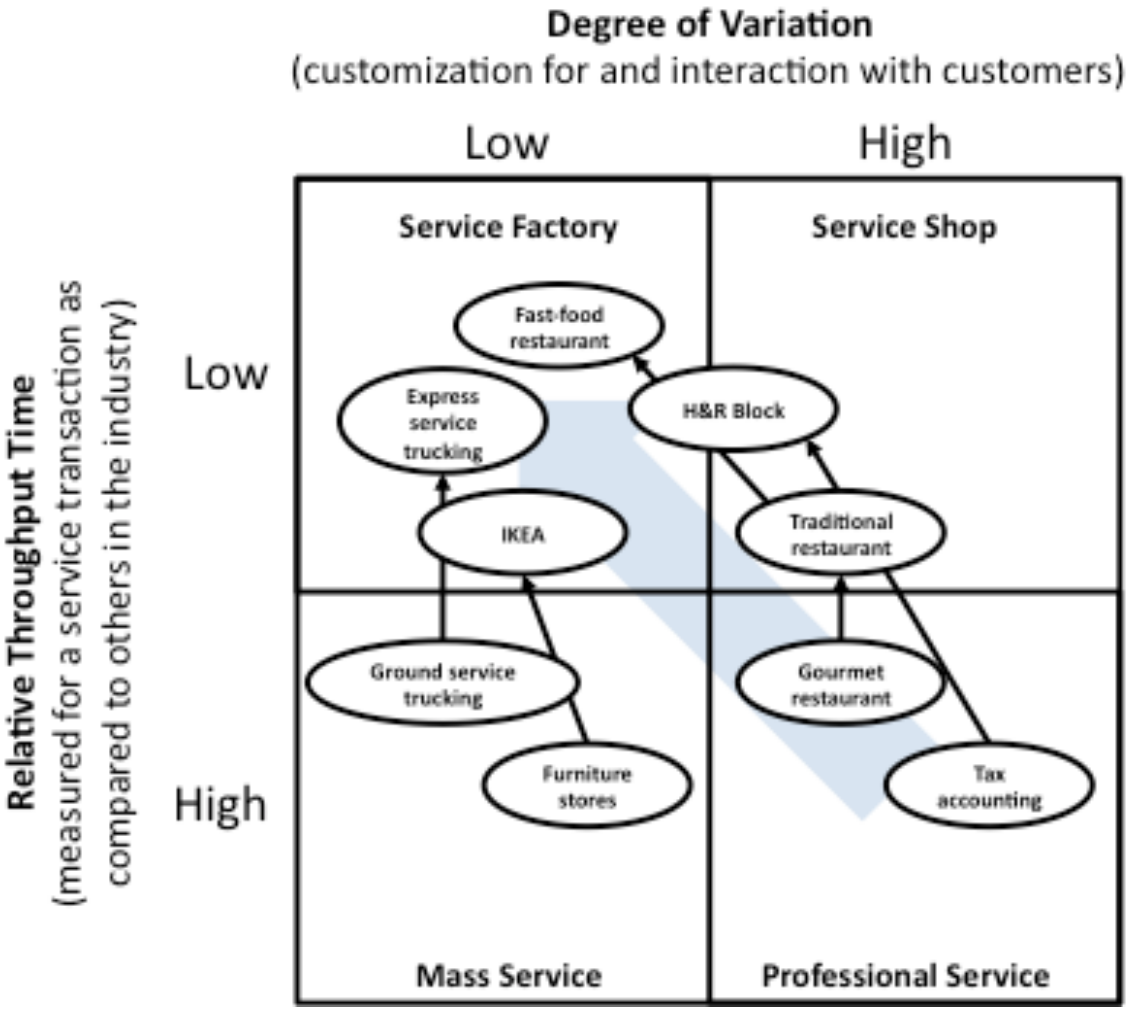

Figure 3. Classification of services (Schmenner 2004).

Transitioning towards a more swift, even flow can also be seen as improving the service provider's process, and corresponds well with the concept of internal efficiency. It can also be seen as better controlling the required customer contributions: according to Fließ and Kleinaltenkamp (2004: 392-393) low quality of customer participation, manifested as delays can cause bottlenecks and capacity problems and thus lead to an overall delay of service delivering – whereas changing or uncertain customer requirements can negatively affect service effectiveness. In certain cases, though (Fließ and Kleinaltenkamp: 2004), increasing customer participation may lead to higher effectiveness, as customers can handle some service tasks by themselves – thus reducing relative throughput time.

3.1.2 Reliability of Cost Estimates

For any new project or business venture, cost estimates are often used to determine their economic feasibility. As the theory of Swift, Even Flow posits, an increase in the degree of variation in process flow – whether in quantity, quality or timing – results in the decrease of productivity in a services process. Similarly, reduction in service throughput time increases productivity, and decreases the wasted effort for a given project. (Schmenner 2004: 335) From an estimates point of view, this also reflects in the reduced variability of effort estimates, and an increase in their accuracy, when moving towards a swifter, more even flow.

Jørgensen and Sjøberg (2001: 940) make a clear distinction between *price-to-win*, *estimated effort* and *planned effort*. If the effort estimate is considered to be the median value of the amount of effort required, then it is by definition 50% likely that the actual effort is higher than that. To compensate for this, *planned effort* may thus be increased to compensate for possible risk associated with the project. It is important to separate these two measures from *price-to-win*, which may be based on the effort estimates, but is ultimately a mere sales tool – a company may decide to allow a high-risk project to be sold less to win a key customer. In many cases however these different estimation terms are mixed, leading to poor estimation accuracy. (Grimstad et al 2005: 308-309) If a project is contracted with a fixed price, overrunning costs can decimate the expected profits entirely.

3.2 Measuring Efficiency

Grönroos and Ojasalo (2004: 420) present three basic ways of measuring efficiency (internal efficiency) in a services process. Physical measures - also known as *traditional* productivity measures – gauge the amount of physical outputs provided for a set of inputs, such as amount of customers served per employee working hour. Financial measures, on the other hand measure the business costs and consequences of a service process. In other words, they measure the costs of the inputs and the revenue generating process outputs. As a third measure, a combination metric is presented, which combines either a financial cost measure with a physical output measure or vice

versa. Examples of such measures include total revenue generated divided by each employee, or the cost of employee resources divided by number of customers served.

Of these three measures, Grönroos and Ojasalo (2004: 420-421) conclude the financial metrics to be the most useful in providing real managerial instruments that would assist in productivity management. The lack of both cost and revenue effects means that physical measures can hide financial pitfalls in the service. By only concentrating on the amount of physical interactions or "service units" delivered, physical measures do not in any way reflect the effect service quality has on revenue. Similarly, these metrics do not give precise information on the cost of input resources used to produce these services.

Combined metrics also suffer from the same pitfalls as physical measures – their abstractness from actual revenues and costs make them less than optimal to be used as service production steering instruments. For these reasons, Grönroos and Ojasalo hold that financial measures, nevertheless with their own deficiencies, are likely to be the most suitable for expressing the interrelatedness and thus the concrete sum of internal efficiency, cost effective use of production resources, external efficiency and customer perceived quality (Grönroos and Ojasalo 2004: 421). As such, the most correct way of measuring a service process' productivity is the relation between revenues from a given service and costs of producing said service. If a resource structure for a given service is changed so that costs increase, but revenues increase more than the costs, productivity increases.

3.3 Measuring Quality

There are several frameworks that attempt to explain the phenomenon otherwise known as quality, and particularly try to address the problem of measuring it. According to Kang and James (2004: 266-267) these frameworks are often divided to either an American or European perspective. One of the most often cited instruments in measuring service quality is SERVQUAL, developed by Parasuraman et al. (1988). However, there is disagreement as to what are the dimensions of service quality that should be measured, and Kang and James (2004: 266) suggest that SERVQUAL's focus

on the functional aspects of service delivery (American perspective) does not take into account two more components, technical quality and image (European perspective). They conclude that while SERVQUAL's validity in measuring the functional aspects is clear, to get a comprehensive view of a service company's quality, more instruments are needed.

3.3.1 The SERVQUAL Model

SERVQUAL is an instrument for measuring consumer perceptions of service quality. It was developed by Parasuraman et al. (1988) and subsequently refined and revised in 1991. Instead of measuring objective quality, which the authors consider to be a purely conceptual and academic construct (Parasuraman et al. 1998: 15), the instrument measures quality as perceived by consumers when interacting with a service company. In line with Grönroos (1982), this service quality is viewed as "the degree of direction and discrepancy between consumers' perceptions and exceptions", where the expectations of a customer are viewed in terms of needs or wants of customers: what they expect a high quality service provider should offer. (Parasuraman et al. 1988: 15-17) It should be noted, that the aspect of service measured by SERVQUAL is purely functional, and as such does not reflect technical service quality (Kang and James: 2004).

The SERVQUAL instrument measures customers' perceived quality of a service using a 22-item questionnaire instrument. In the instrument, the 22 items are divided into five distinct dimensions: reliability, assurance, tangibles, empathy and responsiveness. (Parasuraman et al. 1988) These five dimensions are distilled from a set of 10 different dimensions identified in an earlier study by the same set of authors: reliability, responsiveness, competence, access, courtesy, communication, credibility, security, understanding and tangibles (Parasuraman et al. 1985). The five dimensions of SERVQUAL are described in Table 22.

Table 2. The five dimensions of SERVQUAL (Parasuraman et al. 1988).

Reliability	Ability to perform the promised service dependably and accurate- ly
Assurance	Knowledge and courtesy of employees and their ability to inspire trust and confidence
Tangibles	Physical facilities, equipment, and appearance of per- sonnel
Empathy	Caring, individualized attention the firm provides its customers
Responsiveness	Willingness to help customers and provide prompt service

According to Parasuraman et al. (1985), the measure of quality in SERVQUAL – the difference, or *gap* between service that a customer expects, and the one that they perceive – is a byproduct of several other gaps in the service organization. This logic is further illustrated in Figure 4.

