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TAMPERE UNIVERSITY OF TECHNOLOGY

VESA TIITOLA

VALUE ASSESSMENT AND COMMUNICATION WITH A MANAGEMENT ACCOUNTING APPROACH IN HOME CARE: CASE STUDY WITH A TECHNOLOGY SERVICE PROVIDER

Master of Science Thesis

Examiners: Associate Professor Teemu Laine and University Lecturer Jouni Lyly-Yrjänäinen
Examiners and topic approved by the Vice Dean for Education at the Faculty of Business and Build Environment on 29th January 2018

ABSTRACT

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Home care organizations in Finland are facing a strong dilemma with increasing demand and a need to decrease costs. Some technology service providers have developed solutions that can help home care organizations face these challenges, but municipalities remain sceptic towards these solutions creating new challenges within both the purchase processes and the implementation. Thus, the objective of this thesis is to discuss a way to face these issues by exploring the possibilities related to using a management accounting approach in value assessment and communication in home care context. The thesis hence contributes to the research gaps in how management accounting can support value assessment and how value and financial information are perceived in home care.

The thesis draws on literature concerning customer value, management accounting, decision-making and home care. The objective is approached using as a case study with a technology service provider in home care context. The empirical study follows an interventionist approach. A value assessment was conducted within five homecare organizations by using existing data and interviews to document the effects of the offering, which were later measured using cost assessment. The value and cost assessment processes and the related communication are narrated to discuss the process and related findings.

Value assessment proved to be an efficient tool in documenting customer value and seemed to provide important information to both the case company and its customers. Not only could the management accounting tools be applied within the value assessment process, but even more importantly within the cost assessment to measure the significance of the identified value elements. The value assessment and management accounting could also be used to identify and measure a new and significant value element related to the resource perspective.

It would seem that companies could benefit from including a management accounting specialist within the value assessment process. Additionally, it seems that the stakeholder perspective is a relevant issue to take into consideration when communicating either value or financial information within homecare context. As such, this thesis contributes on both emic and etic level by both documenting the customer value within the case context, narrating the process of performing a value assessment in home care and discussing the role of management accounting in assessing and communicating value in home care context.

PREFACE

This thesis was conducted as a part of a broader MASI -research project of the Cost Management Center (CMC) focusing on a case with one of the collaborating companies. Working with the case company has been an interesting experience which has taught me a lot and I hope that my contribution to the customer cases has met their expectations. I also wish that the homecare organizations have gained as much as I have from working with them. My study has given me a lot of insight about the work of home caregivers and I have high appreciation towards their work.

This thesis summarizes my studies and learning so far at Tampere University of Technology. While my interests have evolved quite a lot from marketing to business development and further to management accounting orientation, this thesis has also enabled me to clarify what I want to do after graduation. Therefore, the research process has been an important process for me since I have also learned much about myself and my interests. Hence, I am grateful for my superiors for giving me the chance to work on my thesis as part of the CMC research group and I wish that our co-operation continues in the future.

I want to especially thank Associate Professor Teemu Laine and University Lecturer Jouni Lyly-Yrjänäinen for guidance and support during the research process, in helping me develop my thesis and mentoring me daily through my learning process. I have learned a lot by working with them. I also owe my co-workers gratitude for the supportive environment and insightful discussions. I also want to thank the case company and all its customers for openly inviting me to study their daily work and discuss the topics of this thesis with them. Finally, I want to thank my girlfriend Anu and my family for patience and all the support during the research process.

Tampere, 16.2.2018

Vesa Tiitola

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LIST OF SYMBOLS AND ABBREVIATIONS

TCV	Total customer value
TCC	Total customer cost
CPV	Customer perceived value
VA	Value assessment
VP	Value proposition
ADD	Automatic dose dispensing
S-D Logic	Service-dominant logic
G-D Logic	Goods-dominant logic
DVP	Distinctive value proposition
MA	Management accounting
MAS	Management accounting system
MCS	Management control system
MACS	Management accounting and control system
SMA	Strategic management accounting
CA	Customer accounting
ERP	Enterprise resource planning

1. INTRODUCTION

1.1 Motivation

There is a large interest in creating value in the health care industry (Lindgreen et al., 2011). The main reasons for this are continuously increasing demand (i.e. Väyrynen & Kuronen, 2017; Lyly, 2017) and an increasing need to decrease costs (e.g. Groop, 2012). Simultaneously, the health care sector is facing challenges related to resource deficit (Kuisma, 2017; Repo, 2017) and low work satisfaction resulting in high ratio of sick leaves (Koponen, 2017). The problem with this equation is that it is impossible to solve without making the current processes more efficient. Therefore, some technology service providers have started searching for solutions that can help health care organizations in providing the same or higher level of service, but for a lower cost. However, there exists a clear need for research in validating the value provided by these healthcare technology providers, which could help convince buyers (Lanne, 2018). Therefore, the health care sector provides an interesting platform to study value assessment and communication.

Some studies (i.e. Vandenbosch & Dawar, 2002; Pruchnow et al., 2006; Ulaga & Eggert, 2006) suggest that with recent market developments, it is no longer valid to capture value in traditional way, but instead within the interactions with the customer. There have been some attempts to solve this (i.e. Pruchnow et al., 2006; Ulaga & Eggert, 2006; Lindgreen et al., 2009), but they have not explicitly discussed about identifying and communicating the value. However, there are some methods that can help organizations facing these issues. Value assessment is a method that can help understand where most of the created value actually comes from (Keränen & Jalkala, 2013; Anderson et al., 2009), and value propositions help companies in communicating it (Anderson et al., 2006; Frow & Payne, 2011; van Rensburg & van Niekerk, 2010). However, while some level of value assessment is conducted in every company, the research on the topic is still quite scarce (Keränen & Jalkala, 2013).

Keränen and Jalkala (2013) argue that while there is a need for assessing value from a financial point of view, there are no approach to how it should or could be done. For this reason, management accounting could provide the necessary knowledge to transform the value to financial format. However, this rouses some challenges, since stakeholders in the health care field are not necessarily too familiar with the language of accounting (e.g. Kraus, 2012). Therefore, it would seem that a systematic assessment and documentation of value is needed to understand the effects of technology solutions, translate these into financial format and communicate them efficiently throughout the stakeholder network.

1.2 Research questions

This research is carried out as a part of a MASI research project (Managing service impact – engaging facts and feelings in managing customer value and profitability). The research project is part of the project portfolio of Cost Management Center (CMC) research group in Tampere University of Technology. In the case project, the researcher participates in measuring and communicating value within a certain context. This enables the gathering of empirical data concerning the assessment of value from accounting point of view and communicating the value proposition of both by being involved in the communication and researching it as an impartial party.

The research focuses on applying management accounting approach to value assessment and communicating value propositions in the homecare field. In addition to a clear need for researching the role of accounting as a support function to sales, the topic was also chosen based on the researchers own interest, previous experience and the possibilities provided by the research case project. Moreover, the researcher wanted to develop value communication in different kinds of decision-making scenarios with various stakeholders. Thus, the objective of this thesis is

…to explore the possibilities in using a management accounting approach in assessment and communication of value in homecare context. Hence, this thesis investigates how financial value is experienced and can be communicated to different stakeholders in home care.

As such, the objective is divided into four research questions. These research questions are:

RQ1: Can a combination of value assessment and management accounting be used to identify and communicate new value elements in home care?

RQ2: How can management accounting support value assessment and communication?

RQ3: How can value be effectively communicated to different homecare stakeholders?

RQ4: How is financial value experienced from different perspectives within homecare processes?

The research questions and their relation to theory is illustrated in Figure 1. The first research question investigates the narrow gap between the three areas to identify, if the combination of management accounting and value assessment and communication can be used to provide additional value to the supplier-customer relationship by either identifying new sources of value or new value elements for the current solutions. The second research question explores the role of management accounting in conducting a value assessment. The third question continues with the previous question to apply how homecare

technology providers can adjust their value communication to fit the homecare stakeholder portfolio. Finally, the last research question discusses how different stakeholders in home care perceive and experience customer value and, moreover, financial value.

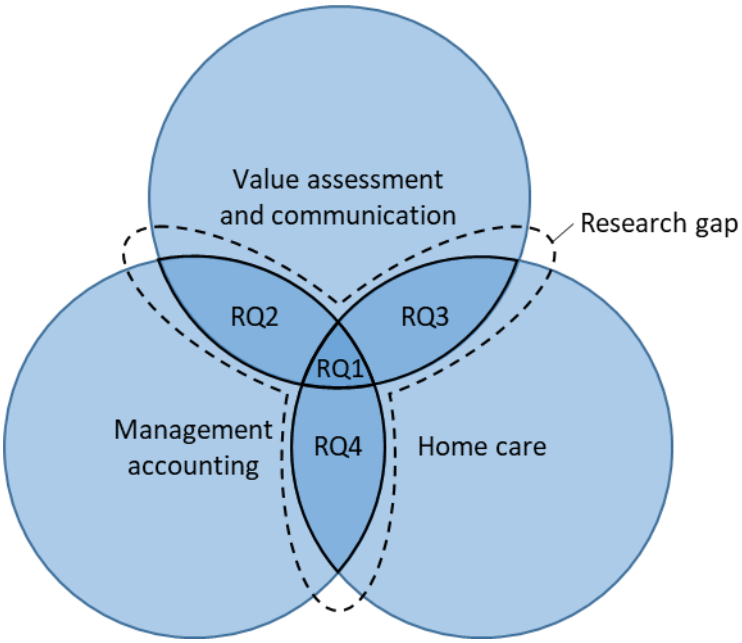

Figure 1. *Exploring the research gap.*

The thesis has both academic and practical purposes. From academic perspective, the thesis aims to contribute to research on value assessment and value propositions in the homecare field by exploring possibilities that management accounting approaches have for assessing and communicating value in a homecare context. In practical sense, this thesis contributes to narrating how a value assessment process can be done, which can be utilized by managers starting their own value assessment projects. Additionally, the thesis contributes to discussing homecare organizations as institutions, and how technology and service providers could create value in the field.

1.3 Research methods

The way the research objective is approached in this thesis is by performing a value assessment within a case study in collaboration with the case company and its customers. In the value assessment, a set of management accounting tools are used to measure the value in financial terms to review if management accounting can contribute to the value assessment process. Additionally, the communication of the assessed value is discussed taking into consideration the relevant stakeholders and their preferences. The case study is conducted with a healthcare technology service provider on its customers using an interventionist approach. Hence, the researcher actively participates in the value assessment process simultaneously gathering empirical data via action science, participant observation, qualitative interviews and both primary and secondary data.

This thesis aims to contribute to exploring the current research gaps, which is why the research strategy consists of an exploratory a case study (Gummesson, 1993). To gain deep insight about the topic, the case study is conducted with a single case company and its customers lasting for fourteen months. During this time, several customer cases are studied, some with a cross-sectional study approach (Saunders et al., 2012) by interviewing and analyzing what has happened, and some with a longitudinal study approach (Saunders et al., 2012) by observing and assisting the customers in several phases during their technology implementation. Thus, the research also requires a deep understanding of the industry being studied in addition to the knowledge concerning both value assessment and management accounting.

The field of study consists of healthcare and, more specifically, home care. While this field is quite specific, it acts as a good platform to apply the discussed concepts and explore the potential benefits and challenges. As these organizations are most commonly public, there are more material publicly available to study than in private organizations. Similarly, these organizations are relatively open towards research by other public organizations and official structures have been constructed to support research done in this field. However, these organizations have a deficit on accounting expertise. While this suggests that they could have an interest for analytical support, it also suggests the researcher might not be able to discuss the accounting issues with a management accounting specialist within the homecare organizations. Hence, there seems to be a lot of potential in studying the research topic within the field of home care.

To approach this topic, an interventionist approach is used. As Hall (2010) argues, it is important to focus on "Not the output but the methods, processes and activities that participants engage in when conducting tasks." The interventionist approach requires that the researcher also gave some of his own input to processes being studied (Suomala et al., 2014), which in this case is contributing in the value assessment process and related analytics. One of purposes of contributing in the analytics for the customer organization is to be able to get an access to the group as well as to be able to steer the conversation to include issues relevant to the research topic. This way, the researcher also has a better change in understanding "… what "goes on at the clinic" …" (Jönsson, 1998). As a result, the emic findings of the specific case study can later be applied in a more etic and general way as contribution to theory (Suomala et al., 2014).

The interventionist approach exploits a set of traditional research methods. From the selection of empirical research methods by Gummesson (1993) action science, participant observation, qualitative interviews and existing material are used. Firstly, the value assessment uses an action science approach as this process fell as the responsibility of the researcher. However, this also gives a good chance to study the challenges and possibilities related to applying management accounting in value assessment, especially as the researcher has a background in studying and working with sales, marketing and management accounting. Secondly, participant observation and qualitative interviews are used

during the discussions with the case company and its customers. Some of the research situations are organized by the researcher himself and to other situations the researcher asks to be invited into. Lastly, existing material such as reports, previous studies and statistics are used to analyze the effects of the service to measure the value and make the requested analytics.

This research uses both deductive and inductive approaches. As Saunders et al. (2012) argue, it is possible commence a management research project by analyzing a theory based on the data available deductively or by trying to identify and develop a theory from data inductively. Therefore, the structure of this thesis follows an inductive approach as it starts by defining the theory framework, which is later followed by applications in a case scenario. However, as the research method follows an interventionist approach, the inductive and deductive approach go more hand in hand taking turns to shaping the findings of this study (e.g. Suomala et al., 2014). As the goal is to explore the potential of doing something new, which means that the research direction is guided by an inductive approach, while the findings of the thesis are gathered mostly deductively (Saunders et al., 2012).

The interventionist approach also resulted in evolution of the research questions during the research process. The interventionist research sometimes requires for the researcher to focus on secondary issues that might not be directly related to the research objective but enable the researcher to build trust and enable sufficient access to study the phenomena (Suomala et al., 2014). Therefore, certain flexibility is required from both the researcher and the research objective so that the research fits the potential of the studied field (Suomala et al., 2014). In this thesis this means that the research objectives had to be reformulated from communicating financial information to value assessment oriented based on the earlier analyses. While this signifies the importance of later analyses and yields a practically relevant setting, it also creates scientifically somewhat problematic setting. This is the case at least from a more hard-knight oriented research perspective (Gummesson, 1993). However, it should be noted that without this evolution of the research process and reformulation of the research questions, the scientific contribution and most interesting findings would have most likely remained undiscovered.

1.4 Research process, structure and contents

During the research process, several sources of information were used to gather data. This included 15 interviews, 13 project related meetings, 3 seminars, 195 emails, 17 skype or phone calls, 7 observation sessions and 40 analyzed data files during the project. The sources have been summarized in Table 1. From the researcher's point of view, a large share of the research was conducted in Harjavalta. They seemed very interested in the effect analysis and, therefore, were quite open towards a co-operation with the research group. A similar case was in Sipoo where the municipality had specifically asked for researchers to participate in the service deployment project. In both municipalities, the

researcher was invited to visit a homecare round of a caregiver to observe the daily work with the customers, some of which were participating in the medicine-dispenser deployment projects. However, the research in Sipoo was started during this thesis, but due to scheduling issues, the results from that municipality were not included in this study.

Table 1. *A summary of the data sources in the interventionist research project.*

Organization	Case company	Vantaa	Joensuu	Harjavalta	Sysmä	Sipoo
Interviews	3	2	2	3	2	3
Project related meetings	5		1	3	1	3
Seminars	3					
Emails	110		10	37	7	31
Phone calls / Skype	12	1	1		1	2
Observant sessions	2			2		3
Analyzed data files			10	25	5	

As previously discussed, a significant share of the work was conducted with the customers of the case company. An active role of the researcher was needed to organize the research situations and gaining access to certain meaningful situations within the deployment projects. In addition, the homecare organizations sometimes required assistance in using their systems to export the required data to analyzable format, which also gave a good chance to discuss the service with the coordinators of the home care. Overall, the research process lasted around 14 months and is illustrated in Figure 2.

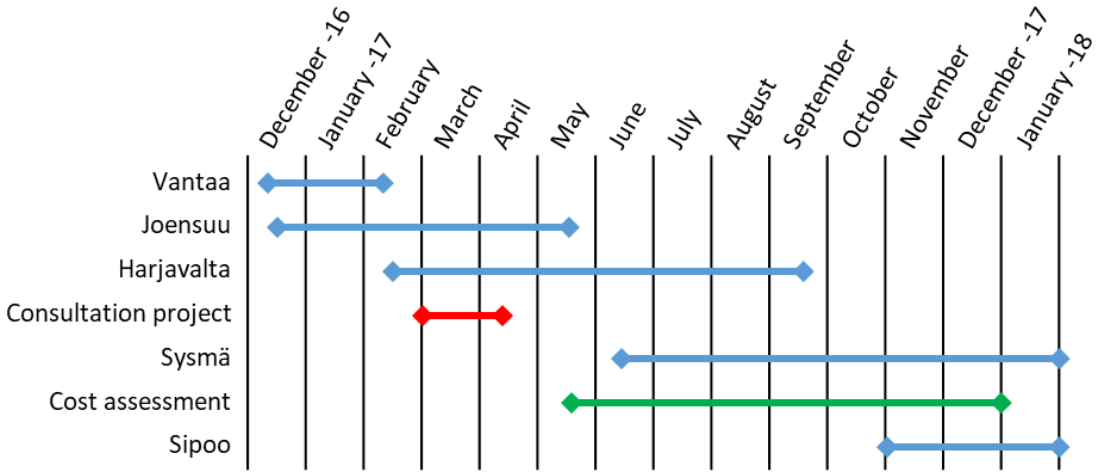

Figure 2. *The research process timeline.*

During the autumn 2016, the researcher was working as a research assistant, helping gathering materials for the research project. During this time, discussion on the researchers own research was still on a preliminary basis, which meant that the research performed during this period was mainly purposed for other researcher projects other than this study.

However, during December 2016, the project for this thesis was started and the findings of preceding research are also included in this study. The case with Joensuu was finished in mid-January. A visit to discuss the project with some of the responsible was carried out in February including an interview concerning the customer case. The case within Harjavalta began with a meeting with both the customer and the case company representative also in February. The researcher also took responsibility of this customer case, organizing it further by meeting them again February and organizing the project. During March and half of April, the researcher was working in a separate consultation project with the case company, which enabled the researcher to gain even better access and an insider status within the case company. However, the project was not related to this study. From April to August the participation in the customer cases was lower because of the summer vacations. This calm phase in the project also gave the possibility to start the cost assessment process to gain more insight to the customer value. In August, the second phase and value assessment of Harjavalta was conducted. Additionally, from October to December, the researcher was participating in three new customer cases, some of which did not make it to this thesis due to their schedules.

In the first chapter, the research question and methodology are presented. The next three chapters discuss the theoretical framework of the thesis combining the theory on accounting knowledge and managerial decision-making with the concept of value. In the second chapter, the basic concepts of value, value assessment and value propositions are discussed. In the third chapter, the accounting information and its role in managerial decision-making are discussed. The fourth chapter starts by discussing home care and then combines all the previous concepts to develop a framework that is later applied in the value assessment process. The fifth chapter present the cases, which apply the concepts and frameworks discussed in the previous chapters. This chapter follows a combination of chronological and theme-based structure: the customer cases are presented in a chronological order to illustrate the development of the customer value understanding during the value assessment, which in return is supported by discussion about the cost impacts and decision-making whenever relevant. The two remaining chapters gather and analyze the findings of the research. The sixth chapter discusses the main findings, applies them to the framework developed in chapter four, as well as investigates the managerial implications and future research possibilities of the topic. The final seventh chapter summarizes the thesis and draws the findings into a conclusion.

2. CUSTOMER VALUE AND THE VALUE PROPOSITION

2.1 Customer value, customer perceived value and value co-creation

2.1.1 Customer value

Value, and more specifically customer value, is a concept that is used to measure and compare different offerings with each other. The concept is commonly used in inter-organizational context, such as marketing, as a tool to assess, evaluate and communicate the relationship between benefits and costs related to a market offering (Kotler & Keller, 2012; Anderson et al., 2009). However, there are some differences in how the concept is utilized and comprehended. According to different sources, customer value can be defined as:

> *"... the worth in monetary terms of the economic, technical, service and social benefits a customer firm receives in exchange for the price it pays for a market offering."*
>
> *(Anderson et al. 2009)*

> *"The monetary worth of something"*
>
> *(Merriam-Webster, 2017)*

> *"... the sum of the tangible and intangible benefits and costs to her [or him]."*
>
> *(Kotler & Keller, 2012)*

> *"The difference between what a customer gets from a product, and what he or she has to give in order to get it."*
>
> *(BusinessDictionary, 2017)*

> *"... any demand-side personal perception of advantage arising out of a customer's association with an organization's offering, and can occur as reduction in sacrifice, presence of benefit; the resultant of any weighed combination of sacrifice and benefit; or an aggregation, over time, of any or all of these."*
>
> *(Woodall, 2013)*

While there are some differences in the definitions, a basic principle is that there are two main elements, which make up customer value: benefits and costs. Therefore, the definition of Kotler and Keller (2012) is used in this thesis. Additionally, both elements can be divided to sub-elements. As Anderson et al. (2009) argue, the benefits consist of "…economic, technical, service and social benefits." The sum of benefits is understood as total customer value (TCV) (Lyly-Yrjänäinen et al., 2014). However, these sub-elements can also be perceived as costs if they are inferior compared to the current situation or alternatives. For example, a company often needs to make some economic sacrifices to purchase the offering. Thus, these economic sacrifices can be divided into purchase, usage and disposal costs, which sum up to total customer cost (TCC) (Lyly-Yrjänäinen et al., 2014). This is illustrated in below Figure 3.

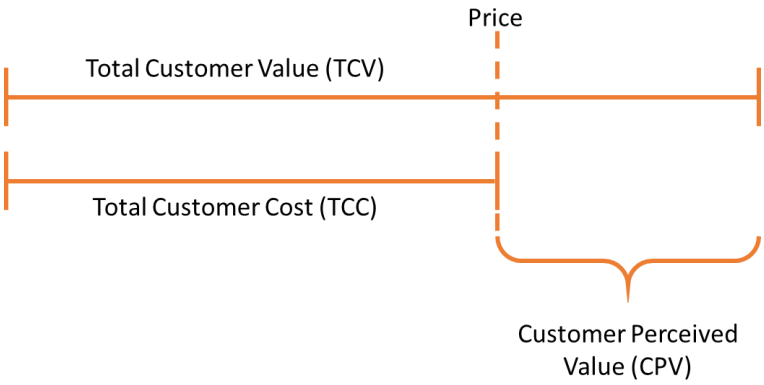

Figure 3. *Customer value framework (Lyly-Yrjänäinen et al., 2014).*

Customer perceived value (CPV) is the difference between the total customer value and total customer cost (Kotler & Keller, 2012; Lyly-Yrjänäinen, 2014). Customers tend to maximize value (Kotler & Keller, 2012), which means they review the benefits and costs related to each offering to find the one they perceive to have highest CPV. Therefore, there are three main ways to create value, by providing higher benefits for the same cost, by decreasing costs, or by doing both things simultaneously (Lyly-Yrjänäinen, 2014). Hansen et al. (2008) argue that CPV, with word-of-mouth and decreased interest to search alternative suppliers, "… are key indicators of relationship strength." Customer perceived value seems to also have benefits in customer portfolio management, by identifying the components of CPV and tailoring those to make different customer types more profitable (Hansen et al., 2008). However, Anderson et al. (2009) note that value is always only an estimation, and the parties involved in the exchange can underestimate or overestimate the value. Thus, it is important to note that all parties involved in the exchange might not perceive the value the same way. For this reason, Songailiene et al. (2011) discuss a concept called supplier-perceived value (SPV) to emphasize this difference in perception between the customer and the supplier.

While some call this difference between total customer value and cost as perceived customer value or customer perceived value (CPV) (e.g. Kotler & Keller, 2012; Lyly-

Yrjänäinen et al., 2014), some other terms are used for it, such as customer incentive to purchase (Anderson et al., 2009), and value for customer (Woodall, 2013). An interesting notion by Woodall (2013) is also the distinction of temporary forms of value for the customer. He argues that there are four different forms: Ex-ante, transaction, ex-poste and disposition value for the customer. Thus, the customer perceived value not only depends on the customer but could develop during the lifetime of the offering and its use. As his definition understands value for the customer as something that is perceived, this distinction means that the perceived value can evolve during the use (Woodall, 2013). So not only are the perceptions of the value different between different parties, but they can also evolve during the exchange and use. Therefore, effort must also be put to customer interactions (Pruchnow et al., 2006) and delivering value (Anderson et al., 2009) to be able to create long-term customer relationships.

2.1.2 Market and competition perspective

While the previously discussed definition of value helps organizations better create and deliver value, it still neglects the influence of the market. In addition to only looking at the supplier-buyer relationship, there is also the competition to consider. This perspective is emphasized by Anderson et al. (2009), who suggest the following equation for value:

$$(Value_f - Price_f) > (Value_a - Price_a),$$

where $Value_f$ and $Price_f$ present the company's offering and $Value_a$ and $Price_a$ the competitor's offering. It is important to note that in the formula derived by Anderson et al. (2009), the benefits that make up the value are net benefits, meaning the sums of benefits and relevant costs. Therefore, only the price of the offering is excluded from the costs. Deriving this formula further, the formula can be reformed to:

$$(Value_f - Value_a) > (Price_f - Price_a),$$

which means that it is also possible to analyze the value by comparing the value and prices of alternatives between each other. So as long the difference in value is higher than the difference in price, there is an incentive for the customer to purchase the offering (Anderson et al., 2009). However, in addition to the market perspective, there is also the time perspective to consider. Just looking at the predefined value assessment and purchase price provided by the supplier can most likely be misleading, and therefore the whole lifetime perspective should be considered. In many cases, only the purchase price occurs during the transaction, meaning that the value manifests during the following years. In addition, the offering often has cost impacts during the use of the offering (Anderson et al., 2009; Lyly-Yrjänäinen, 2014). Thus, management accounting tools that evaluate the time value of money can also be utilized to assess the lifecycle perceived value. Nevertheless, while there are many tools to evaluate customer perceived value, it also needs to be competitive against alternatives, which can be approached with differentiation.

2.1.3 Differentiation

It is not sufficient that the offering brings value compared to the current situation, but the offering must also be unique compared to its competitors (Anderson et al., 2006; Levitt, 1980). This process is called differentiation (Kotler & Keller, 2012; Levitt, 1980). While differentiation of an offering might not be the focus of this thesis, differentiation is a key concept concerning value approach of communicating accounting information, especially to multiple stakeholders or different types of customers. This is for example the case in the paper by Pruchnow et al. (2006), who suggest differentiation of interactions as a potential key to success. It is also a basis of developing a good value proposition (Anderson et al., 2006). Therefore, it is an interesting concept influencing value propositions and value communication and should be discussed to some level.

According to Kotler and Keller (2012), products can be differentiated based on form, features, customization, performance quality, conformance quality, durability, reliability, repairability and style. Additionally, they argue that services can be similarly differentiated based on ordering ease, delivery, installation, customer training, customer consulting, maintenance and repair and returns (Kotler & Keller, 2012). If these bases are compared with the customer value framework in Figure 3, it can be noticed that each basis of differentiation can increase the total customer value, but unless the company is able to offer these additional benefits with the same cost, there are some additional costs related to the additional benefits. Thus, the customer evaluates if the value added is worth the costs, meaning that they evaluate the customer perceived value of the additional offering and consider if it is worth it compared to the competitors' offerings. However, it is also worth noting that the book by Kotler and Keller (2012) is quite consumer marketing oriented, so some of the bases of differentiation might not be so relevant in B2B context.

2.2 Value assessment and value elements

2.2.1 Value assessment process

When the offering is rather new, it can be difficult to measure customer value. The main reason for this is that value assessment as well as any forecast is sensitive to some level of uncertainty. The supplier might not have a sufficient knowledge about a customer's processes or the solution might not be as applicable to other customers as it is for one. Thus, companies need to try to evaluate the customer value and a one way to do this is to perform a value assessment (e.g. Anderson et al., 2009; Keränen & Jalkala, 2013; Keränen & Jalkala, 2014; Johansson et al., 2015). Anderson et al. (2009) suggest nine different approaches to assessing value; internal engineering, field value-in-use and focus group value assessments, as well as indirect survey questions, direct survey questions, conjoint analysis, benchmarks, compositional approach and importance ratings. These

methods require a different amount of involvement from both the supplier, and the potential customer market and possible customer partners. Regardless of the method, the basic principle is that the organization gathers information concerning the affected area and evaluates the possible impact in both benefits and sacrifices (Anderson et al., 2009). The difference between the value assessment methods, thus, is in what is the relation between the dependency on supplier assessment and customer perception (Anderson et al., 2009). This information and the monetary estimations can then be used in negotiations to convince the customer to buy the supplier's offering.

When looking at a delivery process in simplified terms, here are usually three phases in the value delivery: prior to delivery phase, delivery process phase and post-delivery phase (Keränen & Jalkala, 2014). These steps are illustrated in Figure 4. There is also a huge difference on the information available during these different phases. Thus, prior to the deliver, the value can only be assessed (Anderson et al., 2009), and therefore depends mainly on previous or similar customer cases and forecasts. On the other hand, during the delivery process the responsibility of value management increases (Anderson et al., 2009), to ensure that the promised value is delivered. Finally, after the delivery the performance should be evaluated and realized long term (Keränen & Jalkala, 2013) by identifying the key elements that create the customer value and can be applied in future.

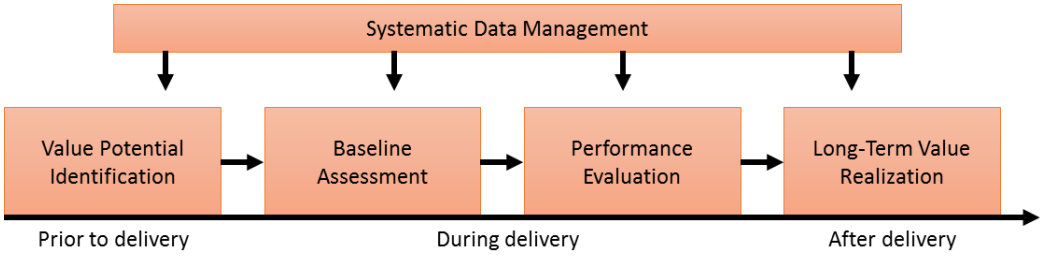

Figure 4. *Value delivery phases (Applied from Keränen & Jalkala, 2013).*

Keränen and Jalkala (2013) studied key activities and processes in customer value assessment. They identified five key activities evolving around four steps: value potential identification, baseline assessment, performance evaluation and long-term value realization supported by systematic data management throughout the whole process (Keränen & Jalkala, 2013). In value potential identification, the explicit need is identified, which can prove to be quite difficult as customers might be reluctant to share or even identify their core problems by themselves (Keränen & Jalkala, 2013). Thus, at this point the value proposition is mostly dependent on estimations and lacks the documentation to be validated.

After the value potential has been identified, the next step is baseline assessment (Keränen & Jalkala, 2013). This assessment of the current situation acts as a basis to later evaluate the delivered value. As previously discussed, it can be difficult to identify the complete picture and thus identifying the value elements that construct the value potential can help managers in assessing the complete value (Anderson et al., 2009). Keränen and Jalkala

(2013) also argue that it is important to define mutual understanding of the current situation as well as the expected outcomes because customers might overestimate their current situation and outcome specification can help the customers communicate their expectation to the supplier as well as ensure that the supplier actually delivers the expected outcome. The baseline assessment is mainly done prior to delivery but some part of it can be done during the negotiations so that common understanding can be developed (Keränen & Jalkala, 2013).

Once the first actual value impacts occur, the value assessment process can proceed to performance evaluation phase (Keränen & Jalkala, 2013). Thus, this phase usually happens during and after the delivery, depending on how large implementation is needed. As it is hard to exactly understand and evaluate the customer's processes, assessing the exact customer value is almost impossible (Keränen & Jalkala, 2013). Therefore, the performance evaluation is a crucial part of the process to ensure that the expected value is delivered. However, pilots or test projects can be used instead to test out the offerings in a smaller scale before the full implementation to avoid unnecessary risks (Keränen & Jalkala, 2013). This way companies can try to lower the perceived risk for the customer to make the offering more attractive (Vandenbosch & Dawar, 2002).

The challenge with the performance evaluation is its time perspective; customers want to verify the results as soon as possible even though some of the impacts only occur in long-term (Keränen & Jalkala, 2013). Thus, it would not be surprising if the first performance evaluation would suggest that the expected value was not delivered. It can take some time to accept the offering to the current processes and customers might even need some help from the supplier to operate the offering (Keränen & Jalkala, 2013). This is especially the case if the provided offering is quite complex and influences multiple functions in the customer organization. Therefore, the role of long-term value realization is to ensure that the necessary steps to deliver the expected value are made (Keränen & Jalkala, 2013). Hence, this method is also similar to customer value management discussed by Anderson et al. (2009). Customer value management is a progressive continuous approach to deliver competitive value to the customers while attaining acceptable earnings (Anderson et al., 2009). However, Keränen & Jalkala (2013) also argue that this phase is "… more often occasional than systematic." either because of poor life-time planning at the beginning of the sale or insufficient resources from either the supplier or the customer. Thus, the need for regularity concerning these meetings was emphasized in their study (Keränen & Jalkala, 2013).

A high emphasis in the life-time value realization was on documentation (Keränen & Jalkala, 2013; Anderson et al., 2006). The companies Keränen and Jalkala (2013) studied, reported case studies, success stories and joint articles as commonly used ways of documentation. However, while the technical details of the offerings were often documented, the emphasis should be also on the financial aspects such as the benefits in monetary terms (Keränen & Jalkala, 2013). Thus, the last part of the process is a continuous and

systematic data management (Keränen & Jalkala, 2013). With the exception to the previous phases, systematic data management related to the whole value assessment process meaning all the previously discussed steps. Therefore, the role of systematic data management is in managing the whole value assessment process and it for example enables the creation of detailed customer value assessments (Keränen & Jalkala, 2013).

2.2.2 Value assessment strategies

Keränen and Jalkala (2014) have also studied different strategies for value assessment. Their findings suggested that companies mainly use some application of the model illustrated in Figure 4. However, while the tasks of the value assessment are quite similar, the difference is between the responsibilities and allocating resources for the tasks. Thus, during their interviews, three strategies stood out (Keränen & Jalkala, 2014):

- Emergent value sales strategy
- Life-cycle value management strategy
- Dedicated value specialist strategy

In the emergent sales strategy, the sales function of the company performs the value assessment in purpose of better performance in the negotiations (Keränen & Jalkala, 2014). This strategy rose naturally from need to enhance sales activities and, more specifically, help in value-based pricing (Johansson et al., 2015). Thus, the results were not always common knowledge within the company outside the sales function (Keränen & Jalkala, 2014). The customer value assessment typically consisted of a spreadsheet calculator which sales personnel use as a part of the selling process (Anderson et al., 2006). Another issue with this type of strategy is that as the value assessment is a responsibility of the sales function, the follow-up of this method is usually scarce (Keränen & Jalkala, 2014). Thus, the follow-up is mainly done as a part of understanding if the company has really perceived the value and no systematic value management is done (Keränen & Jalkala, 2014). Similarly, if the value assessment is left to be the responsibility of the sales function, the main cost drivers have already been decided and there is not much that can be done to drive the costs to relate with the perceived value (Johansson et al., 2015). Thus, some companies have adopted a life-cycle value management strategy where other functions of the supplier also have a noticeable role in the value assessment (Keränen & Jalkala, 2014).

In life-cycle value management strategy, companies go further from value potential identification to baseline assessment and long-term value (Keränen & Jalkala, 2014). The responsibility is shared between functions that participate in different phases of the delivery (Keränen & Jalkala, 2014). As an example, the service function can continuously gather information concerning new development ideas for the R&D using this strategy (Keränen & Jalkala, 2014). By also continuing the value assessment post-delivery, companies can make sure that the expected outcomes are in fact delivered by measuring the delivered

value over time (Keränen & Jalkala, 2013). However, compared to the emergent value sales strategy, this method requires more resources and possibly a closer relationship with the customer (Keränen & Jalkala, 2014). In addition, as the responsibilities are shared between the functions, each function focuses on its own area (Keränen & Jalkala, 2014), potentially resulting in separated data collection and management (Keränen & Jalkala, 2013), as well as possible challenges in communication.

To solve issues between functions, some companies have approached the value assessment with designated value specialists (Keränen & Jalkala, 2014). These specialists are a cross-functional team, involved in the whole value assessment process and related documentation (Keränen & Jalkala, 2014). Considering the scale of resources needed for this strategy, the strategy is strongly linked with the business model of the company (Keränen & Jalkala, 2014). Therefore, this strategy gives an even better basis for value-based pricing than life-cycle value management strategy (Johansson et al., 2015; Keränen & Jalkala, 2014). The role of these designated value specialists is in a support role for mainly sales, but the rest of the organization as well. They are considered a critical function in the company, emphasizing that recruiting the right persons for the tasks is crucial for the strategy's success (Keränen & Jalkala, 2014). However, considering the requirements for this strategy, it might not necessarily be suitable for all companies and its benefits would most likely be most visible in suppliers with expert knowledge about the customers businesses (Keränen & Jalkala, 2014). Additionally, the more complex the offering and intangible the value, the more beneficial would it be to follow the latter strategy.

2.2.3 Value elements

Anderson et al. (2009) argue that it is important to be elemental in value assessment. Elemental approach enables the supplier to identify the micro level benefits that make up the total customer value. Since the value of small single elements is easier to assess, the accuracy of total customer value should also increase (Anderson et al., 2009). Thus, one way to approach this is via a value stack (Anderson et al., 2009). The value stack principle is illustrated in Figure 5 below.

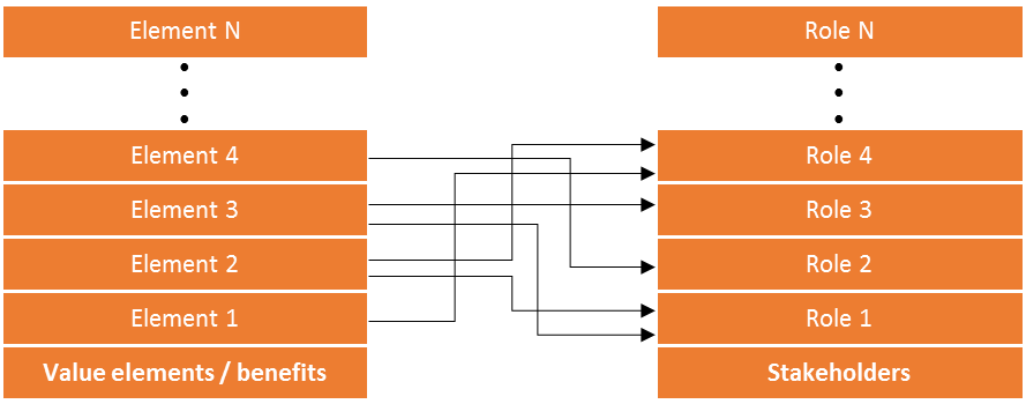

Figure 5. *An example of a value stack (Applied from Anderson et al., 2009).*

By placing the more important value elements at the bottom of the stack, the company also evaluate the value elements and categorize them in the order of importance (Anderson et al., 2009). In addition to this, the supplier should also identify the relevant roles in the purchasing team and create another stack again based on their importance (Anderson et al., 2009). The particularly useful feature of this approach is that each value element can be joined with the related stakeholder, identifying the needs and ensuring that what the suppliers considers important is also important to the customer. This can help later coordinate the communication of the benefits to the relevant stakeholders (Frow & Payne, 2011) or customers (van Rensburg & van Niekerk, 2010). The process can also work vice versa by going through the relevant stakeholders in the customer organization and developing the offering according to features they might consider beneficial.

Another good practical example of identifying different value elements as well as stakeholders interested in them is in the study done by Lindgreen et al. (2009). Instead of approaching the case from a value stack point of view, their approach emphasized the decision-making process resulting in a value matrix. Thus, in addition to elements and stakeholders, they also measured the purchase process over time. They also identified three major value elements: product elements, service elements and supplier elements. While there were minor differences on how important these main element levels were for different groups, the differences were much more visible on a subcategory level (Lindgreen et al., 2009).

The study by Lindgreen et al. (2009) suggests that clinical organization roles were most interested in clinical value elements, operational roles in technical and usage related value elements, and business roles in supplier relationship and brand related value elements. Price related issues, for example, were most interesting for clinical and business roles, while customer experience differentiation was considered important, especially for the business influencers as this way they differentiated themselves from the competitor clinics and hospitals (Lindgreen et al., 2009). The image quality mainly considered business and clinical roles while adjustability had a high impact on operational roles (Lindgreen et al., 2009). Additionally, operational roles valued easy patient handling highly, while business and clinical roles were also interested in interoperability between different sites and locations (Lindgreen et al., 2009). In supplier related elements, there are not any specific interests, but it seems that business roles are more interested in them than other groups (Lindgreen et al., 2009). The same phenomenon seems to occur in the brand related elements, apart from buyer-seller relationship being of high value for business roles (Lindgreen et al., 2009). Overall, it seems that stakeholders seem to be interested in value elements that can have a direct impact on their own work.

As a conclusion, Lindgreen et al. (2009) suggest that while all the different roles have a need for the same product, their interests on different benefits or value elements can differ quite much. This separation of value elements should make assessing total value easier (Anderson et al., 2009), but it should also help focus value communication to the relevant

stakeholders (van Rensburg & van Niekerk, 2010). Thus, the results of their study would suggest that considering this ideology when developing the value proposition can prove to increase the chance of making a successful sale.

2.3 Value communication through a value proposition

2.3.1 Value propositions and separating the benefits

When discussing communicating customer value, the research of then discusses value propositions. However, like customer value, there seems to be no clear agreement on the concept of customer value proposition; there is no criteria on what makes a value proposition persuasive and companies create them without backing them up (Anderson et al., 2006). Thus, Anderson et al. (2006) argue that "Suppliers can provide such a [simple and captivating] customer value proposition by making their offerings superior on the few elements that matter most to target customers, demonstrating and documenting the value of this superior performance, and communicating it in a way that conveys a sophisticated understanding of the customer's business priorities." Therefore, for an offering that already has the potential to deliver superior value to the customer, the emphasis stands on demonstration and documentation. As such, the previously discussed value assessment as well as the value proposition have a great role in enabling the success of the sale.

