

Creating Value or Waste?

Evaluating the Production of Real Estate Services with Lean Thinking

Tuuli Jylhä



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Creating Value or Waste? Evaluating the Production of Real Estate Services With Lean Thinking

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This thesis is interested in the production of value in real estate services. Real estate literature has not addressed the value creation but has rather adopted input-output thinking: services are managed by the ratio of output to input instead of managing the actual value creation. How can we expect a better output if the work done between the input and output is not changed? The aim of this thesis is to contribute to the knowledge on the value creation of real estate services.

In the thesis, value creation is studied using lean thinking as a framework. The thesis includes four in-depth case studies with more than 120 interviews and workshops.

This thesis has two main research questions. The first research question addresses how capable the current value creation is in customer value delivery from the lean thinking perspective. The findings indicate that the capability of the current value creation to deliver customer value is limited. The current value creation processes and practices do not provide customer value coherently throughout the value creation and thus the likelihood that the outcome is not in line with the case-specific customer value increases.

Based on the findings regarding the first research question, the second research question was focused on waste, i.e., how value creation is interrupted from the lean thinking perspective. In the cross-case analysis, six common sources of waste were identified as interrupting the value creation: (1) *poor information management*, (2) *unresponsive processes*, (3) *adversarial bidding*, (4) *lack of systematic improvement*, (5) *overload of employees*, and (6) *separate sub-processes*.

The sources of waste can be viewed one by one, although they also interact with and aggravate each other. For example, *poor information management* with flooding, lacking and missing information generates more wasted activities, such as searching for information, and thus increases *the overload of employees*. Similarly, *the overload of employees* aggravates *poor information management*. The interaction between the sources of waste creates a vicious cycle. To break the vicious cycle, attention should also be paid to the root source of waste: *separate sub-processes*. For example, separate sub-processes stimulate poor information management when information is passed from one sub-process to another. Therefore, breaking the vicious cycle becomes more difficult, if the improvement actions do not minimise the sub-processes.

The results of this thesis encourage to continue utilising lean thinking in the real estate field. Lean thinking is available to all practitioners and academia and offers a different perspective on how to improve the value creation of real estate services.

Keywords value creation, customer value, real estate services, lean thinking, waste**ISBN (printed)** 978-952-60-5344-8**ISBN (pdf)** 978-952-60-5345-5**ISSN-L** 1799-4934**ISSN (printed)** 1799-4934**ISSN (pdf)** 1799-4942**Location of publisher** Espoo**Location of printing** Helsinki**Year** 2013**Pages** 144**urn** <http://urn.fi/URN:ISBN:978-952-60-5345-5>

Tekijä

Tuuli Jylhä

Väitöskirjan nimi

Kiinteistöliiketoiminnan palveluiden arvontuotanto lean-ajattelun näkökulmasta

Julkaisija Insinööritieteiden korkeakoulu**Yksikkö** Maankäyttötieteiden laitos**Sarja** Aalto University publication series DOCTORAL DISSERTATIONS 148/2013**Tutkimusala** Kiinteistöliiketoiminta**Käsikirjoituksen pvm** 20.05.2013**Väitöspäivä** 08.11.2013**Julkaisuluvan myöntämispäivä** 16.09.2013**Kieli** Englanti **Monografia** **Yhdistelmäväitöskirja (yhteenveto-osa + erillisartikkelit)****Tiivistelmä**

Tässä väitöskirjassa tutkimuskohteena on kiinteistöliiketoiminnan palveluiden arvontuotanto. Vaikka kiinteistöjen ja kiinteistöpalveluiden roolia arvontuottajana on korostettu kirjallisuudessa, itse arvontuotantovaihe, eli miten palvelut tuotetaan, on jäänyt vähemmälle huomiolle. Sen sijaan on keskitytty ns. panos-tuotos-ajatteluun, jonka mukaan palveluita voidaan johtaa panoksen ja tuotoksen suhteella eikä arvontuotantovaihetta huomioida. Miten voimme odottaa parempia palveluita, mikäli teemme asiat samalla tavalla? Tämän vuoksi tässä tutkimuksessa tutkimuskohteena on kiinteistöliiketoiminnan palveluiden arvontuotanto.