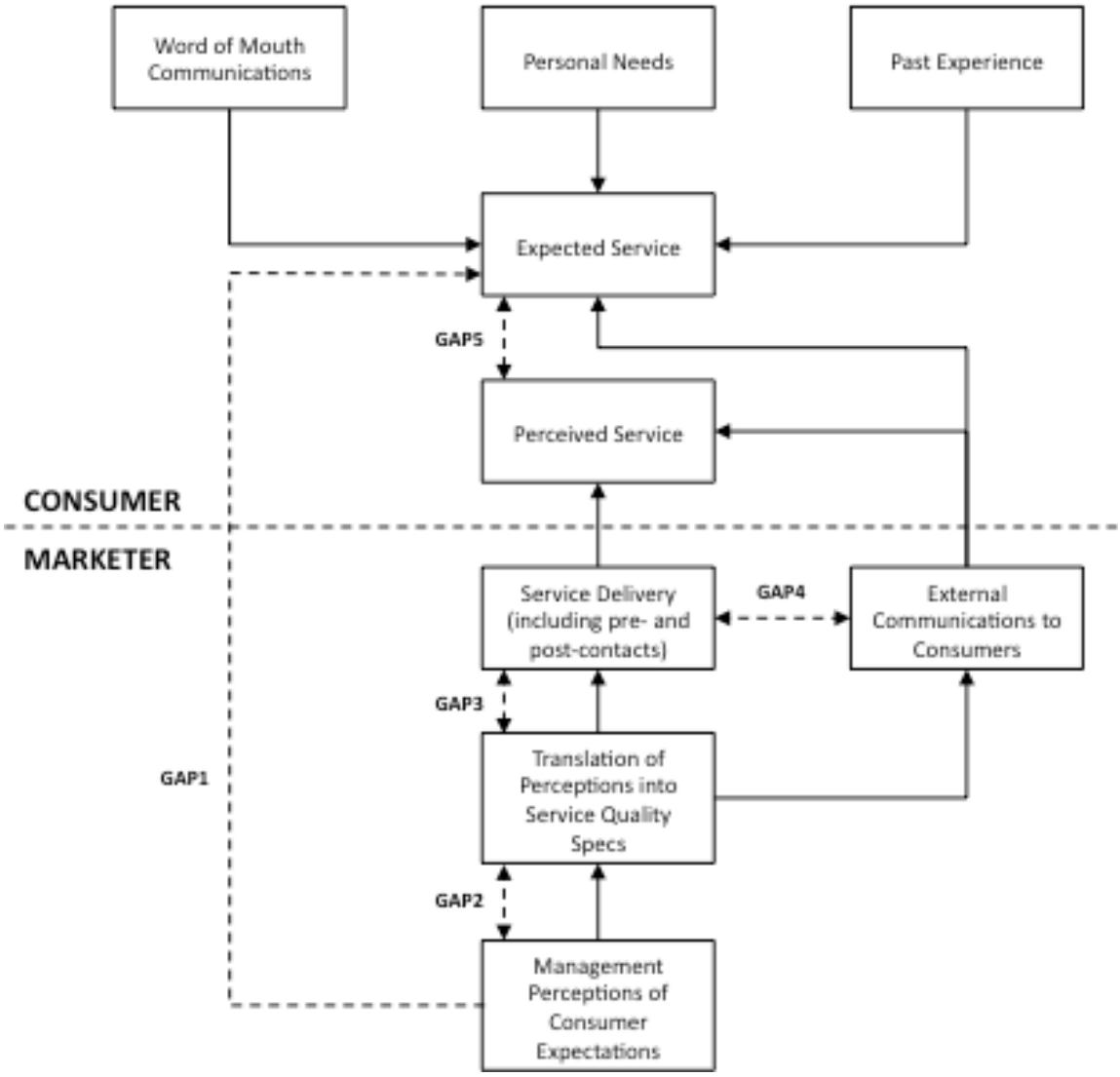

Figure 4. The service quality model (Parasuraman et al. 1985).

Together, Gaps 1 to 4 affect the size of Gap 5. It is notable that the quality of service delivery can only affect the perceived service, and not expected service. However, via communication, both the perceived and expected service can be affected (Parasuraman et al. 1985). This not only highlights the importance of managing customer expectations by keeping them on a level that can be matched by service delivery, but it also means that good communication can affect the perceived service quality level as well, by highlighting features that are otherwise not noticed. Naturally, a large difference in gap 5 is not always completely undesirable, as it may also signify a service experience that exceeds a customer's expectations.

3.3.2 Technical and Functional Quality Model

The *technical and functional quality model* posits the European perspective, and divides service quality in three main perspectives. The quality of the end result of a customer's interaction with a service firm is *technical quality*, as illustrated in Figure 5. Together with *functional quality* – how the technical outcome is reached during the service process – the technical and functional aspects contribute to a service firm's image, with the image perspective acting as a filter for the other two dimensions: a customer with a positive image of a firm may seek excuses for a negative service encounter (Grönroos 1993: 38-40). This perspective is markedly important to service firms, as they interact with the customer directly and cannot hide behind corporate brand names or distributors.

Figure 5 illustrates the technical and functional quality model developed by Grönroos (1993).

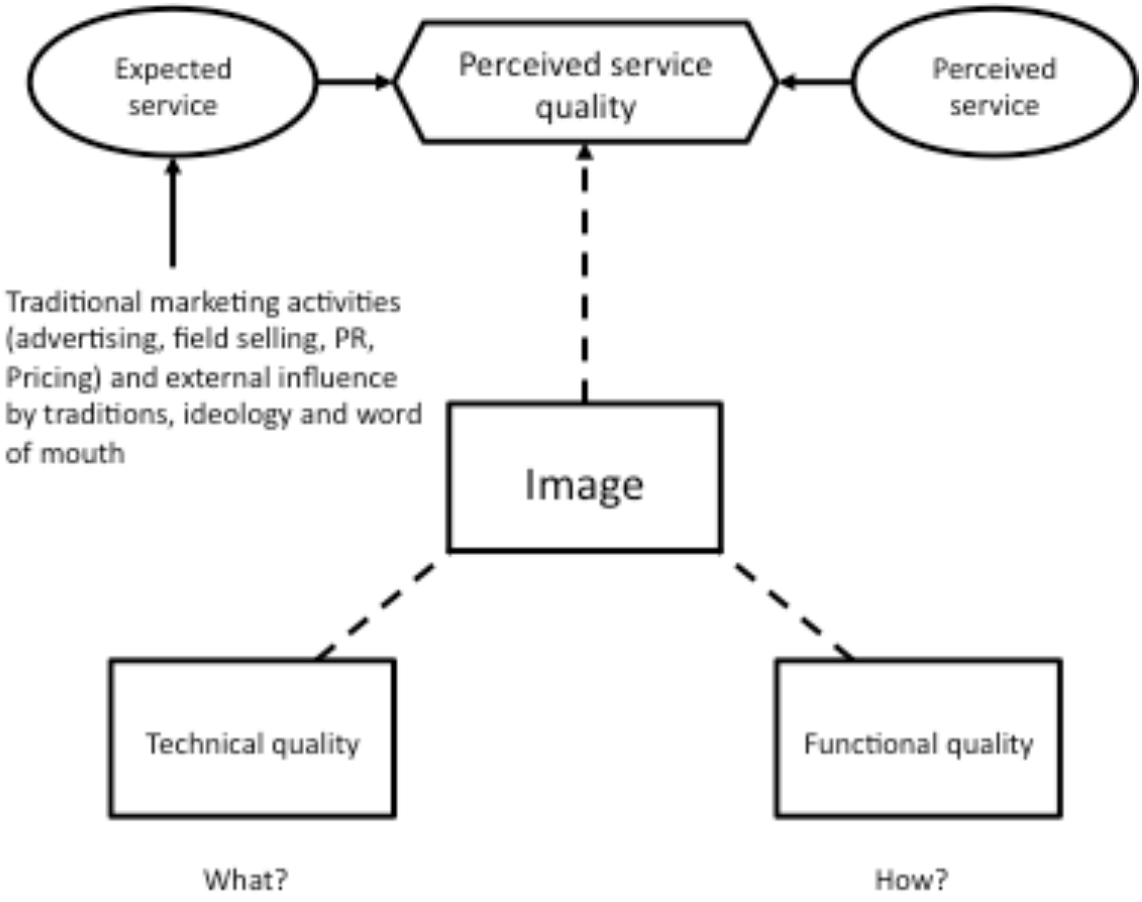

Figure 5. Technical and functional quality model (Grönroos 1993).

According to Kang and James (2004), in several service fields the technical quality aspects of a service are difficult to ascertain. Since the customers do not possess the necessary skills to evaluate the technical quality of a service, more emphasis is based on functional quality aspects instead. Also, according to their findings (Kang and James 2004: 274), functional quality has a greater effect on image than technical quality. Nevertheless, their conclusion is that a comprehensive measurement of a service firm's quality necessitates all three perspectives.

3.4 Capacity Management in a Services Context

Armistead and Clark (1993: 5) highlight three issues that affect the management of supply and demand in a services company: 1) The organization's limited ability for capacity alterations facing rapid fluctuations in demand; 2) Consistency requirements in the level of customer service delivered; 3) Uncertainty of demand.

Whereas traditional manufacturing industry can benefit from a capacity buffer stored in a warehouse, services must be produced real-time, which makes matching supply and demand very important. In any case, all organizations will at times run out of capacity to satisfy demand within the required timeframe. In these situations, the capacity of the company moves to a "coping" zone, and service quality will invariably fall – either controllably or in a controlled manner. It is important to note that often service operations managers are not aware their company is entering the coping zone. Some early warning signals may be present, such as customer complaints and staff stress. Neither is it often known in what way the service levels degrade (Armistead and Clark: 1993). Nevertheless, the links between capacity and quality – and thus overall services productivity – are clear.