Once the customer value has been assessed, it also needs to be communicated. As previously discussed, the total customer benefits and costs consist of different value elements (e.g. Anderson et al., 2009). However, some benefits are similar to the competitors' offered benefits, which means that they do not encourage customers to choose the particular company's solution even though it brings value to the current situation (Anderson et al., 2009). Similarly, different customers might measure the value differently by using different investment calculation methods or different key performance indicators. These factors are some of many that influence how the customer perceived value needs to be communicated and is finally accepted. Therefore, just assessing the total customer value and comparing it with the price might not be sufficient. Instead, the communication of customer value is done by creating a value proposition. By Kotler and Keller's (2012) definition: "Value proposition consists of the whole cluster of benefits the company promises to deliver; it is more than the core positioning of the offering." The development of the value proposition therefore starts by identifying and separating different types of value elements, so that their relevancy could later be measured.

Total customer value often consists of multiple types of benefits, some of which are harder to identify and evaluate. One quite easy way to categorize benefits is to separate them into economic and non-economic benefits (Anderson et al., 2009). If the offering can increase sales, decrease costs or do both at the same time, it has a clear economic benefit (Anderson et al., 2009). However, some psychological benefits for example can

be impossible to evaluate in economic terms. Thus, economic benefits create the structure of the value proposition while non-economic benefits help to increase the brand and make the relationship stronger (Anderson et al., 2009). In addition to economic and non-economic categorization, the benefits can also be evaluated based on their tangibility (Anderson et al., 2009). A tangible benefit is easier to grasp and evaluate while an intangible benefit might need some convincing to be communicated successfully. Thus, intangible benefits are often identified by the customer and support the relationship between the supplier and the customer. Additionally, these two categorizations are not substitutive but concurrent instead. Therefore, these scales can be combined to a 2-by-2 matrix (Anderson et al., 2009), as is illustrated in Figure 6 below.

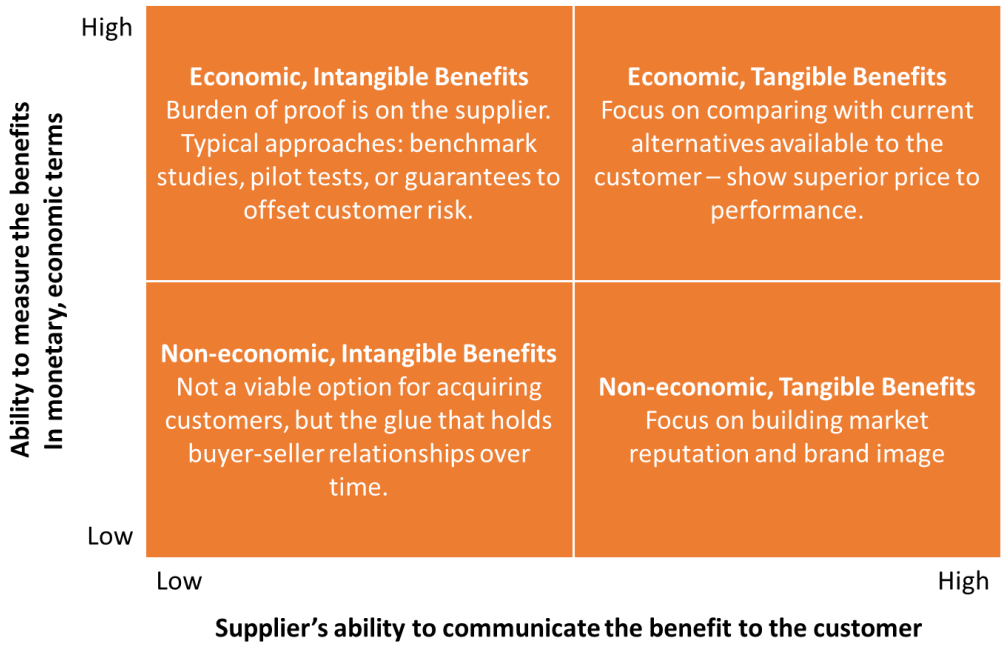

Figure 6. *Typology of customer benefits (Anderson et al., 2009)*

Anderson et al. (2009) suggest starting from economic tangible benefits to communicate the value, when pursuing new orders. After the economic tangible benefits have been communicated, non-economic tangible benefits can be used to differentiate the offering from competitors. Once the differentiated offering has been communicated, intangible benefits can be used to create a strong customer relationship starting from the economic ones (Anderson et al., 2009). However, while tangible economic benefits are easier to argue, the impact of the intangible and non-economic benefits should in no way be undermined. A study by Hansen et al. (2008), for example, found a relatively strong link between corporate reputation, information sharing and flexibility influencing the customer perceived value. Thus, different types of benefits have a corresponding role in the perceived value, but assumptions concerning their effectiveness can be misleading.

The typology of customer benefits in Figure 6 (Anderson et al., 2009) gives a good principle for value element categorization. While this principle illustrates the basic logic of

using different value elements to develop a value proposition, it lacks some perspective on the limitations of purchasing processes. First, the value propositions can be quite complex (Anderson et al., 2009), meaning that each value element most likely has both economic and non-economic benefits as well as tangible and intangible benefits. Second, some value elements might not be that important for all potential customers or members of the buying center. This stakeholder and buying center perspective will be discussed more in-depth in Chapter 3.2.2. In a more specific study on value propositions, Anderson et al. (2006) argue that the best practice is to analyze the main points of difference, demonstrate them and communicate them in a robust way. Thirdly, there is also a need to communicate the value "… in a timely manner." (Anderson et al., 2009), as the purchasers only have a limited time to allocate for meetings with the potential suppliers.

2.3.2 Evaluating the benefits

To evaluate the benefits further and create a functional value proposition, Anderson et al. (2006) reviewed most relevant literature and case studies concerning developing value propositions and summarized their findings with the Table 2 below.

Table 2. *Three kinds of value propositions (Anderson et al., 2006).*

Value proposition:	All Benefits	Favourable points of difference	Resonating focus
Consists of:	All benefits customers receive from a market offering	All favourable points of difference a market offering has relative to the next best alternative	The one or two points of difference (and, perhaps, a point of parity) whose improvement will deliver the greatest value to the customer for the foreseeable future
Answers the customer question:	"Why should our firm purchase the offering?"	"Why should our firm purchase your offering instead of your competitor's	"What is most worthwhile for our firm to keep in mind about your offering?"
Requires:	Knowledge of own market offering	Knowledge of own market offering and next best alternative	Knowledge of how own market offering delivers superior value to customers compared with next best alternative
Has the potential pitfall:	Benefit assertion	Value presumption	Requires customer value research

Evaluation of benefits is a comparison with the current state and competitors. This way, benefits can be divided into points of difference and points of parity (Anderson et al.,

2006). Points of difference are benefits that differentiate the offering from its competitors, while points of parity are benefits that also exist in other offerings or as the industry standard (Anderson et al., 2006). Similar to Anderson et al. (2006), Kambil et al. (1998) categorize the value elements to four categories. These categories are basic, expected, desired and unanticipated value elements (Kambil et al., 1998). Basic elements act as industry standard and expected elements are the ones competitors are also delivering (Kambil et al., 1998). These elements correspond with the points of parity discussed before. Desired elements are something that the customers are looking for but have not found yet, at least with good enough performance to cost -ratio (Kambil et al., 1998). Moreover, unanticipated elements are something that the customer needs but does not realize to ask for, which is why these elements have the highest potential (Kambil et al., 1998). As such, these two latter elements are similar to the favorable points of resonance discussed next.

Some companies tend to list all their benefits (Anderson et al., 2006). This requires the least work as the used information is based on their own offering. While the benefits would arguably exist, they might not be desired by the target customers. Similarly, some or even most of the benefits might be similar to the benefits provided by the competitors. While these points of parity bring value to the customer, they do not differentiate the offering from those of competitors (Anderson et al., 2006). Following the line of differentiation, the next step would be to identify the favorable points of difference (Anderson et al., 2006). This way the company stands out from its competitors, bringing unique benefits to the customers (Anderson et al., 2006).

However, there are still some drawbacks concerning this approach as well. Mainly, the identified points might not be interesting for the target customers, meaning that there had been a value presumption on how the customers would appraise their offering (Anderson et al., 2006). Therefore, the next step would be to identify which of the favorable points of difference actually bring value to the customers. These resonating points of focus can draw the customers' attention, differentiate the company's offering from the competitors and justify the relationship between the benefits and the price (Anderson et al., 2006). However, these points still need to be identified, demonstrated and communicated in a way that the customers know that the company understands key elements of their business (Anderson et al., 2006).

2.3.3 Choosing the presentation method

The importance of monetary evaluation of value has been emphasis in several occasions already. However, when customer value is analyzed with a high emphasis on accounting information, it is not only important on what is being communicated but also how. Different studies (e.g. Cardinaels, 2008; Cardinaels & van Veen-Dirks, 2010; Ohlert & Weissenberger, 2015; Cuganesan & Dumay, 2009) have been done on how different information presentation formats enable receivers to assess the information they are receiving,

analyze it and make accurate decisions based on the information. It seems that visualization can help adopt intangible issues such as intellectual capital (Cuganesan & Dumay, 2009) or complex data such as tables and other unformatted data (Cardinaels, 2008).

Based on the findings of the study, Cardinaels (2008) suggest two methods to get the most out of the potential of accounting information. First, the selecting a right presentation format based on the accounting sophistication of the decision maker can prove to get more out of the analysis (Cardinaels, 2008). Second, there can be a higher chance of unexpected judgement if the accounting information format does not fit the mental model of the decision maker (Cardinaels, 2008). Cardinaels (2008) also points out that it could be interesting to let the decision makers choose the format they prefer. However, just focusing on graphical format is not necessarily enough. Cardinaels & van Veen-Dirks (2010) studied the differences between a balanced scorecard and unformatted scorecard to identify what kind of measures receive most weight in making decisions. Their findings suggest that different arrangements formats and marking usage can have a quite high impact on which measures the decision maker focuses on (Cardinaels & van Veen-Dirks, 2010).

A study by Ohlert & Weissenberger (2015) suggests that visual presentation formats can significantly help reducing biases. Like many studies in this area, their study is based on an experimental approach using Bayesian inference tasks to study the problem-solving capabilities of both non-business students and business students. It also seems that visual formats succeed tabular formats, especially with the non-business students (Ohlert & Weissenberger, 2015). They argue that this could be the result of business students being more familiar on tabular formats based on the educational background (Ohlert & Weissenberger, 2015).

Interestingly, the study by Ohlert and Weissenberger (2015) also analyzes the role of cognitive styles in making correct judgements. Compared to their prior expectations, it seems that there were no major differences in the accuracy of judgement, with the exception of poor thinking style with low faith in intuition and low need for cognition clearly having the lowest judgement accuracy (Ohlert & Weissenberger, 2015). Similarly, their study suggests that the amount of statistical knowledge has no impact on the judgement accuracy (Ohlert & Weissenberger, 2015). However, the reason for this could be that the variance in statistical knowledge between the participants was quite low. Additionally, it is important to note that the experimental research approaches used in all three studies (Cardinaels, 2008; Cardinaels & van Veen-Dirks, 2010; Ohlert & Weissenberger, 2015) also mean that there is a chance that the findings will not be applicable in real-life organization context. Still, the results would highly suggest that there could be some benefits putting effort to the both the visual format and arrangement of the accounting information taking also the recipient into consideration.

2.3.4 Creating and differentiating value propositions

Once the value elements have been identified and evaluated to find the resonating points of difference, the next step is to choose a best combination for the value proposition. Here, it is important to identify the most influential stakeholders (Frow & Payne, 2011) and the relevant value elements (Anderson et al., 2006). It should also be noted that the stakeholders and their preferences might differ between potential customers and while some generalizations can be made, each customer should be interacted with at least somewhat unique way (van Rensburg & van Niekerk, 2010). This, however, is difficult without any structured principle for different types of interactions (Pruchnow et al., 2006).

One way to create a value proposition mixture is by combining one point of parity with two points of difference (Anderson et al., 2006). This type of value proposition is called a distinctive value proposition (DVP) (Anderson et al., 2006). What is good about this approach is that it efficiently both demonstrates the necessary level of performance with the point of parity, but also emphasizes the points of difference that have a resonating focus. Moreover, the one point of parity also makes sure that the customer knows the supplier is capable of delivering the same level of quality as the next alternatives (Anderson et al., 2006).

Another important perspective to value propositions is that sometimes companies might need to customize value propositions for different types of customers (van Rensburg & van Niekerk, 2010). The reason for this is that each customer and role in customer organization consider a different portfolio of value elements to be important (van Rensburg & van Niekerk, 2010). This is especially the case if there is much variance in the types of customers even if they are considered part of a same segment. On the other hand, it might not be enough to develop a value proposition for the different types of potential customers but sometimes it might be necessary to even create a value propositions for specific stakeholders (Frow & Payne, 2011).

Anderson et al., (2009) argue that the supplier should make sure that every stakeholder able to influence a purchase should be aware of the customer value of the offering. Taking things further, Frow and Payne (2011) argue that as customers seldom exist disconnected from the outer world but instead relate to other markets. Therefore, suppliers should also focus some effort to developing value propositions to other stakeholder markets, such as internal, referral, influence, recruitment and alliance markets (Frow & Payne, 2011). These stakeholder markets have the potential to enable or even support a sale, but also prevent or undermine the potential of an offering. Lastly, Frow and Payne (2011) argue that from the stakeholder perspective, it is more important to focus on increasing company's value than trying to maximize profit.

A paper by Pruchnow et al. (2006) discusses how differentiation is the key to success in high-tech industries. However, unlike the consumer market, differentiation in B2B focuses more on operation of the business (Levitt, 1980), such as customer interactions and service support (Ulaga & Eggert, 2006; Pruchnow et al., 2006). Pruchnow et al. (2006) specifically consider scenarios where suppliers are getting stuck in the middle of providing transactions and intimate customer relationships. One of the suggestions is that companies should segment their customers based on the intensity or complexity of the interactions, which also supports the discussion by Ulaga and Eggert (2006). This means that they should provide simple standardized products to some while also being able to provide highly customized interactions with others, naturally depending on the customer preferences. They also suggest that by doing so, companies save costs by standardizing some of the sales processes and differentiating others. Similarly, the findings of Ulaga and Eggert (2006) suggest that the relationship value perspective surpasses cost perspective as the relationship costs consists of maybe 20 % of the total cost while relationship benefits can be four times more important. As a result, they argue that companies should change from traditional customer segmentation to customer-interaction based segmentation.

The logic of the concept is that companies should segment based on the behavior of the customer instead of categorizing them based on other traditional indicators such as customer size or geographical location (Pruchnow et al., 2006). While this might prove a useful tool in some supplier-customer relationships, this idea can also be applied when communicating with different decision makers inside an organization. The importance of communication becomes even more important if the value element is in financial format. For example, if the receiver such as a factory worker has little-to-none knowledge around accounting, a simple solution-based communication might work better while a chief financial officer (CFO) with a degree in financing might prefer quite detailed information. Several researchers (i.e. Cardinaels, 2008; Ohlert & Weissenberger, 2015) have studied the effects of different information presentation formats, and one of the common outcome seems to be that the level of accounting knowledge influences on how well different presentation formats are received. While graphical format seems to be best received regardless of the background of the decision-maker, people with financial background are able to make more accurate judgements with information presented in tabular format (Ohlert & Weissenberger, 2015). Therefore, the role of accounting information and managerial decision making requires some attention.

2.4 Measuring customer value using management accounting

As a summary of this chapter, the concept of customer value has been discussed from multiple perspectives. Customer value can be used to measure the benefits and costs resulting from purchasing the company's offering. However, while costs can be measured to relative degree, benefits are much more difficult to assess. For this reason, companies

can conduct a value assessment with their preferred level of effort. Value assessment can be used to develop the value proposition especially in the early stages of the offerings life-cycle, but it can also be used to identify new sources of value. On the other hand, even though the supplier might get a decent understanding of the customer value, the value communication requires some attention. Thus, some discussion should be put to limitations and current research gaps in the field of customer value.

As previously discussed, there has been some confusion in the status of research about if customer value exists objectively or if it is always subjective. One of the latest trends is service-dominant logic (S-D logic) (Lusch & Vargo, 2014), which differs from the traditional goods-dominant logic (G-D logic). The traditional goods-dominant logic views transactions roughly as follows: suppliers manufacture products and therefore add value to the value chain, these products transferred to customers or consumers that consume the product in exchange for money and, by doing so, the suppliers create defined amount of value for customers to consume (Lusch & Vargo, 2014). However, Lusch and Vargo (2014) argue that "… value creation is a joint function of the service provision of multiple actors, as integrated by the beneficiary." This S-D logic suggests that actors (suppliers) give other actors (i.e. customer) the necessary recourses such as tangible products and related knowledge that can be integrated by the customer actor to co-create value (Lusch & Vargo, 2014). Therefore, every interaction is different (Vandenbosch & Dawar, 2002), and the value does not exist by itself but needs to be co-created with the customer (Komulainen, 2014).

Frow and Payne (2011) summarize the relationship of value co-creation and value propositions by suggesting: "Value is co-created in-use with both parties playing a role and the VP [value proposition] sets expectations of value in-use." Thus, companies can only offer value propositions and costs, but the value manifests only during value-in-use (Frow & Payne, 2011). This also means that different customers might not be able to use the full value potential of the offering, which reflects on the customer perceived value. Thus, companies need to put effort to making sure that each stakeholder recognizes the customer value and can utilize most of it.

Since companies often compare total customer value with the economic cost of the offering, there is a clear need to monetize customer value as well. Not only has this need been discussed many times in several studies (e.g. Anderson et al., 2006; Keränen & Jalkala, 2013), but if the offering can cover its economic cost and still bring additional value, it would make sense for a customer organization to make the purchase from financial perspective. However, to monetize the customer value, tools such as management accounting might be required. Moreover, managers also need to understand the organizational decision making to successfully communicate customer value. Therefore, these two topics need to be reviewed further.

3. MANAGEMENT ACCOUNTING IN DECISION MAKING

3.1 Management accounting

3.1.1 Information types and accounting principles

There are several terms used to define the different levels of information. First, there is accounting data. When the information is in the form of data, it is hard to make any interpretations based on it (Suomala et al., 2011). Data usually consists of tables of raw entries or unprocessed information that, while being useful for the original purpose, does not bring much value for managerial purposes. Therefore, this data must be refined to accounting information such as reports or calculations by using accounting tools (Suomala et al., 2011). However, while this accounting information is more refined summary of a certain interesting phenomena, the information by itself does not bring much value, but instead must be interpreted. Whether the interpretation is done by the person who refined the accounting information or a manager who interprets the provided calculations, during the interpretation this information is transformed into knowledge that can be applied in the managerial work (Suomala et al., 2011; Hall, 2010). Taking things further, combining the knowledge from many sources of information can result in financial understanding, meaning that the person understands the cause-and-effect relations between different objects (Suomala et al., 2011). In the final level, this understanding must be applied correctly to make the right decision and this ability to do this is called wisdom (Suomala et al., 2011).

Accounting is commonly divided to two different categories; financial accounting and managerial accounting (Horngren et al., 2005; Suomala et al., 2011). Financial accounting is a legal responsibility of all companies. It consists of financial statements including income statement and balance sheet and follows the bookkeeping of the company (Suomala et al., 2011). This type of accounting and reporting is external (Horngren et al., 2005) and its purpose is to provide information about the last fiscal year to the shareholders, other stakeholders as well as the government and tax offices (Suomala et al., 2011). Interestingly, while financial accounting is systematic, there can be differences in the quality of the financial accounting depending on the industries. Chaney et al. (2011) argue that there is a clear difference between the accuracy and quality of accounting information between companies that are politically connected and ones that are not. They argue that politically connected companies stand a chance to publish lower quality accounting information because they are less dependent on market pressure (Chaney et al., 2011). Nevertheless, while financial accounting has a regulative purpose, it is also sometimes used as a basis of managerial accounting.

Management accounting analyses financial information with the purpose of giving support to management (Horngren et al., 2005). Instead of providing information for regulative purposes, it is provided for specific operative and strategic management tasks (Atkinson et al., 2004; Horngren et al., 2005). It can be provided as recurring service to for example performance measurement or cost management purposes, or nonrecurring to specific needs such as unique investments (Horngren et al., 2005; Suomala et al., 2011). In many cases, the managerial accounting is also aimed to be future oriented instead of historical, as it is typical for financial accounting (Atkinson et al., 2004). Additionally, cost management is sometimes separated as an independent accounting category, used by managers in short- and long-term management of costs (Horngren et al., 2005).

3.1.2 Accounting systems and strategic management accounting

Accounting information by itself does not bring much value to the organization, as the previous discussion implies. Instead, accounting information is used by managers to develop knowledge that assists them in future decisions (Hall, 2010). However, to refine the accounting information to knowledge that helps managers in their decision-making, different systems are required. Commonly used terms for these systems are management accounting systems (MAS), management control systems (MCS) (Suomala et al., 2011) and management accounting and control systems (MACS) (Atkinson et al., 2004). Management accounting systems, or MASs, consist of information systems, principles and frameworks used by the organization and its employees to organize their accounting information (Suomala et al., 2011). Management control systems, or MCSs, on the other hand, mean all the mechanisms the organization decision-makers use to ensure operations that fit the company's objectives (Suomala et al., 2011). In contrast to Suomala et al. (2011), Atkinson et al. (2004) discuss combined system of management accounting and control systems, or MACSs, which are a combination of the two. Management accounting and control systems are considered as larger entities that generate and control accounting information with the purpose of aiding managers in decision-making and evaluating organizational performance (Atkinson et al., 2004). However, while the aim of management accounting is to be future oriented, MAS systems have still been criticized for being internal and history oriented (Drury, 2007 cited in Al-Mawali, 2012). Therefore, some limitations of these systems have been tried to overcome with the concept strategic management accounting (SMA) (e.g. Horngren et al., 2005).

Strategic management accounting (SMA) is an approach to make accounting more strategy oriented (Roslender & Hart, 2003). Thus, it combines principles from both management accounting and marketing management, with a strategic management perspective (Roslender & Hart, 2003). Similar to traditional management accounting, SMA consist of a set of tools that are strategy oriented such as activity-based costing (ABC), target

costing, product life-cycle costing, customer profitability analysis and backflush accounting (Horngren et al., 2005). However, there is still a lack of clearly defined role for SMA (Roslender & Hart, 2005; Cadez & Guilding, 2008). Cadez and Guilding (2008) argue that just implementing strategic management accounting does not necessarily relate to higher performance, but a well-executed match of other possible factors and the SMA on the other hand can. Thus, SMA does not create value just by itself, but instead when used in right circumstances. Nevertheless, one of the interesting approaches to tackle management accounting tools application, especially within service business, is customer accounting (CA) (Atkinson et al., 2004).

Sometimes it can be more beneficial to measure different customers instead of product costs. Customer accounting (CA) is a tool that measures the profitability of the organizations customers (Atkinson et al., 2004). CA originated from the need to allocate non-manufacturing costs such as marketing expenditure but proved to be quite useful in analyzing different customers (Atkinson et al, 2004), which could create a lot of potential in the service industries. A study by Cadez (2006) suggests that customer accounting is indeed more useful in companies with an emphasis on providing services and other people-oriented industries. Similar to the study by Cadez (2006), Guerreiro et al. (2008) studied the concept of cost-to-serve as a tool for customer accounting. Their findings suggest that CA and, more specifically, cost-to-serve can provide accurate information in identifying the profitability of different sales channels and specific customers regardless of the industry (Guerreiro et al., 2008). Thus, while there are mixed results in the impacts of CA analyses, there are some indications that it can help manage organization profitability and performance (Al-Mawali et al., 2012). However, it should be noted that CA focuses on profitability of having customers instead of analyzing the customers' profitability. Hence, there is scarce research on if there are any benefits from managing or helping customers manage their own profitability. Instead, the management of customers' profitability is more often considered a part of customer value management (Anderson et al., 2009).

3.1.3 Activity-based costing as a tool for baseline assessment

While management accounting includes a large set of accounting tools (Suomala et al., 2011), this thesis mainly discusses costing tools with a focus on activity-based costing (ABC) as a tool to unveil process costs and customer value potential. The reason for this is that activity-based costing is considered a good tool to identify indirect costs and cost-to-serve, which are particularly helpful in analyzing different customers (Guerreiro et al., 2008). Additionally, the activity analysis provides an excellent tool for identifying the key resources and the key activities of the inspected process, which then can be measured using activity-based cost assessment. Thus, it would seem that activity-based costing has multiple purposes when utilized in value assessment.

To clarify the activity-based costing tool further and implement it as part of the empirical study, it needs to be discussed shortly. Activity based costing originated from a more

accurate need to allocate indirect costs (Suomala et al., 2011). The traditional costing methods such as contribution costing and full costing can easily result in cost smoothing where the indirect costs are averaged for each product (Horngern et al., 2005). This can result in product under-costing where costs are underestimated or product over-costing where too many costs are allocated for a product. The need for a more accurate system particularly grew as the complexity of the companies' product portfolios started to increase (Suomala et al., 2011). Simultaneously, the share of indirect costs increased further decreasing the accuracy of the commonly used contribution costing and full costing methods (Suomala et al., 2011). Therefore, there was increased interest to manage the indirect costs and to understand the profitability of different customers. At the same time, the development of IT-technologies enabled the use of more advanced costing methods (Suomala et al., 2011).

The focus of ABC naturally lies in activities (Suomala et al., 2011). Thus, the process of allocating the indirect costs starts by identifying and categorizing used resources, activities as well as target cost objects. The process is illustrated in Figure 7.

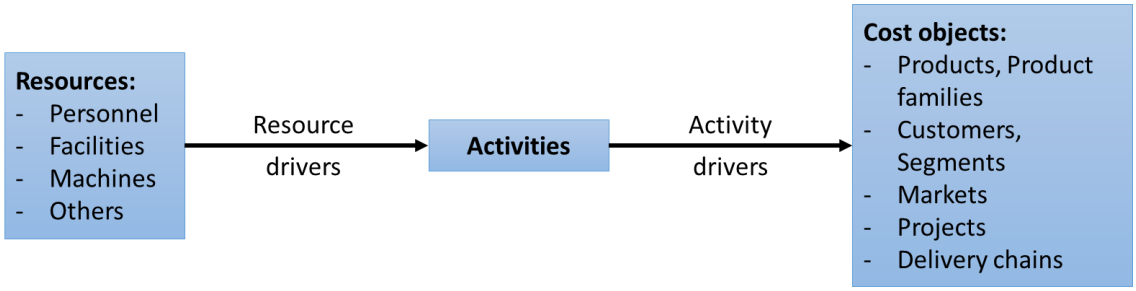

Figure 7. *The process of activity-based costing (Suomala et al., 2011).*

Resources can be divided into homogeneous indirect-cost pools where the costs are allocated with a same cause-and-effect relation (Horngren et al., 2005). Activities are units of work that relate to the cost object (Horngren et al., 2005). Cost objects, on the other hand, are the targets that costs are allocated to. These can be products, services, customers (Horngren et al., 2005), as well as markets, projects or even delivery chains (Suomala et al., 2011). The resources can then be directed at activities using resource drivers and activities can be directed to cost objects using activity drivers (Suomala et al., 2011; Horngren et al., 2005). Since the resource drivers and activity drivers should be defined in a way that they can be measured, it is possible to calculate the cost per activity and use it to calculate the share of this activity per cost object based on the amount of activities needed per cost object.

The activity-based costing process supports baseline assessment phase of value assessment by providing a systematic way to identify relevant resources, activities and target objects. This is especially the case, when total customer value largely consists of some kinds of cost savings. However, there is some criticism towards ABC. First, the complexity of the costing method can more easily create errors. Datar and Gupta (1994) have

divided the errors into three categories: measurement errors, aggregation errors, and specification errors. However, these errors are mainly the result of bad measuring or defining, meaning that the errors arise if the tool is applied poorly (Suomala et al., 2011). Second, some critics complain about the work effort needed to run an ABC system as well as that increased complexity might not necessarily increase accuracy (Suomala et al., 2011). Additionally, the implementation of an ABC system can often result in resistance due to economic, political or organizational culture origins (Malmi, 1997), which can result in implementation errors and even failures (Horngren et al., 2005). These errors should be kept in mind when applying ABC in value and cost assessment.

3.2 Managerial decision making and decision making processes

3.2.1 Managerial decision making and decision types

According to Teale et al. (2003), decision-making becomes quite a complex phenomenon since it can take quite a many different forms. There is a large variety of different decision-makers, decisions, contexts, purposes, methods and dimensions related to decision-making resulting in unique decision-making situations (Teale et al., 2003). Thus, finding an unambiguous definition is almost impossible. Nevertheless, some different definitions for it are listed below:

> *A commitment to action.*
>
> *(Mintzberg, 1983 quoted by Teale et al., 2003)*

> *The act or process of making choices or decisions with a group of people, especially in business or politics.*
>
> *(Merriam-Webster, 2017)*

> *A moment, in an ongoing process of evaluating alternatives for meeting an objective, at which expectations about a particular course of action, impel the decision-maker to select that course of action most likely to result in attaining the objective.*
>
> *(Harrison, 1999 quoted by Teale et al., 2003)*

> *Decisions are situation-behavior combinations ..., which can be described in terms of three essential components: alternative actions, consequences, and uncertain events. ... Decision making refers to the entire process of choosing a course of action.*
>
> *(Hastie, 2001)*

The similarity between these definitions comes from having a point or several points in time where a certain action is needed and this action lead to certain outcome. These steps are conceptualized by Hastie (2001) who approaches decisions from a decision tree point of view with decision leading to a roadmap of different outcomes. The main components in this decision framework are the courses of action (i.e. alternatives or decisions), outcomes and uncertain events (Hastie, 2001). A template for this is illustrated in Figure 8.

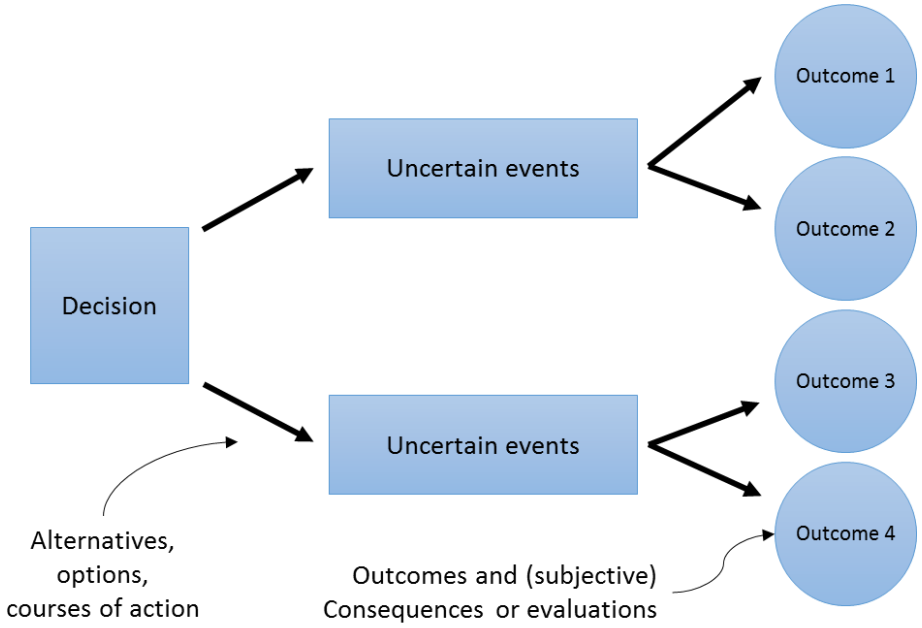

Figure 8. *Definitional template for a decision (Hastie, 2001).*

Simply put, a manager uses his judgement within the decision-making process to select preferable a course of action (Hastie, 2001). These actions are influenced by potential uncertain events and result in certain outcomes. Judgement in this case relates to assessing, estimating and inferring the possible events and what reactions in those scenarios are needed (Hastie, 2001). Outcomes are the describable potential results of the decision and other occurred events that can result in subjectively measured consequences and can be measured on the level of good-to-bad or gain-or-loss (Hastie, 2001).

Traditionally it is thought that decision-making is needed to coordinate and control different functions, therefore being a key role of management (Teale et al., 2003). This would also suggest that decision-making is based on rationality, weighting different alternatives and making a choice based on hard facts (Certo et al., 2008) such as accounting information (Horngren et al., 2005) or other fact-based information. However, this is hardly the case and there are reasons such as biases (e.g. Certo et al., 2008) that might result in irrational decision-making. According to Teale et al. (2003), one way to categorize systems of decision-making is the division between System 1 and System 2 types of decisions. These are illustrated in Figure 9.

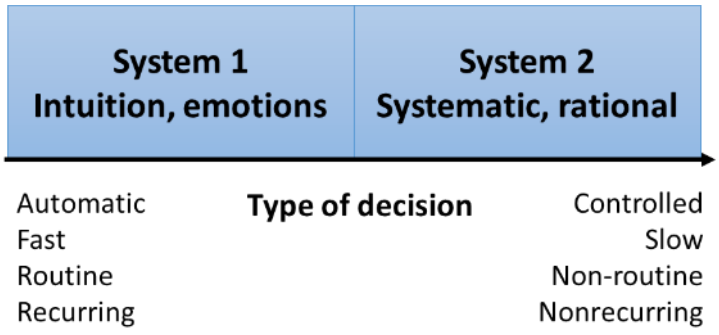

Figure 9. *The two cognitive decision-making systems (based on Stanovich, 1999).*

System 1 types of decisions are often more automatic, routine and recurring, meaning that they are often done on impulse and based on emotions (Certo et al., 2008; Teale et al., 2003). Commonly the impacts of these decisions are perceived to be quite small and more limited by time than impact, so basing these on intuition could be justified. However, while this accelerates decision-making, the quality of the decision is compromised (Eisenhardt, 1990). On the other hand, System 2 types of decisions are more controlled, non-routine and nonrecurring, and they require a more systematic and rational process (Certo et al., 2008; Teale et al., 2003). As such, it would be reasonable to assume that in System 2, all decisions are based on careful analysis and neutral evaluation of alternatives. However, as Certo et al. (2008) and Hall (2010) argue, this is rarely the case and there are multiple biases controlling the decision-making.

Regardless of the types of decisions, their outcomes are often a mixture of probability and impact. Teale et al. (2003) for example argue that: "Uncertainty and doubt will always interfere with managerial decision-making unless clarified through improved communication and risk assessment." Therefore, when managers are making decisions between alternatives, they tend to review the outcomes of each alternative. In addition to different outcomes, each decision has some risk, meaning there is some uncertainty involving if the outcome will occur or not (Teale et al., 2003). The simple way to consider the risk is to multiply the possible outcome with the risk. However, this is rarely enough; as it is often almost impossible to estimate the probability of the outcome other than on a relative, "from small to large" scale (Teale et al., 2003). Similarly, there most often are multiple possible outcomes for a decision with each outcome having a unique probability resulting in quite complex array of possibilities. There are management accounting tools such as expected value and decision trees (Suomala et al., 2011) that support in evaluating multiple outcomes and probabilities.

It would be misleading to assume that managerial decision-making consists of decisions as the final output. More often, a decision-making situation is more of a process with multiple micro decisions than a process of gathering information that leads to a single decision. In some cases, it might be even hard to find any decision that would be most important and relevant from the process perspective. Thus, managerial decision-making

focuses more on change instead of choice (Jönsson, 1998). Therefore, managerial decision-making consists more of a process with multiple steps and an aim to change something. In addition, there are often multiple persons involved in managing this change.

3.2.2 Decision-making process and the stakeholder perspective

In managerial decision making, a decision is often a result of a group effort, either consciously or unconsciously. This is especially the case in the public sector, where stakeholder networks are typically complicated and stakeholders have varying ambitions. To develop the communication to these different stakeholders, the process and stakeholder perspective must be also discussed. This is especially important in a case where accounting information is provided to support the decision (Hall, 2010). In these cases, there is often some kind of teamwork influencing the decision and all stakeholders do not necessarily have the same level of financial understanding (Cardinaels, 2008). A good way to illustrate these two dimensions is by looking at a purchase process.

Typically, there are some stakeholders with interest and possibility to influence a purchase process. This bundle of stakeholders is often called a buying center (Webster & Wind, 1972). Based on Webster and Wind (1972) and expanded by Anderson et al. (2009) and Kotler and Keller (2012) a typical buying center consists of five to seven roles. These roles are:

1. Initiators
2. Users
3. Influencers
4. Deciders
5. Approvers
6. Buyers
7. Gatekeepers

Compared to Webster and Wind (1972) Anderson et al. (2009) and Kotler and Keller (2012) have included the initiator and Kotler and Keller (2012) the approver roles to the buying center. Each role has a certain relationship and a level of involvement in the decision. An initiator realizes the potential of the offering and, thus, initiates the purchase process (Anderson et al., 2009). A user is later responsible of implements the offering in his or her work (Anderson et al., 2009). Influencers have an impact in the decision process by providing information that influences the purchase (Webster & Wind, 1972). Deciders have authority over the alternatives (Webster & Wind, 1972), and ultimately choose the supplier (Anderson et al., 2009). Approvers can have a more indirect influence on the purchase decision by authorizing the buyers and deciders to make the purchase (Kotler & Keller, 2012). Buyers take care of the practical issues related to the purchase by choosing the alternatives, making specifications, and managing negotiations (Kotler & Keller,

2012). Finally, gatekeepers can control the information flows by limiting a potential supplier's access to the buyers or controlling information flows within the organization (Anderson et al., 2009).

There are two things to consider about the buying center perspective. First, the organizational roles are not set to specific individuals, but individuals can have several roles (Webster & Wind, 1972). Making things more complicated, the members might also be from outside the organization (Anderson et al., 2009). Second, while the organizational buying behavior is always based on individual behavior, the individual is influenced by other individuals in the buying center (Webster & Wind, 1972). Therefore, it is impossible to completely control the purchase process as the relationships between the individuals participating in the purchase are so complex. However, a supplier can influence the behavior of the buying center by making sure each member in the buying center is aware of the customer value (Anderson et al., 2009), as discussed previously in making value propositions.

The involvement of different stakeholders can vary between different steps of the decision-making process. Some stakeholders might be more involved in some steps, while ignored in others. Lindgreen et al. (2009), for example, discuss in their paper the purchasing process of high-tech products and delivering value in the health-care industry. Their study is based on a case study with a company delivering magnetic resonance scanners to medical use, and they apply the customer value analysis within the purchase process of the customer of the case company (Lindgreen et al., 2009). The main purpose of this analysis is to investigate the value elements and their importance during the purchase process, and to do this, they identified which influence-roles are involved in each step of the purchasing process. This is illustrated below in Figure 10.

Decision-influencers / Stages	Clinical				Operational		Business			
	Radiologist	Referring physician A	Referring physician B	Clinical physician	Technical services	Operator	Board of directors	Supervisory board	Purchasing manager	Department manager
1. Identify benefits of and acquire budget for magnetic resonance imaging scanner	X						X	X		X
2. Identify specification of magnetic resonance imaging scanner	X	X		X	X	X				X
3. Evaluate alternatives and select supplier of magnetic resonance imaging scanner	X	X		X			X		X	X

Figure 10. *Stages and decision influences in the purchasing process (Lindgreen et al., 2009).*

There were three major groups of decision influencers: clinical, operational and business influencers (Lindgreen et al., 2009). Each role in these groups were interested and able to influence the decision in different steps of the process, except for department managers and radiologists that were involved in the whole process (Lindgreen et al., 2009). Previously the decisions regarding high-tech machines was mainly done by clinical roles such as physicians, doctors and caregivers (Lindgreen et al., 2009). However, nowadays it seems that the business unit is more and more involved in the development to ensure cost efficiency. This is also supported by their literature study, which suggests that medical organizations have the need to provide higher quality service with lower cost (Lindgreen et al., 2009). As the case study by Lindgreen et al. (2009) suggests, decision-making especially in purchasing is not a unique moment on which the decision is made, but a process with multiple steps and multiple decision-makers. Thus, the seller must be able to provide the related information to the related stakeholders to be able to advocate the sale.

3.2.3 Biases related to decision-making

While managerial decision-making is often thought to be more systematic and rational than for example consumer decision-making (Certo et al., 2008; Teale et al., 2003), it is far from optimal. According to Certo et al. (2008), there are five main biases related to managerial decision-making. These biases are (Certo et al., 2008):

1. Framing and loss aversion.
2. Risk seeking.
3. Source dependence.
4. Escalation of commitment.
5. Overconfidence.

First, framing refers to framing potential outcomes with certain expectations based on the current situation (Certo et al., 2008). Thus, if the current situation is unprofitable resulting in losses, the managers might make irrational decisions just to avoid the losses (Certo et al., 2008). Similarly, managers might neglect a better investment choice just on the basis that the negative case of the sensitivity analysis results in losses. Certo et al. (2008) even suggest that managers "... are approximately twice more likely to try to avoid losses than favor gains…" An example of this kind of situation could be an investment that has had a longer payback period than expected. In this kind of scenario, the manager might frame each alternative based on the current situation and choose irrationally just to get out of the current situation. They might even take unnecessary risks to avoid the current losses as referred in the second bias (Certo et al., 2008).

Second, it seems that managers sometimes irrationally seek and evaluate risk (Certo et al., 2008). As related to loss aversion, managers seem to prefer a small chance of extensive losses to certain but smaller losses and they seem to also consider changes in probabilities non-linearly compared to the possible outcomes (Certo et al., 2008). This bias for

example partially explains why people enjoy gambling even though they know that the probabilities are against them.

Third, according to Certo et al. (2008) managers not only consider possible outcomes but also take the source of these outcomes into account. This phenomenon is called source dependence (Certo et al., 2008). This means that in some cases managers might prefer an option from a familiar source to a better alternative from an unfamiliar source. An example of this could be a manager choosing the next market entry. They might prefer a familiar country with higher risk to an unfamiliar country that has more potential. Similarly, they might evaluate two opportunities proposed by different people based on their previous relation to these people.