3.4.1 Cutting Corners

According to Hendriks et al. (1998: 185-186) multiproject environments suffer from *project scatter factor*. As specialist employees focus on a certain discipline, the number of people needed to fulfill all areas of a project increases. A higher project scatter factor means that more people are needed to accomplish a task, and these people subse-

quently shift from one project to another. As the scatter factor increases, the efficiency and devotion of a single expert on a project subsequently decreases. One tactic to reduce this scattering is to fix people into the project. According to Hammer and Champy (2009), one way of doing this is by giving more autonomy to a small project team. This requires better technical skills, and thus an investment in training and development, but in balance the team requires less expert assistance and can be more efficient.

Hendriks et al. (1998: 187) propose a division of multi-project personnel in three groups according to a *resource dedication profile*. All-round project members have knowledge of the entire project, and are capable of handling majority of issues within the project. Occasionally, these all-round project members will require help from a small group of expert employees in the organization. These experts can have very narrow and deep field-specialization knowledge, and they will move from one project to the next according to the projects' needs. A third cross-project group of employees should exist to perform routine-like activities that need to be executed in several projects. Project personnel may enlist the services of this group when they are needed.

Findings of Oliva and Sternman (2001: 907-908) support the effect of scatter factor on service quality. Result of their studies demonstrate, that employees in services organizations are more likely to cut corners than work overtime when faced by greater work pressure. This reduction in quality in instantaneous whereas an increase in capacity can only have an effect in the company capacity at a far greater time scale, and without established quality norms, constant random increases in demand erode the company quality standard that eventually becomes embedded in employee service standard. Oliva and Sternman (2001: 910) also conclude that overtime, while an indication of capacity issues, is a natural response to work pressure, and can be used periodically to handle peaks in demand. However, extended periods of overtime increase employee fatigue, leading to lower productivity. These periods should therefore be avoided.

3.4.2 Effect of customer-intensity on capacity

Anand et al. (2011) note that since the quality of service in customer-intensive service processes is directly related to the time spent in interacting with the customer, it is possible for the service provider to increase productivity by focusing on spending adequate time with each customer, rather than focusing on maximizing throughput by

speeding up the service. Each customer that interacts with a service company also forms a negative externality on all other customers interacting with the same company, as without increasing the amount of staff associated with a service, it is impossible to allocate the same amount for an increasing customer base. Therefore it is argued that the overall productivity of customer-intensive services does not increase directly with the amount of customers interacting with the service concurrently.

The evidence presented by Anand et al. (2011) supports the conclusion that for a customer-intensive service, the service provider stands to gain from limiting the amount of customers it interacts with. From a capacity standpoint, Hendriks et al. (1998) conclude that the quality of a service falls when the amount of projects served by a single employee grows, also supporting the notion that after a certain point, productivity of a service will not increase linearly with the amount of customers served by the same amount of staff.

3.5 Summary of Productivity in Services Processes

Assessment of productivity in services-dominant logic requires a set of new principles. It is neither no longer conclusive, nor in many cases even possible, to measure a service processes efficiency with traditional manufacturing methods: as costs associated with producing a one unit of service. Instead, the productivity of a service process is the factor of Internal Efficiency, External Efficiency and Capacity Efficiency. (Grönroos and Ojasalo 2004)

Assessing each of the tree factors requires their own set of metrics. Internal efficiency, or efficiency *in* the service process can best be analyzed through financial methods. (Grönroos and Ojasalo 2004: 420-421) The technical and functional quality model (Grönroos 1993) offers an insight into external efficiency, or the efficiency *of* the service process and its end results in fulfilling the customer's value foundation – the functional aspects of which can be measured using a SERVQUAL survey (Kang and James 2004). Resource dedication profile and scatter factor can highlight capacity efficiency of a multi-project services environment. Overly scattered employees may start cutting

corners to reach their expected productivity quota, leading to deterioration of quality standards and "coping".

These three different factors create a factor for analysis, later applied against the case company data. In Section 4, the case company is examined against these three identified factors and the final recommendations are developed in Section 6.

4 Case Company Analysis

The purpose of this section is to analyze the available quantitative and qualitative information found within the case company, as relates to the three factors that constitute the framework of productivity in services firms, as discussed in Section 3. The main data sets for the analysis of capacity and external efficiency are the hour reports generated by the company. This analysis is performed in Sections 4.1 and 4.2 respectively.

In addition to time tracking data analysis, a qualitative analysis of internal efficiency is performed in Section 4.3, based on discussions with the company Controller. The results of these three analyses are presented for discussion to the research subjects in Section 5, to obtain feedback into the data and both its validity and usefulness in explaining and monitoring the productivity within the case company.

4.1 Capacity Overview

As discussed in Section 2.2 company time tracking data is the main source of quantitative data in this research. The use and therefore comprehensiveness of data in the time tracking tool has increased towards the second half of year 2011, and for the purposes of research performed in this chapter, only considered valid and reliable from that point onwards.

In total, the time tracking data represents some 34 000 employee hours over a period of one year and ten weeks, spread across 35 different employees. With an average of 22 working days per month per employee (Finnish Tax Administration 2012), and 7.5 working hours per workday for 11 months per year, the time tracking data for the whole year covers some 53.5% of all accountable working hours.

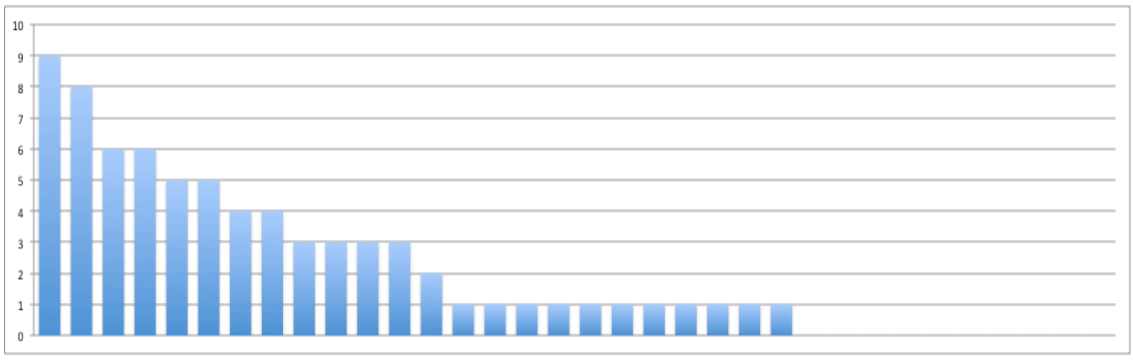

Figure 6. Number of weeks where an employee has worked over 40 hours.

Figure 6 displays the number of times during the reporting period an employee has accrued over 40 hours of working time in one week. Overtime requires a separate bilateral consent between employee and employer – however, since the company uses a flexible working hours system, the employee can due to work requirements collect a periodical overtime balance, which they can negate by working shorter days in return. According to Oliva and Sternman (2001: 907), employee overtime is a clear indication of a service process not having enough capacity: as employees respond to sudden increases in demand firstly by cutting corners and secondly by working overtime, a capacity overrun has already taken place when overtime is being accrued.

According to the Finnish working hours act (1996/605, 13§), maximum allowed flexible time is ±3 hours, with a maximum of 40 hours accrued in overtime balance for the employee. On average, an employees weekly working hours should not exceed 40 hours. According to figure 10, during the one-year reporting period, most of the employees accrued significant overtime only on 1-3 weeks.

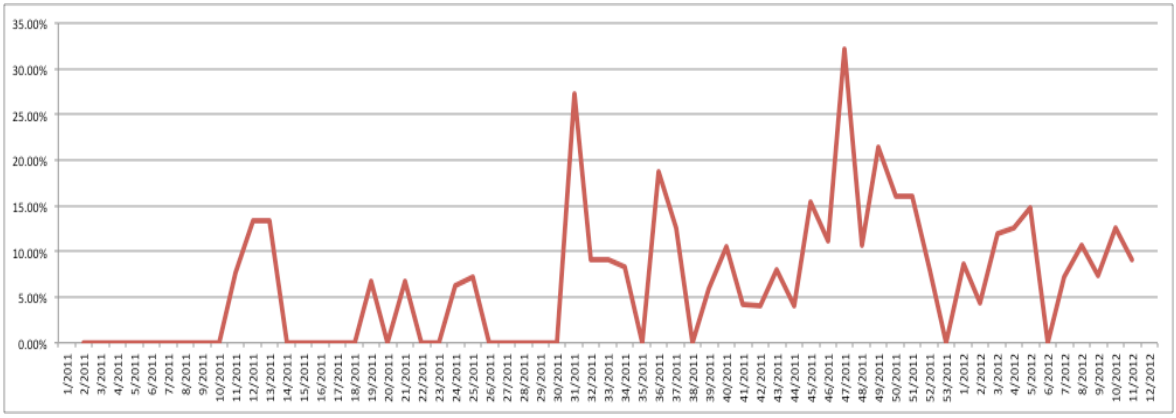

Figure 7. Percentage of employees reporting over 40 hours per week.

Figure 12 shows the percentage of employees reporting having worked of 40 hours on a given week. It is notable that on nearly any given week, at least one employee has reported having worked for over 40 hours. On week 47 of 2011 – from 20.11.2011 to 26.11.2011 – one third of employees reported over 40 hours of working time. Apart from this anomalous week, likely caused by extra effort due to U.S. Thanksgiving Day holidays, the data would not seem to signify that the company has a problem with overtimes.

4.1.1 Resource Types and Planning

The company not exhibiting high overtimes might not yet indicate that capacity problems do not exist. An employee can still be overwhelmed by work, and yet refuse to work overtime. Based on discussions with project managers, when resource planning is performed, some employees are very often "overbooked", and thus their scheduled work exceeds their ideal capacity of 100%. Particularly senior employees are recognized to be key in multiple different projects, potentially increasing their scatter factor.