The fourth bias listed by Certo et al. (2008) is the escalation of commitment. This refers to making irrational choices in situations where the decision-maker has put a lot of effort to something (Certo et al., 2008). For example, it is often quite hard to cancel a development project that manager has put a lot of effort into, even though it might be highly unprofitable. In these cases, it might require an external person without any background with the project to be able to evaluate alternatives neutrally enough (Shimizu & Hitt, 2005; Certo et al., 2008).

The fifth and last bias listed by Certo et al. (2008) is overconfidence. This refers to managers regarding themselves higher to others, thus overestimating their own capabilities (Certo et al., 2008). This is especially dangerous in making estimations as managers might have higher expectations about themselves than they are really capable of. An example could be that the manager without any sales experience might overestimate how many products he can sell in a year and use that as a basis for sales estimations while doing budgeting. Certo et al. (2008) also remark that there are multiple other biases, but they considered these as the main biases managers and decision-makers can relate with. As such, these five biases should create a sufficient basis to understand that the traditional view on the managerial decision-making might not be enough to understand the whole practice.

3.3 The role of accounting in managerial decision-making

3.3.1 Roles of accounting

There are multiple ways to look at the role of managerial accounting (Suomala et al., 2011). Suomala et al. (2011) emphasize three perspectives to the role of management accounting. First perspective is as a support for decision-making processes (Suomala et al., 2011). This means that management accounting exists to provide support for decision-making and is shaped by the needs of decision makers (Suomala et al., 2011). The second perspective is as organizational function (Suomala et al., 2011). In this perspective, man-

agerial accounting exists as defined in the organization and it has its own specified resources often close to the top management of the organization. The third perspective is that managerial accounting is a set of calculation tools (Suomala et al., 2011). Here, management accounting would be a tool used based on the requirements of the situation and could be exploited by anyone who desires to do so. However, they also argue that these perspectives are not in any way exclusive but rather support each other (Suomala et al., 2011).

Accounting analyses mainly look at two separate time perspectives: ex-ante and ex-post. Simply put ex-ante analyses focus on estimating the future and ex-post analyses investigate what has happened in the past. These two types have completely different levels of accuracy, which is natural taking into consideration the material available for the analyses. As ex-post analyses use historical data generated before the analysis, the goal is to get as accurate understanding of the occurred phenomena as possible. This information can help better understand, for example, the occurred costs and product cost structures (Horngren et al., 2005). Ex-ante analyses, on the other hand, are predictions of the future, meaning that any relevant data available is applied to forecast how things will develop in the future. These analyses are used for planning and budgeting (Horngren et al., 2005). Thus, ex-ante analyses might depend on ex-post analyses, and vis-à-vis, ex-post analyses are used to confirm, track or control the accuracy of the ex-ante analyses (Horngren et al., 2005).

3.3.2 Tasks of accounting

Taking things to a more practical level, managerial accounting systems provide tools for different managerial decision-making situations. These situations often revolve around planning and control (Horngren et al., 2005) and roughly follow the process illustrated in Figure 11.

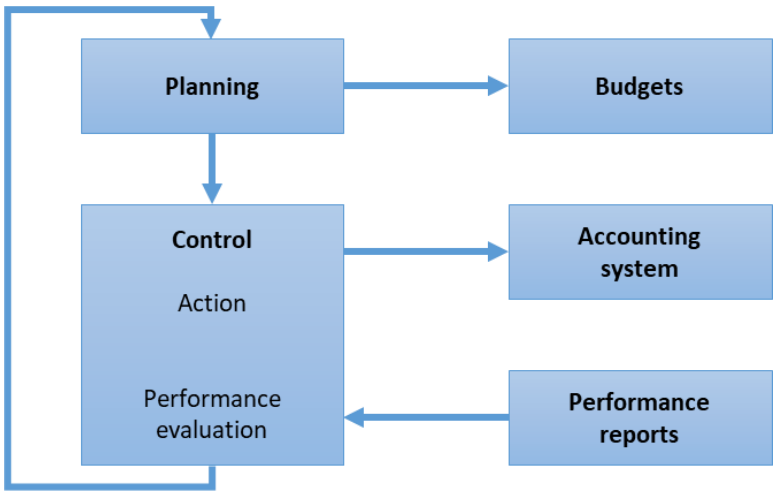

Figure 11. *The role of accounting systems in planning and control. (Horngren et al., 2005).*

The planning phase involves most uncertainty, as there is no actual data concerning the project. Therefore, the role of MAS in this phase is to provide ex-ante -based budgets that help managers to understand the scale of the project, guide it to the right directions and communicate the impacts within the organization (Horngren et al., 2005). Once the control phase starts, the role of accounting shifts from forecasting to monitoring, as the first ex-post data become available. Here the role of MAS is in helping managers organize the activities and make decisions that follow the set objectives (Horngren et al., 2005). Finally, when the project comes near to the end, the budget (ex-ante) and the realized costs (ex-post) are compared to evaluate the performance (Horngren et al., 2005), also enabling new planning and further development, which starts the process again.

Accounting information seems to be specifically useful in decision concerning operations management (Wouters & Verdaasdonk, 2002). This is especially the case in situations where the uncertainty is caused by insufficient knowledge about what kind of effects might and will happen (Wouters & Verdaasdonk, 2002). This type of information is useful when there is no sufficient knowledge about the relative influences of the possible consequences (Wouters & Verdaasdonk, 2002). Thus, it would seem that in these kinds of scenarios, accounting information could be used to translate the different consequences in to measurable scenarios, which would decrease the uncertainty involved in the decision. The students participating in the study also commented that, because they were working with multiple different departments and people with varying backgrounds, the process of translating the knowledge into a single model proved to be quite difficult and required the student to understand the operations of the company (Wouters & Verdaadsonk, 2002).

3.3.3 Usage of accounting information

Wouters and Verdaasdonk (2002) also discuss how there are multiple dimensions or levels in decision-making and accounting information acts as a tool to translate these dimensions into a financial language. They suggest that money is a useful measurement when the decision is partly or completely new, or when some new issues must be considered when making the decision (Wouters & Verdaasdonk, 2002). Ex-ante analyses are also useful when the information has been divided between multiple employees (Wouters & Verdaasdonk, 2002). Thus, it seems that financial tools are most useful when there is uncertainty involved in the decision. As an example, Wouters and Verdaasdonk (2002) described this uncertainty related to the big picture in production management as "…'throwing the goods over the wall'…". When information is distributed within the organization, this knowledge can be communicated within departments by first translating it into a common financial language (Wouters & Verdaasdonk, 2002). This common language then helps to coordinate the knowledge between different specialists. The role of accounting in relation to uncertainty of objectives and uncertainty of cause and effect is illustrated in Figure 12.

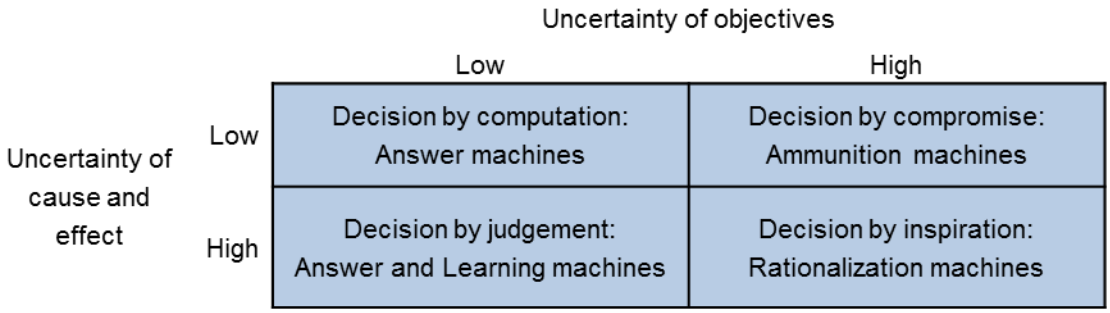

Figure 12. *Roles of accounting information in decision-making (Burchell et al., 1980).*

According to Burchell et al. (1980), when the uncertainty is low in both cases, it is possible to choose the best alternative based on the calculations or estimations. When the uncertainty involved in cause and effect increase, managers have to start applying their judgement to the estimations and probabilities and expected outcomes start to become more meaningful (Burchell et al., 1980). However, as uncertainty of objectives start to increase the decision moves away from choosing the best alternative to political preferences where negotiation and persuasion become more important (Burchell et al., 1980).

In these four decision scenarios, accounting information can have quite a different role. Burchell et al. (1980) discusses how accounting can act as answer machine, learning machine, ammunition machine or rationalization machine. An answer machine acts as the number generator discussed by providing analyses and estimations on each alternative (Suomala et al., 2011). A learning machine instead helps the decision-makers to understand the situation, thus acting as a consultant for the decision-maker (Burchell et al., 1980). If the uncertainty of objectives and the role of persuasion increases, ammunition machine provides tools for argumentation while rationalization machine attempts to provide at least some insight to the uncertainty, which can also motivate the employees towards certain objectives (Burchell et al., 1980).

3.4 From accounting as an input to accounting as a service

While a great amount of research has been performed in the field of accounting information and managerial decision-making, the research focus on management accounting has been developing in a way that is no longer connected to actual managerial work (Jönsson, 1998; Hall, 2010). In many cases, accounting information is still mainly considered as input for specific decision (Teale et al., 2003). Similarly, managerial work is still often considered as a set of decisions or other situations where decisions are rational and based on facts (Hall, 2010). Thus, Figure 13 illustrates the perception of the role of accounting information with the limitations of these two types of research areas in mind.

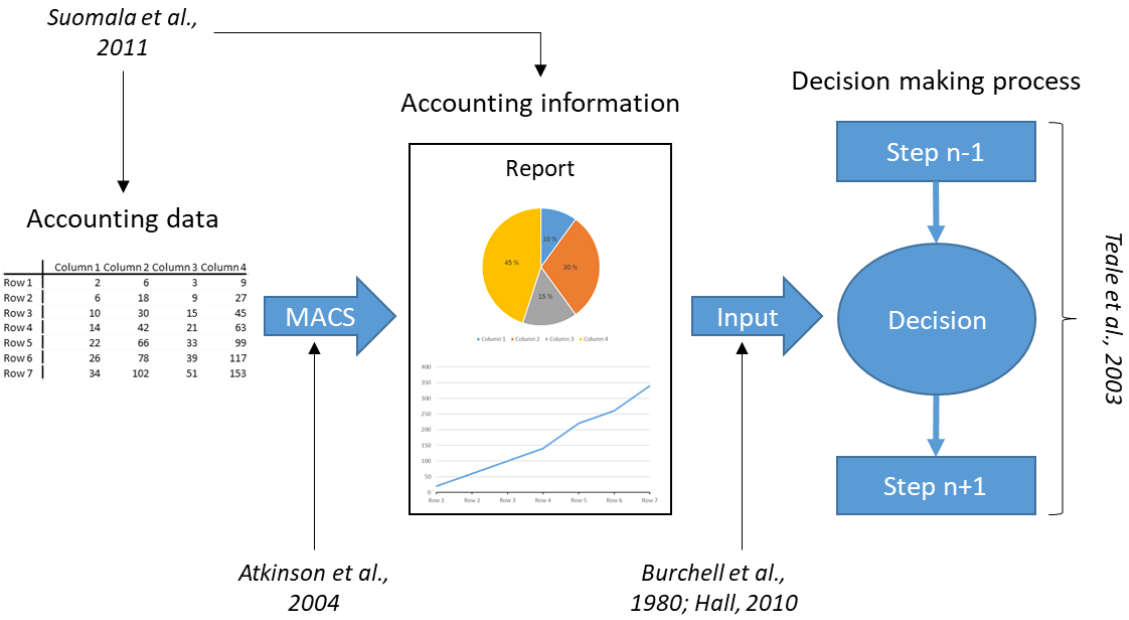

Figure 13. *Simplified framework of the role of management accounting.*

The first problem with this perspective is that there is not always a specific decision-making situation or process, but great share of the managerial work consists of managing continuous change (Hall, 2010). Empirical studies suggest that since managerial work occurs mainly in groups, decisions are not the main activity of managers but rare events instead and a lot of responsibility is on verbal communication (Jönsson, 1998). Similarly, quite often the role of accounting information is not to act as an input but to increase the accounting knowledge of the decision maker (Hall, 2010). Therefore, the communication of accounting information analyses and other information gathering should be constructed in a way that it supports the more up-to-date conception of managerial work.

The second concern is that even though management accounting provides a set of systematic tools and systems to refine data to usable format, the costing processes do not always occur systematically. Not only are the tools sensitive to error, some costing scenarios do not only have a single way to conduct the assessment but instead require the judgement of the management accounting specialist (Suomala et al., 2011). However, this room for error also gives room for surprise, and should not only be considered a negative issue. For example, while activity-based costing might bring insight to the activities of the organization, it might not completely reflect the level of resource utilization. Similarly, a completely different approach might be needed to find a way to increase organizational performance. Thus, as Burchell et al. (1980) discuss, management accounting can rationalize different phenomena and therefore it should not only aim for accuracy.

There are several academics that have criticized the direction of management research, and the generic neoclassical perspective to decision-making (e.g. Hall, 2010; Nørreklit et al., 2010; Lusch & Vargo, 2014; Jönsson, 1998). The common concept standing out in

their research is the idea of an actor: an individual, a group of individuals or an organization with a purpose of co-creating value via resource integration and service-for-service exchange (Lusch & Vargo, 2014). However, Lusch & Vargo (2014) also argue: "Actors, however, are not the fully rational, insightful, maximizing agents that neoclassical economics purports." Instead, they develop an understanding of their environment and act based on this reality (Nørreklit et al., 2010).

According to Nørreklit et al. (2010) and the pragmatic constructivism, reality consists of four dimensions: facts, possibilities, values and communication, which the actor must integrate to undertake actions (Nørreklit et al., 2010). In short, facts are the basis of any action, possibilities enable choice, values enable one to choose between possibilities and communication is needed to enable action in a social situation (Nørreklit et al., 2010). Thus, action is based on the integration of the four dimensions of reality (Nørreklit et al., 2010). Following a similar but a more practical approach, Lusch and Vargo (2014) argue that managers exist in specific ecosystems and they work to improve their own system. They do this by using a set of resources available for them. As actors thrive to improve the viability of their own system, they also influence the systems of other actors (Lusch & Vargo, 2014). While these two perspectives can seem intangible, they bring out the challenges in management accounting and decision-making research.

Hall (2010) follows the criticism earlier discussed by Jönsson (1998) with an objective to guide the research on accounting and managerial work. He argues that most of the management accounting research has focused on how accounting information is applied in predefined decision-making scenarios (Hall, 2010). However, based on his literature study, decision-making consists of only a small part of the managerial work (Hall, 2010). Similarly, Jönsson (1998) argue that more time is spent asking questions and gathering information than in making decisions. Hall (2010) also argues that accounting information is mainly used to develop an understanding of the environment instead of as an input to certain decision-making scenario. Hence again, the frameworks discussed in this chapter are not enough to comprehend the whole picture.

Even though a lot of discussion is on the biases, misinterpretations and communication challenges concerning managerial decision making (e,g. Certo et al., 2008; Boland, 1993; Nørreklit et al., 2010; Hall, 2010), there is not enough research how things should be done (Jönsson, 1998; Hall, 2010). However, first it is important to understand the process of applying accounting data in managerial work. Following the S-D logic, accounting information should not only be an output of an analysis and an input to a decision (Hall, 2010), but continuous service instead (Lusch & Vargo, 2014). Within the service accounting information used directly or indirectly to increase the accounting knowledge of the recipient to thrive for better managerial work and decisions (Suomala et al., 2011). This service can enable either a high or a low level of accountingisation, depending on how well the core values and work practices enable this (Kraus, 2012). Figure 14 illustrates this approach.

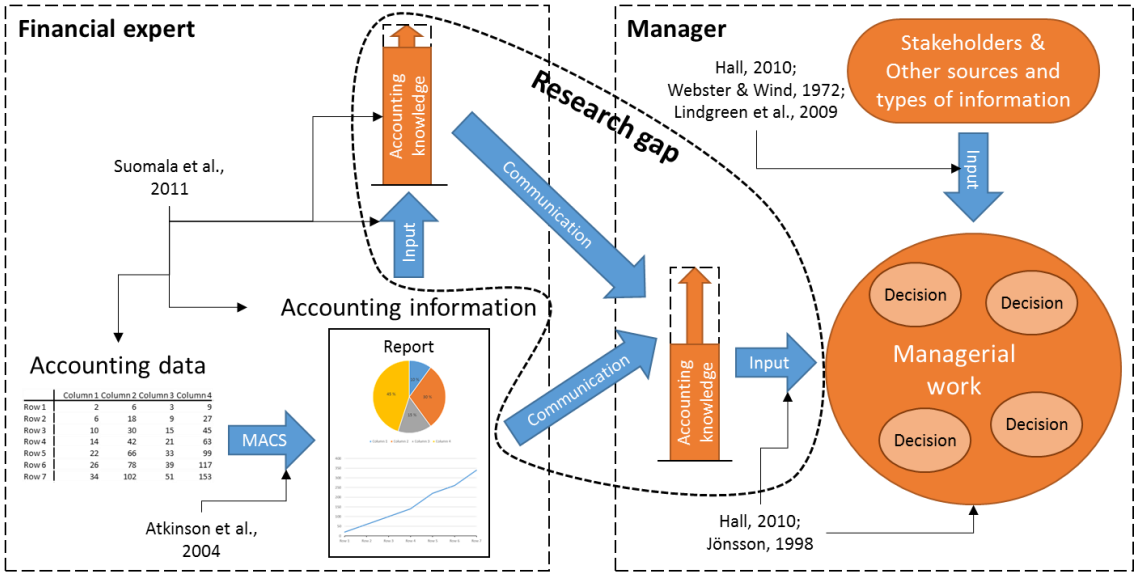

Figure 14. *From accounting information to better managerial work*

Comparing this with the Figure 13, the biggest change concerns the decision-making and the interface between the accounting information and applying it in a decision. This also is the largest research gap within the current research. First, the managerial decision-making is replaced by managerial work where only a small part of the work consists of decision-making (Hall, 2010). Second, instead of accounting information being an input of a decision, it is used to increase the accounting knowledge of the recipient (Suomala et al., 2011), and moreover the understanding of the environment (Nørreklit et al., 2010; Hall, 2010). Third, to increase the accounting knowledge of the manager, communication is needed (Nørreklit et al., 2010; Hall, 2010). Finally, management accounting research should also understand and consider other sources of information that managers rely on (Hall, 2010). Understanding this combination of "facts and feelings" (Nørreklit et al., 2010) is something that needs to be thrived for but would require interdisciplinary expertise to be fully comprehended. This is especially the case in industries with high regards to values, such as the field of home care. Therefore, some thought must be put to the homecare field to understand how customer value and accounting information are utilized in the decision making in the homecare field.

4. VALUE ASSESSMENT IN HOME CARE

4.1 Home care in Finland

4.1.1 Home care and recent statistics

The work of home caregivers consists of two main bundles of activities: According to Väyrynen and Kuronen (2017) medical home care consists of a bundle of medical treatment activities performed at the customer's home. Other activities, such as preparing meals, assisting in daily activities, cleaning and care, are included under home services (Väyrynen & Kuronen, 2017). However, as these two bundles of activities are often blended together, they are reported as a single activity called home care (Väyrynen & Kuronen, 2017). The type of home care also varies a lot between different customers. Some tasks are human centered such as discussing with the customer and making sure that the customer has everything she needs. On the other hand, many manual tasks relate to helping customers in daily activities that they cannot perform independently anymore. These are for example making food, helping with dressing, getting the mail, distributing medicine and so on. While these tasks are viable to the customer, they require a lot of work as the caregiver might need to visit the customer 1-4 times a day to help in these tasks.

To get a better perception of the big picture, the next figures illustrate the current situation concerning customer base, age and monthly visit distribution between counties. First, the amount of regular homecare customers per county is illustrated in Figure 15.

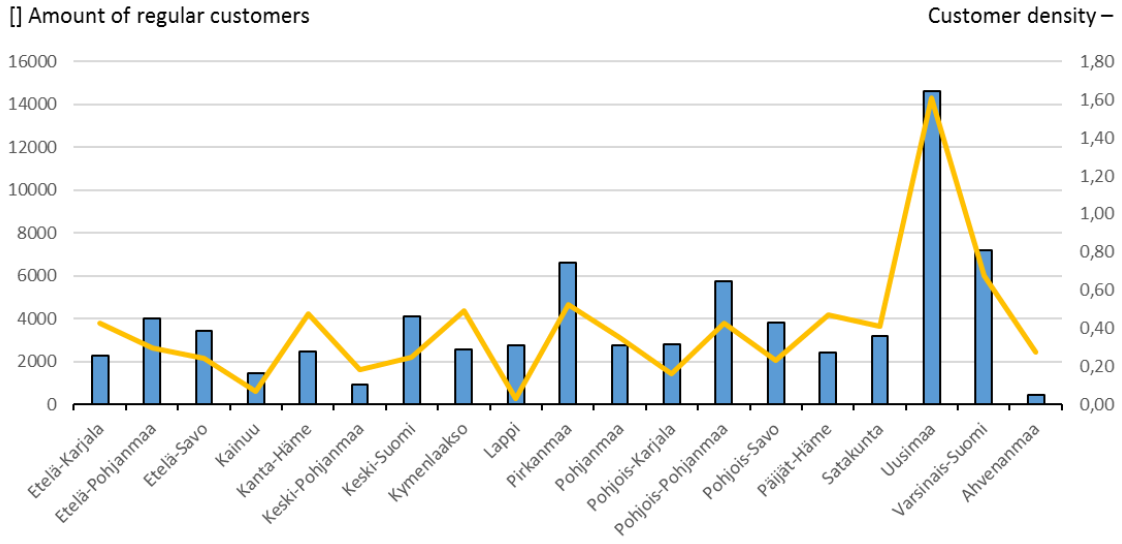

Figure 15. *Regular homecare customers and their density per county (Based on Väyrynen & Kuronen, 2017; Tilastokeskus, 2017).*

The figure shows the amount of regular customers (column) and the customer density of customers per square kilometer (line) of different counties. As visible in the figure, the amount of customer varies a lot between counties. While a part of the variance is explained by size of these counties, the population is also focused more densely in southern Finland and around the bigger cities. Therefore, there is more research material available concerning the large cities than smaller municipalities (e.g. Lyly, 2017). As it is also possible to see in the figure, the resident density does not always correlate with the amount of regular customers. On the other hand, even though the size of the customer base varies a lot between the municipalities, there is quite little variance within the age distribution of customers. The age distribution per county is shown in Figure 16.

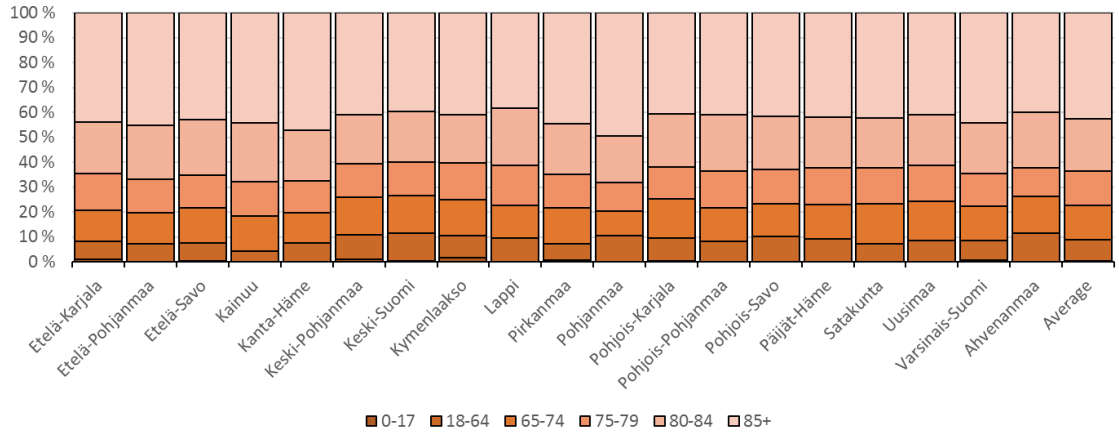

Figure 16. *Age distribution of customers per county (Based on Väyrynen & Kuronen, 2017).*

The above figure shows the share of customers in six different age categories. The size of the age categories is non-linear, but the graph still represent the overall condition of the customers. Overall, in every Finnish county about 60 % of the homecare customers are over 80 years old. It also seems that the variance in age distribution is relatively low between counties. Thus, it would seem that home care is relatively similar between counties, only with different capacities. Finally, Figure 17 illustrates how the homecare workload distributes between counties based on monthly visits.

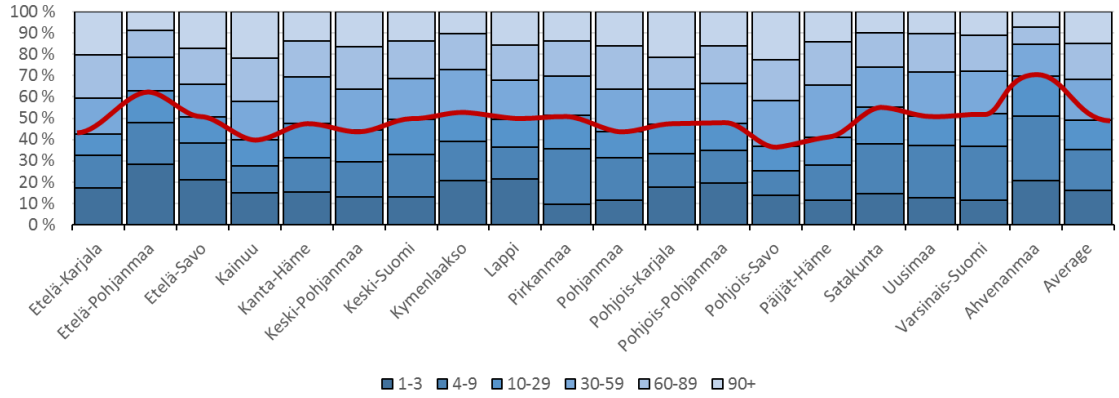

Figure 17. *Monthly visit distribution per county (Väyrynen & Kuronen, 2017).*

In the figure, the customer base of the county is distributed between the intensity of the care. The stacked columns show how large share of customers fall in specific visit categories. It should be noted that the intensity categories are not the same size. Additionally, the red line is added to illustrate how large share of the customers have daily visits, meaning there are activities that have to be done each day. As Groop (2012) suggests, if the customers have less than 30 visits per month, the visits should not be time critical, since the customers can manage some days without a homecare visit. However, the customer might also participate in interval care, in which they regularly stay at a sheltered accommodation to participate in activities with other elderly. Thus, less than 30 visits per month does not necessarily relate to visits not being time critical. Additionally, these figures illustrate one of the basic requirements for home care, which is that sufficient homecare service has to be provided regardless of the density of the population. As a result, the homecare organizations have different ways to adopt to these requirements.

The important point to notice from the graph is that the variance between counties in monthly visits is much higher than in age distribution. Customers with daily care can vary from 30 % to 60 % of the customer base. Hence, even though the age distribution of homecare customers is pretty much the same, some counties have more customers that require a higher intensity of care. Thus, technology service providers could use this information to assess the business potential of a county. However, the customer distribution mainly reflects the business potential and not the total customer value per county. Simultaneously, there is an increasing trend in the demand for home care and development projects aim to provide dignified aging for the elderly. This is illustrated in Figure 18.

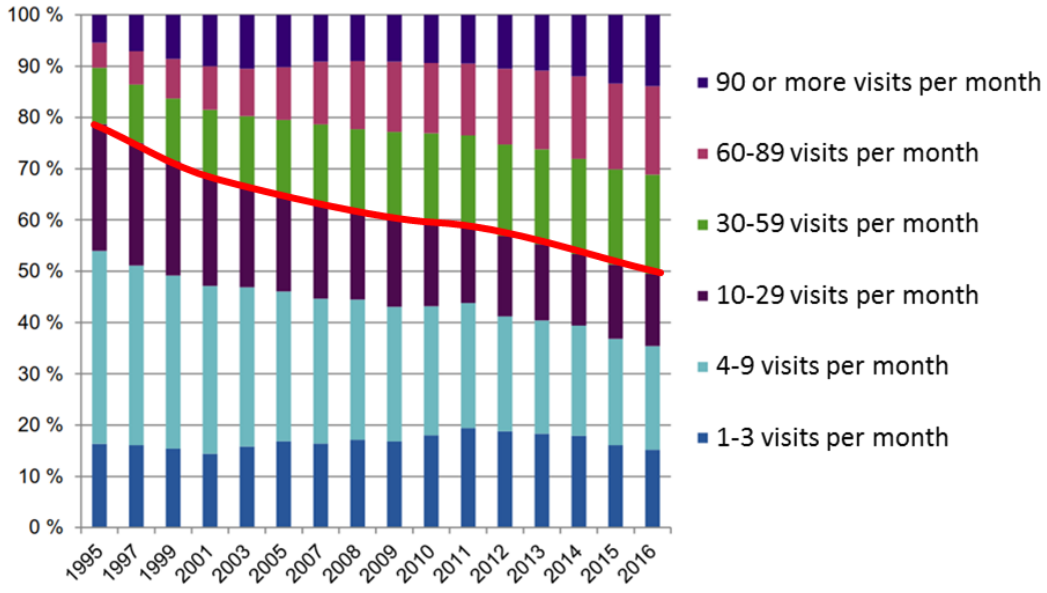

Figure 18. *The annual development of amount of homecare customers divided between different intensity categories in Finland (Väyrynen & Kuronen, 2017).*

Maybe the most noticeable trend in the above graph is that the share of customers with at least one visit per day has increased from 20 % to 50 % of all customers. Home care has a smaller cost per customer than facilitated care making it a more cost efficient way to manage the increasing need for elderly care. Similarly, a large share of elderly wish to spent their pension at home. Still, based on the recent study done concerning the six largest cities in Finland (Lyly, 2017, p.135), as much as 13 % of the elderly care costs were homecare costs. This means that the total homecare costs in the six largest cities in Finland were almost 290 000 000 Euros in total last year providing service for up to 43 000 customers (Lyly, 2017). Therefore, the average annual cost per customer in the six largest cities in Finland is around 6 750 Euros, with a large share of customers being temporary. Because of this, the average cost of regular customers such as the ones with 30 to 90 visits per month is even higher. Thus, solutions that help manage the homecare costs are more than welcomed.

4.1.2 The stakeholder network

As previously suggested, the stakeholder network within home care is quite complex. The homecare organization mostly organizes a large share of the operations, but their authority is restricted in some cases. The homecare organizations are under direct jurisdiction of the municipalities themselves and most of the medical care such as prescriptions need to be authorized by a doctor. Additionally, most of the time customers have jurisdiction over issues that affect them, but sometimes the relatives want to participate in the coordination of care as well. This results in a quite complex organizational chart and makes purchasing processes challenging. While a complete stakeholder network and especially the information flow network would be quite complex, it is simplified in Figure 19.

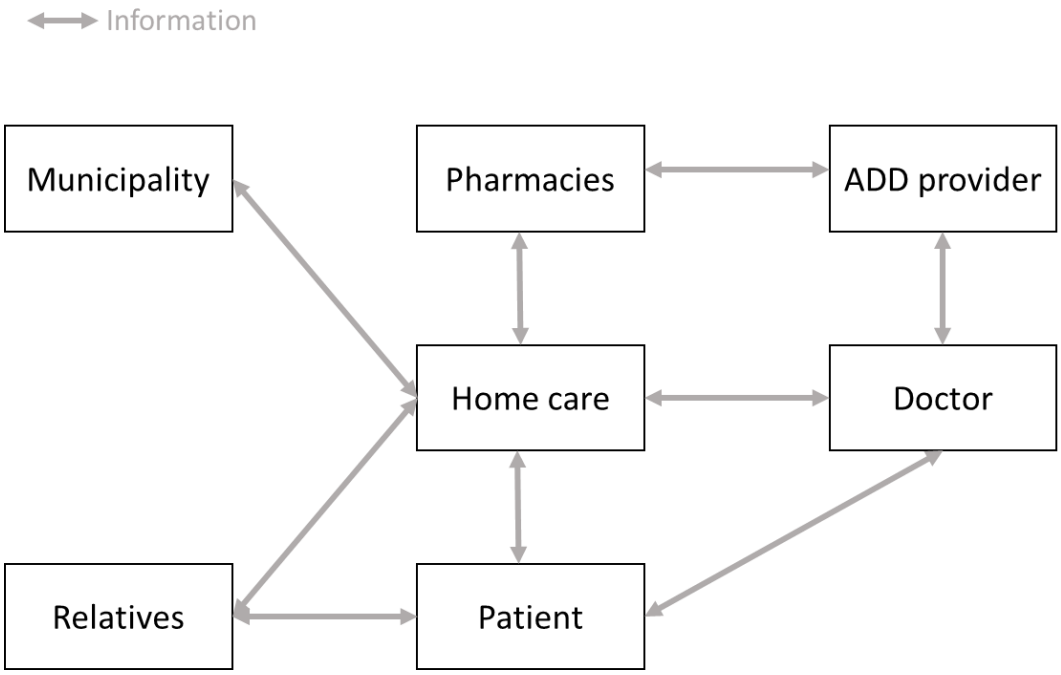

Figure 19. *The stakeholder network of the case company.*

The actual stakeholder network varies quite a lot between municipalities. In some cases, the home care is even outsourced to private companies. However, few key stakeholders have been identified. Naturally, the homecare organization is in the center of the whole network. They are responsible of organizing most of the activities. The homecare organizations serve the end customers and get their medicine from the pharmacies. In case the customers are using automatic dose dispensing, the pharmacies work with the ADD-providers who manufacture the medicine sachet rolls. However, the doctor of the customer is responsible of giving the prescription that is used to make the medicine sachet rolls. Lastly, the municipality organizes and finances all the social and health care within the municipality, which means they have a strong influence on the activities of the homecare organization. By applying the purchasing organization by Webster and Wind (1972), six typical purchase process roles can be identified and gathered in Table 3.

Table 3. *Buying center roles in the municipality purchase process.*

Role	**Relevant stakeholder**
Initiator	Anyone in the stakeholder network
User	Caregivers, customers, relatives
Influencer	Pharmacies, doctors, caregivers
Approver	Customers, relatives
Decider	Homecare management, health care management, municipality
Buyer	Municipalities, homecare organization
Gatekeeper	Municipalities, secretaries

Not only do these roles influence the purchase decision, they can influence the success of a pilot. Based on the value co-creation logic, unless the service is not dependent on the customer's processes the customer will have an effect on how the value is realized. If nothing else, the supplier must be able to convince the customer to create a sufficiently high customer perceived value that can result in a purchase decision. Thus, homecare service providers might need to take this into consideration when entering markets.

4.1.3 Typical metrics and costs

There are some metrics that are typical to the homecare sector. The cost of an average homecare visit is estimated to be around 40 Euros per visit (Hujanen et al., 2008). This value is a result of dividing the home care related costs with the annual homecare visits. However, this cost has developed from 2008 and it varies between municipalities. The cost of an average homecare visit in the six largest cities on Finland was 36 Euros in 2016 (Lyly, 2017). The cost varied from 42 Euros per visit in Helsinki to 27 Euros per visit in Turku (Lyly, 2017). However, this costing method does not consider where the cost comes from and what kind of level of performance it represents. By looking into the financial statements of municipalities with functionally separated statements and reports (e.g. Harjavalta, 2017; Joensuu, 2017), studies on elderly care (e.g. Groop, 2012) and statistical reports concerning elderly care (e.g. Lyly, 2017; Väyrynen & Kuronen, 2017), a few key metrics and statistical focus points recurred. These metrics are listed below:

- Amount of customers
- Amount of annual visits
- Share of direct work at the customer
- Share of customers per total residents
- Age distribution of customers
- Cost per visit
- Customer distribution based on monthly visits
- Travel time and travel cost

As expected, most of the used metrics are demographical. This is most likely the result of the information gathering methods and the target groups of these reports. These reports are meant as statistical sources of data for government, municipality, and possible service provider use as well as different research purposes. Therefore, they are almost as general as possible and provide little use for specific analyses. Unfortunately, in some cases the information is already refined to a more specific format as is the case in the annual amount of visits per municipality reported by Väyrynen and Kuronen (2017). In that case, instead of reporting the total annual visits, they reported the share of annual visits separated into six categories (Väyrynen & Kuronen, 2017). The absolute value would have been important information concerning the study, which makes some analyses more complicated than necessary. Nevertheless, these statistics can give a nice starting point for people interested in working in this area.

Some other issues as well make cost calculations difficult, even though public sector financial information is widely reported in statistics and financial statements. First, municipalities have several ways to separate different functions and their costs. Some municipalities divide health care, elderly care and even home care as separate functions (e.g. Harjavalta, 2017) while others combine these to a single health care function (e.g. Joensuu, 2017). As there are no direct labels on the cost pools, it is impossible to accurately allocate costs based on resource use. Secondly, the sectors often have multiple purposes. An elderly care sector might include retirement home, non-institutional care and temporary home care. The employees might also work in multiple units, which means it can be complicated to allocate costs in a way that reflects the real case. Thirdly, the share of outsourced services is quite high. This means that some of the homecare visits like emergency visits during nighttime can be outsourced, but the services and metrics such as annual amount of visits are still reported as a single cost pool instead of being divided to different functions or operations. Thus, the homecare field has certain issues that might make value assessment more complicated. On the other hand, these kinds of issues are minor in comparison to other industries where customers might be highly reluctant to share any information.

4.2 Management accounting and value communication in value assessment

So far a variety of relevant phenomena and concepts has been discussed, but it can be difficult to see the affiliations between them. However, this chapter combines the topics discussed so far to synthesize them into a representation of the value assessment and communication in value delivery process and how management accounting should be able to support the process as whole. However, some thought must be put to conceptualizing the understanding of customer value of a specific context before the framework can be developed further.

In Figure 14, the actor's ability to comprehend the financial objects inside a single organization was measured with accounting knowledge. However, accounting knowledge is not sufficient to understand the complete picture once customer value is inspected instead. After all, not only does the value specialist need to know the relevant value elements, but also how these affect the customers' operations and what do they mean in financial terms. As discussed in Chapter 3, the skill to comprehend cause-and-effect relations of financial objects is called financial understanding (Suomala et al., 2011). Thus, in this thesis a term "customer value understanding" is used to demonstrate the actor's ability to understand the cause-and-effect relationships within value elements and ability to translate the customer value elements into financial value. Moreover, by combining the decision-making process illustrated in Figure 14 and the value specialist strategy discussed by Keränen & Jalkala (2014), it is possible to illustrate the role of value assessment in the value delivery process and how value assessment is used to increase both the value specialist's and the

customer's representative's customer value understanding. This is illustrated in Figure 20.

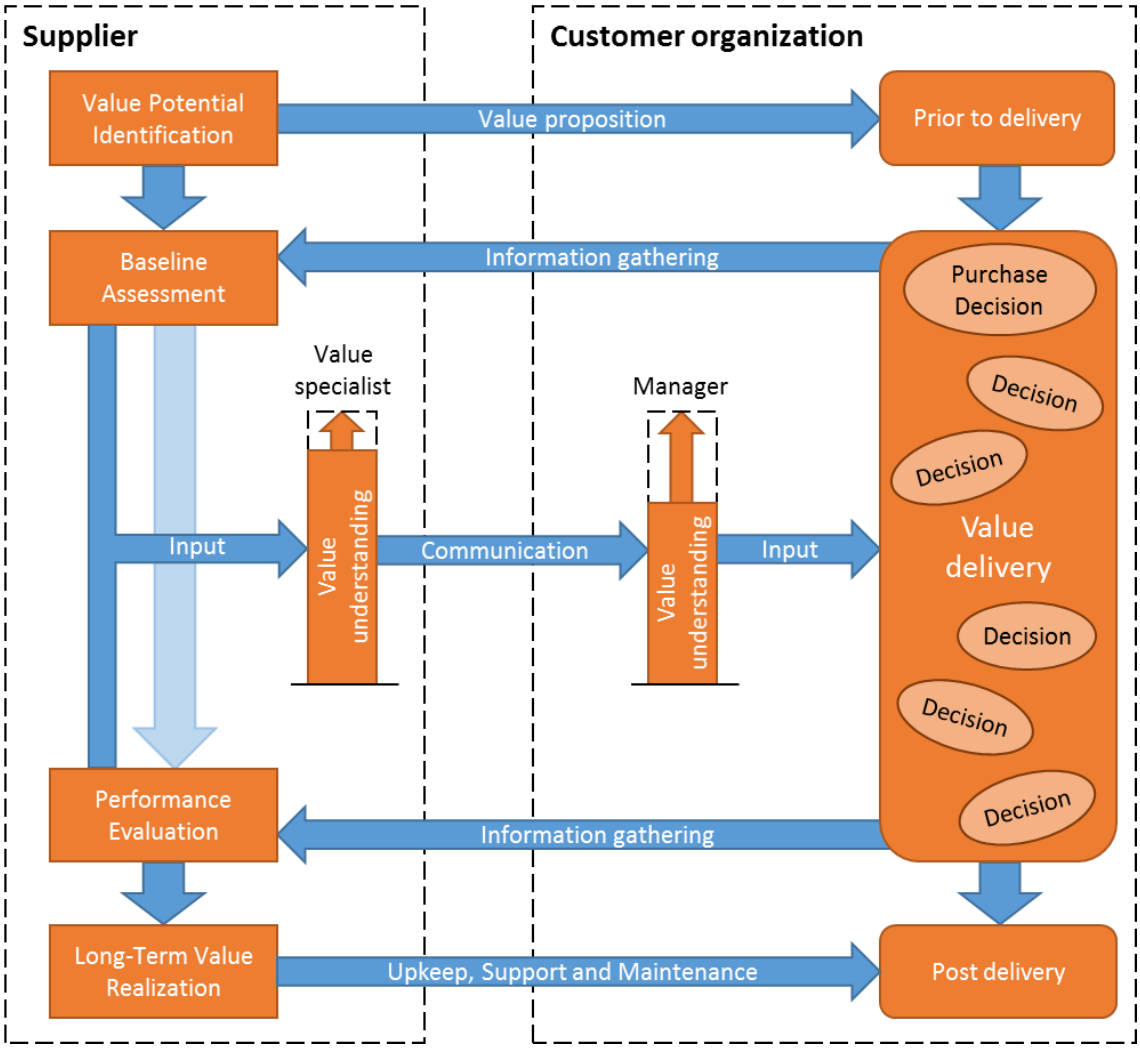

Figure 20. *Value assessment as a tool to increase customer value understanding during value delivery.*

As Keränen & Jalka (2013) argue, value assessment is often conducted during value delivery (Keränen & Jalkala, 2013). The identified value potential can be used to develop a value proposition and initialize the purchase decision. The value delivery phase contains everything from a purchase decision to a successful implementation and further to acceptance of the new offering as a part of the customer's processes. With the information gathered during baseline assessment and performance evaluation, the value specialists should be able to increase both their and customer's value understanding, which should also reflect on the customer perceived value. By documenting the customer value as well as assisting the customer during value delivery, the company should be able to ensure long-term value realization, where their focus shifts to supporting the customer and maintaining the customer perceived value. However, there are some challenges in conducting a successful value assessment before the company can get that far.

First, the challenge in evaluating customer perceived value is often related to not having sufficient resources to conduct a value assessment. As Keränen and Jalkala (2014) found out, a large share of suppliers only uses an emergent value sales strategy for value assessment. Thus, the sales managers conduct value assessments for their own purposes only when they need it. However, many companies seem to have realized the potential of having a dedicated employee investigating and documenting the value (Keränen & Jalkala, 2014). After all, a high emphasis during the value assessment process should be on value documentation and it is argued to be an important part of a successful value delivery (Keränen & Jalkala, 2013; Anderson et al., 2006). However, being able to document the effects of the offering requires an identification and a clear specification of the relevant metrics.

Second, it can be difficult to develop a systematic way to measure the delivered value, for which financial analyses might be required. Keränen & Jalkala (2013; 2014) brought up financial customer value multiple time in their value assessment research. Similarly, Anderson et al. (2006) argue that "Suppliers also must document the cost savings and incremental profits..." for the supplier to be a best-practice firm. Since financial language is commonly used in business transactions (Wouters & Verdaasdonk, 2002), companies could strengthen the acceptance of the value proposition by being able to measure customer value in financial terms. Additionally, customer perceived value oftentimes faces challenges during communication due to a large share of it being either non-economical or intangible (Anderson et al., 2009). Therefore, an in-depth knowledge about the customer's processes should help in measuring the value from a financial perspective. The proposed way to do this is to include a management accounting specialist to the value assessment and to also gather accounting data from the customer during the value assessment. This is illustrated in Figure 21.

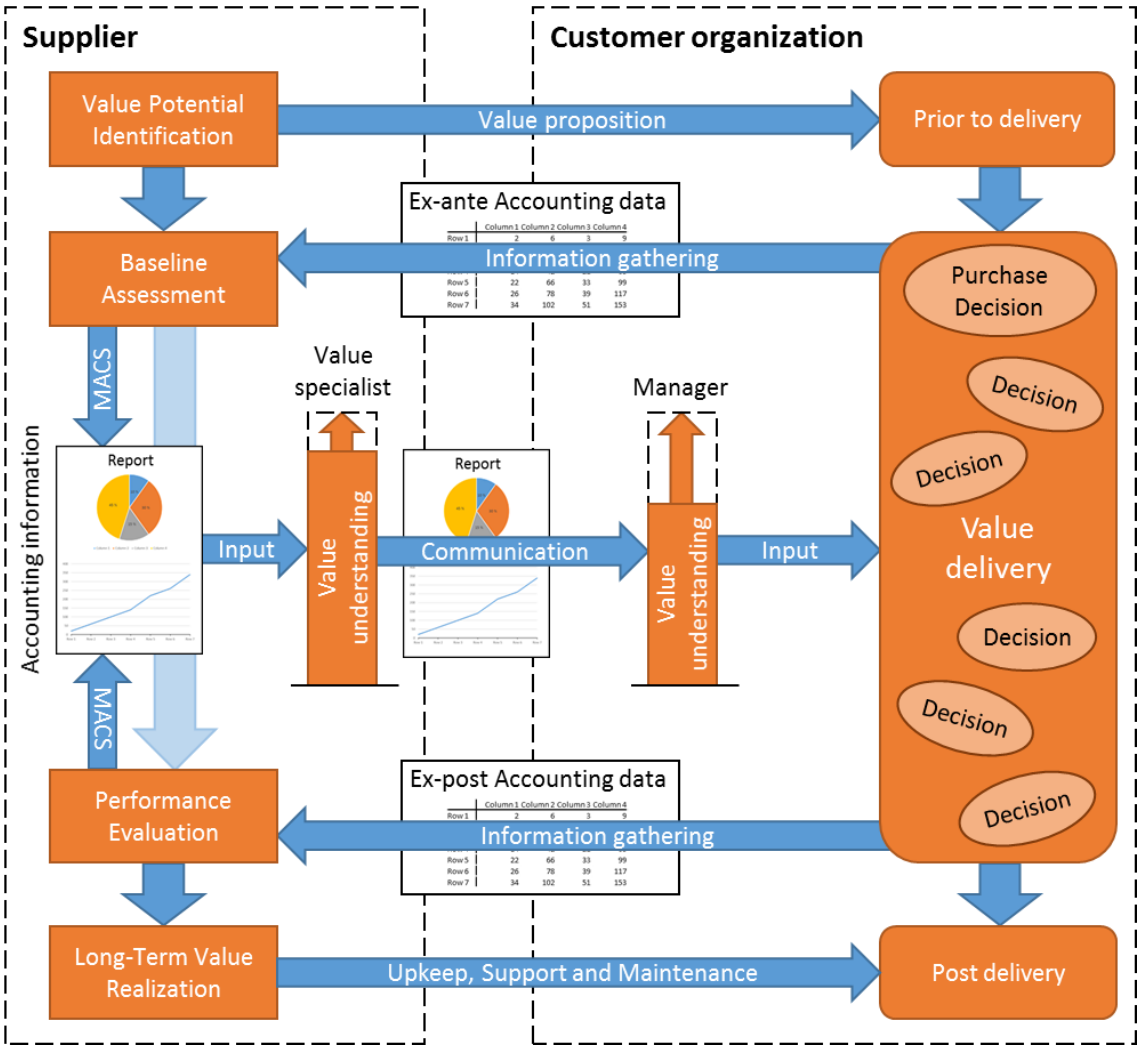

Figure 21. *Performing value assessment using customer's accounting data.*

In comparison to Figure 20, the information gathering now includes accounting data or any other viable data for MA uses. This data can be utilized to provide support to both baseline assessment and performance evaluation by using MACS and tools such as activity-based costing. In addition to analyzing the accounting data from the customer, there are several other tasks that can benefit from having MA specialist. Hence, the role of MA evolves roughly as illustrated in Figure 22.

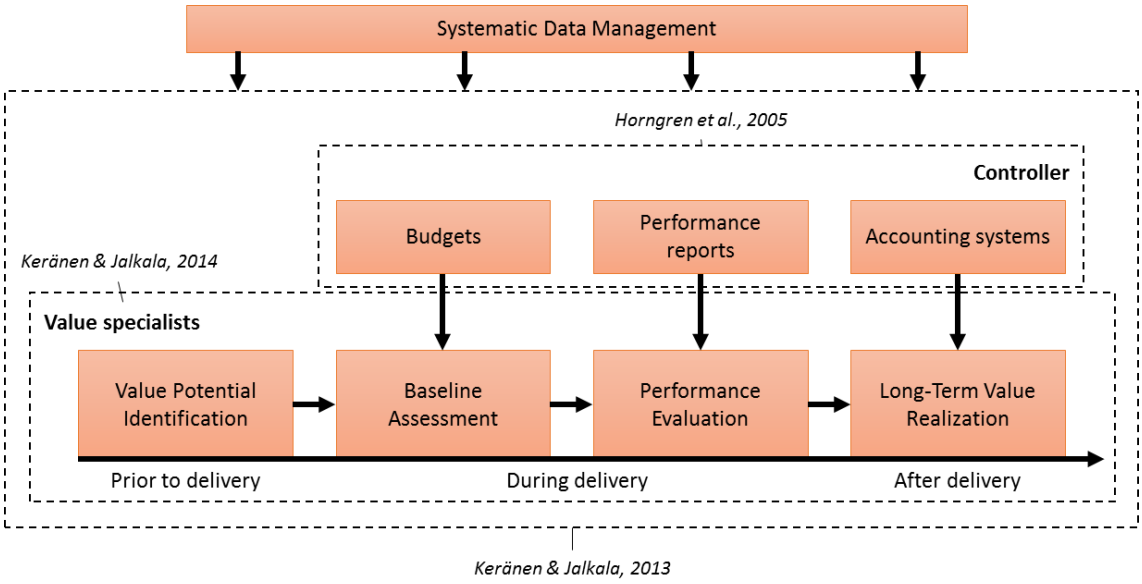

Figure 22. *The tasks of management accounting in value assessment (Applied from Keränen & Jalkala, 2013, Keränen & Jalkala, 2014; Horngren et al., 2005).*

In a typical process, the tasks of accounting evolve from budgeting to control via accountings systems and further to performance evaluation via performance reports (Horngren et al., 2005). Considering the value assessment process, the performance is evaluated before the control phase where the value is managed to make it realize long-term (Keränen & Jalkala, 2013). Thus, the tasks of accounting should shift places as well first assessing current situation and developing a budget, then reporting the performance of the pilot phase and finally supporting other functions in long-term value realization.

Considering the roles of accounting by Burchell et al. (1980), the role of accounting in the value assessment would start as rationalization machine. During the baseline assessment, not only the current situation has to be assessed (Keränen & Jalkala, 2013), but also the goals for the value delivery must be set. Here, the understanding of cause-and-effect as well as the objectives is quite low, especially if the situation concerns the first customer pilots. Thus, management accounting could contribute to rationalize and measure the realized value and help the managers understand both the cause-and-effect and the objectives of the value delivery better. Additionally, as the understanding grows, the role of management accounting can shift to either ammunition machines or answer and learning machines, especially when the solution is being offered to new customers. Thus, MA not only helps value specialists in measuring the value, but also in communicating it to current and new customers. However, as previously discussed in Chapters 2.3.4 and 3.2.3, there can be a larger group of stakeholders that need to be convinced. Thus, the manager in Figure 21 is replaced by the relevant stakeholder, and the resulting framework is illustrated in Figure 23.

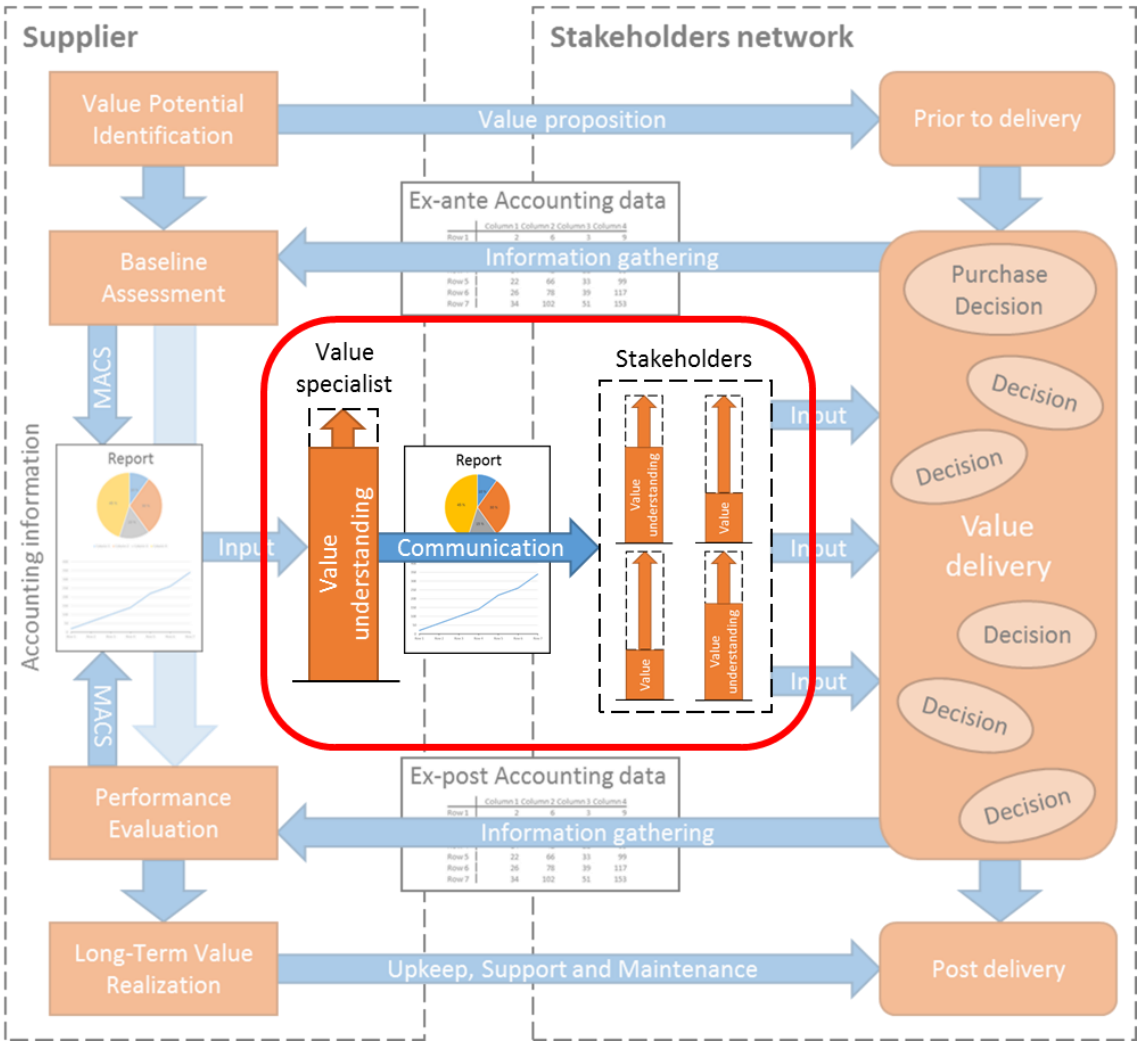

Figure 23. *The role of value communication during value assessment.*

Now, instead of handling the communication with the company representative, the discussion should revolve with all the parties involved in the value delivery. However, employees of the organization might have different backgrounds, which can result in a different structural way of sense making (Jönsson, 1998; Ohlert & Weissenberger, 2015). For example, while a sales expert or a purchaser might have similar education, they look at a same scenario from two completely different perspectives. Thus, communicating over organizational boundaries might require extra effort (Jönsson, 1998).

Based on the discussion in Chapter 2.4, value proposition should be both communicated to all stakeholders (Frow & Payne, 2011; Anderson et al., 2009) and customized to fit each individual stakeholder or a similar role (van Rensburg & van Niekerk, 2010; Pruchnow et al., 2006; Anderson et al., 2009). Cardinaels (2008) also suggest that the presentation of accounting information should be modified to the needs to the decision-maker. Similarly, the more relevant the information is to the receiver the more interested would the receiver be in the message. Thus, with value assessment the value specialist should be able to manipulate the value stack and its elements to customize the value propositions

and communication to each stakeholder. Based on these findings, the framework in Figure 24 can be developed.

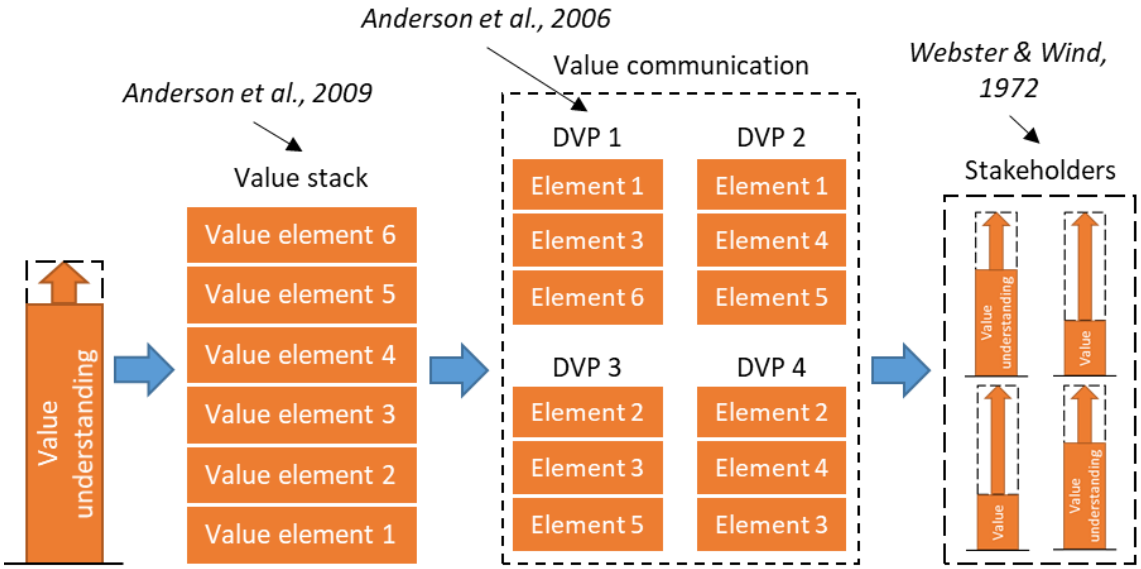

Figure 24. *Customizing distinctive value proposition for the stakeholders.*

Different stakeholders have different preferences and needs interests so they each require a unique format of communication, even if the issue to be communicated is the same. One way to develop the individual value propositions is to use the distinctive value proposition discussed by Anderson et al. (2006). There two points of difference are paired with one point of parity to achieve a value proposition, which is comparable with the current situation or competitors' offerings (Anderson et al., 2006). For example, if the offering would be able to decrease the time it takes to manufacture something, the reduced time could be the resonating focus, the cost savings achieved through this could be the second point of difference and the fact that quality stays the same could be the point of parity. Moreover, these individual value elements could be mixed to find the appropriate combination for each stakeholder. However, the challenge here is that to communicate the right value proposition to a right person requires an access where the value specialist can discuss issues with each relevant stakeholder or stakeholder group.

Overall, the objective of the value assessment framework in Figure 23 is mainly to help both the supplier and the customer understand how the value realizes (Keränen & Jalkala, 2013). This should increase the value understanding of both parties and with this understanding, suppliers can improve their value propositions and customers can more objectively determine if they see sufficient customer perceived value to match the cost of the offering. The idea of increasing value understanding can be illustrated by first looking at a scenario where no value assessment is conducted. This is illustrated in Figure 25.

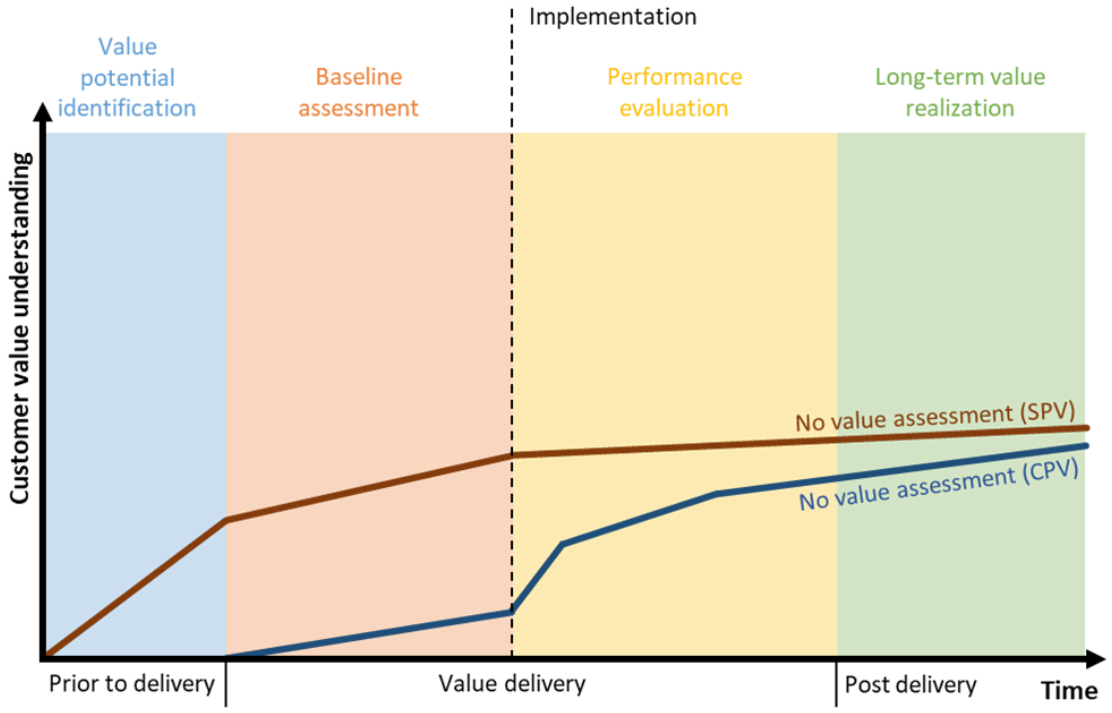

Figure 25. *Development of value understanding without systematic value assessment.*

The supplier value understanding mostly develops during the development of the offering and delivery to the customer. If the supplier performs little to no value assessment or documentation, they might not find out how well their offering actually performs in the market. In contrast, the customer can only develop their customer perceived value based on the value communication before they implement the offering as part of their own process. At this point the value should start to manifest and the supplier should start to better understand the mechanics behind the customer value. If the supplier does not have a lot of contact with the customer after the value delivery, their possibilities in evaluating the delivered value-in-use is only based on the feedback from the customer, which might emphasize negative issues. In some cases, the customer's value understanding might even surpass the suppliers understanding.

As discussed at the start of this chapter, defining an appropriate metric for the knowledge brought by the value assessment has been difficult. This framework does not reflect on if the perceived value increases or decreases over time, but instead measures how well the different parties understand the customer value of the offering. However, the customer value understanding creates the preposition for the perceived value and with a higher understanding, the customer should be able to develop more realistic perception of the customer value regardless if the customer perceived value increases or decreases. Thus, performing a value assessment and communicating it to the customer will not necessarily increase the customer perceived value, but can create a more realistic perception of it.

Therefore, the increased customer value understanding should then affect the customer perceived value CPV and supplier perceived value SPV.

If the supplier is able to perform a value assessment during the value delivery, they should be able to gather a lot of information about the customer and their offering during the value delivery. This should be especially the case if they measure the customer value using management accounting tools or a specialist. The customer value understanding potential achievable with a management accounting supported value assessment is illustrated in Figure 26.

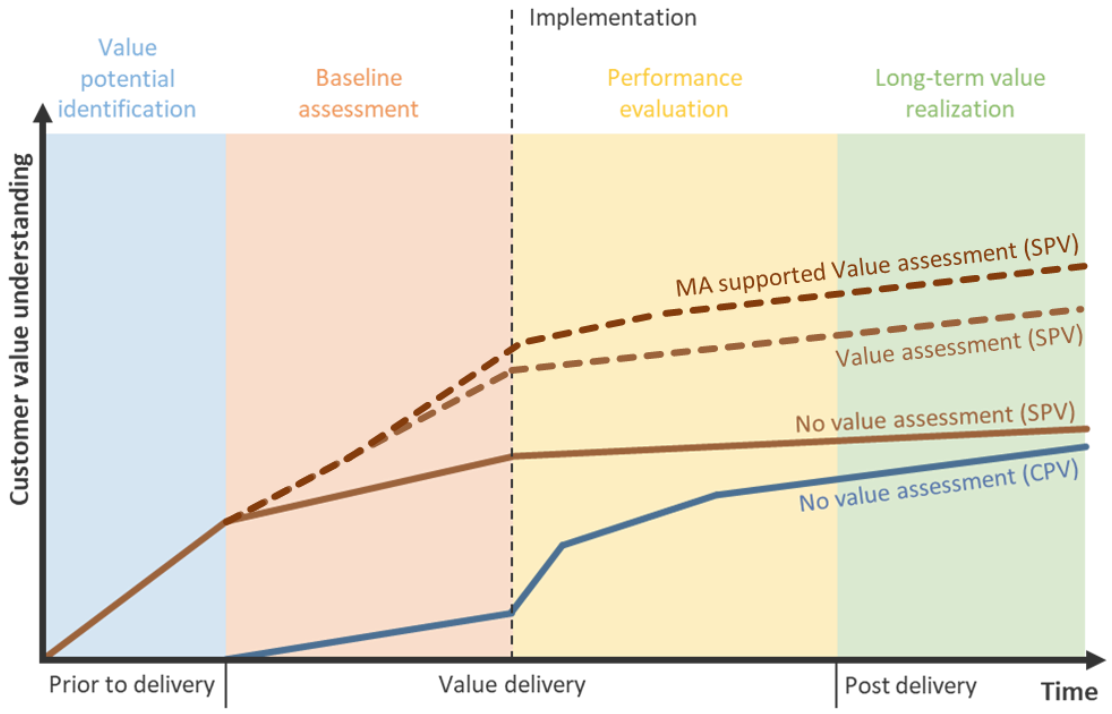

Figure 26. *Increasing value understanding with value assessment.*

By performing a value assessment, the supplier should be able to understand how the customer value manifest in more detail. By documenting their offering's value-in-use, their value understanding no longer depends on assumptions. By also applying the management accounting methods, they should also be able to measure the customer value in financial terms, providing information to evaluate the different value elements and support for example the pricing the offering (Johansson et al., 2015). Hence, if the value potential of the offering is already high, the supplier should be able to communicate it better to the company with value assessment. On the other hand, if the value potential is not high enough a value assessment should bring important information that can be utilized in developing the offering and its customer value (Keränen & Jalkala, 2013). Regardless, the value understanding of both parties should increase as illustrated in Figure 27.

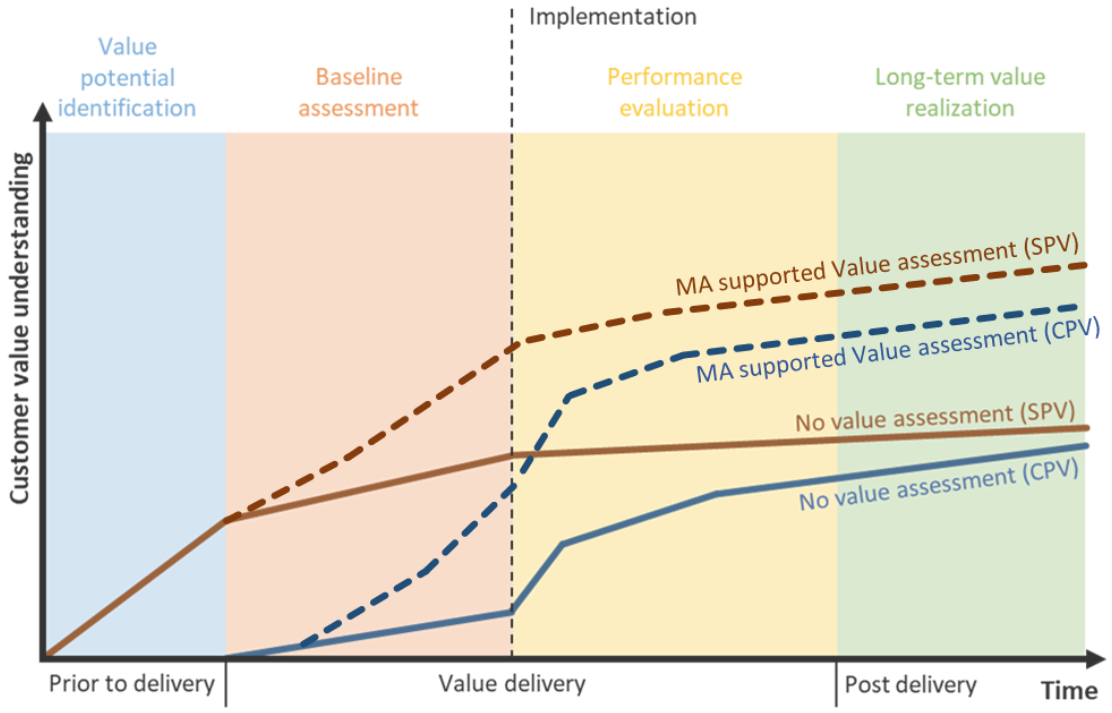

Figure 27. *Customer's value understanding*

Thus, by performing a baseline assessment, the supplier can communicate what their offering means for the specific customer instead of only communicating based on assumptions and previous findings. Additionally, by documenting the customer value during the performance evaluation, both parties should have a better perception of the value-in-use (Keränen & Jalkala, 2013). Additionally, by co-operating more during the value delivery, the supplier should be able to ensure that the customer has a successful implementation and can get the highest performance out from the offering of the supplier. Thus, if the hypothesis of the framework holds true, both parties should benefit from a value assessment and the increased value understanding should decrease the chance for issues resulting from misaligned perception of the customer value.

By combining the research so far, a framework could be developed to guide the value assessment, management accounting's role during the value assessment and communicating the value assessment findings and value documentation to the relevant customer stakeholders. However, this framework was developed deductively, meaning it is based on previous research instead of empirical findings. Therefore, the next step is to apply the developed framework within a customer case.

5. CASE STUDY: VALUE ASSESSMENT AND COMMUNICATION

5.1 The case company

5.1.1 About the case company and the service

The case company is a Finnish health care technology service provider that provides solutions for the homecare sector. The founder of the company had been observing how home caregivers distribute medicine to his relative and he had noticed how cumbersome the process was. During the visits, most of the concentration of the caregiver was focused on medication. Additionally, the contact with the customer during the homecare visit was partial at best. Hence, in 2007 the founder of the company and few other students started working on the idea during a university project, and in 2008 they decided to start developing a machine that would help in the distribution of medicine.

In mid-2009 during the development process, a new CEO joined the development team. Soon after, they decided to develop the solution further to bring more value to the homecare sector. The solution they develop should be able to relieve home caregivers from some of the medicine distribution visits, so that they can also bring cost savings for the homecare organization. However, the legal issues concerning independent medicine handling are strict and require a medical device class 1. This also required that the machines would have to be clinically tested, developed and CE marked as medical devices.

While the company is currently around 8 years old, they have been on the market for only 3 years. This is due to the development of the advanced solution and strict regulations including e.g. clinical tests. Additionally, the company wanted to provide a high-value solution that could assist in several challenges faced daily by homecare organizations and make it harder for competitors to enter the market. Hence, when the target level was achieved in 2014, they started their first customer pilots.

5.1.2 Medicine dispensing in home care

Many homecare customers live at home and have trouble taking their medicine independently. A common reason for this is dementia. The customers would gladly take the medicine prescribed to them but have trouble doing so. Thus, traditionally the homecare staff must visit the customers at least weekly just to fill the pill dispenser. The most commonly dispenser in Finland is a plastic box that has a specific locker for each date and time and that is manually filled. A typical box is shown in Figure 28.

Figure 28. *A typical medicine dispenser called Dosett.*

There are multiple issues related to this type of medicine dispensing. Sometimes the home caregivers must visit a customer daily just to instruct them to take the right medicine. This means that the home caregivers might visit the customers even from two to three times a day, mainly to give the medicine for the customer and make sure they remember to take it. Additionally, some customers also have a bad habit of playing, transferring or removing medicine from the dose dispenser. This is illustrated by how a caregiver described one of her customers:

> *"One of our customers is really stressed about her medicine. We tried to hide the Dosett in one of the higher cupboards in the kitchen so that we could distribute them, but she even climbed a stool to get it."*

There are also multiple points in the prescription process where mistakes can happen. As medicine are manually inserted to the Dosett, the process of filling it can be quite difficult. The medicines are commonly stored in the customer's apartment inside a locked container. However, caregivers can visit more than 10 customers a day and some customers can have up to 40 different medicines. Thus, it can become a hassle to distribute them into the Dosett without mistakes. Similarly, the control of the prescription process has some challenges as well. First, the prescriptions change from time to time. New medicine are added, older are taken away, and some are replaced. This creates a risk that the list of medicine might not be compatible with each other anymore. Second, some of the older medicine containers can become unnecessary and need to be disposed of even before all medicine has been taken. While this issue could be solved by repurposing the medicine, it is not possible to do so since the customers pay for their medicine in batches instead of as individual pills and repurposing medicine is prohibited based on hygienic issues.

The first solution to help in this scenario was the automatic dose dispensing (ADD) provided by pharmacies. In this service, the medicine is inserted into medicine sachet rolls based on the prescription provided by the doctor. Each sachet has the information concerning the contents and the time when the medicine should be taken. This meant that the

customer only needed to check when the time for the next medicine and take it at the right time. This solution also solved some of the previously discussed issues. First of all, the medicine compatibility is always checked before the medicine are inserted to the sachet rolls. Secondly, the medicine is distributed individually reducing waste medicine and ensuring that the medicine has not expired. Thirdly, now the caregivers only have to replace the roll, instead of inserting the medicine into a dosett, again reducing possible mistakes in the dispensing process. However, it was still too difficult for a customer with dementia to remember to take the medicine. They do not always remember to check the next sachet or in some cases they do not even remember what day it is. It is also hard for some customers to handle and open the sachets. Therefore, while this solution made the work of home caregivers a bit easier, it is not enough for taking the medicine independently for everyone.

5.1.3 Service of the case company

The solution provided by the case company is a medical dispensing robot that reminds the customers to take the medicine at the right time. When it is time to take the medicine, a large button in the middle of the machine starts to blink and the machine tells the customer that: “It is time to take your medicine.” This continues for some time until the customer presses the button. When the button is pressed, a hatch below the button opens and machine outputs the medicine sachet and makes a small cut to it to help the customer to open the sachet. After the sachet is removed from the machine, the hatch closes and the machine instructs the customer in taking the medicine. For example, commonly the machine tells the customer to take the medicine with water. Once the medicine has been taken, the machine waits until it is time for the next medicine to be taken and the process starts again. This machine is shown in Figure 29.

The robot uses the sachet rolls provided by the pharmacies. One roll usually contains around 2 weeks’ medicines, which means that the machine requires a minimum of two refill visits per month. However, the machine has two slots for rolls, meaning that it can be filled during any visit providing flexibility to the refilling. Once the machine has been filled, it will read the customer identification and medicine information from the next two sachets, to make sure that the medicine of the right person is inserted. Only little time is needed to setup the machine and the rest will be coordinated by the information in the medical sachets. This previous process is also illustrated in Figure 29. Additionally, the time window for taking the medicine can be set to short (1 hour and 15 minutes) to long (3 hours) to give some flexibility for the customer if necessary. Once the machine is ready to operate, it will wait for the time for the first medicine sachet to be distributed.

Figure 29. *The service provided by the pharmacies and the case company.*

While the machine typically works as previously described, there are situations where different actions are required. First, it is possible that the customer does not press the button. In this case, the machine will not distribute the medicine, but instead will deposit it in a locked container that only the caregivers have access to for medication safety reasons. The machine in connected to a Telecare System, which will also alert the homecare unit that the medicine was not taken, so they can decide on appropriate actions. In case the customer presses the button but forgets to take the sachet, the sachet will roll back inside and will be also deposited in the container. In this case, the caregivers are once again alerted. Second, if the amount of medicine is too high for one sachet, they can be packed to multiple sachets and the machine is able to distribute several sachets with the same timecode at the same time. Finally, the machine has one day's worth of battery and can connect through different operators' mobile networks reducing problems caused by power outages and problems in network connectivity.

The service is product-driven, which means the robot is actually instructed by the sachets. This means that the medication plan does not need to be programmed for each customer but the information on the medicine sachets is enough to coordinate the medication instead. Only the customer information and a few settings have to be inserted during the setup. Thus, instead of coding the prescription for each customer, the caregivers only need to setup the customer information, time window, audio level and language for the customer. Moreover, the process of filling sachets is quite flexible, but the medication plan depends on the prescription of the doctor. However, if the caregivers would like to change the schedule of the medicine, the change has to be done into the prescription instead of to the machine. This is for example the case if the customer's daily schedule is different from the prescription and they do not like to wake up early. Thus, there are some steps

that require the approval and participation of other stakeholders in addition to the home care organization. The case company's role and the material flows in the homecare stakeholder network are illustrated in Figure 30.

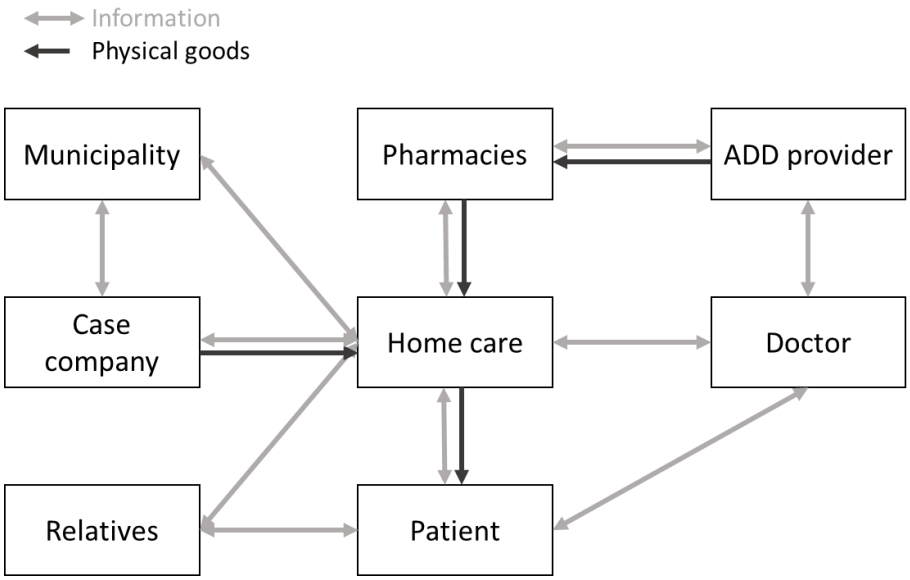

Figure 30. *The role of the case company within the stakeholder network.*

The sales process starts with the sales function making a deal and coordinating the purchase process. The municipality mainly handles any purchase, but the homecare organization and the caregivers have a significant role on how it is implemented. The ADD-provider has the smallest influential role, but they are needed to even be able to use the service, providing supplementary service. Overall, the buying center has been divided inter-organizationally and several stakeholders have to be satisfied to be able to make a sale. Taking also into consideration the fact that municipalities are more willing to pilot the service before a larger implementation, the process becomes more challenging. Thus, the perquisite for a large implementation is that the general satisfaction has to be high throughout the buying center. Additionally, before the service is delivered and started with customers, the customers and their relatives first have to approve the service.

Once the contract has been confirmed, the service production team takes over and coordinates the training and implementation. The service production trains the main users that take responsibility of the robots and train other caregivers to fill the machine or answer alarms. They also support the home care organization in selecting suitable service users, manage possible change resistance and monitor the effects of the service. After successful implementation, the role of the service production -function changes into support, helping the homecare organizations whenever any trouble rises. They also supervise the service packages, making sure all alarms are being handled. Thus, there is a large role on the service in addition to the robot itself, which is why each machine is called a service package. This is also one of the main reasons why the service is given with a monthly fee

instead of sold to the customer. The robot just by itself would not fit all the legal requirements of medicine distribution, and it is actually almost useless to anyone without access to the service network. Therefore, the case company needs to have a team and a service infrastructure coordinating the robot fleet and making sure everything works. Hence, selling the robots alone would not even be a viable possibility and the solution provided by the case company is therefore a service instead of a product.

5.1.4 The situation before the value assessment

At the beginning of the research project, the number of customer reference cases that the case company had was quite low. The case company had only been in the market for a short time, which meant they were still only working on their pilot projects. Therefore, the customer value was estimated based on their first pilot project as well as the information available in national statistics concerning different health care costs (Hujanen et al., 2008). In their first pilot project in 2014, they had identified an average decrease in monthly visits of 15 visits per month. Combining this with the 40 Euro average cost of a homecare visit (Hujanen et al., 2008), an average customer would result in cost savings worth 600 Euros per customer and a "payback period" of around 5 reduced visits per month per customer. Thus, they were able to develop an easily understandable and tangible economic value proposition. In addition to that, the offering provided several tangible and intangible benefits related to more controlled medicine distribution. Therefore, they had a very strong value proposition and expected the sales to grow exponentially.

The case company, however, faced some challenges. First, the purchasing process in many cases took longer than they expected. They had identified a main reason for this to be the complex purchasing processes of public organizations. Public organizations have certain principles for purchasing procedures, which makes it complicated to make investments. To conquer this, they have developed an expert understanding of the required processes. However, even so the process is dependent on several stakeholders, some of which have no direct contact with the homecare field. This means that there are multiple moments in the purchasing process where a single stakeholder can withdraw the whole deal. Taking also the fear related to robotics and automatization into consideration, these withdrawals can quite easily be based on intuition instead of looking into the issue. Hence, this particular problem was directly connected to the topic of the research project concerning facts and feelings.

Second, their customers preferred starting with a pilot project instead of a full implementation. There are a few reasons for this. Even though the service had been already piloted with satisfying results elsewhere, each homecare organizations wanted to make sure that it works with them as well. Therefore, they approached the solution with a pilot project and wanted to test it out themselves before implementing further. However, this is not the only reason. In addition, the financing of homecare organizations is friendlier towards

purchases related to development projects instead of straightforward investments. Therefore, the homecare organization is more capable of arranging a pilot project and testing the service with a smaller number of more ten or more service packages for a limited time than acquiring machines for long-term use.

Third, the volume of purchases even after the pilot was lower than expected. Based on the customer selection of the municipalities, the case company had estimated that half of the homecare customers are applicable service users. However, the volumes that the homecare organizations have started using have been closer to 3-10% of their homecare customers. Similarly, the number of packages did not seem to vary much between municipalities and more commonly, the typical pilot volume had been around 10 to 40 regardless of the size of the municipality. Thus, there were some inconsistencies in the service package volume that the case company was interested in understanding.