Both scatter factor and resource dedication profile inside the company are measured based on the available time tracking data. Scatter factor for a project was measured by the number of employees performing contributions to that project over the period of one week. To augment this metric, resource dedication profile was constructed by calculating the relative amount of work performed by dividing project participants into three groups as defined by Hendriks et al. (1998: 187): all-round project members, services group (e.g. testing and systems infrastructure), and experts. In addition to

these three groups, a management group consisting of project management input was added as fourth group.

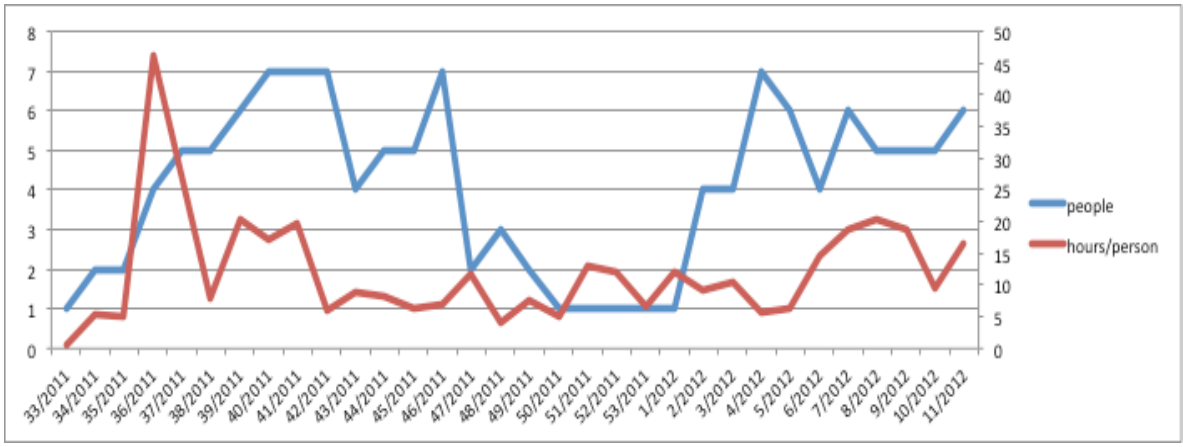

Figure 8. Project scatter factor.

Figure 8 displays the scatter factor for a project over its lifetime. Apart from the stand-still period when the illustrated project was put on hold, there were at any given week at least four employees involved with the project. This number was found to remain relatively same across different projects, when they were active. Next, the distribution of work efforts between different groups of employees, i.e. their resource dedication profile, was analyzed.

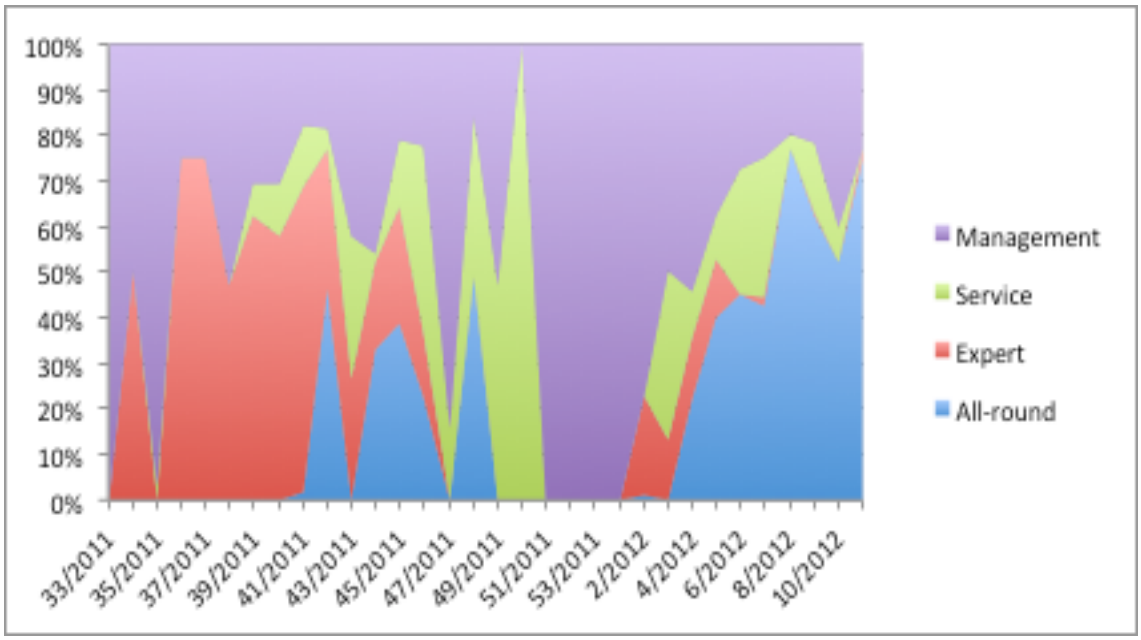

Figure 9. Resource dedication profile for a single project.

Figure 9 shows the resource dedication profile for the project displayed in Figure 12. In order to construct the diagram, employees contributing efforts into the project were divided in four groups based on the researcher's understanding of their role in the project, and their general role inside the company.

The dormancy period of the project is again emphasized in Figure 9, with the project manager being the single person expending effort on the project during this period. After the dormancy period, the project begins to exhibit a typical pattern for projects in the company – work is handled more by all-round employees and the role of expert personnel diminishes. However, as this chart was constructed retrospectively, it shows more that projects tend to focus around a certain core group of employees when implementation begins. Owing to retrospective grouping of employees and lack of project documentation, it cannot be directly observed whether the core group was defined in advance, or whether it formed organically.

4.1.2 Scatter Factor of Individual Employees

In addition to project-level data, scatter factor of individual employees across different projects was measured by assessing the amount of contributions to different projects an employee has made on a weekly level.

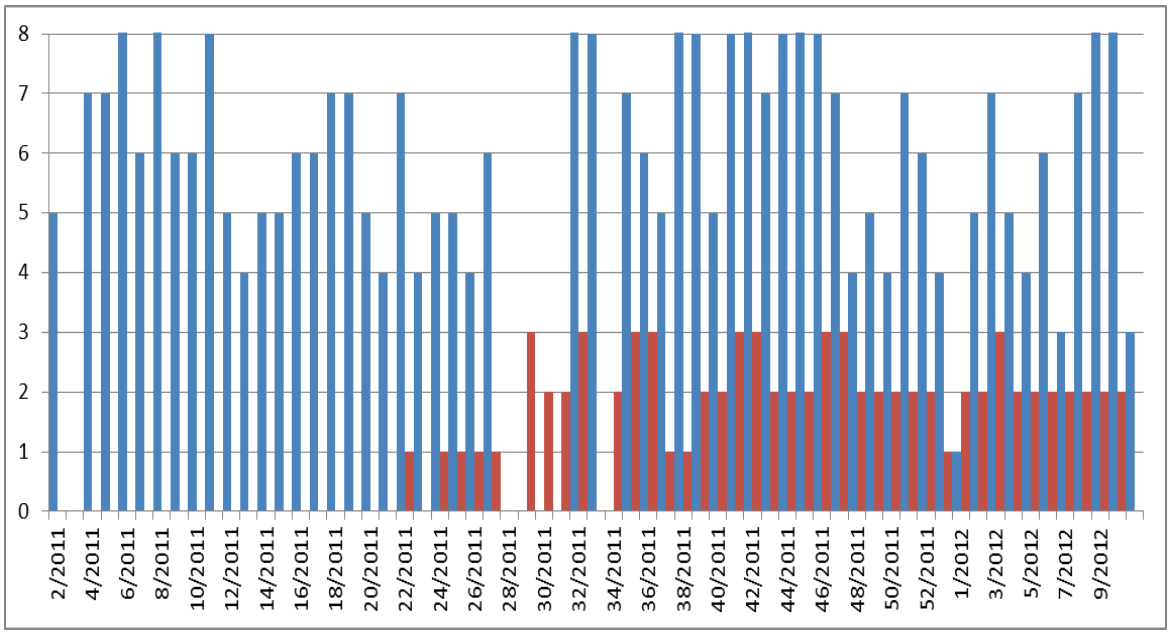

Figure 10. Comparison of scatter factors between senior and junior employee.

As illustrated in Figure 10, scatter factor varies greatly within the company: in general, senior employees have been associated with a larger project portfolio, whereas junior employees are more dedicated to a single or only few projects. Also, employees that can be categorized as belonging to a services group – such as systems administrators and testers – tend to migrate between several different projects. Figure 17 displays a comparison in project scatter between a senior services group employee (in blue) and a newly hired, relatively project-dedicated employee (in red). According to a project manager in the company, a problem for the organization is the large amount of small "backburner" projects, which have been accumulated over time. These projects often incur a very small amount of work monthly that requires input from more senior employees. These projects tax the more senior employees, but as such the workload associated with each individual project is so small that they are felt not considered to warrant a dedicated team.

4.2 External Efficiency Overview

In order to assess potential quality implications associated by exceeding capacity, and to establish a baseline of quality understanding within the company, a functional service quality questionnaire (Appendix 1) based on revised SERVQUAL framework (Parasuraman et al. 1988) was sent to several customer companies, altogether to a total of 10 recipients. After two weeks of the original request for questionnaire, a reminder was sent to recipients that had not yet responded to the query. All in all, in four weeks only one recipient responded to the questionnaire request. Therefore the results of the survey do not represent an overall view of the entire clientele, and can only be used to gauge functional service quality as expected and perceived by this single customer.

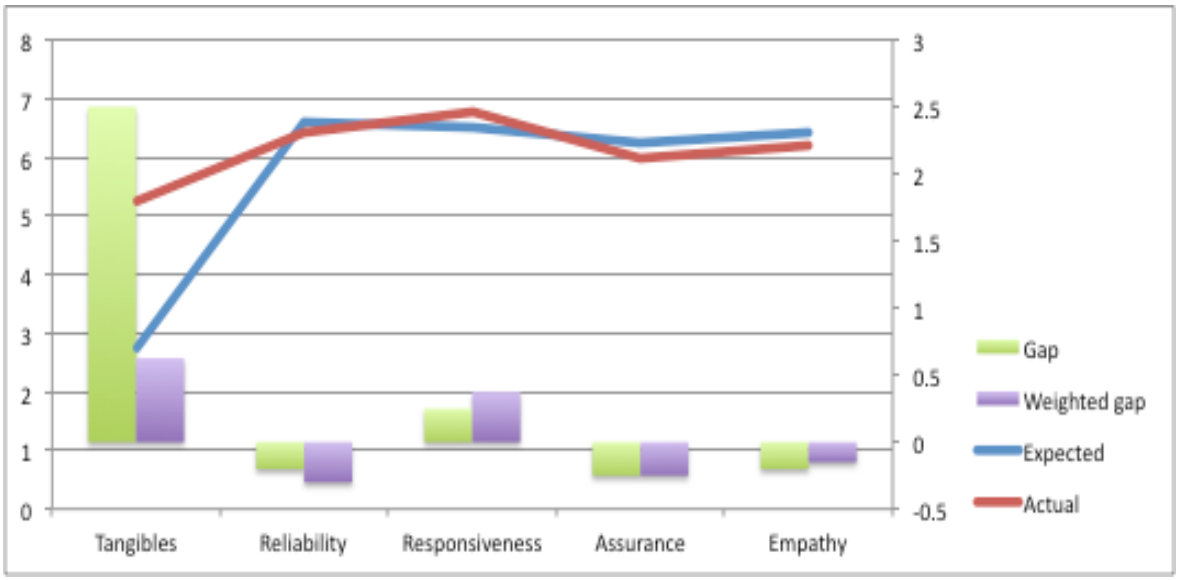

Figure 11. SERVQUAL dimensions of the respondent project.

Figure 11 represents the results of the SERVQUAL questionnaire, as responded by a single customer. Overall, the case company appears to have managed to meet customer expectations in this project. Reliability, Assurance and Empathy axes are slightly below what the customer would expect, and in turn on Tangibility and Responsiveness aspects the company has managed to exceed customer expectations. A particularly large positive absolute gap in Tangibles is countered by a relatively low weight of importance to the customer – overall, even though the case company far exceeds customer expectations of its tangible assets (such as brochures, physical facilities and overall appearance), this factor is not significantly important to the customer.

Owing to the customer's inability to verify the technical quality of the provided solution in several projects, and also due to the dissimilarity and variation of technical solutions provided to the customers, a technical quality overview was deemed to go beyond the scope of this research.

4.3 Project Efficiency and Costs

According to Grönroos and Ojasalo (2004: 421) financial instruments provide the best option from other alternatives (namely, physical or combined metrics) for managerial feedback and actions. Stated in a more simplified way, they posit that efficiency is a function of cost input spent per each unit of output generated. For financial purposes, these can be assumed to be analogous to costs versus profits. Since comprehensive financial data from customer solution projects was not available within the company, the assessment of internal efficiency was performed through interviews. According to discussions with the company Controller and CEO (listed as Interviews #1 and #2 in Table 1, respectively), there have not been reported any foundational profitability issues in individual projects – that is, in the long run all projects in the company will reach a point of profitability. There are, however two key issues that were pointed out within the case company:

1. On a per-project-level, the timeframe to reach break-even point for a project is often longer than anticipated

2. On company-level, high costs are being accrued, which cannot be directly assigned to any particular project

Both levels considered, Figure 12 presents a typical cost-profit breakdown for a project.

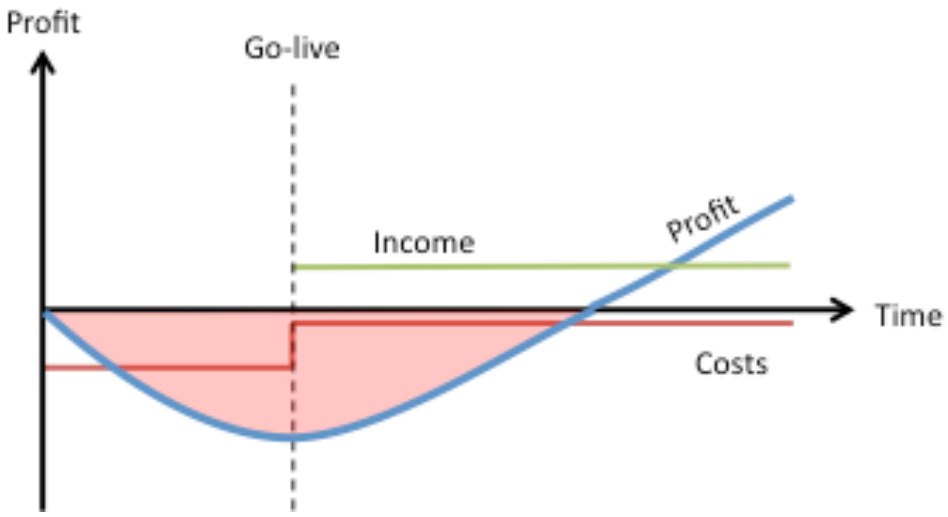

Figure 12. Typical cost-profit breakdown for a project.

Figure 12 shows a typical timeline for a customer project in the company, involving an initial set-up project followed by a maintenance phase. Customer pays a certain fee for the initial project, dependent of the project scope. After project go-live, a license fee for the use of the software is in effect. The license fee always includes a support contract, but the justification for a license cost is that of a compensation for the accrued domain-specific knowledge that has been instilled in the platform, which allows for actual project costs to be lower, since a large part of reusability comes from the software platform itself. Depending on the project, there may in addition be an upfront payment or a payment-upon-go-live, which subsequently have positive effects on overall profits.

A common alternative for the typical project timeline is demonstrated in Figure 13

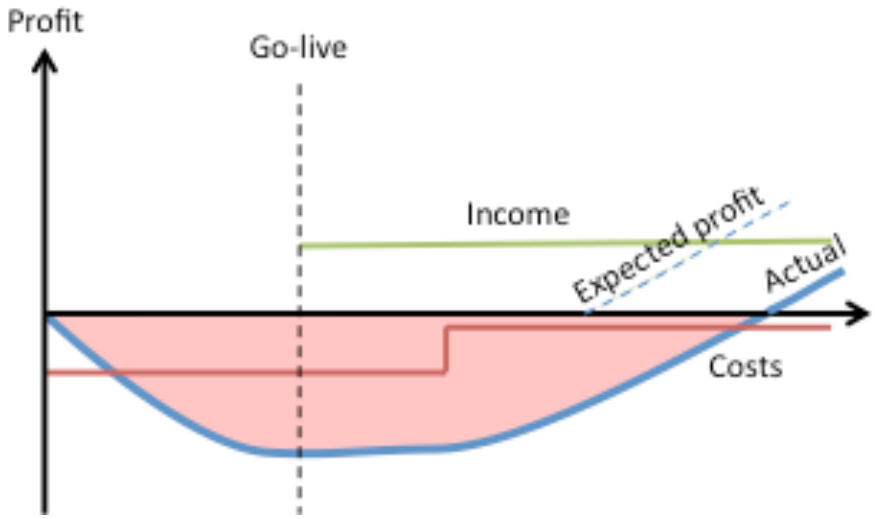

Figure 13. Unestimated additional costs push break-even point forward.

Figure 13 shows a very common scenario in the case company projects: unexpected costs are accrued after project go-live, either delaying the planned project break-even point, or in some cases even the go-live date, thus also delaying the beginning of license fee revenue stream or fixed-cost payment upon go-live. Of several projects inspected within the company, nearly half of the projects were affected by the latter scenario. Reasons for this phenomena are assessed in Section 5.2.

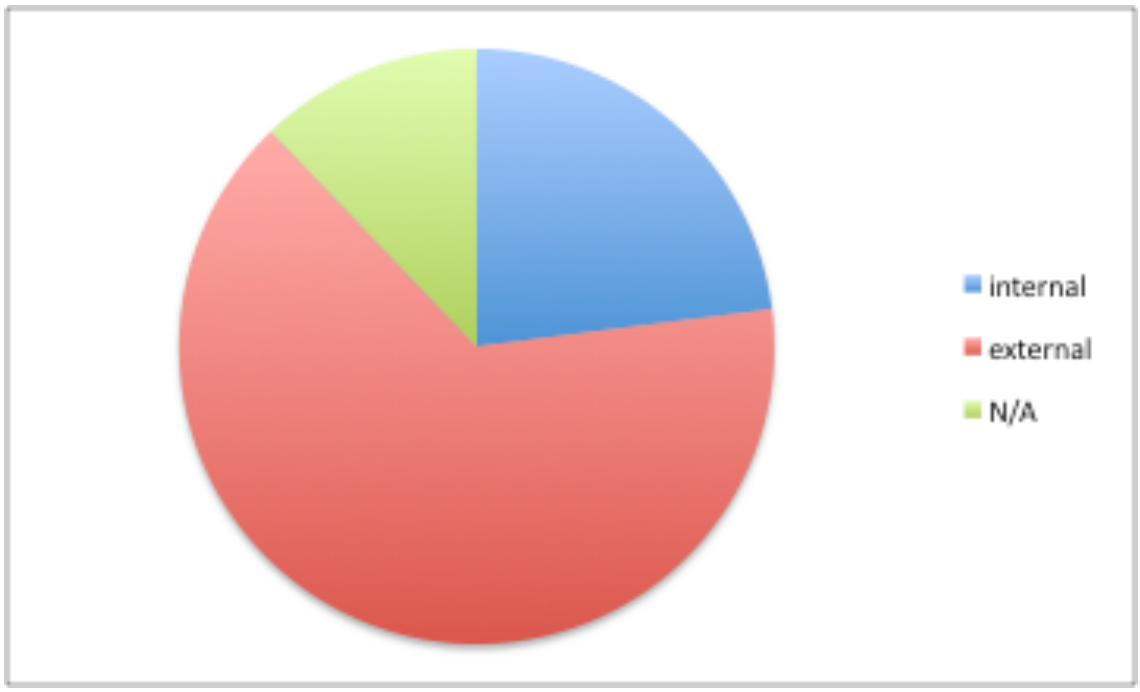

Figure 14. Ratio of internal and external costs.