Fourth, the customer organizations quite seldom had resources to analyze the results of the pilot projects by themselves. The employees with the skills to make the necessary analyses or even cost analyses were working for within the municipality administration where the homecare field is not necessarily on the priority list. Thus, especially the caregivers had a quite clear conception of the reduced visits, but they had not systematically documented the results. While the customer organization might have been happy with the results, they could only recommend the solution to their superiors but did not have any documented argumentation to convince them. On the other hand, the case company did not get sufficient documented results either to use when offering the solution to other homecare organizations.

To tackle some of the previously discussed challenges, the research group was invited to perform a value assessment with the customers. While one of the goals was to develop marketing material to help in further deals, the case company was mainly interested in understanding how customer value manifests with their customer and why some homecare organizations do not increase their amount of service packages even though they report being satisfied to the service.

5.2 Value assessment in customer cases

5.2.1 Exploring the customer perceived value

The first customer case where the researcher could get more familiar with the service was in Vantaa. Vantaa had 14 service packages, which had been distributed into four subregion homecare units. While Vantaa did not have an ERP-system gathering data about the number of visits, they seemed to be quite satisfied with the service and the representatives in the case company had informed the researchers that there had been quite clear reductions in the number of visits. Therefore, Vantaa seemed to be an obvious choice for

a reference case that could not only be used in the negotiations with other municipalities, but also as a guide on how the customer value could be achieved.

Three interviews and one phone interview were carried out during autumn and winter 2016 – 2017, including 14 customers in total. The researcher was participating in two interviews in the sub regions 2 and 4. The interviews included certain topics and questions that were discussed with each customer. The structure of the interviews was quite flexible and issues outside of the interview structure were discussed if interesting topics came up during the discussion. All notes and issues discussed in the interviews were gathered together to create a summary report for the case company. The visit reduction results can be found in Table 4.

Table 4. *The results from Vantaa customer survey.*

Customer	Monthly visits before the service	Monthly visits after the service	Change in visits	Relative change in visits (%)
C14	60	30	-30	-50 %
C22	60	30	-30	-50 %
C23	60	30	-30	-50 %
C11	30	4	-26	-87 %
C21	30	8	-22	-73 %
C12	30	20	-10	-33 %
C31	16	8	-8	-50 %
C13	8	4	-4	-50 %
C15	90	90	0	0 %
Total	**384**	**224**	**-160**	**-42 %**

With a quick overview, the customer value seems to be quite apparent. With monthly visit reduction being around 0-30 on a customer level, the results seem similar with their first customer pilot. Hence, the average monthly visit reduction was 17,8. With the 40 Euro cost per visit, the total customer value of direct visit reduction would be 6 400 Euros per month as cost savings. While the actual service fee depends on the volume and contract duration, by using a 200 Euro service fee for each service package, the total customer cost would be 1 800 Euros per month, resulting in a customer perceived value of 4 600 Euros per month with 9 customers. However, it should be noted that these cost estimations have some limitations that are discussed more in-depth later in Chapter 5.3. Nevertheless, with the interviews it was possible to document direct cost savings, and the caregivers seemed to have a positive impression, since there were also some intangible benefits. One of the caregivers for example commented a customer's well-being by saying:

> *"He's been happy that the caregivers don't visit every day. His control over the daily rhythm has increased so much that he's much more talkative."*

Thus, it is safe to say that the total customer perceived value should also be positive. However, some individual cases draw attention. While in most cases over a 50% decrease in visits could be reached, there are a few cases where the reduction was smaller. One of these cases is the C15 without any visit reduction. However, the interview revealed that the reason for this is that the customer has eye-drops, which must be given at least 2 times a day. Thus, the first value assessment case suggests that there are some elements that might limit the reduction of visits, but in most cases, a reduction could be reached.

This first customer case provided the researchers a chance to get familiar with the offering, get some feedback from the caregivers and identify some criteria that enable visit reduction. The researchers even got to see an end customer using the service. Thus, the offering seemed to be able to match or even surpass the case company's value proposition and the caregivers seemed to report that after some initial doubts, they have found the service quite satisfying. The representative of the case company and the caregivers also explained that a positive attitude against medicine was one of the starting criteria for customer selection as they would not be able to know for sure, if the customer actually takes the medicine or throws the medicine sachet to garbage after taking it from the machine. Additionally, it seems that there are activities, such as giving eye-drops, which can limit the visit reduction to smaller than expected. Finally, two end customer groups could be identified during the pilot:

- Customers with minor memory issues
- Customers with a need for medication control

The first customer group includes elderly with minor memory issues such as incipient dementia, meaning they have trouble remembering to take their medicine. Thus, the caregivers have to visit the customer to distribute the medicine in a medicine dispenser and in some cases even to remind the customer to take the correct medicine once or multiple times a day. The second customer group consists of elderly whose medicine distribution needs to be controlled. This can be connected to a dementia as in the previous group, but instead of reminding and guiding the medicine distribution, the caregivers need to control that the end customer does not take too much medicine. Some of the customers might have painkillers with addictive side effects or they might just stress about their medicine so much that they take the medicine earlier than prescribed. Regardless, the homecare organization needed a way to make sure the customer does not take the medicine before the correct time.

Finally, these results were gathered in a summary memo, which was presented to the case company. The translated version of the cover page of the report can be found in Appendix 1. It should be noted that the sub region 4 differed from the rest; the customers were staying in the care center, diminishing the cost savings that could be acquired by reducing visits. While they had recognized the same benefits as other sub-regions, the cost savings potential from direct visit reduction was almost non-existent. Therefore, the results from

the sub-region were summarized in the report, but the five customers were not included in the reduced visits summary. In addition, the report also had a written summary of the complete pilot project as well as more detailed reports on each customer. All the customer names were under confidentiality and marked with tags for later identification.

From management accounting perspective, the cost assessment in this customer case was not too difficult to make. All that was required was some time to interview the caregivers concerning each end customer, sum up the total monthly visit reduction and use the average cost of visit to calculate the total cost savings. Thus, there seems to be no clear benefit in having a management accounting professional participate in this type of analysis, other than maybe in approving the methodology used in analyzing the cost savings.

Now the question is; why did not anyone from the homecare organization or the case company do this value analysis? There could be several reasons for this. First, the homecare organization might not have the resources to allocate someone to analyze the results in all four sub-regions. They might have made something for internal use, but at least it was not made clear for the researchers. Second, the case company is still a quite small start-up, which means that they face a similar resource related challenge. Third, and most apparent, reason is that it was beneficial having a neutral third party to do the analysis. More specifically, because the third party in this case was a research group of a university, they were quite openly invited to analyze the effects of the service.

Interestingly, it seems that the case company used the analysis provided by the case company directly as marketing material. As the sales director of the case company clarified:

> "*We certainly do not wish to edit the material into ... [the case company's] ... slideshow, it would only reduce its value at the eyes of the customers. The authentic table seems to work better because it even looks like a study done by researchers."*

This again reflects that while an academic report style might not be the most efficient way to communicate the results, there are benefits related to using an authentic study instead of visualized slideshows as marketing material. Interestingly, the researcher had not anticipated this and had focused more on trying to summarize each relevant point neutrally about each end customer. This is why, for example, the quotations in the interview memos were not included in the report, even though they would have been useful material for marketing. Overall, there was no clear objective for the value assessment study other than reporting the findings as neutrally as possible, which would mean that communication of the results would have required more attention.

While the Vantaa project gave a nice customer reference case for the case company, the material had some issues as well. The findings were gathered with interviews and while the caregivers used service plans to remind themselves of the changes, the results only reflected how they had changed their service plans. Hence, the case measured quantitative metrics with mostly qualitative interviews. While this type of information gave a good

insight of the change in standard level of care, it only communicates what the caregivers already know. However, this information does not tell when the visit reduction happened, if the level of service actually followed the service plan, if there had been many non-planned visits, and how the service had effected the workload of the caregivers. Therefore, the next step was to validate the findings using enterprise resource planning (ERP) data.

5.2.2 Measuring the effectiveness of the service

At one point, the researchers were invited to study the customer case in Joensuu, gaining access to the ERP-data available at the homecare organization. A project manager responsible of the deployment of the medicine distribution robots collected the ERP-data and forwarded it to the researchers. The researcher joined the project in midway, meaning that some preliminary data analysis on the provided material had been already done. However, the preliminary analysis had reviewed individual customer cases instead looking at the municipality level. Additionally, there was some new data available for analysis. However, the challenge was that the months were not directly comparable, because the services were started on different times.

The data had information concerning the amount of monthly visits, time spent at each customer per month, and the timetable of the visits. However, instead of a list of ERP entries, the information was already summarized for each month. Thus, there was no way of knowing if a visit had been at the beginning or at the end of the month, but it was possible to know when during the day it had happened. This way of reporting had some limitations for the further analysis and decreased the accuracy of the resulting analysis. Therefore, the provided data required some intermediate analytical methods to be processed into usable format. For example, the implementation month for the customers varied, which meant that the data had to be readjusted in relation to the starting month. This was done setting the starting month to zero and reviewing negative (before implementation) and positive (after implementation) relative months. This process is illustrated in Figure 31.

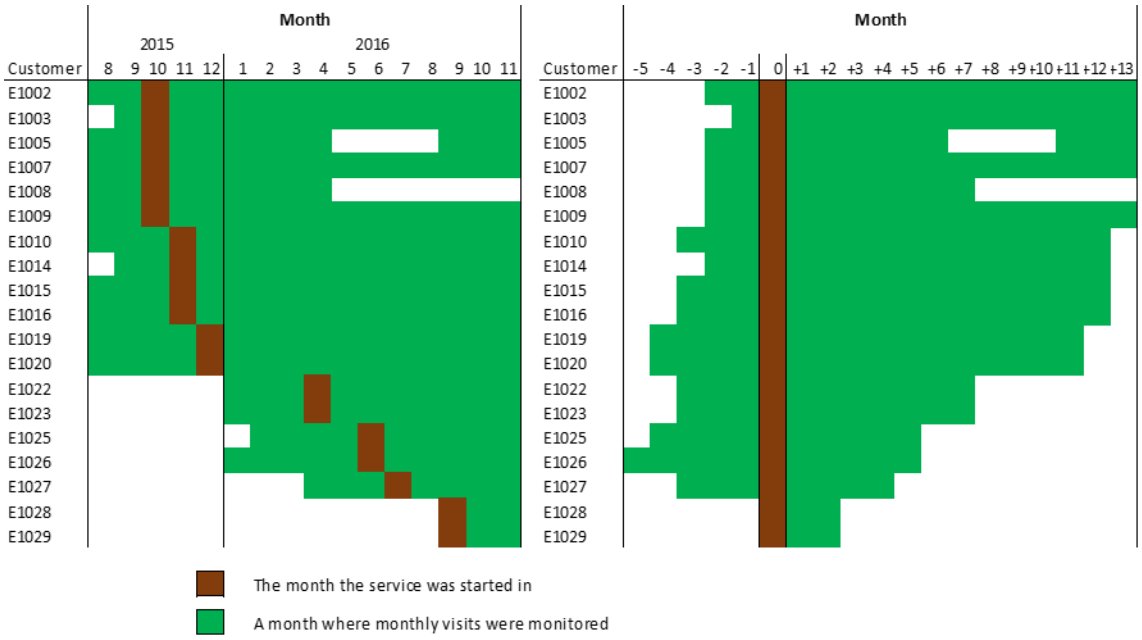

Figure 31. *Readjusting the monitoring periods based on starting month.*

The readjustment of the starting month provided a nice starting point and enabled to assess the before and after on the municipality level. However, the next step was to formulate the information in a relevant format that could help decision-making and lead to action. However, a new problem arose; the monitoring period of the customers varied quite a lot. As such, reviewing the total amount of visits per relative month was not possible. Therefore, the idea was to calculate the average monthly visits for each customer before and after the service implementation and sum up these totals to get a before and after analysis. This method proved to work quite well, as it reduced the problems caused by monitoring periods, gave a before and after analysis on each customer, but was also measurable on the whole pilot scale.

As the monitoring period was relatively short especially before the service implementation, the starting month was included in the analysis, but with a weighted average depending on which day the service had been started. While there is a small margin of error because of the change in visits during the starting month, this addition made the before and after more comparable for some customers and also enabled to include the customers E1028 and E1029 in the analysis. The results of this method have been collected in the Table 5. Additionally, the same averaging method as in visits could be applied to the time spent at each customer. This way it was also possible to estimate the duration of an average visit for each customer and how it changed after service implementation.

Table 5. *Monthly visit averages per customer.*

Customer	Before (visits/month)	After (visits/month)	Abs. change	%-Change
E1027	38,21	6,41	-31,80	-83 %
E1025	52,30	23,15	-29,15	-56 %
E1015	57,84	32,15	-25,69	-44 %
E1020	25,53	8,51	-17,02	-67 %
E1009 (x)	60,51	43,98	-16,53	-27 %
E1007	29,76	26,90	-2,86	-10 %
E1016	35,22	34,18	-1,04	-3 %
E1029	5,00	3,98	-1,02	-20 %
E1019	42,18	43,32	1,14	+3 %
E1028	4,00	6,05	+2,05	+51 %
E1002	8,06	11,49	+3,44	+43 %
E1022	33,38	37,70	+4,33	+13 %
E1010 (x)	30,45	35,18	+4,73	+16 %
E1023	31,03	36,47	+5,44	+18 %
E1003	22,98	28,43	+5,45	+24 %
E1008 (x)	30,51	51,29	+20,78	+68 %
E1005 (x)	6,00	28,26	+22,26	371 %
E1026 (x)	68,07	96,09	+28,01	+41 %
E1014	58,67	93,40	+34,73	+59 %
SUM	**639,70**	**646,94**	**+7,94**	+1,1%

The first noticeable issue was that the average monthly visit reduction seemed significantly smaller than in the previous cases. The total sum of monthly visit reduction was actually positive, meaning the number of monthly visits with the current customer base had actually increased by 7,9 visits per month with the 19 end customers. Because the total visit reduction was negative, there were no direct cost savings but a cost increase of 318 Euros per month. Considering also the service fee, the total cost increase would be 4 118 Euros per month. Similarly, there did not seem to be any correlation between the amount of visits and the visit reduction potential. However, a three customer groups could be identified based on the monthly visit reduction:

- Customers with clear monthly visit reductions (Green)
- Customers with minor changes in monthly visits (Orange)
- Customers with clear increase in monthly visits (Red).

Additionally, it was found out that the service was cancelled with five end customers during the monitoring period. These customers are marked with (x) in the table above. Two of the customers (E1005 and E1008) had passed away as their condition had gradually worsened. The reason for these was not related to the service according to the caregivers. The next two customers (E1010 and E1026) were unsure if they wanted the service and without any clear visit reduction, the caregivers had chosen to cancel the service. The

reason for one of the most potential customers (E1009) had not been explained, which naturally arose questions.

While the homecare personnel understood the strain created by the visits during the morning and had noticed that the case company's service can provide some flexibility to the morning strain, the impact had not been documented before. However, Joensuu case provided a possibility to analyze the relative visit distribution during an average workday. Thus, the Figure 32 below shows before and after, how many visits of the total visits occurred at each hour of an average day. The analysis required the use of a bit complex spreadsheet computing as the information was organized in a somewhat challenging way. Thus, at first, only the relative distribution could be estimated, at second, the time distribution of an average customer was estimated and at last, the time distribution of an average day could be calculated. While the Figure 32 shows the latest analysis, the report in Appendix 2 that was sent to both the project manager and the case company only had the relative distribution.

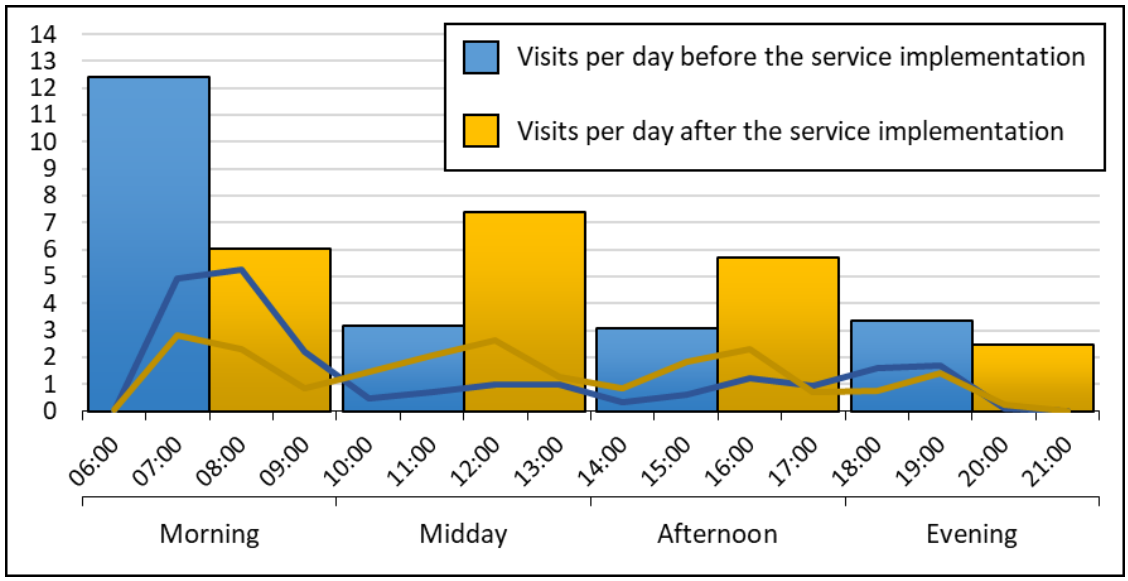

Figure 32. *The time distribution of homecare visits during an average day.*

It seems that with the 19 customers, a major development occurred in the time distribution of visits; the visits during the morning between 6 and 10 decreased dramatically, while the visits during midday from 10 to 18 increased a similar amount. There also seemed to be a minor decrease in monthly visits at the evening around 18-22. The Figure 32 suggests that on an average day the homecare organization had a maximum of six visits per hour during morning shifts, and two visits per hour during the evening shift with the 19 customers. After the service had been implemented, the peak leveled out so that on average the homecare organization only had around 3 visits per hour as a maximum hourly output. Thus, it seems that even though the homecare organization was not able to decrease monthly visits, they gained some flexibility into planning the visits, which might help

them in their resource planning. While this also brings a new perspective to cost savings potential, it was only later when the potential of this approach was fully realized.

While there seemed to be potential in the daily visit distribution, the visit reduction perspective needs to be first discussed further. The monthly visit reduction results seem totally opposite to the previous cases. This suggested that there was something going on that required attention. As this increase in visits was quite alarming, the project manager at Joensuu got an idea to ask the caregivers about how many visits would be needed if the service were to be cancelled at the current state. The results are illustrated below in Figure 33.

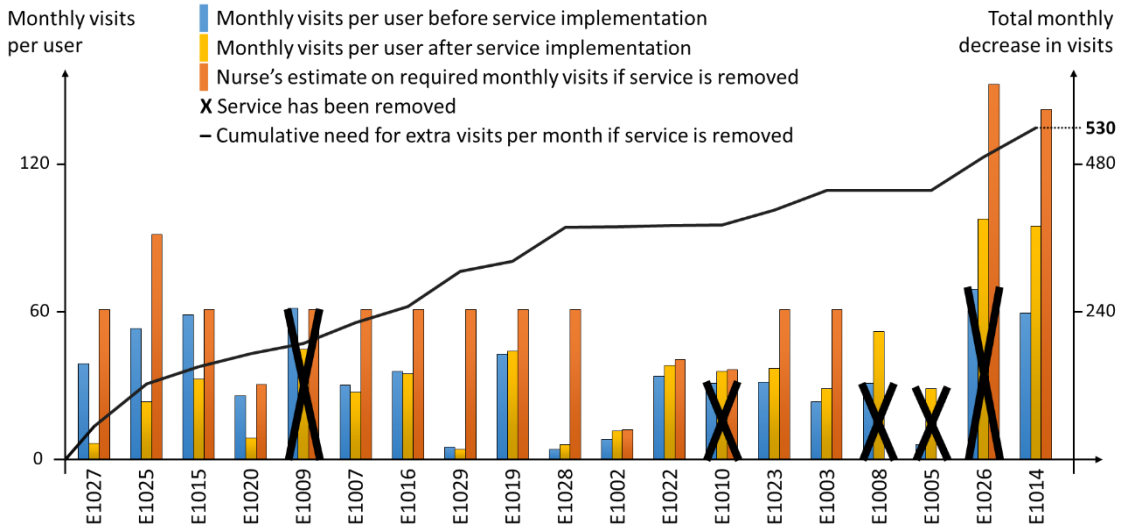

Figure 33. *The caregivers' estimation of required extra visits, if the service would be removed in the current state.*

These results bring a bit more insight to the impact of the case company's service. There are at least two ways to interpret the estimation of the caregivers. The first one is that it presents the organic change in the number of visits, and the case company's service has been able to contain the number of visits roughly at its current level. In this case, the analysis of calculating the visit reduction could be conducted based on the estimation and the monthly visits after. However, the estimation in some cases is so inconsistent that it would be hard to imagine such an organic growth in visits. Thus, the second way to look at it is that the estimations demonstrate the value seen by the caregivers, thus not necessarily only evaluating the number of visits but other benefits as well. The key term for this interpretation is the equivalent level of care. This would suggest that there are other benefits realized by the caregivers that would require or be measurable as needed extra monthly visits. Additionally, these interpretations are in no way exclusive. However, regardless of the interpretation, communicating the caregivers' estimation became just as important as the ERP-data as it at least partially explains the actual increase in visits.

In Vantaa, it was easy to report the results when they were satisfying to most recipients. However, in Joensuu the case was different. While the longer observation period gave a better chance to get a more accurate average of the visits per month, it also meant that there was a higher chance of other factors influencing the amount of visits. Once the sum of total change in the number of visits per month was analyzed to be negative, the stakeholders in that particular project wanted to know what happened. This meant that in addition to using spreadsheet tool to analyze the before and after per each customer and the whole project, additional information was needed to explain the various customer results. So in fact, this identification of "something being wrong" as discussed by Jönsson (1998) was required to start looking into the elements enabling the visit reduction and behavior of the homecare organization. This meant that, the researcher needed to contact the project manager, as she was the contact between the researchers and the homecare organization.

During a skype-meeting with the project manager, the researchers were aiming to gather more data concerning the stories behind the numbers. There were some customers with a visit history, which was quite hard to understand only based on the numbers. For example, the service was removed with one of the customers (E1009), who had the fifth best results in visit reduction. The comment on the removal was that the condition of the customer had decreased dramatically. However, the data told a different story with the number of visits being almost 37% less than before the service. When the project manager was asked about the customer, she explained it as follows:

> *"It seems that the condition became worse in December, after the monitoring period so it is not yet visible in the results."*

This example is one of many meant to illustrate that there can easily be important issues going on, which the numbers do not show, but have a high importance concerning the decision-making. Another similar example is that in 2017 the amount of service robots were decreased from 30 to 20 according to their contract with the service provider. This meant that they had to remove the service from some of the customers who either were not too happy with the service, did not have enough visit reductions or did not want to pay the extra 20 Euros for it after the pilot program. An opposite case was with a customer with the highest increase in monthly visit, but with whom the service was still continued. It was found out that this customer was a Parkinson patient, to whom the service provided important health benefits, because the time of the medicine was crucial. Additionally, later in the project it was found out that the monitoring period had also started in the middle of the month with some of the customers resulting in lower number of monthly visits before the service implementation than in reality. Taking this into consideration, the final total change in monthly visits was -16, meaning that while a minor visit reduction was possible, it was not sufficient to cover the service fees.

Once the analysis was done, the next step was to develop how to communicate the results. The goal was to format the information in a form that would clarify the pilot project the best way. To do this, the main requirements and the preferences of the stakeholders needed to be taken into account. Additionally, as discussed before, it was important to still have access to the input information, meaning in this case, the original customer cases as in the previous analysis. The discussion that the analysis is made for different uses concerning the continuity of the project. Thus, the needs are measuring the realized customer value, assisting during the bidding process and identifying potential customer profiles. The targets of communication case are operative management of homecare, decision-makers of the municipality, the case company and potential customers in case the results are later used as a reference case. Therefore, the communication method had to be simple, preferably visual summary of the pilot that could be used for multiple purposes. The overall performance of the pilot should be visible, but also the value elements and other remarkable changes in the operations of the homecare organization should be identifiable. The resulted method of communication was an A0-size poster that had the total summary in the middle, and customer overviews around it. A small version of the poster can be found in Appendix 2.

The analysis was well received by the case company and they wanted to order six more posters to use as their reference cases. They were interested in the time distribution of visits and the positive customer cases, but wished for a higher total visit reduction. Thus, all the necessary topics could be communicated with little to none discussion or explanation outside the poster. However, it should be noted that the employees in the case company have a history and high expertise in technology, which would suggest that this type of reporting was familiar to them. Unfortunately, only little feedback could be gotten from the pilot project team. During the skype meeting, the project manager of the pilot commented the poster being interesting, but had not had the time to look thoroughly into it. Additionally, the technology project in which the service was piloted had already ended, meaning that there were not a chance to reflect the findings with the homecare management.

There were some challenges in being able to analyze the time distribution of visits because of the limited information. However, this type of partial information might be similar to what other companies have to go on. Moreover, based on the assessment process a management accounting professional, or at least a person experienced with data analytics and spreadsheets would have been required to refine the data to uncover these findings. Nevertheless, the documentation of the customer value mechanics seemed to be beneficial for both the customer organization and the case company and it enabled the researcher to better understand the customer value. After all, at this point the focus was in identifying the mechanics of the customer value, which in this case would be the value elements. Once these elements could be identified, the next step would be to measure them using

cost assessment. However, before this could be done, more information about the mechanics and more specifically the potential of different types of customers was required.

5.2.3 The role of customer selection

Previously, the researcher was mainly expected to report the before and after for the reason that the customers and the case company were interested to know if the pilot projects were going as expected. However, the reports had proved to be in high importance during the bidding process after the pilots. Therefore, instead of supply based reporting accounting information there was now an identified demand for information to help in the communication during the negotiations and making specific decisions. In addition to answering the question should the service be continued or not, the analysis should also answer questions on how many robots should be acquired, which customers they should be allocated to and what other things should be considered when scaling up the service. Thus, reporting the results was not enough, as it did not promote any action.

Nørreklit et al. (2010) remarks that it is crucial for the accountant to understand the phenomena behind the numbers. The researcher also noticed this during the final steps of the Joensuu case. As there was now a clearer understanding for the role of the project analyses, the Joensuu case directed the researchers to investigate how the homecare organizations choose the customers for the service. An excellent possibility for this occurred, when the researchers were invited to a meeting where the service was demonstrated to the caregivers and preliminary discussions concerning the customer selection took place. The discussion proved to give important insight to the customer selection process and opened up a new object to research further.

The meeting began by the presentation of the robot and the service. This was done by the representative of the case company, during which caregivers asked some questions. Each caregiver had the opportunity to take a candy sachet out of the machine, helping them to understand the principles of the service. Particularly in the beginning, the mood of the caregivers seemed to be skeptical and one of the caregivers also clearly expressed her preconception. However, the caregiver also continued as follows:

> *"Just some time ago, we started using a new software, which we were also skeptical in the beginning. However, it proved to be quite useful, so I would like try to keep an open mind towards this as well."*

Thus, a new ERP-software had been successfully implemented in the recent past, which made them more receptive towards technologies. During these discussions, several stakeholders were present. These stakeholders included the caregivers, managers of the homecare organization, representatives of the pharmacy and the case company as well as the researchers. The discussions began by going through the responsibilities of different parties of the value chain. The purpose of this discussion was to clarify if there are any

requirements that still have to be met before the service can be implemented. Simultaneously, schedule of the implementation process was also presented to the relevant stakeholders.

Once the customer selection began, the representative of the case company opened up a preliminary list of potential customers and started going through the customers one by one with the caregivers. She suggested that they rank the potential customers from one to three based on how suitable they would be to use the service. During this ranking process, they ranked many customers, with whom only a few visits per month could be removed, to the highest rank mainly based on the capabilities of the customer. Therefore, at one point one of the researchers interrupted the discussion by saying:

> *"The monthly cost of the service is about 200-300 Euros. If an average homecare visit in Finland costs 40 Euros, 5-6 visits need to be eliminated per patient in order for the service to provide financial benefits…"*

At this first brought up some doubt. The caregivers emphasized the well-being of the customers as the main priority. One of the caregivers even joked that they should not listen to the researchers because they have an engineering and financial background. However, one of the caregivers responsible for also coordinating the homecare visits quickly responded:

> *"Unfortunately it is a raw fact that it is the Euros that run this world."*

After a moment of silence, the caregivers went through the previous customers again, now also discussing about the amount of monthly visits. They realized that with some customers, as much as 30 visits per month could be removed, and started to notice the potential of the service. In a moment, the caregivers started going through the customers much quicker, with the head of the caregivers presenting names of customers with daily visits and other caregivers commenting if it would be possible to decrease the visits with the particular customers.

Hence, by communicating the financial benefits in a simple way using payback period, the caregivers were quite quickly enable to identify the potential end customers from financial point of view. They started to take the visit reduction potential into a concern when analyzing the next potential customers and some of them also started to notice factors, such as specific medicine that requires measuring and liquid medicines that impact if any reduction in visits can be achieved. However, as the financial value comes from decreased homecare visits, it is also possible that they saw the benefit of lowered capacity from the daily work perspective. Regardless of the reason, they were able to identify potential customers without any additional intervention from the researchers. Also, later it was found out that the caregivers did not have almost any knowledge about the topic of the meeting. They were asked to be present in a meeting concerning a service that has a large impact in their work and was to be implemented with a tight schedule.

Based on the discussion, the researchers and the representative of the case company were able to budget the total visit reduction potential of the homecare organization. Based on the discussion, as much as 235 visits could be reduced with 10 service packages and the homecare organization started planning the visits where they present the service to the potential customers. Thus, both the representative of the case company and the researchers left the meeting with high hopes.

The homecare organization was open towards the researchers and the researcher visited the homecare organization a few times and even participated in a homecare round of one of the caregivers. During the discussions, the caregiver told they had had some trouble getting customers agree to participate in the pilot. Nevertheless, they were still able to get 10 customers to start the service, and the pilot project started two months after the first discussions. When the pilot started, the researchers were given a short list of the end customers with budgeted visit reductions for some. While only four out of the 13 potential customers were to start the service, the budgeted visit reduction still seemed quite good with a reduction of 92 visits per month with only five of the customers. However, after the first data-analysis, the results had become worse once again. The development of the customer selection and the budgets is shown in Figure 34.

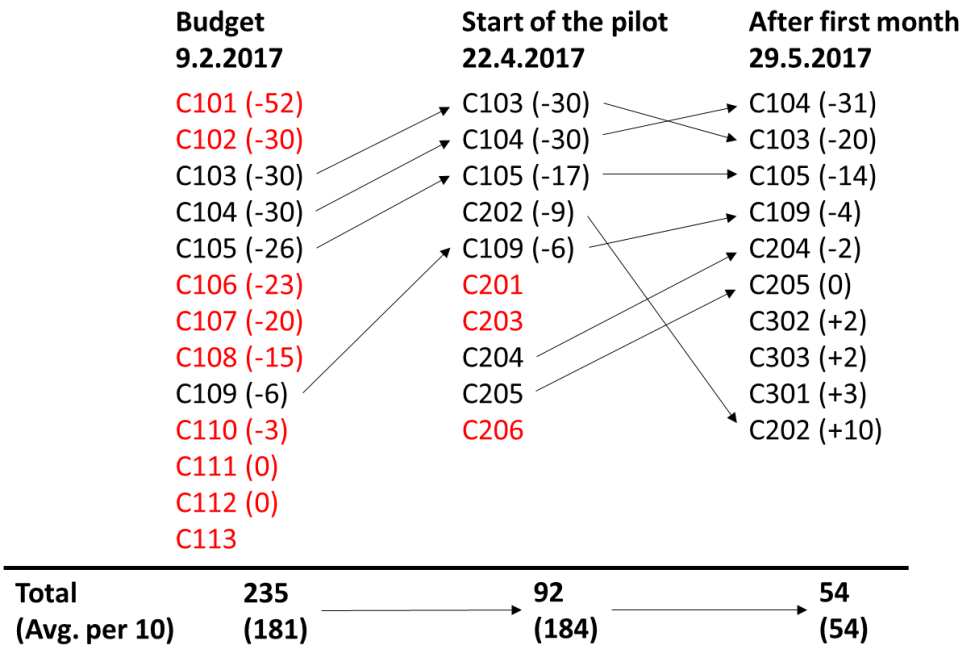

Figure 34. *The customer base development from budget to first month of service.*

For privacy sake, the customer names were changed with first number of the id presenting at which step the customer was selected. As it is possible to see in the above figure, only four of the original chosen potential customers ended up accepting the service. However, interestingly these four customers were also had the highest visit reduction. Similarly, the ones selected before the start of the pilot ranked second with the exception of C202 having highest visit increase. The last three customers selected after the pilot had started had

minor increase in amount of visits. This would suggest that the caregivers were quite able to identify and budget the visit reduction, but there are some other issues related to end customer acceptance or unidentified criteria that can limit the overall success.

Additionally, there were some other changes made in the customer base during the pilot. The caregivers commented that a few of the customers experienced the robot as stressful or uncomfortable and got confused by the voice telling them to take the medicine. One of the customers was stressed about waiting by the machine to make sure she gets the medicine and even called the pharmacy to make sure she gets her medicine. Thus, they discontinued the service with three of the customers and selected three new customers with a short notice as replacements. The three new customers all were aimed for precautionary care, meaning that they try to keep the amount of visits at the level they are currently.

After the first month with most customers, the ERP-data concerning the case in Harjavalta was collected and analyzed. In addition to the results of the ERP system, this time the researcher also wished to interview one of the caregivers in charge of the robots and the service in the homecare organization. Important factors were also included in the analysis, especially if something had gone differently than in the budget. The results are illustrated in Figure 35. A larger overview of the analysis can be found in Appendix 3.

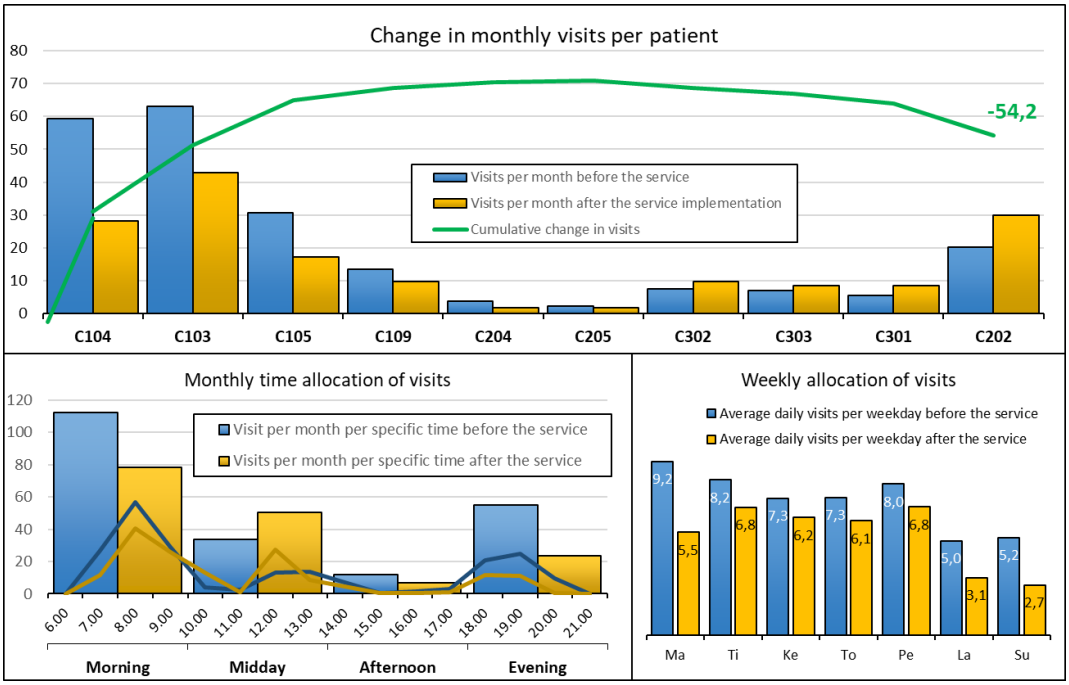

Figure 35. *Service impact analysis in Harjavalta after the first month of service.*

As a result, the visit reduction varied from -31 visits per month to +10 visits per month depending on the customer. Overall, the total monthly reduction in visits with the 10 customers is currently around -54 visits per month. Thus, similarly to the Joensuu case, the three customer groups could be identified in Harjavalta as well. This suggests that the reduced time at some customers can be used to provide another higher level of service at

others. While this does not necessarily bring direct cost savings, it enables a more flexible allocation of resources and focusing resources based on customer need.

In Harjavalta, the data enabled to allocate each visit to specific timeframe, thus enabling the analysis of visits per specific time, instead of a share of total visits per specific time. The resource use with the 10 customers decreased during the mornings (6.00-10.00) and evenings (18.00-21.00) but increased during midday (10.00-14.00). This level of detail also enabled a new perspective, as this was the first time that the allocation of visits per specific days of the week could be analyzed. The finding brings also interesting insight to the resource planning perspective, since the caregivers in Finland get some bonuses from inconvenient working hours. Additionally, the caregivers might prefer if the amount of work is reduced during weekends. Thus, this again should bring some flexibility to resource planning as well as other indirect benefits through, for example, motivation.

Showing the results in Vantaa and Joensuu helped the manager of the homecare organization see the business potential provided by the service. However, the manager's interest was relatively low until the results were from their own organization. When the first preliminary results were shown to the director of elderly care, she commented it as follows:

> *"This analysis is of high importance of us. After all, its significance is in helping us understand the effects of the service better and help us in making the right decisions."*

Unfortunately, the researcher could not get access to the meeting concerning the first month of service and continuity of the service. However, the sales director of the case company later said that the analysis provided by the researcher was used and discussed during the meeting. The sales director later also commented that both the case company and the managers in Harjavalta were satisfied with the results so far and were enthusiastic about how the results will develop during the next months.

The analysis was updated in August. Similarly to the last meeting, the researcher visited the homecare organization to get the ERP-data, but the main reason for the visit was to be also able to interview both the coordinator of operations as well as the main user caregivers. The preliminary topic was to discuss if there had been some changes in the condition of end customers that could explain any fluctuations in the visits. The discussions proved to be useful, as it seems that the service will be discontinued with two of the customers; C205 and C105, latter of which was quite a positive case. The former case ends the service for personal reasons while the latter was a similar case as C202, and required support hoses. Thus, in all the cases where the monthly visits increased drastically, an external reason could be found. However, some increase in visits could be identified during the period that the robot was implemented with the customers. Similarly, some of the customers felt some negative reaction towards the robot, but in most of these cases, the customer either adjusted to the service or the service was terminated.

Once the updated data had been analyzed, the findings were gathered in an updated version of the poster that can be found in Appendix 4. As the template used in the Joensuu case had proved to be quite satisfying, the same template was used to make the new report as well. However, based on the amount of pilot customers and accessibility sake, the analysis could be fit to A3-size, making it easier to print in non-digital format as well. The development in the selected customers is illustrated in Figure 36.

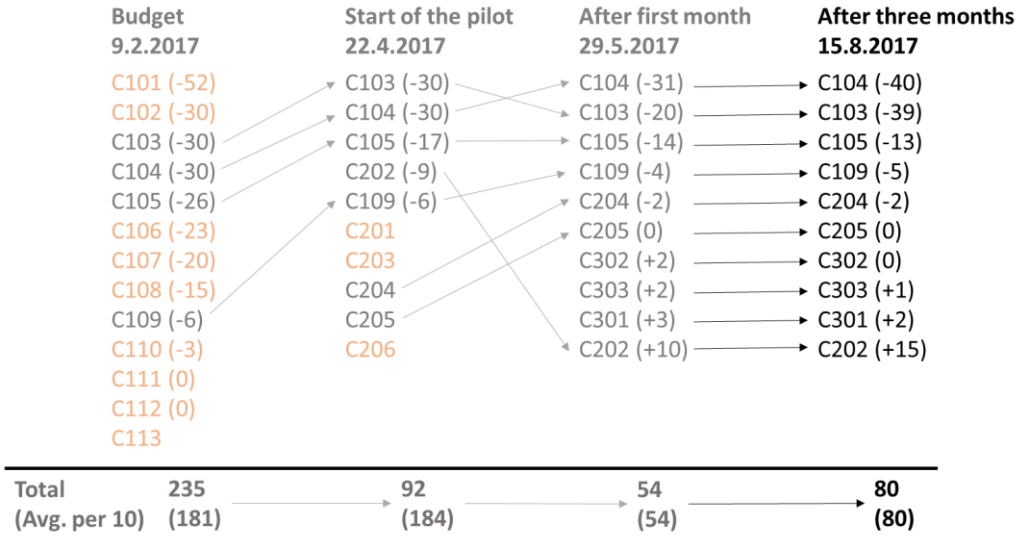

Figure 36. *Customer base and visit reduction development during the second monitoring period.*

The visit reduction had decreased as expected, with largest development with C104 and C103. The total visit reduction summed up to 79,6 visits per month with the 10 customers. This means that using the 40 Euro cost per visit, the total customer value from direct cost savings would be 3 184 Euros per month and the service fee around 2 000 Euros. Thus, the customer perceived value would be 1184 Euros per month without taking into consideration the other benefits of the service. While this was a better customer case than Joensuu, the visit reduction was only half of the originally budgeted visit reduction potential. Thus, making sure that the service is forwarded to the most potential customers is crucial for the success of the pilot from the cost point of view.