Another concern raised by the company CEO in Interview I is demonstrated by data shown in Figure 14. According to the figure, on a company-wide level, only roughly 65% of all accumulated costs (as measured by number of working hours) can be assigned to projects targeted at external customers. Remaining hours are either not being reported at all, or are reported against projects that have been initiated by the case company itself. It should be noted, however, that as not all of these reported hours are being billed from the customers, the ratio of profits against costs changes with each project. Therefore the ratio presented in Figure 14 does not directly correlate with overall revenue gained from external projects versus revenue "lost" to internal projects, but merely represents the costs accumulated per project type.

Assessing the trend in the amount of hours reported in the time reporting system over history, and the division of those hours across different employees, it can be noted that the amount of unreported hours is gradually diminishing towards zero. In addition, another trend can be seen in the data, where hours that have previously been reported as having been spent in projects initiated by the case company are moving to be targeted to external projects instead. According to company Controller's opinion, voiced in Interview 2, this phenomenon is caused by pressure from project management to have

employees target their hours preferably against the external customer project that initiated the need to perform work on internal projects, instead of considering that work to be strictly initiated by the case company itself.

4.4 Findings and Discussion

Based on analysis of the data selected for this research, findings as analyzed in terms of capacity efficiency indicate that overtime amounts are not significantly high in the case company. The scatter factor in case company varies greatly between different employees, most notably based on the maturity level of employees. The project-level scatter factor has a tendency to settle to stable level once an implementation phase begins in a project. The external quality levels could not be analyzed conclusively due to sample size being too small; and since the technical quality aspect in the external efficiency of the case company was not evaluated, the effect and magnitude of employee work pressure on project technical quality remains unconfirmed. The internal efficiency as expressed by project profitability over time is in many cases at risk, facing unaccounted costs. These unaccounted costs are particularly associated with the delay of go-live and subsequent diminishing of implementation costs in external customer projects. The reason for these costs was not clear based on discussions with the company CEO and Controller.

It is the researcher's opinion, since that while the breadth and depth of available quantitative data within the company is too small to base definitive managerial implications on, the phenomena affecting internal efficiency in Section 4.3 provide some insight into how productivity within the case company can be improved. The validity and reliability of the findings was discussed in an informal interview with the company mid-level management. This interview is listed as Group Interview #1 in Table 1. The amount of quantitative data available was also considered quite scattered and representing a moderate sample, and as such it was deemed to be inconclusive to base any concrete managerial implications on. However, it was concluded that the quantitative metrics and analysis tools themselves seemed useful. The discussion group concluded that the data collection efforts used to provide data demonstrated in this section should contin-

ue, and the same metrics that were used for this study will be reanalyzed at a later point in time.

Further feedback on the analysis was gathered in a separate interview, which is detailed in Section 5.

5 Feedback Analysis

This section presents the results of feedback on the analysis of the data gathered in Section 4 by organizing a group discussion with the company personnel.

5.1 Feedback on Quantitative Analysis Performed

To collect feedback of the results of the case company analysis, a group discussion with the company personnel was organized, with the researcher acting as a facilitator and observer. In this meeting, the researcher presented both the theoretical background and the available data to the research group. Further analysis of the group interview was performed by constructing a conceptual map of the discussion, which highlights key themes as they emerged during the discussion, and by triangulating the resultant analysis against the literary background. The group discussion participants were case company key management employees (listed as Group Interview #2 in Table 1).

When presented with the analysis results, the discussion group agreed that findings reported in Section 4.4 were correct – the lack of available data inside the company causes analytical results to be inconclusive. While the quality of data did not support generalizations, the data sources and collection methods themselves were considered to be useful. The group's unilateral agreement was to continue improving data gathering inside the company, and to recreate the analysis at a later stage.

5.1.1 Capacity Analysis Feedback

The concept of scatter factor was recognized as important and reducing individual employee project scatter was considered desirable. Also, the role of expert and service employees was acknowledged – these employees will naturally have a larger scatter factor, but in exchange their contribution to an individual active solution delivery project should be low. One of the project managers highlighted the tendency of projects to "stick" with the original implementers, explaining differences in scatter factors. Employees that have been with the company for a longer period of time have amassed a

portfolio of project involvement. These projects that have entered a maintenance phase do not by themselves contribute large amounts of work, but put together this work adds up, and the employee needs to shift between different projects during a working week. Newer employees instead have the possibility to focus more clearly on fewer projects at a time. The CEO pointed out that this is also natural owing to the rapid growth of the company – being a small company in a niche market it has been difficult and costly to dedicate single employees to any given project, as the percentage of work represented by any single employee was in double figures.

The working group agreed that the root cause for this behavior was the sense of urgency with the relatively small amount of work trickling down from the maintenance projects – associated with the fact that the original implementer could likely finish the task quicker, since they are already familiar with the project and its unique requirements. It was agreed that this both hampers knowledge sharing inside the company, and also contributes to the phenomenon of employees getting stuck with their projects. Project managers concluded that in their view it would be beneficial if employees taking part in an active solution project would be given the possibility to focus on that project – it is their view that creating a new solution requires more effort and concentration that maintaining an existing codebase. Finally, the CEO suggested that it might be beneficial to set up a separate "maintenance team" to take ownership of these projects once the solution is delivered to the customer.

5.1.2 External Efficiency Analysis Feedback

Regardless of having received only one response to the service quality questionnaire, the SERVQUAL Questionnaire tool was considered to be valid and the information it provides useful. The information obtained from the single respondent matched the expectations of employees working with the customer.

Several methods were suggested to improve customer participation in the query. Reflecting to his own experience as a respondent to similar questionnaires, the CEO – along with many other participants - summed their almost univocal dismissal of incoming surveys – "if the survey looks like it will take more than 2 minutes, it goes straight to trash". The sales director suggested adopting the questionnaire to be a part of their follow-up sales process. Owing to their working style, they are most likely to physically

contact with the customer, and can make filling the survey part of their meeting agenda – thus making it difficult for the customer to avoid responding.

As described in Section 3.3.1, the SERVQUAL instrument is based on the Gaps model, by Parasuraman et al (1985). Of all the gaps presented in the model, it was considered useful to be able to measure at least Gap #1: the gap between a customers' expected service level and what management perceives it to be. One method of measuring this gap is to have the questionnaire filled also by management, assuming the role of an imaginary customer transacting with the company. In conclusion, it was decided that the results of this survey can then be used to measure the variance between what management thinks the customer expects from the service – and what their expectation are in reality.

5.2 Analysis of Internal Efficiency

When presented with the results of the internal efficiency analysis, the discussion group agreed that the lack of standardized financial data across the different projects within the case company is a disadvantage, and that in addition to providing insight into capacity, the company time tracking data plays a key role in assessing the financial results of the case company service process.

The company CEO and Controller mentioned that when previously a large number of the time tracking data had been targeted towards internal projects, the situation has since been improved. The employees have been encouraged to report their work against external projects. It was assumed that employees were worrying that their reported hours would directly translate to an invoice for the customer, and out of sense of professionalism would not target hours that they considered to be the result of any errors on their own or the company's part. Expected direct consequences of this change are that the hours reported against internal projects are likely to diminish significantly, and the hours for external projects will increase by the same factor. Nevertheless, the group concluded that the amount of invoiceable hours will likely stay the same, but the comparison between actual costs and revenue is more truthful.

Based on his desire to move the company towards a license-based model, the CEO desired more visibility into how much component reusability and thus "platform value" was being created within the solution projects. These reusable components are utilized across multiple different projects, and therefore a comprehensive set will increase the value of the software platform – and desirably decrease the amount of work required to implement customer solutions. However, part of the case company value increase is realized in the form of "competence capital" inside the company, the effect of which is that even in the absence of a completely reusable component, the same task could be accomplished faster by the same employee, as there is now previous experience of solving a similar issue. It was concluded by the group that it is difficult to measure the direct effect of component reusability on the projects.

The sales director (acting as a project manager for a single project) highlighted his concerns with reliability of the time tracking data. Questions were raised regarding the time between actual accrued hours take place and the time they are reported to the time tracking system. This adds delay to tracking actual costs and therefore makes early flagging of anomalies difficult. It was agreed with the entire discussion group that the aim is to have all employee hours for a given week entered by the end of each week. This would allow analysis to take place on Monday next week. Finally, the project managers remarked that already they need to constantly remind and push employees to fill in their hours each week.

5.2.1 Reasons for Unexpected Costs

The discussion group agreed that the phenomenon displayed in figure 12 is valid: very often projects tend to accrue additional costs beyond those that were planned, thus delaying the break-even point of these projects into the future. According to the sales director this imposes risk on the projects, as the likelihood of a customer contract termination increases over time, and with a sufficiently long timeframe to a break-even, the risk of it never being reached increases.

Several potential reasons were put forward, among these are: 1) initial cost estimates are too optimistic; 2) specifications change during the project; and 3) customers' are not able to deliver expected deliverables on time, i.e. their input to the case company service process is not at a satisfactory level (Grönroos and Ojasalo 2004). Of the rea-

sons above, only the initial cost estimates can be affected by the case company itself. According to project managers, the latter two reasons often cannot be avoided – interfaces change, customers have internal delays in their processes, and very often customers have difficulties visualizing their desires before concrete examples are made available to them. It was agreed that changes to the implementation plan are inevitable, and should not be avoided. Instead, even when changes take place, it should be clear to both the case company and the customer how the goal will be reached, and what effects the change has to the overall project and its costs.

The sales director highlighted the importance of knowing and communicating changes in fixed-cost projects. These projects are always based on a set of presumptions on which cost and profit estimates are calculated. Failure in communicating changes has led the company itself to absorb the additional costs caused by these changes, in some cases negating any expected revenue.

Both Controller and the sales director agreed, that the customers usually do not object additional invoices based on changed conditions. The CEO noted that it is necessary, however, to be upfront with any additional invoicing – the customer will likely object to a radical increase in costs, which have not been notified in advance. Therefore, it was unilaterally agreed that the importance of early notice on any changes to the project is crucial.

5.2.2 Improving Cost Estimates

As discussed in Section 2.3.1, according to Jørgensen and Sjøberg (2001: 940) there are three levels of effort for any given project: a) estimated effort; b) planned effort; and c) price-to-win.

Once a project begins, the accrued spent effort can be compared to any of these. In the discussion, both project managers and the sales director voiced their concerns that the effort estimates for fixed-cost projects are often not very accurate. According to project managers, effort estimates are given and the price-to-win is locked when there is very little in terms of project specification available. Due to lenient specification planning in the company, there are also difficulties in defining what "changes" are. It was agreed by the whole group that more time should be spent on more accurately

defining how the company has understood the solution to be implemented, and communicating this to the customer. Also, the group agreed that having knowledge of what the estimated and planned efforts are for a given project will allow a conscious decision to be made to exceed the price-to-win effort, instead of blindly assuming that any effort beyond it has not been planned. This allows the sales director to use price-to-win as a targeted sales tool for controlling prices in order to capture key customers.

5.3 Implementation Plan: Draft

To assess the potential implementation plan, a second meeting was held with Project Managers, Director of Product, CEO and Controller. The following data points were represented as significant from the previous meeting, and comments were requested whether the data points sufficiently capture the phenomenon of productivity inside the company.

Point 1. *Internal efficiency tracking.* The time reporting data is the main tool for analyzing accrued costs on a project-level, and employee data input is considered to be on the right track. Project managers should monitor the difference between actual and invoiceable hours and flag any anomalies where the difference grows to an undesirable level.

Point 2. *Cost estimates.* Different levels of effort estimates should be tracked, and specifications should be more detailed, so that changes to the specifications can be identified. Estimated, planned and actual effort should be compared with each other to identify overrun risks. These estimates should be tracked separately from price-to-win, allowing price-to-win to be used as a sales tool.

Point 3. *SERVQUAL questionnaire.* In the data analysis session, it was agreed that the tool provides useful data, and thus should be taken into use in broader scale. Sales teams should gauge the service quality of existing customers immediately. Newer customers should be surveyed once the solution is delivered. If possible, the sales personnel will dedicate 10-15 minutes of a customer meeting to fill in the questionnaire in

person. The management team will also fill in the survey, and their responses will be compared with those of the customer to highlight major differences and anomalies.

Point 4. *Capacity tracking.* Project-level and individual scatter factors were considered to be useful in indicating anomalies in projects: e.g. a project with a small scatter factor that is effectively being implemented by one core employee, but this core employee has a high individual scatter factor might be troubled, as the employee needs to constantly shift their focus from one project to the next. It was also agreed that an individual's scatter factor should be taken into each employee's development discussions.

In summary, the data points presented to the stakeholders were considered valid, and effort should be continued to increase their reliability.

5.3.1 Analysis Feedback

Overall, all of the aforementioned data points were concluded to be helpful for the company, but the general consensus of the discussion, according to the Director of Product, would not be enough to convey a true understanding of productivity inside the company, to which Project Managers agreed. Without a common framework of practices, Project Managers considered early flagging to be difficult, and they raised concerns of thresholds, escalation paths and similar risks. Also, without a clear understanding of how the implementation of projects begins – after or during sales efforts have concluded – the effort estimates would be difficult to produce and maintain up-to-date, as some work would have already started, yet not all requirements are clear.

To further analyze the discussion that was taking place between the different participants in the second meeting, a conceptual map was created. This conceptual map is shown in Appendix 2. From this conceptual map, it can be seen that the core issues raised by the team can by summarized and ascribed to the inability to maintain comprehensive project documentation, and on a more general level, lack of a clear process stretching from sales to delivery and maintenance. These two root causes were seen to cause several other issues within the company, each relating to the three tenets of services process productivity discussed in Section 3. To address these root causes, it was recommended that the drafting of a *service blueprint* would be added to the implementation plan.

Point 5. *Service Blueprint.* Service blueprinting is a technique originally developed by Shostack (1984). In blueprinting, discrete service steps are broken into a process chart that takes the customer through the entire fulfillment process. The chart is divided according to a *line of visibility* between front- and back-office tasks, which allows the company to test its service process from the customer perspective, and isolate fail points where the service system might fail. Zeithaml et al. (2006: 267-276) extend this stage by adding a *line of interaction* that separates customer action from supplier action, above which interactions are performed by the customer. According to Kleinaltenkamp and Fließ (2004: 396) an additional *line of order penetration* is also necessary to determine which actions are based on customer initiative, and which are initiated by the company itself.

This blueprint can be used as an analytical tool to obtain an objective overview of the service process which offers several benefits. Firstly, the blueprint provides an overview for employees to relate to and identify their own areas of responsibility. Secondly, a service blueprint highlights the customer's role to the service process and identifies both internal and external potential fail points in the process. Finally, a clear blueprint facilitates bottom-up management by visualizing the entire service process to the responsible employees, who may then contribute to improvements of the entire chain on their own part.

In discussions with two former employees of the company, the lack of a service blueprint was highlighted. Both of the employees worked in the service delivery stage, implementing services according to specifications agreed with the customer, and highlighted the fact that in their previous working environments they had been more aware of the service delivery process, and that process was followed rigorously. They described the working environment within the case company as being more ad-hoc and responsive to external changes, which led them to feeling stressed and unable to anticipate incoming tasks, and thus improve their own work. Both of the employees agreed that creating a service blueprint would be beneficial for the case company.

6 Discussion and Conclusions

This section summarizes the results of this study. It presents the recommendations for the case company, managerial implications and future considerations, and evaluates the validity and reliability of the study.

6.1 Recommendations

This subsection first presents the recommendations for the implementation plan created based on the case company analysis and the review of the literature and best practices. These recommendations were outlined in collaboration with the company mid-level and top operational management.

6.1.1 Service Blueprint

As highlighted in Section 5.3.1, the lack of a clear process was seen as the root cause for most critical productivity issues in the case company. For a services company, a clear process is necessary, so that variations within the delivery can be minimized, leading to a swift, even flow as described in Section 3.1.1. A clear, documented service process will also allow the various roles required to fulfill that process to be visualized, enabling *capacity efficiency* to be controlled on a more granular level. The service process in the case company is best expressed by compiling a *service blueprint*, as detailed in Section 5.3.1.

Several of the benefits of a service blueprint evolve from the process of building it. All employees involved in the service delivery process should be be allowed to participate in the blueprinting effort to express their view of the process. The service blueprint should also act as a framework to which all data gathered in the company can be affixed, thus clarifying thresholds and escalation when *fail points* are identified. It is also important that the blueprint should contain the input interfaces where customer actions are needed.

6.1.2 Improved Effort Estimates

In the discussions with the key operational mid- and top-level management, detailed in Section 5.2.1, it was stated that one of the key issues for project budget overruns in the case company is the lack of an updated project plan, and by extension: the insufficient tracking of changing requirements. This leads to obscurity in the actual required efforts in projects, and causes uncertainty in whether a project is a risk or not.

To reduce obscurity in the required and planned effort, the distinct effort estimate levels described in Section 3.1.2 should be included in a *project plan*. Drafting and revising this project plan should be made part of the overall *service blueprint*. This will allow the company to record and address changing requirements, while still keeping track of the overall effort level.

6.1.3 Service Quality Questionnaire

Section 3 highlighted the three facets of services productivity: internal efficiency, external efficiency and capacity efficiency. As each of the three factors are interrelated, improvements in capacity and internal efficiency do not result in an overall productivity increase if they are accompanied by a reduction in service quality level.

The purpose of a service quality questionnaire is to establish a level of quality to be used for future reference in ensuring that the level of quality stays consistent. A SERVQUAL questionnaire, described in Section 3.3.1 can be used to determine the *functional* quality level of the service offered by the company. This quality measure will provide insight into how well the customer's expected quality level is matched by the company. As discussed in Section 5.1.2, the most natural party in the case company to conduct the service quality assessments should be the sales team, owing to their relationship with the customers. Therefore, it is recommended that the sales team should be consulted to include the execution of a service quality questionnaire as a step in the *service blueprint*.

6.2 Managerial Implications

The managerial implications based on the case company analysis and literary review are divided into three distinct items:

Implication 1. *Service blueprint.* A service blueprint needs to be drafted, with the focus of detailing the entire customer interaction chain. The purpose of this blueprint is to visualize the entire service delivery process, starting from initial sales efforts, and extending to delivery for customer and maintenance after project completion. It is critical, therefore, that the blueprinting should be guided by mid-level operational management, and that all operational employees of the company should participate in the process.

Implication 2. *Improved effort estimates.* Effort estimates and project plans should be tracked at a greater granularity, paying attention to the varying connotations of different estimates given. The act of providing effort estimates should be affixed to the *service blueprint* to ensure that all necessary data required for the estimation are present. The estimates must be recorded in relation to a *project plan*, and changes to the project plan shall be re-estimated.

Implication 3. *Service quality questionnaire*. A service quality questionnaire, following the SERVQUAL framework, needs to be dispatched to current and future clients. Execution of the quality survey should be performed by the case company sales personnel. The stage at which the service quality measurement should then be performed for future clients also needs to be indicated in the *service blueprint*.

6.3 Validity and Reliability in This Study

As planned in Section 2.1, all qualitative and quantitative data in this study were subjected to both evaluating against relevant theory and triangulated. Owing to a close relationship with the company, certain personal bias of the researcher cannot be ruled out completely and could have some effect on the outcome. Nevertheless, the re-

searcher the researcher paid special attention in this study to place a greater weight to the working community's own evaluation and analysis of the presented results.