Additionally, during the interviews the coordinator of operations told that her job had become easier as the time criticality of the visits had decreased. The caregivers also seemed to have noticed the benefits of the reduced visits with some of the customers. However, at this point the caregiver pointed out something interesting:

> *"Sometimes if I have extra time, I will stay at the customer and talk with them or do something else like check the cupboards, even if it is not necessary. Will that show in these graphs?"*

This was a surprise for the researcher, as he had not realized this before. This kind of observation would have been difficult to make just based on the data, especially for a researcher with an industrial management background. While this would not reflect elsewhere but in the average duration of the visit, it was an important note for the cost assessment and a step towards a vaster perspective than just looking at the visit reduction. Thus, the researcher started looking into the one of the customers with noticeable change in visits to identify how the service developed after the service implementation. This again, required a bit more complex computing and a way to visualize the service as well as possible. After the analysis, some interesting developments in the service could be identified. One good example of this is C103, with whom three clear phases could be identified. The visualization for C103 is shown in Figure 37 and a larger version in Appendix 5.

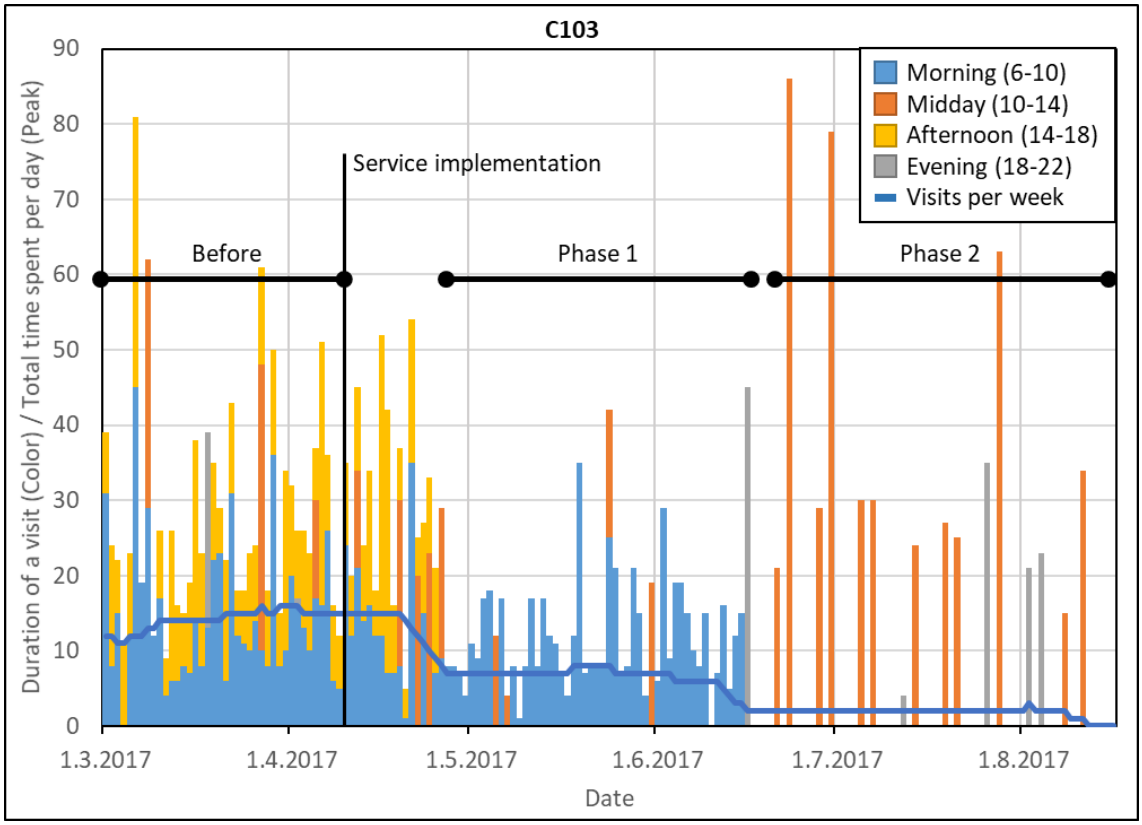

Figure 37. *Service development for C103.*

Each color represents a single visit separated the morning, midday, afternoon and evening visits. The height of the bar represents the duration of the visit and thus, the peak of each bar is the duration spent at the customer during that day. For example, in the beginning before the implementation there were often two visits during the morning (blue) and evening (yellow) and the visit duration was mainly between 10 – 20 minutes. A week after the beginning of the medicine dispensing service, there were some irregular activity, which probably was connected to the implementation of the machine. However, about two weeks after the implementation, the evening visit was almost completely removed, while

the morning visit stayed pretty much the same. This lasted for about 6 weeks, after which the service plan was completely changed. Now the customer is only visited 2 times a week, ant the durations of the visits vary from 20 – 80 minutes, and the visits occur around midday instead of the morning when the resource strain is the highest. Thus, instead of a single medicine dispensing visit that is removed, the whole homecare service could be redesigned to a new format. This suggests that the medicine dispensing service provides the flexibility to readjust the service according to customer needs. It also suggest that just looking at a reduced visit with a particular price tag might be too narrow-minded.

5.2.4 Supporting the customer selection

In June, the researcher was invited to visit a new homecare organization, which had had trouble choosing the customers. Their superiors had identified the potential of the service, and had ordered ten service packages to one of their homecare offices. At the same time, the homecare organization had identified two potential customers, and they were expecting a smaller amount of service packages. Additionally, once the service packages had been delivered, one of the customers had become skeptical towards the service and the other one had been transferred to institutional care. As a result, they had ten service packages but no customers for them.

The issue with a municipality this small is that the amount of regular customers is quite low. At the end of 2016, Vantaa had 1 362, Joensuu had 1 105 and Harjavalta had 130 regular homecare customers (Väyrynen & Kuronen, 2017). In Sysmä, however, there are only 85 regular customers (Väyrynen & Kuronen, 2017). Thus, while there are enough customers that are applicable to be service users, there might not be enough compliant customers, with whom direct cost savings could be possible. Therefore, being able to choose potential customers would require some new kind of thinking.

During the discussion, the researcher went through their list of potential customers with the homecare manager while simultaneously reflecting with the previous customer cases. This kind of approach enabled the identification of limitations early and gave some support to their concerns by going through cases with similar customers. The manager of the home care commented our discussions as follows:

> *"It is nice to get opinions and references of similar customers so that we can identify the right types of customers."*

Thus, it seems that being able to reflect the ideas with previous stories can reduce the uncertainty and doubt related to this kind of technology implementation. The potential to reduce the homecare visits from as much as 2 times a day to few times a week can sound too good to be true, or impossible without a negative influence on the service quality level. Thus, seeing those impacts documented could help realize if it is possible to achieve those benefits. It can also help communicate what these benefits mean for the particular

homecare organization or its employee. For example, when discussing about the potential to reduce the resource strain in the morning, the caregiver said:

> *"It would be really great if we would not have to visit customers living further away directly in the morning. After all, some of our customer live 20 to 30 kilometers away, which almost ties up one of the caregivers for the whole morning."*

Hence, by discussing some of the previous customers' cases, the caregiver and the manager were able to identify that the service is a tool for them to gain flexibility in their customer visits and can have multiple purposes. Similarly, the discussion evolved from doubt to optimism. After a while, the caregiver came up with an idea for a customer with diabetes:

> *"We could send him messages when he takes the medicine to also remind him to inject insulin. He has the accuracy for an independent injection, but he doesn't always remember to do so."*

The particular customer also lived further away from the homecare office, which would have a high effect on the resource strain of the homecare organization. Thus, they decided to propose the medicine dispensing service for that particular customer as well. Overall, the discussion with the manager and the caregiver started from them being worried how to implement the machines to having multiple ideas how they could use the dispensers to their benefit. Later, the homecare manager commented the discussion as follows:

> *"This [discussion] clarified quite well how we should start approaching the customer selection. We will try to organize a meeting where we identify potential customers and start offering the service to them and hopefully things will start rolling on from there."*

Thus, it seemed that the expectations were high both for the managers in the homecare organization and the researcher, and they suggested that a new meeting would be held once the machines were delivered to the customers. Four months later in October, the researcher was invited to the same homecare organization again. However, the organization had made some changes within their organizational structure, which amongst other things meant that the homecare manager had changed. Five of the ten machines had been delivered to the customers and they were still troubling to identify the five remaining customers. However, interestingly four out of five customers using the service were the ones discussed during the first visit. Based on the effect analysis at that time, the development in the homecare visits had been as illustrated in Figure 38. A larger version of the report can be found as Appendix 6.

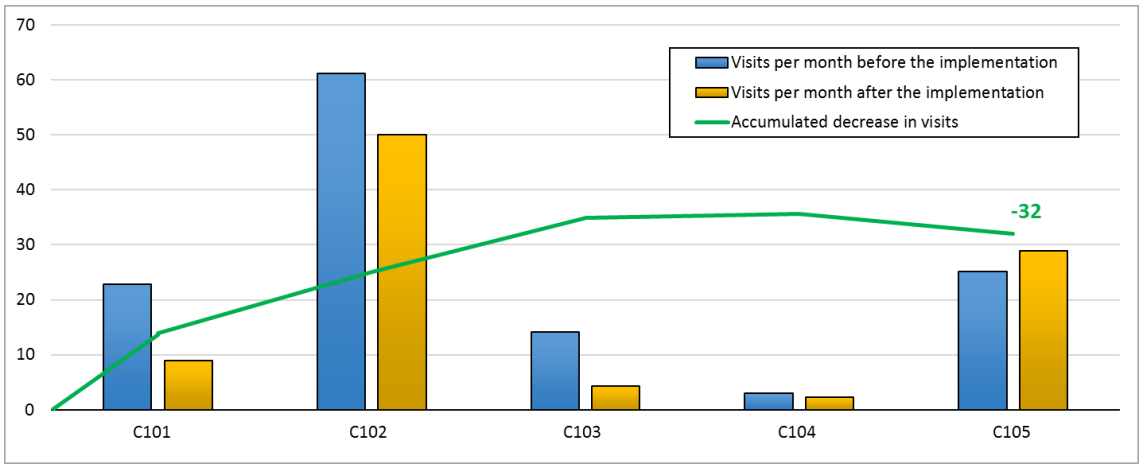

Figure 38. *The development of homecare visits in Sysmä.*

As visible in the figure, the first results seem similar to previous customer cases. The total visit reduction with five customers is 32 visits per month and three same groups can be identified once again. This time, the visits have increased only on one of the customers. The reason for this is that they have not started reducing visits with the C105, because he is the customer with diabetes and they want to make sure he is capable of independently injecting insulin before they start reducing visits. However, they have started practicing independent injection and were hoping to start reducing visits at some point in near future. Additionally, the homecare manager pointed out that some of the visits might not be visible, as no temporary employees use the ERP-system. However, it should be noted that the monitoring period was less than a month after the service implementation, which means that some development is still expected to occur and the available data is not sufficient to make any conclusions. Nevertheless, the results give an overview of the trend about the development of the monthly visits.

When these findings were communicated to the homecare manager with comments on the findings, the manager agreed with the findings, but also told that one of the customers was hospitalized for a moment, which also explains a decrease on the amount of visits. Thus, the researcher was able to analyze the intangible issues related to the data better than previously, but there were still issues that could not be identified.

During the last visit, the homecare manager also asked for advice for the customer selection as they are having hard time selecting customers with whom visit reduction could be possible. Based on the previous customer cases and how a large share of the visits seemed to occur around 9 am, the researcher brought up the issues relating the strain caused by morning homecare visits. Once again, this issue seemed to be well recognized by the homecare manager and she emphasized by saying:

> *"Well, it is quite contradictory that we have the most employees at the office around four to five [pm], when we also have the least visits."*

Thus, a discussion started on the possibility to move a visit from the morning to the midday using the service to reduce the morning strain on the caregivers. The homecare manager said, they would take this into consideration and go through the customer list if they could identify new potential based on this. She also told that one of the potential customers had also refused the service even though the homecare organization saw much potential with him. The distance to the customer was over 20 kilometers, and they could possible decrease the visits from 60 to 4 per month. However, the customer had been skeptical and did not want the amount of visits to be reduced. After the homecare manager had explained the situation, the researcher recommended her that:

> *"What if you tell him that you decrease the visits from 60 to 30 per month, but spent twice as much time at the customer? That way, unnecessary time from travel, documentation and planning are removed and the time of the visit can be allocated to more important things than manual distribution of the medicine."*

The homecare manager seemed to be interested about this and suggested that they will try this approach. However, interestingly the researcher's intervention was necessary to bring up this idea. One reason for this might be that the manager had not been working in the current position too long, and was still getting familiar with some of the operations. Even so, if this approach would work as expected, it would be a direct benefit of using a value specialist approach. More specifically, to be able to make this type of suggestion, the researcher had to have enough accounting knowledge concerning the cause-and-effect relations in planning homecare visits to understand that this approach would still save costs even after the service fee. This had been possible by the concurrent cost assessment that had been started some time ago and will be discussed next in Chapter 5.3. Additionally, the previous scenario is a good example of value co-creation where the supplier helps the customer increase their offering's value-in-use by consulting how the customer can get most out of the service.

5.3 The cost assessment

5.3.1 Cost of the reduced visit

The discussion has naturally revolved around the number of visits since the cost per visit of 40 Euros had been provided by the national statistics organization of Finland (Hujanen et al., 2008) and therefore it had been already approved and suggested to represent the best knowledge about the cost per visit in related publications. However, things proved out to be more complicated. While the cost calculation (Hujanen et al., 2008) is an appropriate presentation of a homecare visit cost, a deeper analysis might be required to understand how the cost accumulates. While the goal was to investigate the cost perspective as soon as sufficient understanding of the mechanics of value elements was acquired, a discussion with a customer representative draw the topic into more acute attention.

During a skype-meeting, the project manager in Joensuu said that they had done a cost analysis concerning the direct costs per medicine refill visit. According to their analysis, there would be no cost savings regardless of how many visits per month can be reduced if the customer lives within four kilometers from the home care organization. This sounded alarming, as the previous conception had been that the payback period would be around four to six visits per month. Even if only a rough estimate on the labor cost of the visit would be taken into a concern, the cost would be still close to 10 Euros per visit resulting in a payback period of 20 to 30 visits per month. Therefore, the researchers also decided to look into the area more.

The cost assessment was not started before a few customer effectiveness analyses had been done, mainly because of the following reasons. Without prior experience with neither the homecare field or with the case company, it took some time to understand both the homecare work and the service provided by the case company. Thus, the discussion revolved around the number of visits, time spent at a customer and the time schedule of the visit. These metrics were both measurable and tangible and thus they could be used to create the basis for a later cost assessment. While the cost of direct work at the customer seemed to be quite straightforward to calculate, there are some indirect tasks such as travelling, planning and documentation that are harder to measure. Thus, more information about the work of home caregivers was needed.

Based on the Kuusikko cost analyses (Lyly, 2017), and the financial statements of the studied homecare organizations (Harjavalta, 2017; Joensuu, 2017), and the studies by Groop (2012), the share of direct customer work, has been around 30-60% so far. In one of the interviews, a home care manager reported it being around 42 % in their organization and Joensuu (2017) stated in their financial statement report that they have barely missed their goal of 60 % utilization rate. However, the evidence from other organizations suggested that the ratio would in most cases be much lower. Nevertheless, even if only about 60% of the work of caregivers can be allocated for customer work, there is a large share of the indirect work that has not been considered yet. After searching for information concerning the time allocation of caregivers in homecare field, a study on work time allocation by Pentikäinen (2011) was found. As part of the study, she interviewed some caregivers concerning their time allocation and the results is shown below in Figure 39.

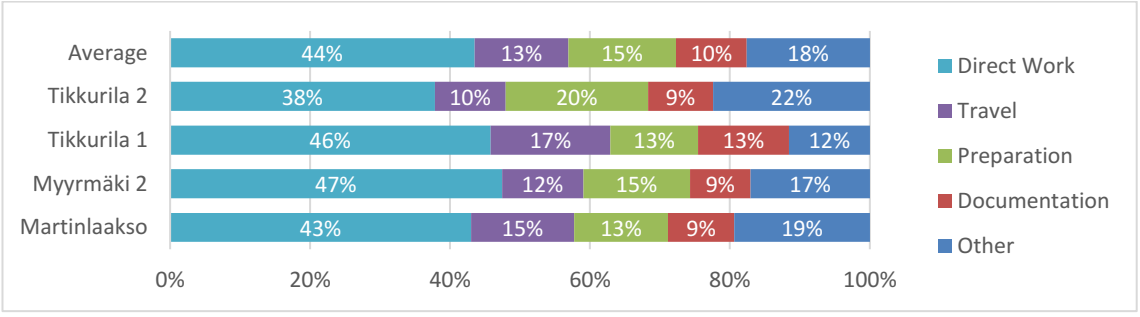

Figure 39. *Time allocation study results (Based on Pentikäinen, 2011).*

On average, the share of direct work in this particular homecare organization was 44 %, which is in line with the previous assessments. Similarly, the share of travel time of 13 % is quite close to 5,5 minutes on an average customer, as estimated based on the observation when the researcher was visiting potential customers with a home caregiver. However, now the interesting notes are the preparation and planning of a visit as well as documentation of the visit. In total, these take 25 % of the caregiver's time resulting in 18 % of the time allocated for other activities, such as meetings, phone calls, and other typical organizational activities. However, there are some issues with this information. First of all, the study was done in 2011, and there has been some developments in the planning of operations via the implementation of ERP-systems. Secondly, this information is based on interviews where the caregivers evaluate their own time usage. Assessing one's own time usage can be quite difficult, possibly resulting in somewhat questionable results. Thirdly, there is much variation between organizations, so in practice the share of different activities might differ quite a lot between organizations. Nevertheless, this assessment provides a bit more accurate understanding than before, which can be utilized to evaluate the cost impacts of the provided service. Based on this information, few important cost elements should be considered. These are:

- Direct customer work
- Travelling time
- Travelling costs (Car)
- Preparation of the visit
- Documentation of conducted activities
- Coordination of visits (Homecare coordinator)
- Indirect work of caregivers
- Other indirect costs (Management, facilities, equipment, other costs)

Now the challenge is to allocate the share of work for different types of customers. There are several metrics required to be able to make an activity based cost assessment. Additionally, as the customer analysis in Harjavalta (Figure 37) suggest, it might not be sufficient to just calculate a price tag for a reduced visit. This for the reason that the medicine dispensing service allows the caregivers to plan the care from scratch instead of just removing an unnecessary visit. Hence, a more appropriate approach would be to assess the monthly cost of a customer before and after. The required information is gathered and estimated in Table 6.

Table 6. *Input information for cost per homecare visit.*

Information	Value	Source
Caregiver's average salary	2 150 €/month	(Oikotie.fi, 2017)
Additional costs	24,40%	(Ilmarinen.fi, 2018)
Annual working days	221 days/year	251 – 12*2,5 (Superliitto, 2017)
Duration of a working day	7,65 h/day	(Superliitto, 2017)
Cost per km (Car)	0,41 €/km	General km compensation (Vero.fi, 2017)
Travel	13 %	Of indirect work (Pentikäinen, 2011)
Planning and preparation	27 %	Of indirect work (Pentikäinen, 2011)
Documentation	18 %	Of indirect work (Pentikäinen, 2011)
Other indirect work	32 %	Of indirect work (Pentikäinen, 2011)

In Finland a caregiver has an average gross salary of 2 150 Euros per month (Oikotie.fi, 2017), works for 221 days per year (Superliitto, 2017) and gets an annual salary that is based on 12,5 months per year including the holiday bonus. In addition, the organization pays pension, insurances and other side costs related to the salaries resulting in a 24,4% overhead. According to the worker's union, a typical caregiver contract consists of 38,25 hours per week, meaning 7,65 hours per day (Superliitto, 2017). Thus, only considering the salary of a caregiver, the cost of hour is around 19,77 Euros.

In addition to the cost per hour of the caregiver, there are activities that take a certain duration, which can be averaged on either a customer or annual level. First, there is the duration of direct work at the customer. This depends on the tasks of the visit and varies from few minutes to more than an hour. Second, in addition to the direct work, there is some travel time depending on the method of transportation and the distance to the customer. This is often considered to most unnecessary part of the caregivers' work and some homecare organizations measure and control the amount of travel to reduce dispensable work (Groop, 2012). Thus, it is also an important part of the cost related to customer visits, especially if the distance to the customer is long. The cost of travel with several transportation methods is estimated in Figure 40.

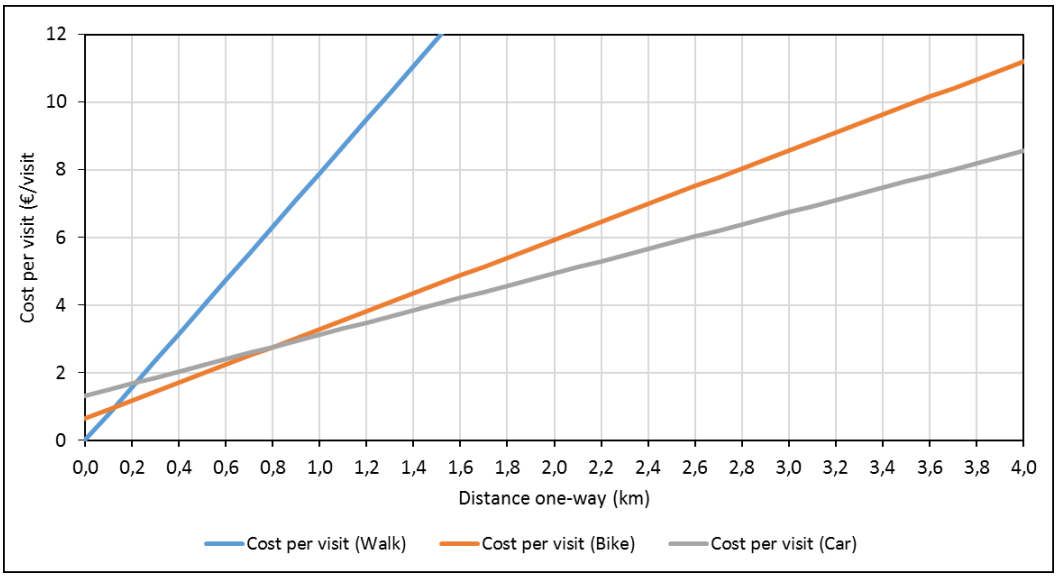

Figure 40. *Cost of travel by foot, bike and car.*

The above figure uses 5 km per hour for walking, 15 km per hour for bike and 40 kilometers per hour for a car. Additionally, each visit requires a short startup time, which for a bike is 2 minutes per visit and for a car 4 minutes per visit. This time includes tasks related to these vehicles such as setting up the bike and arranging parking for the car. Additionally, the cost of travel also includes the cost of the vehicle. In case of car, the most appropriate estimation for the cost of a kilometer would be 0,41 Euros per kilometer, which is the typical compensation for using a vehicle in Finland (Vero.fi, 2017). Hence, it seems that the car is the cheapest method of transportation after 800 meters distance to the customer and walking works only within short distances. As a result, the cost of travel typically varies between 1 to 8 Euros in relatively short distances and increases up to 37,5 Euros when the distance is 20 kilometers. However, it is hard to estimate the average travel time for a specific customer. This is due to the fact that the routes the caregivers take is not always standard. This is illustrated in the example in Figure 41.

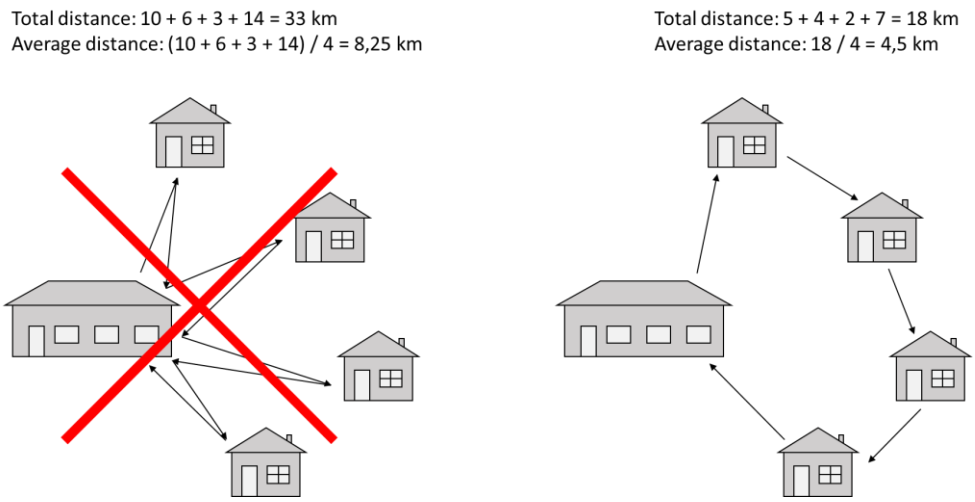

Figure 41. *An example of the customer rounds and average travel distance.*

The caregiver only travels straight between the customer and the home organization in case the travel distance to the customer is long. Most commonly, the caregiver visits multiple customers during a single route. In a few of the customer cases, the distance to the customer has been over 20 kilometers, resulting in almost an hour travel duration per visit. However, depending on the municipality a large share of the customers live quite close to the homecare organization resulting in a 3-10 minutes travel duration. Hence, this cost can be estimated using the share of indirect work if the customer is living close to the homecare office or calculated specifically if the distance is over 5 kilometers.

In addition to direct work and travel, a typical visit also includes some preparation and documentation as previously discussed. In preparation and documentation there are roughly two possibilities for cost allocation: either the preparation and planning costs are related to the duration of the visit, meaning that a longer visit requires a longer planning time, or the average preparation and planning time are estimated as annual averages and used for every visit. Based on the discussion with caregivers, it seems that it is almost impossible to separate the planning and documentation for each customer as they are done concurrently with other activities and between customers. Hence, with the information available, it is easier to estimate these costs in relation to the direct work with the customer and the utilization rate. Additionally, the margin of error in the analysis by Pentikäinen (2011) is already relatively high. However, the separation of activities enables the measurement of the magnitude of different activities, which is why in this thesis it is investigated further. On the other hand, using the utilization rate would be a better approach when making rough estimations on the field.

With the caregiver's costs allocated the last directly related cost is the coordination of visits, which also burdens the homecare coordinator. Using the same principle as with the hourly cost of caregivers, it is possible to calculate a cost of coordination using an average salary of 2 436 Euros per month (Oikotie.fi, 2017) and the annual visits of the homecare organization as the activity driver. Thus, a typical cost of coordination can be calculated for each homecare organization and it is typically around 1 – 4 Euros per visit. A same principle could be used for homecare management, but in that case, a more appropriate driver would be the amount of customers because they are not directly involved in planning the customer visits but instead work on a customer level. However, in that case these costs do not change on a monthly level and are not affected by a reduced amount of customer visits.

With this information, it is possible to estimate the costs for each customer. Considering the before and phase two of customer C103 in Harjavalta for example, the cost per visit can be calculated as illustrated in Table 7. The below cost assessment is based on the before and Phase 2 of the phase analysis in Figure 37 instead of the before and after analysis in Figures 35. Therefore, the cost savings are lower than in the Table 8. However, it should be noted that it proved to be quite difficult to develop a cost model that would reflect each scenario sufficiently and even the model illustrated below has its deficiencies.

Table 7. *Cost per visit and cost per month for C103 using activity-based costing.*

	Before		After		Change	
Indirect costs	**Cost per visit**	**Cost per month**	**Cost per visit**	**Cost per month**	**Cost per visit**	**Cost per month**
Home care coordination	1,63 €	102,8 €	1,6 €	14,8 €	0,0 € ▼	-87,9 €
Indirect work of nurses	2,17 €	136,7 €	5,1 €	46,2 €	2,9 € ▼	-90,5 €
Total indirect costs	**5,30 €**	**334,0 €**	**14,8 €**	**134,4 €**	**9,5 € ▼**	**-199,6 €**
Direct costs						
Documentation	1,22 €	76,9 €	2,9 €	26,0 €	1,6 € ▼	-50,9 €
Preparation	1,83 €	115,3 €	4,3 €	39,0 €	2,5 € ▼	-76,3 €
Travel	1,47 €	92,5 €	3,4 €	31,3 €	2,0 € ▼	-61,3 €
Vehicle cost	2,71 €	170,5 €	2,7 €	24,6 €	0,0 € ▼	-145,9 €
Direct work of nurses	4,52 €	284,8 €	10,6 €	96,3 €	6,1 € ▼	-188,5 €
Total direct costs	**11,7 €**	**740,0 €**	**23,9 €**	**217,2 €**	**12,1 € ▼**	**-522,8 €**
Total cost	**15,5 €**	**979,5 €**	**30,6 €**	**278,2 €**	**15,0 € ▼**	**-701,2 €**

	Before	After
Amount of visits	63	9,1
Average duration	15,2	32,1

Because of a longer average visit, the cost per visit increases. However, by using the relative costing method for the travel, preparation and documentation, these costs also increase. Since the number of visits per month drastically decreases, the cost per month decreases as much as 701 Euros per month. While the whole service process with the customer has changed, it is still possible to create a price-tag for the reduced visit, which in this case would be around 16,3 Euros per reduced visit. However, it is important to understand that no original visit remains, but the service is completely redesigned instead. Thus, the original perspective of analysing the cost per reduced visit was somewhat naive and the research done with the homecare organizations has helped to understand what actually happens within the organization and its customers. Therefore, this before and after -principle is a better way to estimate the cost savings in each customer municipality than using a price tag for a reduced visit. On the other hand, a price tag is much easier to communicate.

Now, this before and after -principle can be applied to all the previous customer cases to assess the organizational before and after. Unfortunately, the information in Vantaa is not sufficient to make this analysis and therefore only Sysmä, Harjavalta and both the realized results and caregiver's estimation in Joensuu were analysed using the method. The results are shown in Table 8.

Table 8. *The cost impact of the service in the three municipalities.*

Joensuu (Realized)			
ID	Before	After	Change
E1027	751 €	123 €	-628 €
E1025	1 121 €	496 €	-626 €
E1015	315 €	207 €	-108 €
E1020	636 €	213 €	-423 €
E1009	746 €	697 €	-49 €
E1007	391 €	354 €	-37 €
E1016	1 139 €	1 122 €	-17 €
E1029	70 €	66 €	-4 €
E1019	685 €	628 €	-57 €
E1028	149 €	240 €	92 €
E1002	73 €	166 €	93 €
E1022	452 €	524 €	72 €
E1010	311 €	366 €	55 €
E1023	1 051 €	1 197 €	146 €
E1003	332 €	323 €	-9 €
E1008	641 €	1 541 €	900 €
E1005	167 €	659 €	491 €
E1026	1 564 €	1 801 €	238 €
E1014	2 051 €	3 235 €	1 184 €
SUM	**12 643 €**	**13 957 €**	**1 313 €**
MAX	**6 184 €**	**4 228 €**	**-1 957 €**

Joensuu (Estimate)			
ID	Before	After	Change
E1027	1 150 €	123 €	-1 027 €
E1025	1 928 €	496 €	-1 432 €
E1015	386 €	207 €	-179 €
E1020	751 €	213 €	-538 €
E1009	950 €	697 €	-254 €
E1007	788 €	354 €	-435 €
E1016	1 970 €	1 122 €	-848 €
E1029	998 €	66 €	-932 €
E1019	870 €	628 €	-242 €
E1028	2 386 €	240 €	-2 145 €
E1002	173 €	166 €	-7 €
E1022	556 €	524 €	-32 €
E1010	375 €	366 €	-9 €
E1023	1 970 €	1 197 €	-773 €
E1003	682 €	323 €	-359 €
E1008	1 541 €	1 541 €	0 €
E1005	660 €	659 €	-1 €
E1026	2 812 €	1 801 €	-1 011 €
E1014	4 849 €	3 235 €	-1 614 €
SUM	**25 795 €**	**13 957 €**	**-11 838 €**
MAX	**10 473 €**	**4 228 €**	**-11 838 €**

Harjavalta			
ID	Before	After	Change
C104	869 €	298 €	-571 €
C103	979 €	431 €	-549 €
C105	464 €	356 €	-108 €
C109	323 €	191 €	-133 €
C204	129 €	61 €	-68 €
C205	88 €	85 €	-3 €
C302	220 €	156 €	-64 €
C303	171 €	187 €	16 €
C301	118 €	182 €	63 €
C202	452 €	552 €	100 €
SUM	**3 814 €**	**2 498 €**	**-1 316 €**
MAX	**3 072 €**	**1 577 €**	**-1 495 €**

Sysmä			
ID	Before	After	Change
C101	710 €	282 €	-428 €
C102	1 201 €	1 010 €	-191 €
C103	715 €	240 €	-475 €
C104	79 €	68 €	-11 €
C105	1 478 €	1 682 €	205 €
SUM	**4 183 €**	**3 283 €**	**-900 €**
MAX	**2 705 €**	**1 601 €**	**-1 105 €**

Above are listed all three customer cases that were based on ERP-data. Based on this cost assessment, the estimated cost savings were from 54,8% of the caregivers' estimation in Joensuu, 41,3 % in Harjavalta and 70,3 % in Sysmä. The higher "accuracy" in Sysmä is explained by the long distances and hence higher cost per visit. In addition to the sum of all service-users in a certain municipality, there is also the maximum cost reduction if only positive cases are considered. As the only indication of a visit increase was in temporary visits related to teaching the service, there seemed to be no direct link with visit increase and the service. Thus, the sum only concurs how the costs have developed before and after the service implementation, without considering if the effects are the results of the service or not. For this reason, the maximum would actually better reflect the potential effect of the service. In those scenarios where the service had a negative effect, the service was transferred to a different customer.

Two things should be noted concerning Joensuu. First, the service was cancelled with five customers: E1009, E1010, E1008, E1005 and E1026. Thus, the total customer value through monthly cost savings at the end of the period would be around 322 Euros. Secondly, there had been developments in the condition of the customers, which means that the higher costs are not related to the medicine dispensing service. Considering the caregiver interviews and visit estimations without the service in Joensuu, the cost savings would be almost 12 000 Euros per month before the service fee.

Taking the service fee to consideration, the total direct cost savings with this type of costing method are not as significant as with the 40 Euro average homecare cost. However,

the trend in the pilot projects seems to be positive. In addition to increased knowledge about the service and cost effects, the objective of the pilot has a significant role in the performance of the projects. In Joensuu, the objective of the customer selection was more to test the service with different customer profiles than to find direct cost savings through decreased monthly visits. In Harjavalta, the caregivers reported that the municipality aims to have at least one over an hour visit per month with each customer. Thus, during the project, they have also started increasing the time spent at a customer, which again reflects in the results. In Sysmä however, the goal was to find the best customers for the service with an emphasis on the cost. Therefore, the homecare managers were interested in the findings and suggestions of the researcher and they were able to identify potential customers from cost savings point of view. On the other hand, the implementation in Sysmä took longer than in the other cases and the organization struggled in findings the last five users for the service due to a small total customer base.

Based on the results, it would seem that a minority of the customers have a potential for significant cost savings and some of these customers unfortunately do not end up as service users, because they are either sceptical or have a negative attitude towards visit reduction. Thus, while clear visit and cost reduction could be achieved with some customers, the volume of these customers would be relatively low within small municipalities. However, it was later identified that direct cost savings from reduced monthly visits is only part of the cost savings potential.

5.3.2 End user perspective

Until now, the focus has been on the homecare organization's perspective. However, the homecare services are rarely free for the customer either. Because the revenue gained from the customer as direct payments is quite low, they are usually not sufficient to cover the homecare costs. However, they do balance the cost for the customer based on the intensity of the homecare service. There is some variety on the homecare service pricing between municipalities, but the basic principle is the same. The price is based on the monthly work per each customer and depends on the salary or the pension of the customer. In Harjavalta, for example, the pricing table looks like in Table 9.

Table 9. *Pricing principle for homecare customers (Harjavalta, 2017).*

		Hours per week					
Customers / amount	Exemption from gross income (€ per month)	<1h	1-3h	3-5h	5-7h	7-9h	>9h
1	573	18 %	20 %	24 %	31 %	32 %	35 %
2	1057	16 %	17 %	19 %	20 %	21 %	22 %
3	1657	13 %	14 %	15 %	16 %	17 %	18 %
4	2050	10 %	11 %	12 %	13 %	14 %	15 %
5	2481	8 %	9 %	10 %	11 %	12 %	13 %
6	2849	6 %	7 %	8 %	9 %	10 %	11 %

In practice, the price customer pays for the service is calculated from their monthly income, which in most cases means the customer's pension. The average pension in Finland is around 1613 Euros per month (Eläketurvakeskus, 2016). From this sum, they first get an exemption based on how many people live in the household, after which a percentage of the remaining pension and the amount of services they need define the price they pay. This also means that the price does not increase linearly and it might differ quite a lot if the customer happens to be in the middle of intensity categories. The price is set indefinitely, and checked if there are any major changes in the customer's solvency or the intensity of the service.

Because of the pricing model, a customer might also get cost savings if the amount of homecare visits is reduced. This is especially the case if the customer is in middle of two pricing categories. To transform the table to a more familiar format, it is possible to use the 22 minutes average duration of a visit to convert the time spent at a customer to amount of visits. That way, the possible cost savings for an end customer living alone can be estimated using the current and potential visits per month. The results are shown in Figure 42. Negative values demonstrate increase in cost.

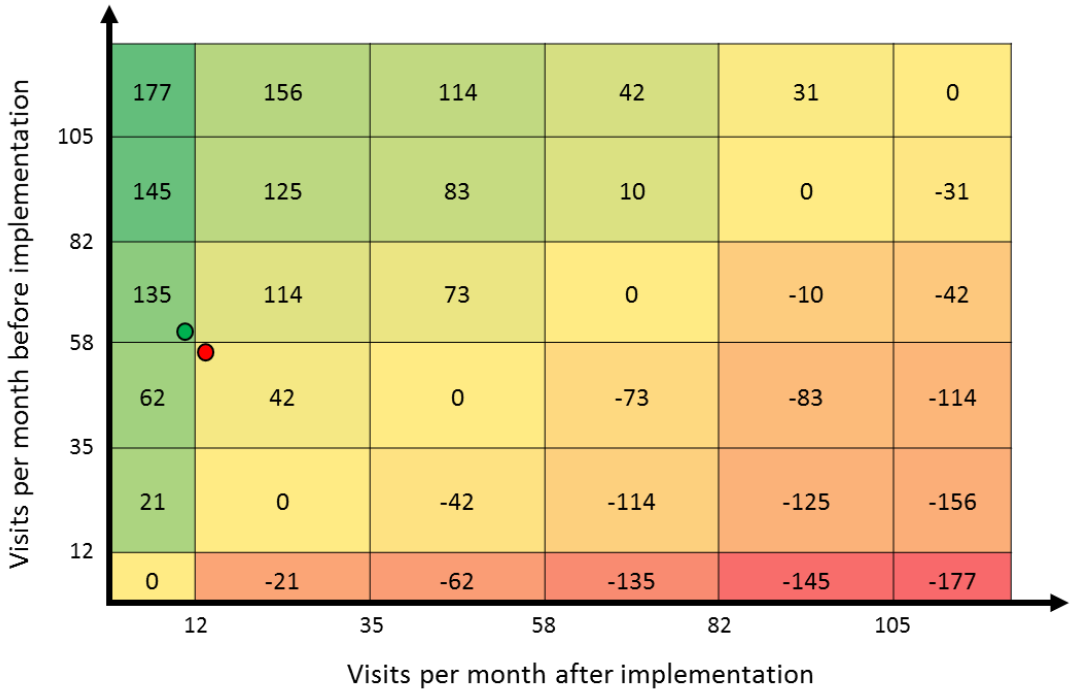

Figure 42. *Cost savings (loss) for the customer depending on visit reduction.*

It is important to note that due to non-linear pricing principle, the price jumps between specific borders. As an example, if a customer had 60 visits per month before and 10 visits per month after (green dot), the customer would save 135 Euros per month. However, if another customer had 56 visits per month before and 14 visits per month after (red dot) the cost savings would be only 42 Euros per month. Thus, even small differences on the category the customer ends up in can result in quite a different cost saving for the

customer. However, it should be noted that these costs scale up based on the customer's pension and the example in Figure 42 only reflects a person with an average pension. One of the interviewed caregivers told about a wealthy elderly woman living alone that currently pays a monthly fee but could pay based on the visits if just a few visits could be reduced. She explained the customer's situation as follows:

"There would indeed be a huge impact [for the customer], if the fee would decrease from 500 Euros [per month] to just around 10 Euros per visit."

Thus, the pricing and cost savings for the homecare organization and the end customer are generated differently, which could be something the homecare organization would want to also consider when making their customer selection. Additionally, this creates another interesting perspective where the caregivers also try to decrease the cost to the customer if possible even though it straightly decreases the revenue of the home care organization. When this revenue perspective, homecare cost perspective and the service fee are taken into consideration, the discussion evolves into interesting scenarios. This is also something that might be worth communicating to the customer, since it might help a reluctant but potential customer to agree to try out the service.

5.3.3 Understanding indirect costs

So far, this study has been focusing on direct cost savings that occur by reducing homecare visits. However, one of the most potential source of cost savings is the indirect perspective. If direct costs revolve around hundreds of Euros per month, the indirect costs revolve around thousands of Euros per day. Also, it seems that some indirect benefits have already been identified for the service. One of the caregivers in Vantaa commented on how one of her customers seemed to be more brisk than usual by saying:

> *"Previously when I was visiting her [to remind her to take her medicine] I had to wake her up. Now she is already up and even offers me coffee when I come visit her."*

Thus, the service can help the customer be more active, brisk and independent than before. Similarly, the service seems to help customers with particular need for time critical medication, such as epilepsy or Parkinson's. Overall, the goal is to avoid unexpected changes in the condition of the customer, such as hospitalization that also have a high cost impact. One of the caregivers in Harjavalta summarized this perspective interestingly:

> *"If a customer with a seizure is carried to a hospital using a helicopter, the amount of money [needed for the helicopter] would pay our machines for six months."*

Hence, the costs related to unexpected occurrences are much higher than typical homecare costs. According to Lyly (2017), the cost of basic medical institutionalized care is 333 Euros per day. Moreover, in special treatment the cost is around 700-900 Euros per day.

This would mean that, if the annual days of institutionalized care could be decreased by three to four per year, the service would again pay itself back. In addition to that, transportation to care can cost several thousand Euros and procedures have their own costs on top of that. Thus, if something unexpected happens, the costs start to pile up exponentially, which means avoiding these occurrences is an important task. Additionally, avoiding unexpected changes is naturally important from the customers well-being point of view, which should not be forgotten even if the focus of this study is on cost perspective.

While the cost savings potential seems high, there are some issues related to the indirect cost savings. First, there is always some kind of probability related to these costs. Thus, there is no way to predict if the customer requires additional care. This also means it is complicated to measure if anything can be done to decrease these costs. Each customer is an individual case that has a certain risk for specific occurrences. Thus, the best approach to measure the indirect effects would be to look at one of the customers with whom the medicine's time accuracy is important. However, even though a sufficient metric could be identified to measure the indirect cost savings, most homecare organizations do not collect enough data to analyze these impacts. So far, the homecare organizations have documented the duration and time of each visit at best. Hence, a customer specific monitoring of indirect costs would be required from the municipality to be able to assess the changes in indirect costs. However, there are some challenges related to that, which rouses the second issue.

Second, the cost savings might not manifest in the homecare organization but under some other function instead. This is for example the case if the customer is hospitalized or sent to emergency care. Even though these functions are theoretically under the same municipality, the access to the information between organizations can be low. The cost of emergency transportation, medical care, special procedures and other activities can also distribute between multiple functions making it quite difficult to follow the total costs per customer.

In addition to health benefits, the service also gives an alternative or support to many safety technology tools such as safety phone or bracelet. As in most cases, the medicine is prescribed to be taken at least two times a day, and the machine will inform the caregivers if the medicine is taken or not, the machine also sends regular confirmations of the situation at the customer. If the customer does not take the medicine, it might be an indication that something is wrong and enables the caregiver to investigate the situation. On the other hand, if the customer takes the medicine, the caregiver has the possibility to check this and be relieved of concerns related to the customer. The CEO of the case company told an interesting story related to this:

> *"One time one customer got a seizure in his home. Our robot reported the caregivers that the customer had not taken his medicine in time and the caregivers went to check*

on him and found him on the floor. Later we [the case company] received a letter from the customer thanking us for saving his life."

Thus, there are far more important benefits for the end customers within indirect cost savings but it is difficult to assess the related risk. However, unfortunately the gathered data so far does not give sufficient material to be able to analyze the indirect cost effects. However, the suggested approach for this would start by comparing the annual days in institutionalized care before and after using statistical cost information (e.g. Lyly, 2017). Unless a clear correlation with the technology solution and the probability of hospitalization can be found, the accuracy of the assessment will be low regardless of which costing method is used.

5.4 The cost of peak time resource constraint

Considering the results in Figures 32 and 35, it would seem that the effects of the service focus on the morning by either removing a morning visit or rescheduling it to a different time. With all the municipalities telling the same story about the strain on the caregivers during mornings, it is clear that the resource perspective requires some attention. Interestingly, during a discussion with a homecare organization they pointed out that another Finnish researcher had been working on the resource perspective as well. After some inquiries, the researcher contacted the case company who then identified to research to be a dissertation done by an industrial management researcher Johan Groop (2012). Unfortunately, the case company had not had time to study the dissertation thoroughly, but the study seemed to send a clear message: half of the daily homecare visits are conducted within 2,5 hours, which reduces productivity and creates a misconception of the homecare organization's performance (Groop, 2012). Hence, the dissertation had an interesting argument from the point of view of this thesis and the researcher started looking into it.

According to Groop (2012), the work of home caregivers is strongly limited by the morning resource peak constraint, which results in a high resource need. Thus, homecare organizations must plan their resource use based on the peak constraint resulting in a quite low share of direct customer work. The resource peak constraint is illustrated in Figure 43.

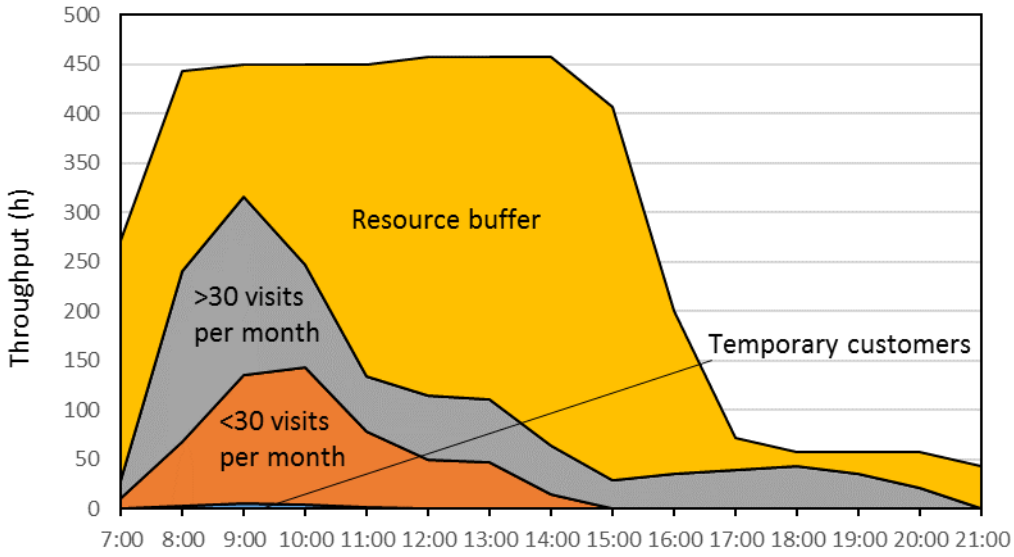

Figure 43. *The relative load distribution during a day (Based on Groop, 2012).*

The study by Groop (2012) suggest that the load distribution of a day is unbalanced, as also visible in the above figure. The daily throughput of the organization varied between 107 hours and 12 hours during the morning shift. As such, the throughput of the organization was almost nine times higher at 9 AM compared to any hour during the evening shift. While this graph demonstrates the throughput of one of his case organizations, the findings of the study seem to be common in other homecare units as well (Groop, 2012). Interestingly, the time distribution analyses in Figures 32 and 35 in this thesis suggest a similar finding, though on a smaller sample scale.

The result of this resource peak constraint is that the homecare organization has to plan their daily resource level for the morning shift based on this peak, which creates a high share of resource buffer later during the shift. When the resource need is based on this peak demand, the share of resource buffer for unexpected tasks remains almost non-existent during peak times and oversized during rest of the shift. Hence, this also has an impact on the share of direct work, which in Figure 43 is around 34 %. Thus, it would seem that a lot could be done to increase the performance of resource utilization.

Groop (2012) started looking into the peak constraint, trying to identify the reason for its existence but also identify ways to level out the demand. While one of the reasons for the peak was the time criticality of some of the visits, it seemed that 43 % of the peak time throughput consists of customers with 0-10 hours of service per month (Groop, 2012). Applying an average 20 minute visit time to this throughput, these customers have at least one visit per day. Moreover, the staff argued that "… as a general rule of thumb, the higher the dependency ratio of customers, the more time-critical their visits will be." (Groop, 2012).

While it is easy to understand why a daily visit is time critical, almost half of the visits resulting in the peak constraint did not occur daily. With the exception of some activities, if a customer does not require assistance every day, the service is most likely not time critical (Groop, 2012). Hence, in his interventionist project, Groop tried to balance the peak by suggesting that temporary visits could be transferred to later in the midday. The basic idea of the objective of the intervention is illustrated in Figure 44.

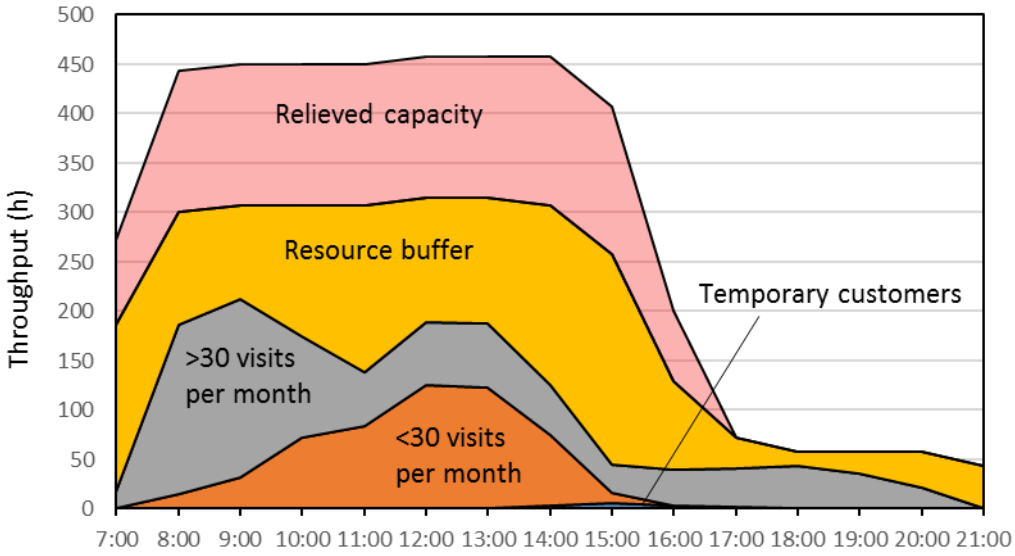

Figure 44. *Basic idea of rescheduling non-time critical visits (Based on Groop, 2012).*

In the pursued scenario, the non-time critical visits could be rescheduled to later time. This would decrease the peak time constraint and relive some capacity from the resource buffer. This way the peak constraint could be leveled, and the required flexibility could be provided with a lower but a more consistent resource buffer (Groop, 2012). This would also mean that the share of direct work would increase to levels such as 48 %, as in the figure above. Additionally, a few caregivers could even be completely reserved for unexpected visits. However, the intervention was not as successful as expected. According to Groop (2012), the practices and principles of the organization have rooted to the culture so strongly that it was difficult to change the processes and mindset of the caregivers.

While it proved to be more challenging than expected to transfer the non-time critical visits to another time, the findings of this study suggest that by using the service, homecare organizations could be able to transform time critical visits to non-time critical visits. Hence, the visits could be removed or transferred to a later time. This is illustrated in Figure 45.

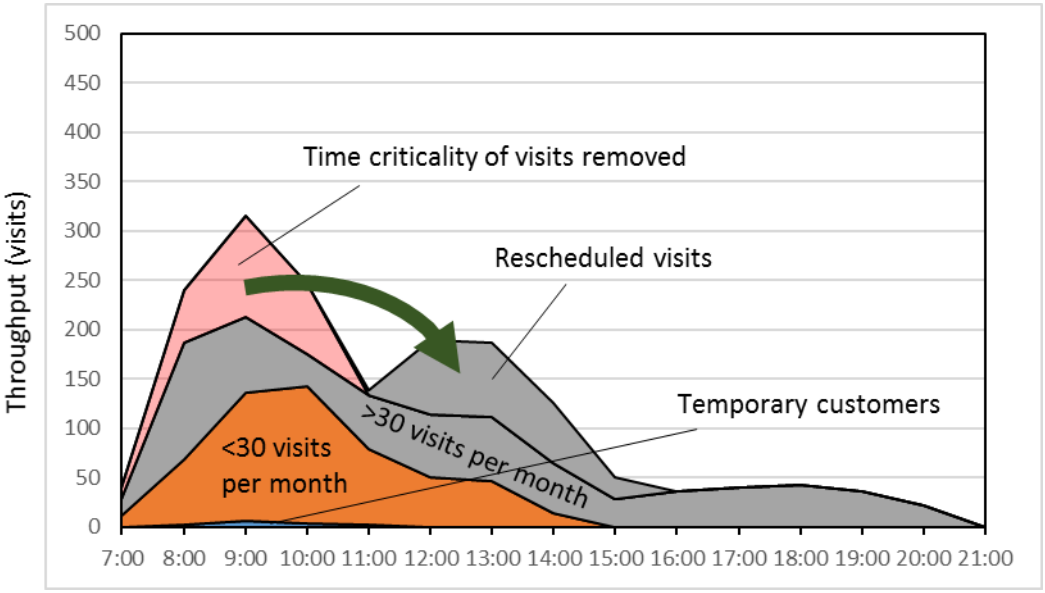

Figure 45. *Leveling out the peak constraint by rescheduling time critical visits (Applied from Groop, 2012).*

As illustrated in the figure, instead of rescheduling the non-time critical visits, the organizations could be able to transform time critical visits into non-time critical. Based on the findings of this study, this transformation has been possible with the medicine dispensing service and organizations have able to reschedule some of the time critical visits at least in two municipalities. Hence, while Groop (2012) focused on rescheduling the non-time critical visits, the service by the case company can transform a time critical visit to a non-time critical visit, giving even more flexibility to the planning of operations. However, now the interesting question is how the service could succeed in rescheduling time critical visits when it seemed so difficult to do the same to the already non-time critical visits. To understand this, some thought must be put to the nature of the rescheduled visits.

One important reason why this is possible is the time window of taking the medication. Due to the fact that medicine is prescribed to a specific time, the medicine reminder visits need to occur in a certain time window. With 8.00 am being a typical time for the morning medication, the visit has to occur sometime between 7.00 am and 10.00 am, increasing the workload during peak times. Thus, it would seem that the visits with some of the target customers of the medicine dispensing service are actually the most time critical and resource consuming visits. Additionally, it seems that some of the time criticality comes from drugs such as vitamins that are prescribed for the morning even if they are not time dependent (Groop, 2012).

Groop (2012) argues that there are difficulties in changing principles that have grown roots inside organizational culture. Based on this, another likely reason would be that due to setting clear objectives for the automated medicine dispensing service, the caregivers were devoted to a change in the customer service plan and therefore it was important to be able to achieve a change with the particular customers. On the other hand, it could be

that the caregivers felt obligated to provide results, since the parties involved in the pilot projects were expecting results and were discussing with them concerning the effects of the service. Regardless of the reason, the findings within the effect analyses suggest that the service of the case company is able to influence the schedule of some visits.

Summarizing the resource perspective so far, a new source of value potential has been identified, the baseline has been assessed using a study done in the field and the performance of the service has been evaluated to some level in few pilot municipalities. However, what is still unknown is financial impact of this value potential. Therefore, before the long-term value realization the magnitude of the identified value potential has to be measured. Overall, there seems to be four potential sources of cost savings in the resource flexibility. These are:

- Lower peak constraint results in lower resource need
- The need for temporary employees decreases
- The work satisfaction and employee well-being increases via lower workload
- Facing the growing demand with the current resource base

First, because the resource peak constraint is the limiting factor in planning the homecare visits, it also defines the need for caregivers each day. However, this has been intangible to communicate. While the results by Groop (2012) are similar with the Figures 32 and 35, the results gained so far in this study have only considered the customers using the service instead of the homecare organization level. With the information so far, it was not possible to reflect how the remaining work was distributed and if the visits with 5 to 20 customers reflect the remaining 70 to 1000 customers. Thus, a theoretical scenario was developed based on the results by Groop (2012) and findings in Joensuu and Harjavalta. The scenario was made to illustrate the resource management potential and it is illustrated in Figure 46 below.

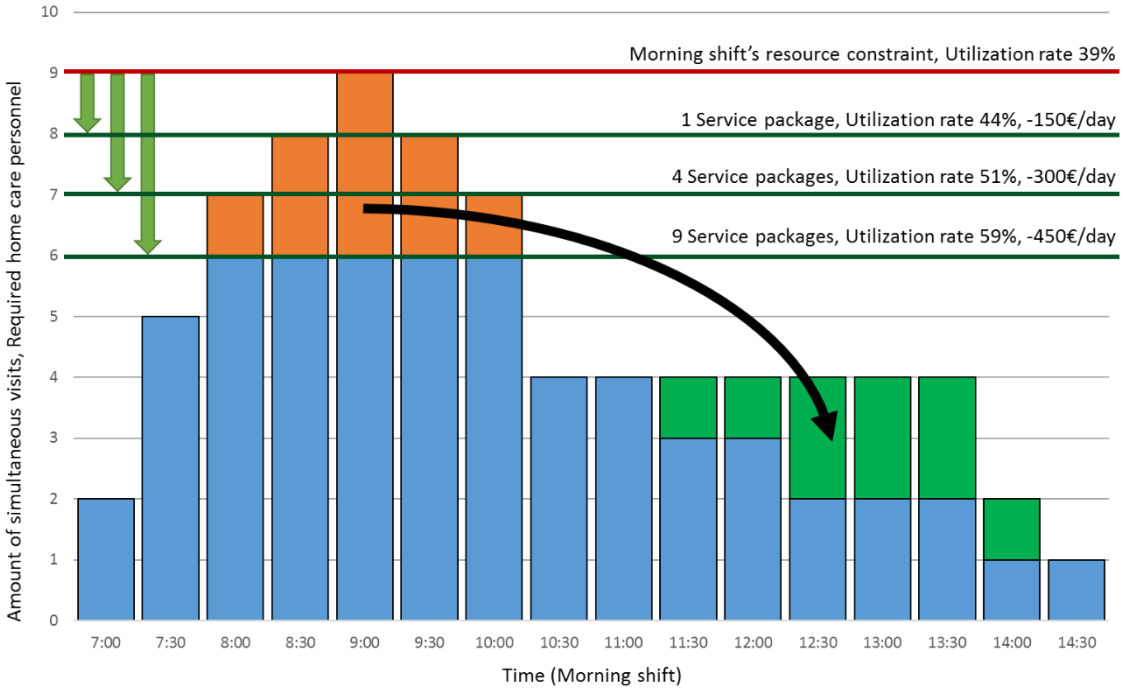

Figure 46. *Example of the resource constraint cost savings potential.*

The figure shows a theoretical scenario of a homecare team working in morning shifts with amount of simultaneous visits in relation to the schedule of a morning shift. The load follows a similar structure with the findings of Groop (2012) in Figure 43 with a peak around 9 am. If currently the homecare team has nine simultaneous visits at 9 am and one of those visits could be transferred to 11.30 – 15.00, the peak constraint would drop to eight simultaneous visits, freeing up one of the caregivers to bench capacity. Similarly, the team would be able to increase the share of direct work by 5 %, resulting in a more efficient use of resources. Therefore, just by transferring one of the visit from the peak time to a more restful time, the organization might be able to remove the requirement for one of the resources or hiring extra resources. Applying the costing method done previously, this would mean around a 150 Euros cost saving per day and 4 500 Euros per month, which just by itself is over seven times larger than the highest documented cost saving through visit reduction. This also means that the cost savings from a single reduced resource could cover over 10 service packages. Additionally, instead of allocating the cost from direct customer work to indirect as with the visit reduction, this cost saving would manifest just by itself.

The reason for this theoretical model was that the idea proved to be too intangible to communicate without a practical example. Additionally, without a way to communicate why it is important, it was difficult to communicate to the homecare organization why this topic should be studied further. To make things even more difficult, research in health care in most scenarios requires a research permit where municipalities can limit what material is available for the study. One of the homecare organizations had been working

with Groop, so they were quite familiar with the idea, but it took some convincing to do to communicate it to the case company or other municipalities.

Interestingly, while Joensuu case did not seem too promising from the visit reduction point of view, they had already been transferring some of the visits from the peak times. One of the objectives in Joensuu is to achieve a 60 % utilization rate in their homecare organization (Joensuu, 2017), which explains these activities. Also, they were able to decrease the peak throughput of an average day from 5,2 visits per hour to 2,8 visits per hour with the particular set of customers. However, unfortunately the gathered data is not sufficient to make any cost conclusions about it as there is no information available on whether if this peak time reflects the rest of the customers as previously discussed. Therefore, instead of only looking at the customers participating in the service pilot, the perspective should be on a team and organizational level.

The second source of cost savings concerns temporary workers. Because of the resource peak constraint, homecare organizations sometimes need to hire temporary employees to be able to manage the peak time. Therefore, by lowering the peak constraint, the organization could manage with the resources they have. If the temporary employees could be hired only for the peak time, it could actually bring the needed flexibility to the organization, but in most cases, the temporary employees are hired for the full shift even if they only visit one customer during the day. Another reason for the required temporary employees is the high share of sick leaves within the homecare field, which relates to the third source of cost savings.

The third source of cost savings is even more indirect, but has other benefits as well. A director of elderly and special care of one of the municipalities commented the resource perspective as follows:

> *"That [flexibility during peak-time] could also have an important role on the job satisfaction and it could decrease the sick leave costs of our caregivers."*

The sick leave ratio seems to be unreasonably high in the homecare sector. Based on a news article by Koponen (2017), average nurses have 20 sick leave days per year, caregivers 26 sick leave days per year and home caregivers 31 sick leave days per year. Thus, an average home caregiver spends one month per year on sick leave, which is twice as much as on the public sector on average. A caregiver in the municipality said that they have too much work on their hands and that they have insufficient resources. While this was first hard to understand when the share of direct work of that homecare organization is around 40-50 %, the next thing she said explains it more:

> *"We have around 40 caregivers here, and seven of them are currently on a sick leave."*

Thus, around 15 % of the caregivers were on a sick leave during that day. With a similar cost assessment as with the cost per hour, having a regular employee costs around 91,6

Euros per calendar day. Thus, even by only considering the salaries, the sick leaves cost annually around 2839,6 Euros per employee for the municipality.

To discuss the fourth source of cost savings, the trend of homecare demand has to be considered. The mayor of one of the municipality commented that because they are a growing municipality, they do not have too much pressure to decrease their social and health care costs, but they want to enhance their service and be able to expand it to a larger customer base. Taking into consideration the trend of a growing customer base, it would seem that this is the case elsewhere as well. As the municipalities are facing growing demand, they also need to increase their resource buffer to match the demand, unless they are able to balance the peak time resource constraint. However, by balancing the peak time resource constraint they should be able to delay the need for more personnel. This is illustrated in Figure 47.

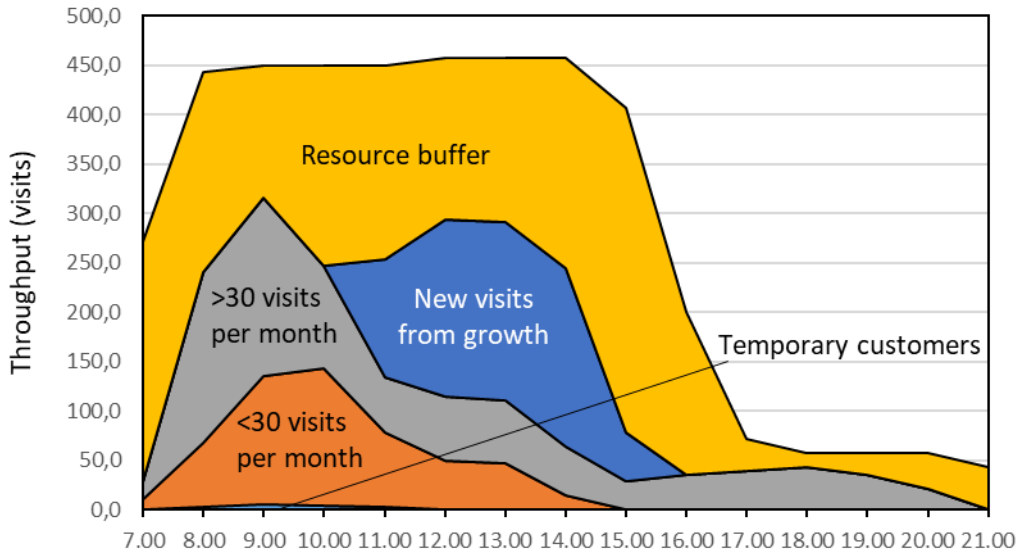

Figure 47. *Higher customer base potential.*

In the example above, the organization serves 50 % more customers than before with the same resource base as before while maintaining a 50 % the share of direct time spent at the customer remains. Additionally, this throughput should be still achievable when compared to Groop's (2012) theoretical maximum of 60 – 65 %. Thus, with a more balanced resource and service delivery management, the homecare organizations should be able to survive the increasing demand and as suggested by the findings in value assessment, the service of the case company is able to help homecare organizations in more flexible scheduling of visits. Hence, in addition to preventing the increase of the amount of monthly visits, the service should also be able prevent the increasing need of resources.

With direct cost savings from reduced visits, the discussion revolved around hundreds of Euros on a monthly basis. However, the resource management perspective discusses the savings of hundreds of Euros per day, taking it to a completely new league compared to

the visit reduction. Additionally, while the cost savings from visit reduction meant that the costs allocated for the visits are freed for other use, the resource perspective either decreases the resource costs or allocates them more efficiently enabling more tangible cost savings. Moreover, these cost savings can be gained without decreasing the direct work with the customer.

5.5 Value and cost assessment summary

As discussed in the customer cases, by adopting the technology in the homecare field, certain rules of the game no longer stay the same, which enables a more flexible planning and coordination of operations. Based on the discussions with the homecare organizations and findings of the effect analyses, it seems that there are at least 4 ways to acquire significant cost savings to either the homecare organization or the customer by using the automated medicine dispensing service. These ways are:

1. By reducing the amount of monthly visits and travel time with a customer.
2. By preventing the increase in monthly visits with a customer
3. By reducing the chance of hospitalization.
4. By bringing flexibility to the peak time resource constraint.

First, based on the effect analyses, at least 0,2 – 4,6 % of the homecare customers are eligible for a visit reduction of more than 10 visits per month. The cost per visit provided by Hujanen et al. (2008) also considers indirect costs that are not affected by the service and, thus, does not sufficiently reflect the cost of a reduced visit. While the actual cost savings per reduced visit varies and is closer to 20 Euros per visit, the cost savings often comes from activities not directly impacting the customer work such as travel, planning and documentation. For that reason the service pays itself back earlier, if the distance to the customer is long. Additionally, in some cases the homecare organizations can achieve cost savings even by increasing monthly time spent at the customer by implementing the service. However, since this type of cost savings come from travel cost savings and cost allocation, the resource is freed to another use instead. It should be also noted, that the visit reduction can also be significant for the end customer but instead of decreasing linearly, this cost saving occurs based on categories.

Second, the service can prevent an increase in monthly visits if deployed with a customer with minor memory loss and sings of unstable or irregular medicine consumption. The benefit of this type of customer is that in most cases the customer is able to adopt to the use of the medicine dispenser quite easily as the memory issues are still mild. Thus, they might be able to prolong the time they can manage their medication independently, also supporting valuable aging. However, the issue is that the occurred visit reduction using the service is hard to measure and only influences future.

Third, the regular and controlled medication can increase the well-being of the customer and reduce the chance of hospitalization. While the potential in this case is high, the probability of potential cost savings remains uncertain. However, based on the cost information by Lyly (2017), if the days in hospitalized care decrease by 0,25 – 0,6 days per month, the service should pay itself back.

Fourth, by allocating the service packages to customer having time critical visits during peak times, the organizations simultaneous resource need decreases bringing flexibility to the resource planning. This way, the organization could save 4 500 Euros per month by as little as one service package. Furthermore, as long as the organization can free a single resource per day with less than 20 service packages, the organization will receive cost savings. The same principle also follows the temporary workers and increasing demand, providing even more flexibility for the future.

Finally, these value elements are in no way exclusive. If a homecare organization is able to reduce monthly visits during peak time, they will automatically create flexibility to resource planning. Simultaneously, the accuracy of medication should be able to reduce the chance of hospitalization regardless if the amount or the schedule of monthly visits changes at all. Therefore, it would seem that the automated medicine dispensing service provided by the case company can be utilized in multiple ways that all have the potential to save costs. However, these cost savings do not occur automatically, but instead require active effort from the homecare organization and caregivers to be implemented on right customers and utilized to achieve flexibility to the resource and visit planning or accuracy to the customer medication.

6. DISCUSSION

6.1 Responding to research questions

The objective of the thesis was to explore the possibilities in using a management accounting approach in assessment and communication of value within the homecare sector as well as to understand how financial value is experienced and communicated in home care. Four customer cases were analyzed and the topic was discussed with two more customer organizations. However, two of the latest customer cases did not get sufficient results at the end of the time scope of this study, and therefore, only the preliminary discussions were included in the thesis. Nevertheless, a wide collection of empirical data was gathered. Findings concerning the effects of the service could be documented and the value could be assessed to a certain level using a management accounting approach. The value was both communicated by the researcher and observed to be communicated by the case company and inside the customer organizations, and the feedback from these situations could reviewed.

6.1.1 Value assessment and new value element identification

The first research question was “Can a combination of value assessment and management accounting be used to identify and communicate new value elements in homecare?”.To answer the question, the first thing is to look at how the value assessment process actually occurred. The value assessment with the homecare organizations quite closely followed the value assessment process by Keränen & Jalkala (2013) and the framework illustrated in Figure 23. The expected value potential was communicated to the organizations by the case company to start the pilot, baseline was assessed either during the performance evaluation or at the expected results budgeting phase, and the effect analysis was provided for the performance evaluation discussions. Once the results were communicated to both the customer and the case company, they decided on the continuation of the service, which lead to long-term value realization. While some changes occurred in the amount of service packages, all discussed municipalities continued as a customer after the pilot. Therefore, looking back to Figure 23, the value assessment process during a single pilot looked something like in Figure 48 below.

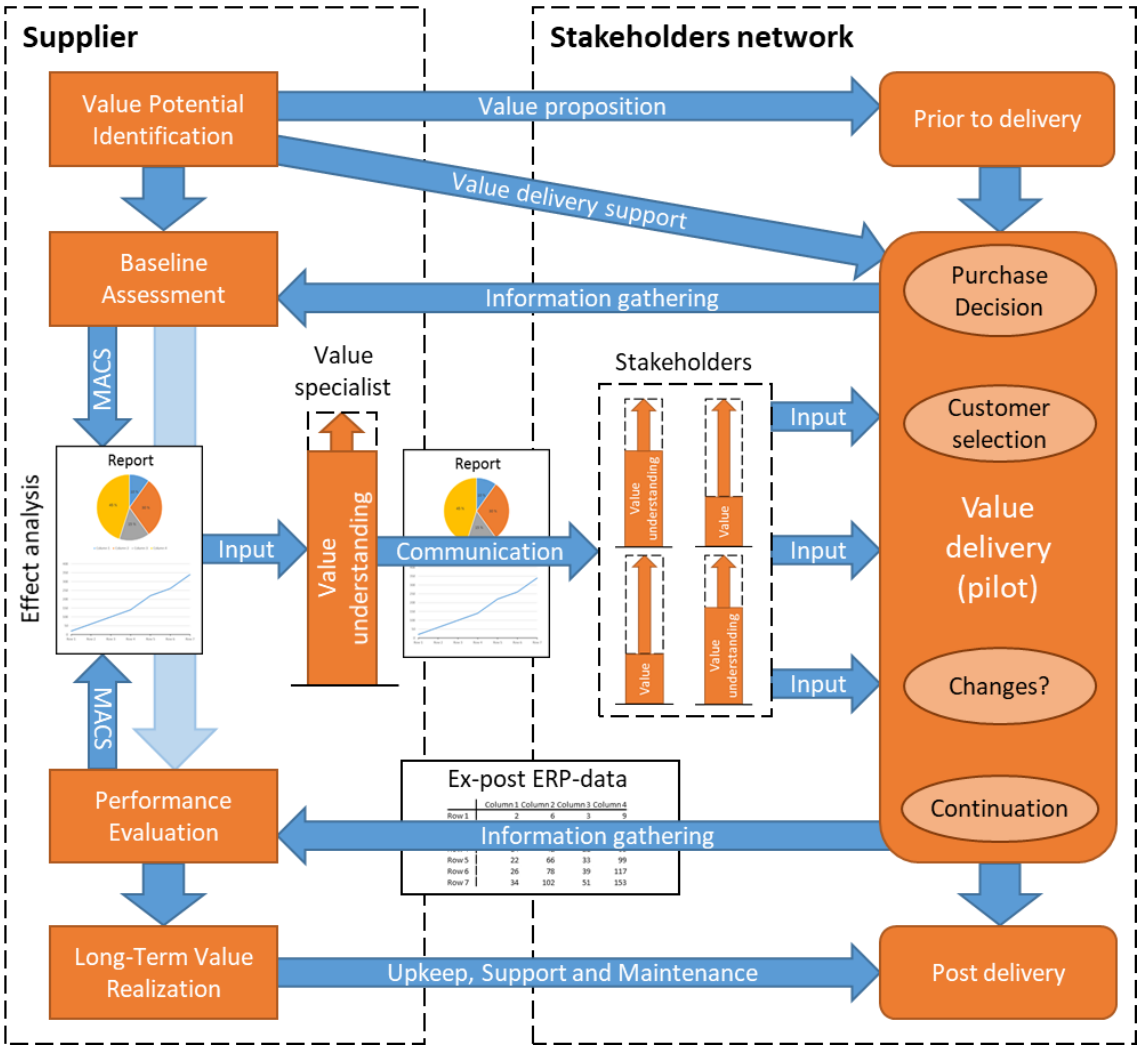

Figure 48. *Value assessment as a part of pilot project decision making.*

The differences to the expected model mostly related to the types of gathered information. Due to the time frame of the study, and the reporting systems of the homecare organizations, accounting information would have been hard to gather and analyze. However, since the service directly influenced the work of caregivers, it was possible to analyze the effects first based on non-monetary metrics. This was done by first gathering service plan based interview material about the monthly visits and later by looking into the ERP-data concerning the service users. The next approach would have been to look into the ERP-data of the whole homecare organization preferably before the service implementation so that the resource point of view could be measured and even used to coordinate the customer selection. Thus, instead of gathering the accounting information from the customer, it was more important to try to understand how the service affected the processes of the customers. As Nørreklit et al. (2010) argue: "… a major and fundamental aspect of the accountant's work is to observe the phenomenon that they are to report on in respect of the accounting facts related to it." Therefore, it is crucial to be able to understand the current processes and the possible impacts of the offering as well as possible before a reasonably accurate cost assessment is possible.

The value assessment was able to clarify the variance between the results in several homecare organization by looking into the customer selection and emphasizing its importance. The effect analyses also documented several customer types and effects, confirming different usage purposes. In addition, the resource perspective was identified during the performance evaluation phase in one of the first municipalities, which guided the researcher to look more into it. Additionally, the management accounting approach and, more specifically, activity-based costing allowed to measure the cost savings on a much larger scale than by only looking at the amount of visits. Finally, the assistance of management accounting approach on the peak time resource perspective allowed to realize the potential of the service in resource management. However, even though the perspective had been identified by Groop (2012) and within the effect analyses, a financial cost assessment was required to measure it in comparison to visit reduction and other sources of cost savings. By reflecting this finding with the framework in Figure 27, we can also consider the new value element identification and its impact in customer value understanding. This is illustrated in Figure 49.

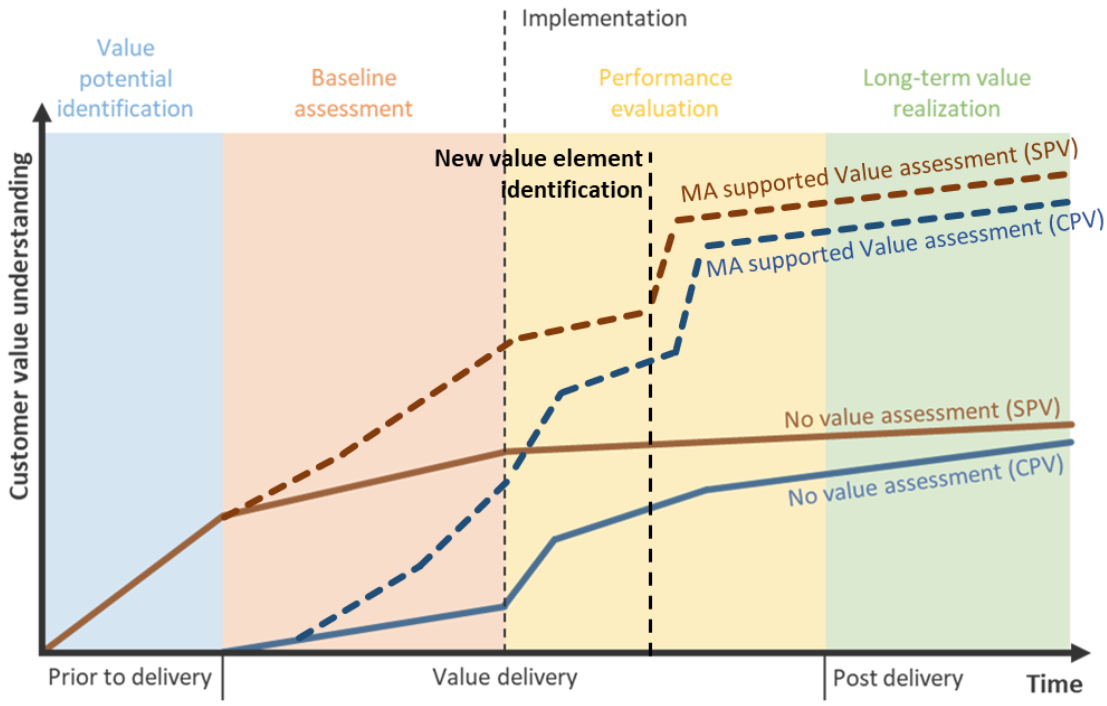

Figure 49. *The impact of new value element identification on value understanding during value assessment.*

Thus, during the performance evaluation and cost assessment a new potential objective of balancing the peak time was identified and measured to be more potential than visit reduction with a single customer. Thus, the value and cost assessment could be used to also identify a new value element for the service, which also responds to the research question. However, now the question is why the researcher did not realize the potential of peak resource constraint earlier. At least three reasons for this could be identified.

First, the researcher wanted to prove the cost savings from reduced monthly visits, since if the service would pay itself back every month while also increasing the level of service, the value proposition would be so tangible it would not make any sense for the homecare organizations to not implement the service. However, after some customer cases, it became evident that even though significant visit reductions could be achieved, the volume of the customers viable for visit sufficient visit reduction was so low, that it would make a larger implementation more challenging. Additionally, both the homecare organizations and the case company had been mostly interested on how the service influences the care of the end customers.

Second, there had not been any access to study the organizational level to identify the magnitude of the peak time resource constraint. The workload reduction during mornings had been identified in Vantaa, but it had not been documented before. Joensuu gave the first insight to the time distribution of visits, but at that point it only had been on a relative scale. Finally, the material in Harjavalta enabled a way to measure the time distribution on an absolute scale, which later could be applied in Joensuu as well.

Third, the study by Groop (2012), which acted as important source of existing data, discusses home care from operations management point of view. Therefore, it is only natural that it did not appear during the literature review. Even though the value element was identified quite early in the value assessment project, it had to be measured and looked into to identify its true potential. This was only possible by implementing the management accounting approach

6.1.2 Management accounting approach to value assessment

The second research question was “How can management accounting support the assessment and communication of value?” The role of management accounting pretty much followed the process illustrated in Figure 22. The value specialist participated in budgeting during the baseline assessment as well as performed the effect analysis and made the performance reports for the performance evaluation. Thus, the role of management accounting followed the expected tasks discussed by Horngren et al. (2005). The exceptions in this case were that several value assessment projects were conducted simultaneously and that the reports did not discuss the financial perspective, but the documented changes in the customer organization processes instead. However, the value assessment concerning the effects within multiple municipalities could be used to conduct a cost assessment. The cost assessments role within the value assessment is illustrated in Figure 50.

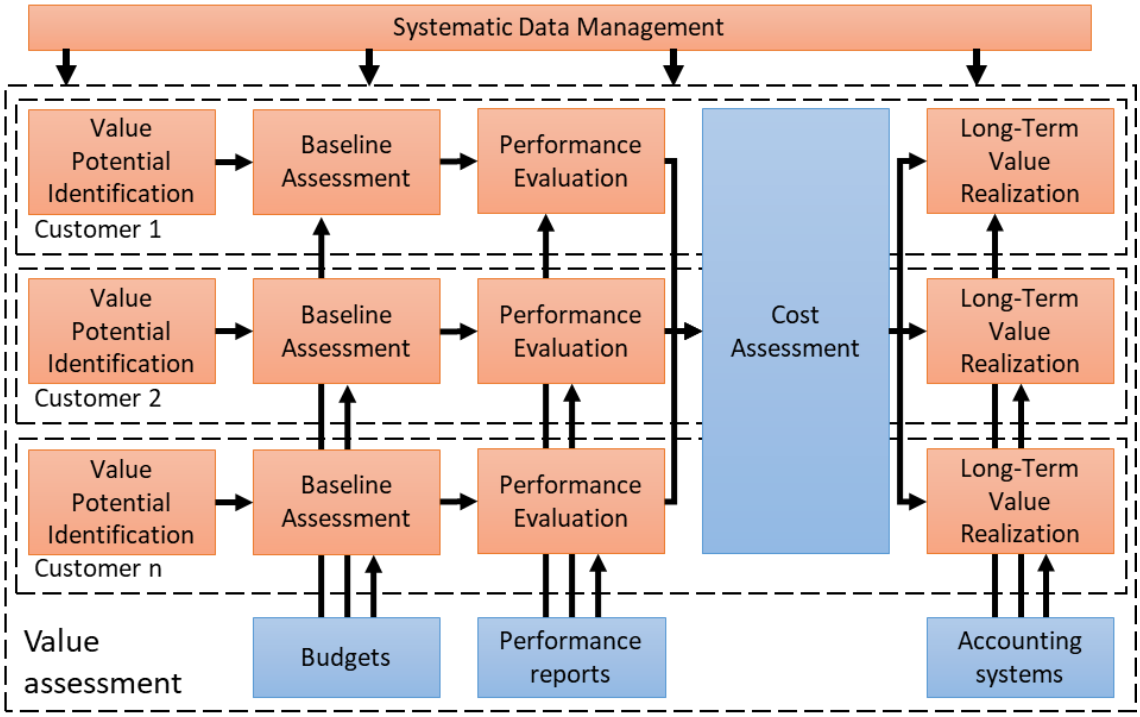

Figure 50. *Cost assessment as a part of the value assessment process.*

The tasks of the value specialists are marked with red and the tasks for management accounting are marked as blue. However, the management accounting specialist can also be part of the value specialist team, but some expertise from other functions such as sales might be required there in addition to the management accounting specialist. Instead of being part of the baseline assessment and performance evaluation, the cost assessment was a separate step within the process where the understanding of the cause-and-effect developed during the value assessment projects was applied to measure the customer value from financial point of view. This finding supports the idea of understanding the phenomena discussed by Nørreklit et al. (2010). The cost assessment was conducted after the first two value assessment projects, but concurrently with some of the later projects. This way there was a sufficient understanding of the customer's processes to start the ABC cost analysis, but it also gave the possibility to fill the blanks within the ongoing value assessment projects.