To lessen the researcher bias, the researcher has distanced himself from actual data feedback by striving to adopt a neutral stance, as described in Section 2.3. The main responsibility of the researcher was to focus only on the collection and analysis of the quantitative data, to link it with relevant literature and to present it to the community. This way the working community itself was helped to understand the experienced phenomena through the presented data. Theoretical literature was used in this study to obtain comparative knowledge from an existing body of literature, and for combining and linking the various manifestations of different phenomena into a cohesive understanding of root causes in the company and ensure their interlinkedness.

Another possible drawback of this study is a limited amount of research data available for quantitative analysis. Therefore, the conclusions in this study are based on qualitative observations rather than extensive quantitative analysis, which could be especially valuable for this type of studies. To compensate for this deficiency, the researcher has ensured the triangulation of data collection and analysis methods for the quantitative part of the research.

As a conclusion, the dilemma posed in the research question, *"How can productivity in the case company be improved, while maintaining quality and ensuring that capacity is at an optimum level?"* was directly addressed in the research design and outcome. Both the theoretical framework and the feedback and introspection of the working community support the findings, and a link between the research question and the findings and conclusions is made visible.

6.4 Future Considerations

In Section 4.2, it was deemed that a technical quality assessment would not be feasible to conduct within the scope of this study. Nevertheless, the technical and functional quality model by Grönroos (1993) described in Section 3.3.2 underlines the importance of all of the three aspects – technical quality, functional quality and image – in defining

the overall service quality as experienced by the customer. Hence, this study recommends the technical quality aspects associated with the case company service to be further studied. The role of technical quality is especially pronounced, since the case company operates in the highly technical field of software services.

This study also assessed the state of quantitative data points available within the case company. While these data were deemed inconclusive at this state, participants in the discussions held within the company nevertheless agreed that while the state of the data does not allow conclusive deduction, the metrics themselves are relevant. Therefore, in the future, these metrics should be studied separately, in greater detail, at a later stage, and put in the context of the service blueprint, so that to best determine which metrics should become the *Key Performance Indicators* for the case company.

7 Summary

As business practice suggests, for a services firm, the underpinnings of its production processes' productivity are not as straightforward as they are for a traditional manufacturing firm. While an industrial production line will produce goods at a more or less constant quality and pace, and allowing capacity variance to be evened out with warehousing, a service encounter takes place in an interaction with the customer and cannot be canned, bottled or otherwise stored for later use. The productivity of a service process is thus dependent on three facets: 1) customer perceived quality; 2) internal efficiency – i.e. "units of service" produced versus costs associated; 3) how well the capacity of the service process is being used.

For a customer-intensive service process, one *unit of service* can be difficult to define, especially so for immature, growing companies, where the service delivery process is still seeking its form, such as the case company studied in this Thesis. To clarify its service process, the company can develop a *service blueprint*, which will detail the process it uses to service its customer. Metrics measuring the three aspects of services can then be attached to the service blueprint, to provide feedback of the functionality of the service process.

This Master's Thesis studies the underpinnings of productivity in software services business. The case company of the Thesis is a European software services company that offers mobile web-based publishing solutions, mainly to the news and media industry. The company has grown rapidly over the last five years, and is now facing unsatisfactory productivity – namely, profits from the customer projects are not increasing in line with costs associated with those projects.

The research approach used in this study is action research. Based on literature review, the main tenets of productivity in a services context are outlined and analyzed as for how it differs from traditional manufacturing. This study examined both the internal documentation data available in the case company, and the interviews with the mid- and top-level management. The data available in the company is gathered through the company reporting systems and semi-structured interviews with the company operational management. The gathered data from the interviews is then analyzed to pro-

duce an improvement proposal, which is further subjected to scrutiny and review by the case company management, leading to a revised proposal. The objective is to conclude what is the best way to improve productivity in the case company, while maintaining quality and ensuring that capacity at its optimum level.

The outcome of the study is a draft of the service blueprint for the company production process. This blueprint will allow issues in each of the underlying factors of service productivity to be exposed in different stages of the case company's service delivery process, thus enabling them to be solved in isolation, instead of attempting to affect the entire process as a whole. The study also suggests recommendations and managerial implications to assist the case company in improving their productivity. Included in these recommendations are concrete action points for the case company management to implement. Finally, the study overviews further considerations and items not addressed by this Thesis, which are recommended to be studied in the future.

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Appendix 1: SERVQUAL Questionnaire

Cover letter

Dear respondent,

I am a student at Metropolia University of Applied Sciences in Helsinki, and as part of my Master's Thesis in Industrial Management I am conducting a service quality analysis. The purpose of this study is to provide measures for assessing the productivity of employees in a software services company. Since productivity in services firms is a function of efficiency at a given quality level, your feedback into the study is very important. The results of this study will be used to increase scientific knowledge of productivity in software services firms, and to create a quality framework for [case company].

Your participation in this study is voluntary, and your responses will be handled confidentially. The name of neither you nor your company nor [case company] will be mentioned in the study.

This questionnaire consists of three parts. The first part measures your expectations of the quality of software services firms in general. The second part is used to assess your perceptions of the same quality aspects in service provided by [case company]. The third and final part of this study will ask you to assign relative weights to the different aspects measured. In total, the estimated time required to complete this questionnaire is 10-15 minutes. Your participation is greatly appreciated.

Sincerely,

Lauri Piispanen
[case company]

Expectations

DIRECTIONS: Based on your experiences as a customer of software development services, please think about the kind of software development services company that would deliver excellent quality of development service. Think about the kind of software development services company with which you would be pleased to do business. Please show the extent to which you think such a company would possess the feature described by each statement. If you feel a feature is *not at all essential* for excellent telephone companies such as the one you have in mind, circle the number **1**. If you feel a feature is *absolutely essential* for excellent software development services companies, circle **7**. If your feelings are less strong, circle one of the numbers in the middle. There are no right or wrong answers – all we are interested in is a number that truly reflects your feelings regarding software development services companies that would deliver excellent quality of service.

E1. Excellent software development services companies should have up-to-date equipment.
E2. The physical facilities at excellent software development services companies should be visually appealing.
E3. Their employees should be well dressed and appear neat.
E4. Materials associated with the service (such as pamphlets or statements, or deliverables) will be visually appealing in an excellent software development services company.
E5. When excellent software development services companies promise to do something by a certain time, they should do so.
E6. When customers have a problem, excellent software development services companies will show a sincere interest in solving it.
E7. Excellent software development services companies will perform the service right the first time.
E8. Excellent software development services companies will provide their services at the time they promise to do so.

E9. Excellent software development services companies will insist on error-free records.

E10. Employees of excellent software development services companies will tell customers exactly when services will be performed.

E11. Employees of excellent software development services companies will give prompt service to customers.

E12. Employees of excellent software development services companies will always be willing to help customers.

El3. Employees of excellent software development services companies will never be too busy to respond to customer requests promptly.

E14. The behavior of excellent software development services companies will instill confidence in customers.

El5. Customers of excellent software development services companies will feel safe in their transactions.

El6. Employees of excellent software development services companies will be consistently courteous with customers.

E17. Employees of excellent software development services companies will have the knowledge to answer customer questions.

El8. Excellent software development services companies will give customers individual attention.

E19. Excellent software development services companies will have operating hours convenient to all their customers.

E20. Excellent software development services companies will have employees who give customers personal attention.

E21. Excellent software development services companies will have the customers' best interests at heart.

E22. The employees of excellent software development services companies will understand the specific needs of their customers.

Perceptions

DIRECTIONS: The following set of statements relate to your feelings about [case company] software development services. For each statement, please show the extent to which you believe [case company] software development services has the feature described by the statement. Once again, circling a **1** means that you strongly disagree that [case company] has that feature, and circling a **7** means that you strongly agree. You may circle any of the numbers in the middle that show how strong your feelings are. There are no right or wrong answers—all we are interested in is a number that best shows your perceptions about [case company] software development services.

P1. [case company] has modern-looking equipment.
P2. [case company]'s physical facilities are visually appealing.
P3. [case company]'s employees are neat-appearing.
P4. Materials associated with the service (such as pamphlets or statements, or deliverables) are visually appealing at [case company].
P5. When [case company] promises to do something by a certain time, it does so.
P6. When you have a problem, [case company] shows a sincere interest in solving it.
P7. [case company] performs the service right the first time.
P8. [case company] provides their services at the time it promises to do so.
P9. [case company] insists on error-free records.
P10. Employees of [case company] tell you exactly when services will be performed.
P11. Employees of [case company] give you prompt service.
P12. Employees of [case company] are always willing to help you.
P13. Employees of [case company] are never be too busy to respond to your requests.
P14. The behavior of employees of [case company] instills confidence in customers.
P15. You feel safe in your transactions with [case company].
P16. Employees of [case company] are consistently courteous with you.
P17. Employees of [case company] have the knowledge to answer your questions.
P18. [case company] gives you individual attention.
P19. [case company] has operating hours convenient to all its customers.
P20. [case company] has employees who give you personal attention.

P21. [case company] has your best interests at heart.

P22. Employees of [case company] understand your specific needs.

DIRECTIONS: Listed below are five features pertaining to software companies and the development services they offer. We would like to know how important each of these features is to *you* when you evaluate a software development services company's quality of service. Please allocate a total of 100 points among the five features *according to how important each feature is to you* – the more important a feature is to you, the more points you should allocate to it. Please ensure that the points you allocate to the five features add up to 100.

1. The appearance of a software development services company's physical facilities, equipment, personnel and communication materials.
2. The ability of the software development services company to perform the promised service dependable and accurately.
3. The willingness of the software development services company to help customers and provide prompt service.
4. The knowledge and courtesy of the software development services company's employees and their ability to convey trust and confidence.
5. The caring, individualized attention the software development services company provides its customers.

Appendix 2: Conceptual map, Group Interview 2