The main benefit of using management accounting approach was being able to compare different value elements in monetary terms. Thus, management accounting approach enabled the researcher to face the challenges of measuring financial value discussed by Anderson et al. (2006) and Keränen and Jalkala (2013). The cost assessment and ABC enabled to make the different value elements measurable, but only after sufficient understanding of the processes was gained via effect analyses and discussions with the customer organizations. Before a sufficient understanding of the processes has been constructed, the cost assessment can provide misleading or partial results.

In addition to being able to quantify the value, management accounting also gave some interesting other benefits during the value assessment process. First, it seemed that budgeting was an important part of the value measurement but also the realization since it provided the required goals for achieving the potential value of the offering. However, interestingly this also meant that by budgeting the visit reduction potential, the organizations were able to have a better success rate in choosing the right customers from visit reduction point of view. This was for example the case in the researcher intervention in Harjavalta where payback period was used to drive the customer selection criteria. Second, in this value assessment, the cost savings potential of peak time constraint and the importance of customer selection could be identified. This was a result of continuous reflection between the effect analyses, discussions with the homecare organizations and cost assessments. Within a different context, the identified value element might be something else. While there are no necessary guarantees of value element identification during value assessment, it has the potential of identifying how the value manifests in the organization. Additionally, it might even bring up new potential sources of value creation.

The value specialist had to walk a fine line between recognizing the caregivers' concerns and challenging their assumptions. Naturally, the second part becomes easier once the value specialists acquires sufficient knowledge to discuss with the caregivers on equivalent terms. If the value specialist emphasizes with the caregivers too much, the implementation might not perform as well as possible. On the other hand, if the value specialist challenges the work and opinions of the caregivers too much, they might face added change resistance. The challenge here is that the value specialist is most aware of the offering, but does not know the end customers. On the other hand, the caregivers know the end customers but do not know the offering. Thus, co-operation between the two is necessary for optimal performance. This again reflects with the S-D logic by Lusch and Vargo (2014) on how value does not exist by itself but is co-created instead.

Once the expertise of the person responsible of value assessment starts to grow, the role of the person can become more consultant oriented. Having studied multiple cases, the person becomes competent enough to start helping the customers in implementing and using the offerings. Thus, the role of that person can transfer from a value assessment oriented to more value management -oriented role (Anderson et al., 2009). However, the value specialist can become such a crucial part of the value delivery process that value documentation is requested in new deals as well.

At the final steps of the research process, two new customers contacted the researchers concerning on making an effect analysis. From these two new customers, one was interested in the analysis but due to long and bureaucratic research permit process, the effect analysis could not be performed in the planned time. However, because there is only limited differences between the customer cases, there is no point in manually performing the value documentation in each case, especially as it might be possible to do it automatically

as a part of the service. For this reason, there is also the need to develop accounting systems to manage the long-term value realization with the customers as illustrated in Figure 17. While the schedule of the research did not enable the researcher to study this, the development of this research area was also started around the end of this study.

The main limitation of the value assessment relates to resource use. The value assessment can end up draining many resources, since it is difficult to achieve an exact level of customer perceived value understanding. Thus, the question is, how much time and resources can be spent on the value assessment for it to bring value to the supplier organization. There is a lot of uncertainty involved in how worthwhile the value assessment process is and it is impossible to say, when the breakthrough in the customer value understanding occurs. On the other hand, a value specialist with a monthly salary of 4 000 Euros, resulting in an annual cost of around 60 000 Euros, would be equivalent of around 25 service packages running for a year. Thus, in this case the value specialist could pay him or herself back with a one-to-three successful pilots resulting in a larger implementation. Moreover, the findings would suggest that if a team of value specialists were deployed for value assessment, it would be reasonable to include the assistance of management accounting specialist when measuring the magnitude of the different value elements. This measurement can also be beneficial in communicating the value elements to the customer organization and other homecare stakeholders.

6.1.3 Value communication in home care

The third research question was “How can value be effectively communicated to different homecare stakeholders?” The communication mainly consisted of discussions with the homecare personnel and the case company as well as providing the effect analyses also shown in appendixes. The few times the researcher brought up financial value during the discussions with homecare personnel, the reactions were unexpected. Either the personnel reacted a bit cautious towards the provided information as in the customer selection of Harjavalta, or they seemed to get excited about it as during the discussions about indirect costs. Because the uncertainty involved concerning bringing up the financial information, the researcher mainly focused on the value elements instead of their financial worth. It might be partly the result of unreasonable assumptions that homecare personnel are not as receptive towards financial value as other industries. On the other hand, most of the discussion revolved around the home caregivers, coordinators or managers and financial value mainly consisted of their salaries. After thinking about the attitude towards the communication, it is completely different to discuss with a home caregiver how the service saves 15-40 Euros per visit by replacing the work of caregivers, instead of how the caregiver no longer has to worry about visiting the customer exactly on time. However, the emphasis on cost issues can be higher when discussing with managers facing cost related pressure.

Based on the discussions the stakeholders had mixed reactions towards financial value. However, the financial value supported to communication of the effects that create the value. By constructing the value proposition in a way that prioritises the most relevant part of the value, the value proposition is personalized for each stakeholder and can help increase the customer perceived value. For example, the value gained from being able to transfer a time critical visit from the peak time to a more quite times could be communicated in multiple ways depending on who it is communicated to. For a director of elderly care or a person in a similar position, this could mean:

> *"The service can save your organization over 30 000 Euros annually by bringing flexibility to the resource planning. In addition, the reduced load during peak times can even help increase employee satisfaction and moreover, reduce the sick leaves among home caregivers bringing even more cost savings."*

For a homecare manager or coordinator, this could mean something like:

> *"With the service, some daily visits are no longer forced on a specific time. This enables a more flexible planning of homecare visits and reduces the need for finding temporary employees, which can save up to 150 Euros per day."*

For a home caregiver on the other hand, a better approach could be:

> *"By choosing the right customers, you do not have to worry about visiting some of the customers right on time. The machine will take care of the medication in the morning so that you can focus on more important issues when you decide to visit the customer."*

Finally, for the end customer, the perspective could be completely different.

> *"Now you will finally be able to take care of the medication independently; just as you have wanted. Additionally, the caregivers will no longer be waking you up every morning, but they can still visit you to make sure you have everything you need."*

Thus, all four value propositions communicate the same value element. Even though the differences are only small nuances, the impact can be quite significant. Interestingly, this finding is linked to the resonating focus by Anderson et al. (2006) where the most important and relevant value elements that are in focus during the value communication. This kind of flexible construction of value propositions can help ensure that each stakeholder understands the significance of the value elements from their own perspective. However, as the communication with the homecare organizations occurred several times in different scenarios, it should be separated from a traditional value propositions. Therefore, during the value assessment the communication is more complex and interactive than in communicating value propositions. However, the discussion during value assessment can instead be used to develop the distinctive value propositions to be communicated to potential new customers. This is illustrated in Figure 51.

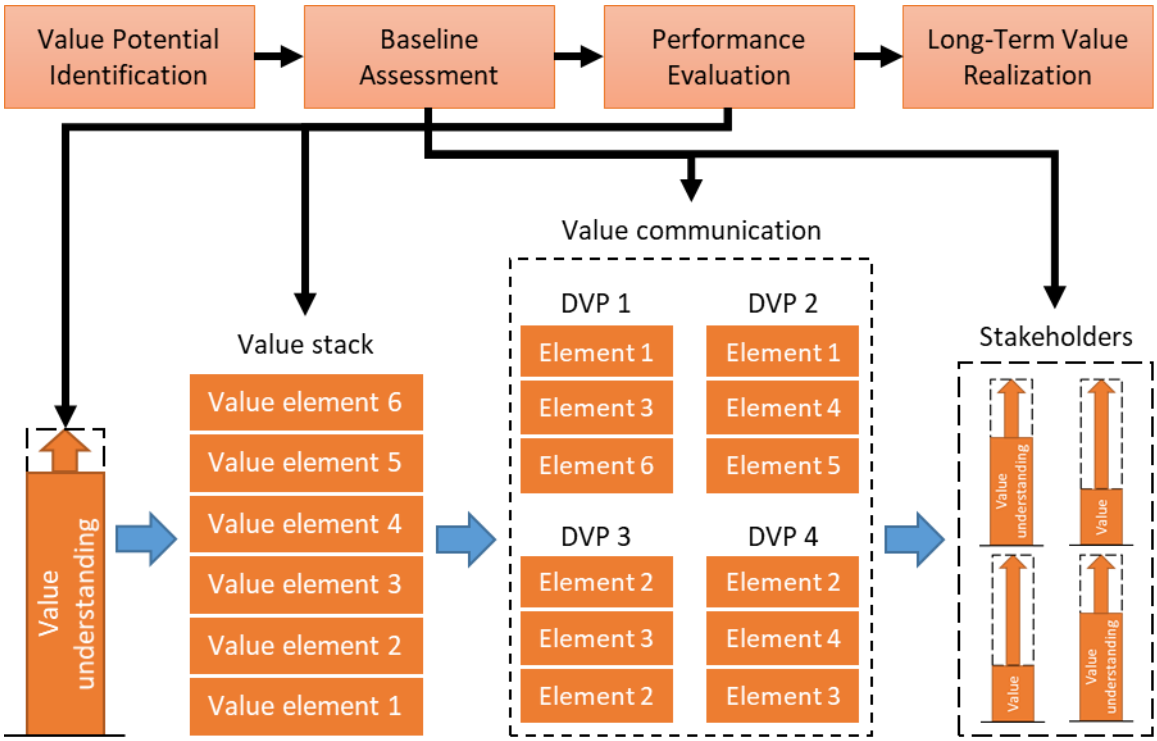

Figure 51. *Value assessment as a tool to develop value communication.*

As illustrated in the figure, an extensive understanding of the value is needed to be able to communicate the value correctly. Interestingly, the baseline assessment helps identifying the preferences and needs of stakeholders and can later be applied in customization of the distinctive value propositions. On the other hand, performance evaluation brings the necessary information and documentation to develop the value understanding and create the value element stack. Overall, value assessment is an important phase in developing the necessary customer value understanding to develop the communication to get new customers.

When the researcher was discussing the graphs from a previous municipality with some of the homecare managers, the graphs required more explaining than expected. This was a clear sign that the form of communication was not enough at least as an individual method of communication but instead a tool to support other communication. As discussed by Hall (2010) and Jönsson (1998), accounting information is now an input to a decision, but the decision making is more complex. Therefore, the graph format was not necessarily suitable for the homecare organization but required verbal communication as well. Reflecting on the study by Kraus (2012), the verbal communication would be required to initiate a successful accountingisation before the financial value could be accepted within the organization. Unfortunately, the impact of communication is difficult to measure without an experimental approach where other variables could be eliminated. These findings are strongly dependent on the feedback the researcher got when discussing with different stakeholders in the customer organization. Thus, the validation of these findings would be necessary especially before they are applied in a different context.

6.1.4 Financial value in home care

The fourth and last research question was “How is financial value experienced from different perspectives within homecare processes?” While most of the employees have a decent financial understanding, the communication within the organization happens on a level of “Can we afford this?” or “It is way too expensive.” Hence, the discussions seldom seemed to revolve around the actual costs or cost estimations but intuitive estimations instead. Even though the researcher always emphasized that they were interested in the financial aspects of the service, not once during the 14 months was the researcher directly asked anything cost related. Additionally, one of the largest challenges in the financial understanding of the whole organization is that homecare organizations commonly have no specific financial assistant, controller or financial manager to work on the financial aspects of the homecare work. Instead, the municipalities often have a small financial team that works on the municipality level and does not have time to focus on single operational functions.

There is also a variance on how different stakeholders in the organizations manage financial issues. Some employees were on the alert when financial aspects were discussed like in the customer selection in Harjavalta. On the other hand, some employees might immediately identify cost savings potential when the possibilities of the service is communicated to them. What is most interesting is that this seemed to not be dependent on the organizational role but the preferences of the employee. For example, while in a one organization the director of elderly care might have quite a financially oriented mindset, in another organization a caregiver might have the better knowledge about the costs related to the home care.

In this case, for the homecare personnel it was enough if the service pays itself back and increases the level of service. Thus, instead of thinking about how to deploy the service to gain large-scale efficiency boost or save costs, they are more concerned about proving their associates that the implementation was reasonable. This might be the result of the organizational structures in municipalities concerning investments, as they are not necessarily made to support all kinds of purchase decisions. It also might explain why municipalities are reluctant to make large-scale implementations.

Overall within the homecare field, financial understanding seems to somewhat correlate with the pressure to reduce the costs. During the discussions, the financial value was most interesting to managers that had the need to make the homecare processes more cost efficient. In other organizations, the interest lied in the possibilities to enhance the service level from more accurate medicine distribution and resource planning flexibility. Some of the managers even openly communicated that they are not that interested in the cost aspect and had completely different goals. However, a subordinate of the latter manager had pressure to cut down the costs, which means there might be some conflict on either the understanding or communication of the current financial situation.

6.2 Research assessment

Interventionist approach works well in an exploratory study. The objective of this thesis was to explore how a financial value proposition could be developed further by documenting effects and studying the phenomena occurring in the implementation phase. The results are preliminary, restricted to the current case setup and would have to be validated using different research approaches. Thus, this study discusses the value assessment process in a certain field in-depth to provide direction for future research. The study also explores the challenges related to assessing and communicating value in financial terms.

Conducting the value assessment in a different context might create some challenges. During the study, two things that influence this were identified: the field in the research was conducted in and the role of having a third party researcher performing the value assessment. First, the homecare field is mostly public, which results in a rather low financial or analytical expertise. This is due to municipalities having limited financial support resources, which then results in some of the homecare personnel taking care of the required activities. Thus, a person with analytical skills and financial background was more than welcome to help in the effect analyses. However, this might not be the case in other industries with a higher expertise on financial aspects.

Second, the party conducting the value assessment was a third party from the academic world. If the value specialists would have come from the case company, there is a chance that they might not have been so openly accepted to study the effects. Additionally, the fact that the value specialists were researchers made it easier to get the necessary access to the homecare organizations. Public organizations constantly co-operate with researchers and supervise student theses. There seemed to exist some level of preconception towards technology providers within the homecare field. As the caregivers in Harjavalta explained, they were openly skeptical towards the service, but wanted to keep an open mind as they had had a positive experience in a recent technology implementation. Thus, a value specialist working for the technology provider might face more issues in creating the required access to gather and document the results and the value. Additionally, it should be noted that this study was done with a service that has little to no competition. Thus, the service was compared with the current situation instead of against competitors.

The intangibility of communication makes it difficult to research with an interventionist approach. Several attempts to get feedback concerning how the reports and posters were perceived were done, but results remained scant. Additionally, no access could be got to the meetings, such as continuity negotiations where the analyses were discussed most. Nevertheless, some thoughts could be collected before and afterwards from the people participating in these meetings. Therefore, the discussion revolves around what kind of preferences could be identified instead of why and how it could be developed.

While the homecare field gave a good platform for studying value assessment, its uniqueness makes it hard to validate the results outside its own context. This is particularly the case concerning the research question three about communication where the study depends on analyzing the feedback the researcher gets from communicating with the case company's customers. This interactive way of interventionist research also results in a low reliability. While the documentation of effects follows a systematic way, there is a lot of uncertainty involved in studying the phenomena related to the implementation and value realization. This type of research is interactive and requires an active input from the researcher. The researcher also needs to actively create access to the situations where important matters are discussed or the implementation proceeds. Thus, the research method is not a train that the researcher just jumps into and which follows a certain track, but the researcher has to lay down the tracks instead. However, while the validity and the reliability of this study are relatively low, this research method enabled to identify issues that could not have been identified with traditional research methods.

6.3 Managerial implications

This study contributes to four managerial areas:

- Exploring and narratively discussing the value assessment process
- Investigating how management accounting could contribute into it
- Exploring the homecare field and how value can be created there
- Discussing how the communication of value can be differentiated for the stakeholder network.

First, in this type of customer relationship, the value assessment can provide considerable increase in understanding the customer and the value. If an access can be created, value assessment can be an effective method to gather information about what happens behind the organizational wall. In addition to understanding how the value manifests, value assessment can also give insight to new potential value co-creation possibilities, especially as they are identified in co-operation with the customer. However, the true benefit of value assessment rouses if there is something unexpected in the value delivery. In this kind of scenario, it can be beneficial to have someone document what has happened during the value delivery and what are the reasons for the unexpected occurrences. On the other hand, this is not the only case and as this study suggests in line with other studies (Keränen & Jalkala, 2013; Keränen & Jalkala, 2014; Anderson et al., 2006), there are several reasons why the supplier should invest in conducting value assessment and documenting the value.

Second, the challenge in creating value propositions has been in promising economic value. The research done on value assessments emphasizes that there is a need to measure and communicate value in financial terms, but also that it is difficult to do so (e.g. Keränen

& Jalkala, 2013). However, the reviewed literature did not comment on why this translation was difficult or what kind of attempts had been made to translate the value. For simplicity sake, organizations might use general statistics, verified cost averages or other acceptable information in creating their financial value proposition. While a simple costing method might create a tempting value proposition, it does not necessarily reflect the real case accurate enough, and a difference between the value proposition and the customer perceived value can even dilute the customer perceived value. For this reason, more advanced accounting and costing methods might be required to increase the accuracy of the financial value proposition, and therefore it can be beneficial to include a management accounting specialist in the value assessment team.

Third, this study discusses the challenges related to homecare coordination. Due to time dependency and varying visit load on different customers, planning homecare visits and required resources is difficult. As Groop (2012) discusses, the morning visits seem to define the peak time constraint which then defines the resource requirement. The same issue was discussed in all of the case homecare organizations and being able to provide flexibility to the time criticality to visits would assist the homecare organizations considerably. Similarly, being able to decrease the chance that an elder has to transfer to institutionalized care can provide significant cost savings, but not directly for the homecare organization. Thus, developing technological solutions that increase the level of care are welcomed within the field, but need to be recognized by multiple stakeholders. However, the benefits would have to be tangible enough or communicated efficiently for the offering to be implemented in the homecare organizations.

Fourth, the amount of effort required for communication seems to depend on the tangibility of the value elements and the complexity of the stakeholder network. Naturally, an intangible value element requires more attention as it is something that is not obvious, and might only be realized after the implementation. On the other hand, a tangible value element can be communicated by informing the customer of its existence instead of explaining it. Again, if something unexpected happens during the purchasing process, it could be a sign that some effort should be put into the communication. In this case, a company might benefit from customizing their communication to the relevant stakeholder, at least in the buying center. While mastering this requires a lot of effort, the company should at least make themselves visible and heard with these stakeholders, especially if there is some value for the particular stakeholders in the offering. Additionally, this concerns all types of communication from verbal to written and public communication.

6.4 Future research

As previously discussed, the role of this study was exploratory. Thus, it would prove valuable to validate the findings as well as measure the findings using quantitative research methods such as questionnaires or experiments. While Keränen & Jalkala have

studied the value assessment process (2013) and the value assessment strategies (2014), the research field could use more statistical research on best practices and the overall usefulness of conducting a value assessment. It would also be interesting to reflect the findings of this thesis with companies using value specialist strategy. In addition, this thesis only scratched the surface of using management accounting as a tool to measure financial customer value, and the preliminary findings would suggest that management accounting can provide insight to the magnitude of value elements and should be utilized more often. However, the latter topic might require a multi-case study to be researched further.

A more in-depth mapping of the different value elements and especially the related indirect cost elements would be highly welcomed in the field of homecare organizations. This seemed to arise interest also in the municipality management, especially as the home care seems to face many challenges related to resourcing and employee dissatisfaction. Additionally, the discussion revolving around the best ways to serve elderly cost efficiently while maintaining sufficient level of service is a topic that requires attention. While there are many different technology solutions revolving in the health care markets, their actual value can be difficult to measure and organizations are having trouble identifying the most appropriate ones for their specific needs. Thus, as Lanne (2018) also discusses, the homecare sector could use more in-depth analyses on the customer value of different solutions and how they could be utilized by home care as well as other health care organizations to manage their difficult situation.

This study introduced the concept of customer value understanding to represent how well both the supplier and the customer understand the cause-and-effect relations of the offering in question. While there is some research that discusses customer value understanding, it has not been a primary topic of research yet. However, after a long period of trying to find and develop a way to express this understanding, customer value understanding was the best way the researcher came up with. Thus, this concept could be studied further as it could prove to explain some of the intangibility related to evaluating and communicating customer value.

7. CONCLUSION

This thesis narrates a process of conducting a value assessment, translating value elements into financial format by conducting a cost assessment based on the gathered information and communicating the results to both the supplier and customer organizations in homecare context. The thesis draws on literature concerning customer value, management accounting and decision making and applies it in homecare context by conducting a case study with a technology service provider.

The objective of the thesis was to explore the possibilities in using a management accounting approach in assessment and communication of value in homecare context as well as to investigate how financial value is experienced and can be communicated to different stakeholders in home care. A theoretical framework was developed to represent both management accounting's role in value assessment and the value communication within value assessment. Additionally, the success of the value assessment was discussed using a concept of customer value understanding. Based on this framework, the value assessment and the included cost assessment were used to clarify the customer value of a service to increase the customer value understanding of both the supplier and the customer. During this process also the stakeholder perspective and communication were discussed.

Concerning the case company, this thesis documented the results of their service in several homecare organizations. While there seems to be several ways to utilize the service to gain both increased level of service and significant cost savings, the realized value largely depends on the homecare organization and its customers. It would seem that the customer selection plays an important role on the successfulness of the pilot, which is why it could use more support during the implementation of the service. While these findings relate to the case company, they have significance to other companies providing solutions to the homecare sector.

The results of the thesis highly suggest that there are several benefits in applying management accounting approach to value assessment and communication especially in the homecare sector. Value assessment is a strong tool in increasing the customer value understanding of the stakeholders involved with the provided offering. Management accounting can assist in measuring the different value elements and help communicate and argue their significance. In addition, the method proved successful in identifying and measuring a new important value element made possible by the service. However, while these findings could also be communicated to the stakeholders, the findings regarding communication and how it should be done in homecare remained scarce.

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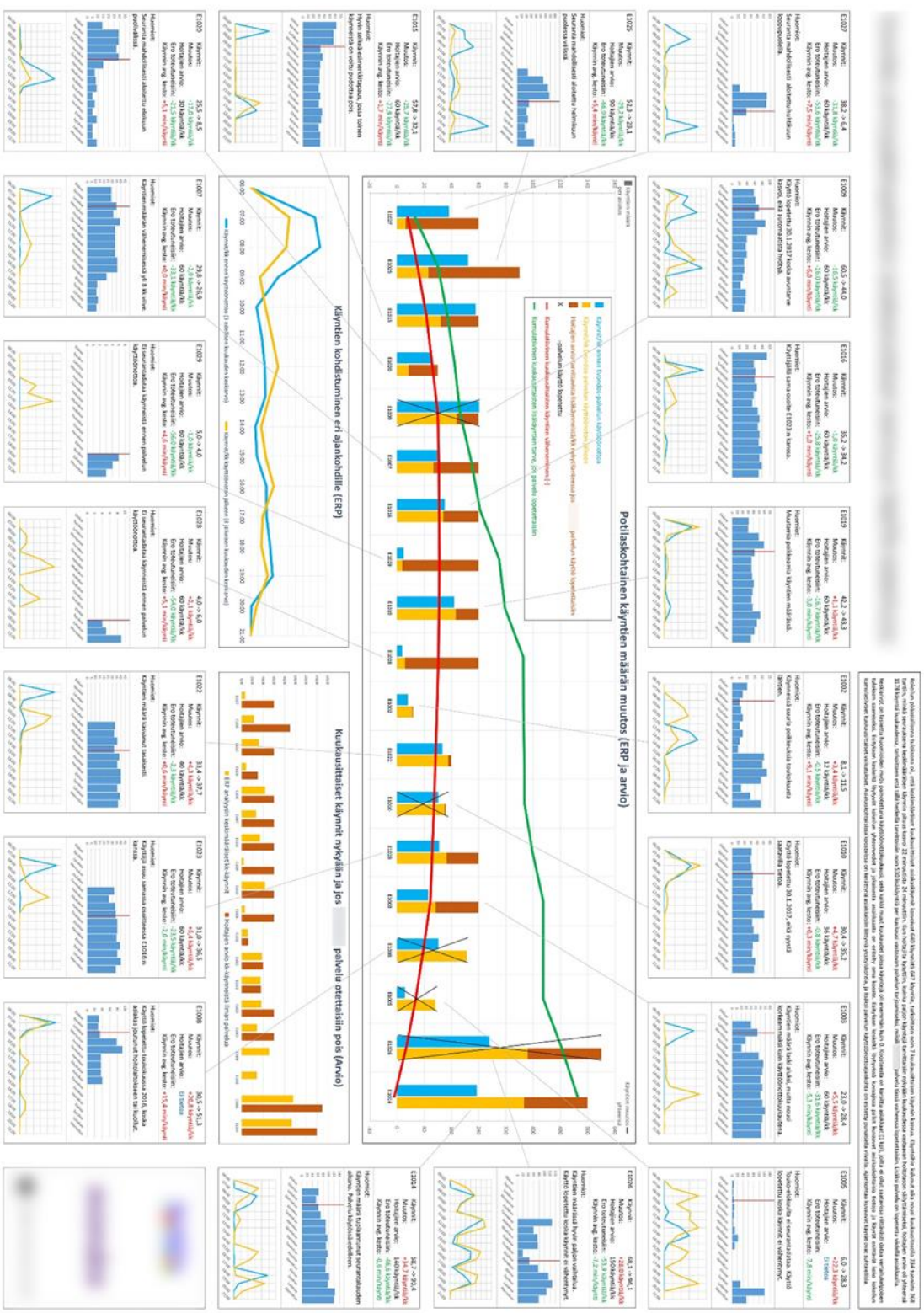
APPENDIX 1: THE VANTAA SUMMARY PAGE

The impacts of the medicine dispensing service in Vantaa home care

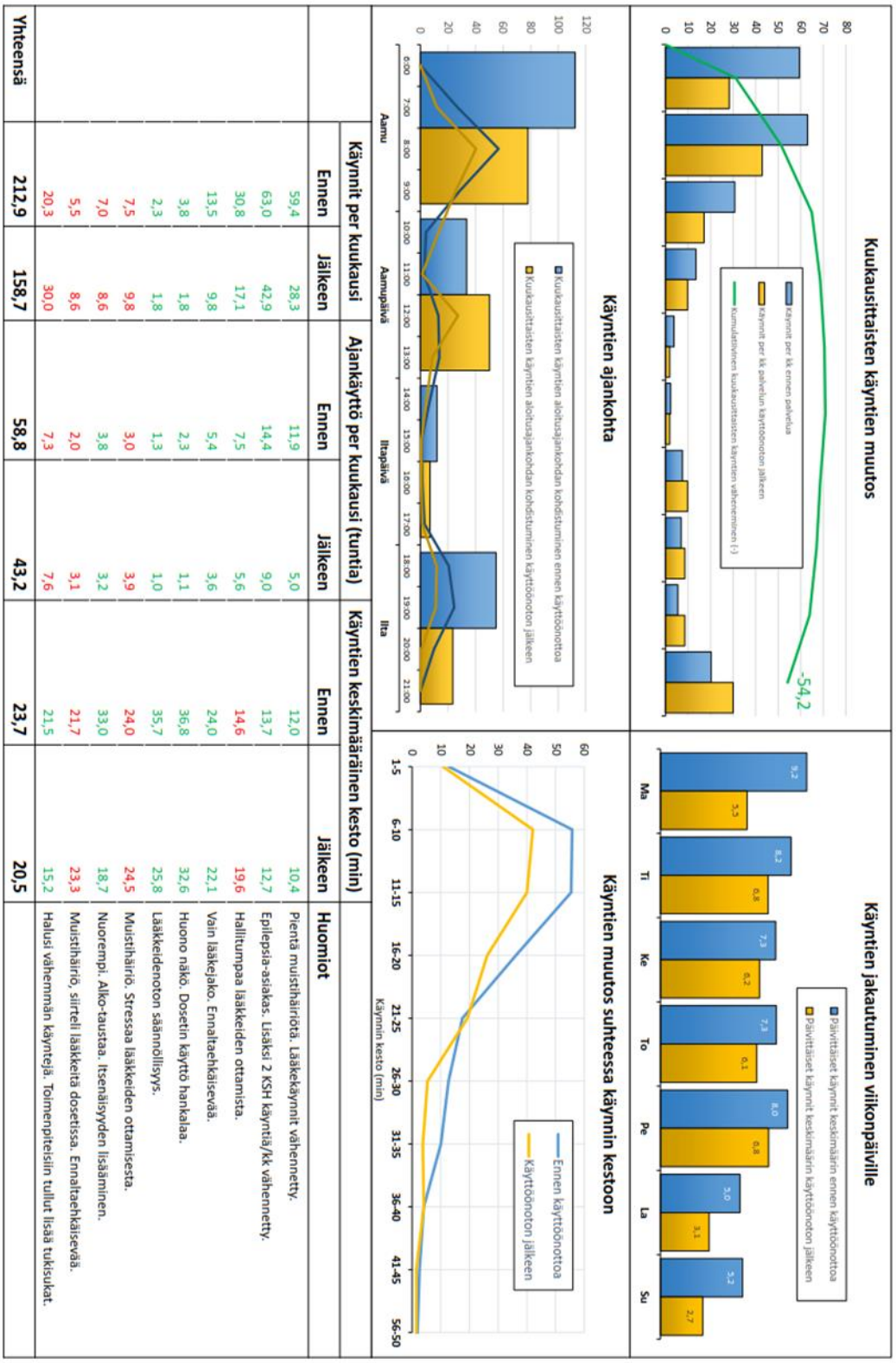
Patient	Profile	Before	After	Comments/Notes
Sub region 1 – interviewed 24.11.2016				
C01	Medicine control	30	4	*Before midday, duration has increased.*
C02	Dementia	30	20	*Visit two hours later, out of traffic, duration stayed the same.*
C03	Dementia	8	4	*No daily calls anymore, duration stayed the same.*
C04	Dementia	60	30	*Before morning and evening, now midday, duration stayed the same.*
C05	Dementia	90	90	*Eye-drops require 2-3 visits per day, duration stayed the same.*
		218	**148**	
Sub region 2 - interviewed 12.1.2017				
C11	Dementia	30	8	*Time of the visit more flexible, duration stayed the same.*
C12	Dementia	60	30	Time of the visit more flexible, *duration increased a little.*
C13	Dementia	60	30	*Before morning and evening, now more flexible, duration the same.*
		150	**68**	
Sub region 3 – interviewed 16.12.2016				
C21	Medicine control	16	8	*Time of the visit has been and stayed flexible, duration the same.*
		16	**8**	
Sub region 4 – interviewed 23.12.2016				
5 customers, who lived in the same assisted living accommodation. They took their medicine in the dining hall during breakfast, lunch and dinner so measuring the amount of home care visits was not relevant.				
Yhteensä		384	224	

Unofficial translation – Vesa Tiitola 15.5.2017

APPENDIX 2: JOENSUU DATA VISUALIZATION

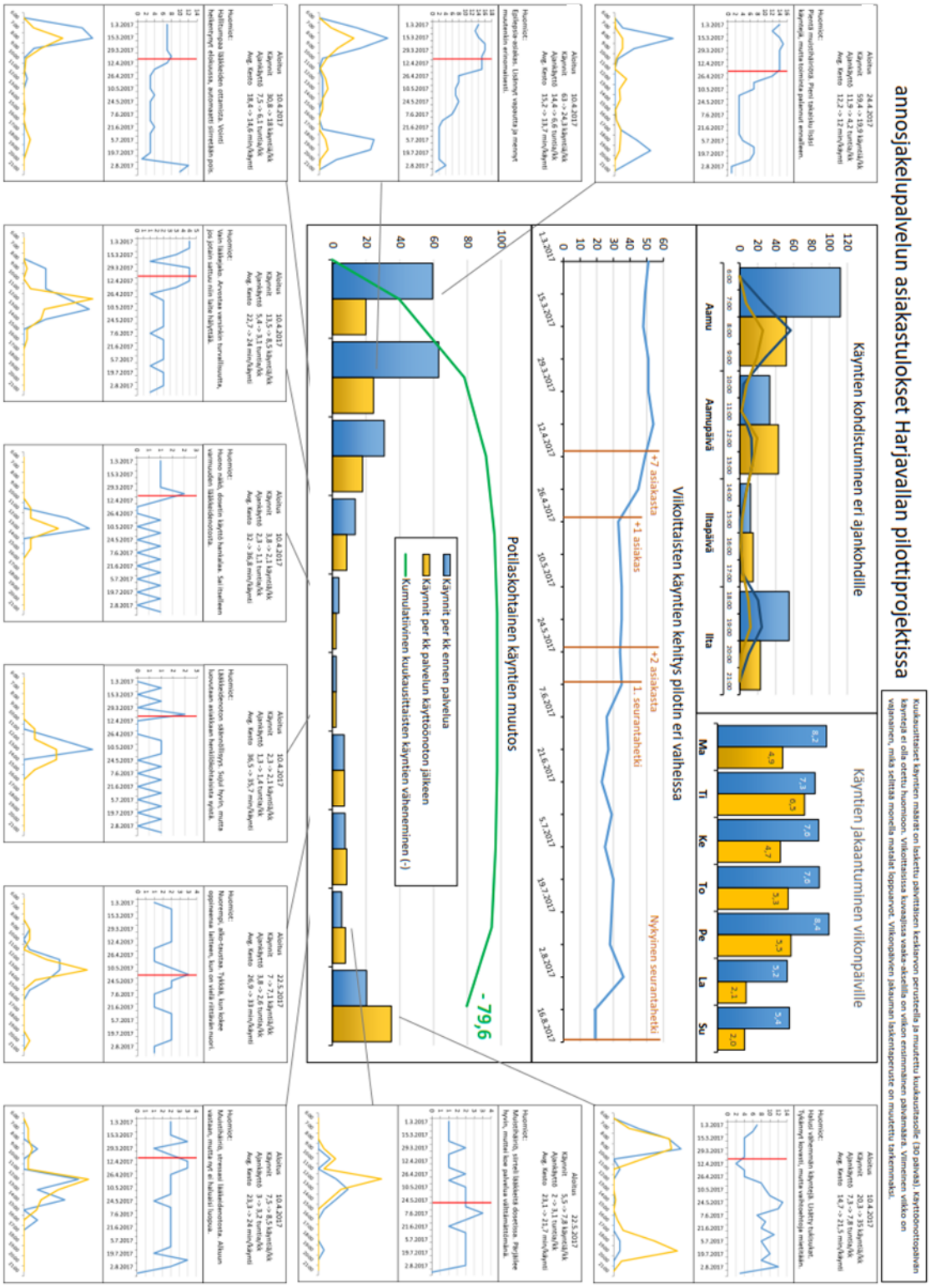


APPENDIX 3: HARJAVALTA DATA VISUALIZATION

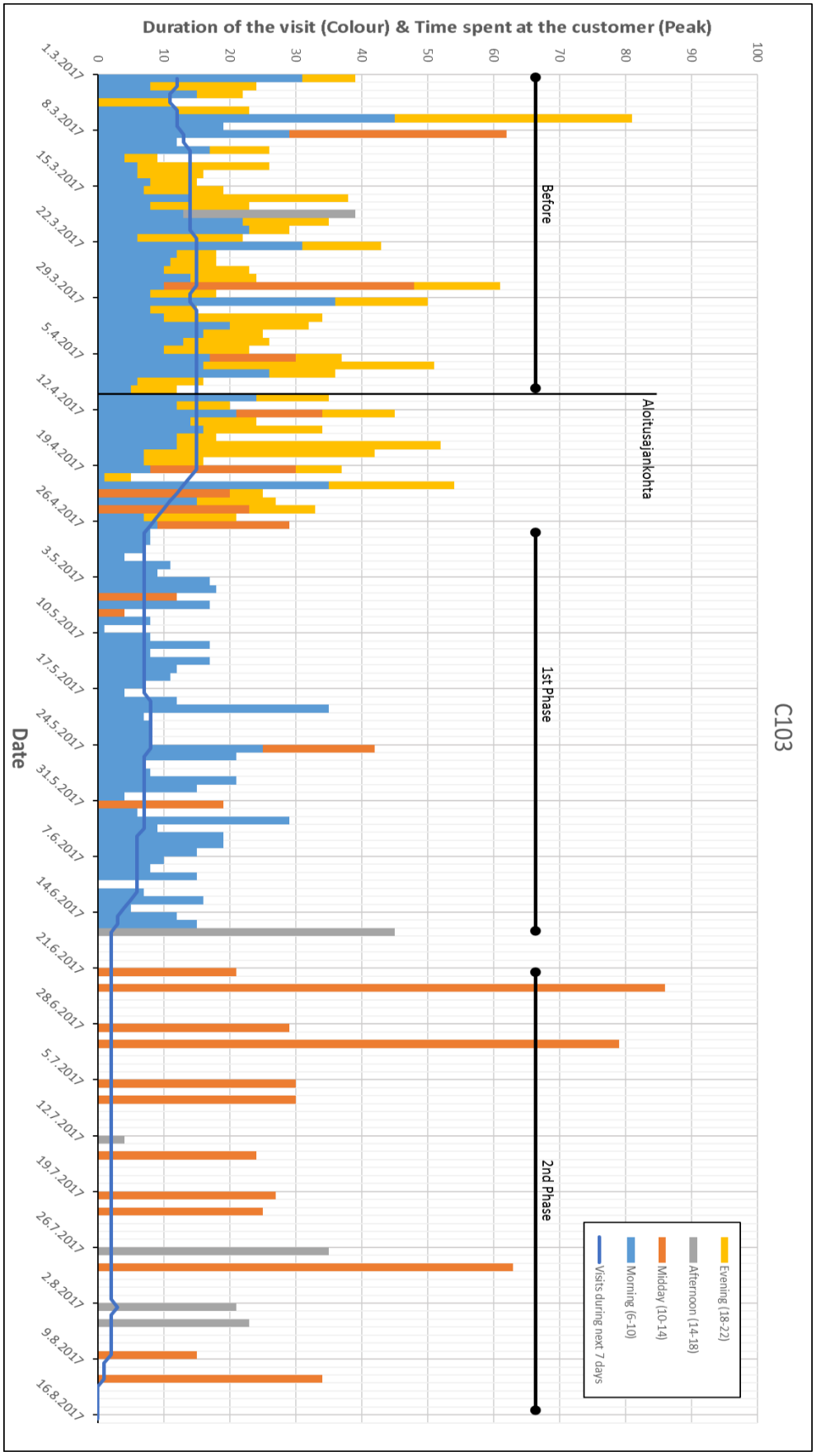


	Käynnit per kuukausi		Ajankäyttö per kuukausi (tuntia)		Käyntien keskimääräinen kesto (min)		
	Ennen	Jälkeen	Ennen	Jälkeen	Ennen	Jälkeen	Huomiot
	59,4	28,3	11,9	5,0	12,0	10,4	Pientä muistihäiriötä. Lääkekäynnit vähennetty.
	63,0	42,9	14,4	9,0	13,7	12,7	Epilepsia-asiakas. Lisäksi 2 KSH käyntiä/kk vähennetty.
	30,8	17,1	7,5	5,6	14,6	19,6	Hallitumpaa lääkkeiden ottamista.
	13,5	9,8	5,4	3,6	24,0	22,1	Vain lääkejako. Ennaltaehkäisevää.
	3,8	1,8	2,3	1,1	36,8	32,6	Huono näkö. Dosetin käyttö hankalaa.
	2,3	1,8	1,3	1,0	35,7	25,8	Lääkkeidenoton säännöllisyys.
	7,5	9,8	3,0	3,9	24,0	24,5	Muistihäiriö. Stressaa lääkkeiden ottamisesta.
	7,0	8,6	3,8	3,2	33,0	18,7	Nuorempi. Alko-taustaa. Itsenäisyyden lisääminen.
	5,5	8,6	2,0	3,1	21,7	23,3	Muistihäiriö, siirteli lääkkeitä dosetissa. Ennaltaehkäisevää.
	20,3	30,0	7,3	7,6	21,5	15,2	Halusi vähemmän käyntejä. Toimenpiteisiin tullut lisää tukisukat.
Yhteensä	212,9	158,7	58,8	43,2	23,7	20,5	

APPENDIX 4: UPDATED HARJAVALTA VISUALIZATION



APPENDIX 5: VISIT ANALYSIS OF A SPECIFIC CUSTOMER



APPENDIX 6: SYSMÄ DATA VISUALIZATION

annosjakelupalvelun vaikuttavuusanalyysi Sysmässä (10.10.2017)

Asiakas		Käynnit (Käyntiä / kk)			Ajankäyttö (Tuntia / kk)			Kesto (Min / käynti)		
Asiakas	Aloituspäivämäärä	Käynnit/kk ennen	Käynnit/kk jälkeen	Käyntien muutos	Ajankäyttö/kk ennen	Ajankäyttö/kk jälkeen	Ajankäytön muutos	Avg. Kesto ennen	Avg. Kesto jälkeen	Keston muutos
C01	20.9.2017	22,8	8,9	-13,9	6,1	2,5	-3,6	16,1	16,9	0,7
C02	20.9.2017	61,2	50,0	-11,2	18,3	15,6	-2,7	18,0	18,7	0,7
C03	19.9.2017	14,1	4,3	-9,8	4,3	1,8	-2,5	18,2	25,5	7,3
C04	20.9.2017	3,0	2,2	-0,8	1,3	1,2	-0,1	26,2	32,0	5,8
C05	20.9.2017	25,2	28,9	3,7	7,0	7,7	0,7	16,6	16,0	-0,6
Summa	19.9.2017	**126,3**	**94,3**	**-32,0**	**37,0**	**28,8**	**-8,2**	**19,0**	**21,8**	**2,8**