Tässä tutkimuksessa arvontuotantoa tutkitaan lean-johtamisfilosofian näkökulmasta. Arvontuotantoa tarkasteltiin neljän syvällisen tapaustutkimuksen avulla, jotka pohjautuvat yli 120 haastatteluun ja työpajaan.

Arvontuotantoa tutkittiin kahden tutkimuskysymyksen avulla. Ensimmäinen tutkimuskysymys tarkastelee arvontuotantokykyä: kuinka hyvin asiakasarvoa tuotetaan lean-johtamisfilosofian näkökulmasta. Tuloksien mukaan nykyisen arvontuotannon kyky tuottaa arvoa on heikko. Koska nykyinen arvontuotanto ei pysty tuottamaan arvoa yhtenäisesti läpi koko arvontuotantoketjun, uhkana on, että arvontuotannon lopputulos ei ole asiakasarvon vastine.

Koska ensimmäisen tutkimuskysymyksen yhteydessä huomattiin nykyisen arvontuotannon rajoittuneisuus, toinen tutkimuskysymys tarkastelee seikkoja, jotka häiritsevät arvontuotantoa. Analyysin perusteella tunnistettiin kuusi tyypillistä hukan lähdeä: (1) *heikko informaation hallinta*, (2) *muuttuviin tarpeisiin heikosti reagoiva arvontuotantoprosessi*, (3) *vastakkainasetteluun perustuva kilpailutus*, (4) *systemaattisten parannusten puute*, (5) *työntekijöiden ylikuormitus* ja (6) *erilliset osaprosessit*. Tarkastelemalla hukan lähteiden välisiä suhteita huomataan, että hukan lähteet aiheuttavat negatiivisen kehityskierteen pahentamalla tilannetta toisissa hukan lähteissä. Esimerkiksi heikko informaation hallinta pahentaa työntekijöiden ylikuormaa ja tämä heikentää edelleen informaation hallintaa. Tämän kierteen katkaisemiseksi erityisesti hukan lähdeä, joka eskaloi negatiivista kehityskierrettä, pitäisi minimoida. Tämä hukan lähde on erilliset osaprosessit. Esimerkiksi informaation kuljettaminen osaprosessista toiseen heikentää informaation hallintaa. Jos toimenpiteet eivät vaikuta osaprosessien vähentämiseen, negatiivisen kehityskierteen katkaiseminen vaikeutuu.

Tämän tutkimuksen tulokset kannustavat jatkamaan lean-ajattelun käyttöä kiinteistöalalla. Lean tarjoaa erilaisen näkökulman arvontuotannon parantamiseen ja tämä näkökulma on jokaisen yrityksen ja tutkijan käytettävissä.

Avainsanat arvontuotanto, asiakasarvo, kiinteistöpalvelut, lean-ajattelu, hukka**ISBN (painettu)** 978-952-60-5344-8**ISBN (pdf)** 978-952-60-5345-5**ISSN-L** 1799-4934**ISSN (painettu)** 1799-4934**ISSN (pdf)** 1799-4942**Julkaisupaikka** Espoo**Painopaikka** Helsinki**Vuosi** 2013**Sivumäärä** 144**urn** <http://urn.fi/URN:ISBN:978-952-60-5345-5>

Preface

This doctoral thesis is based on the *Value Creation Model in Real Estate Business* (ARVO) research project funded by TEKES – a Finnish Funding Agency for Technology and Innovations – and five real estate organisations operating in the Finnish real estate market. I highly appreciate the support and co-operation of the project members, ARVO’s executive group and all the interviewees and workshop participants: your contribution has been irreplaceable.

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I am also grateful for the support and interest that my family and friends have shown to my research. Our godchildren, Tea, Roope, Sara and still unborn little Bébe, have reminded me how precious it is to stop every now and then and enjoy small things. I also want to express my gratitude to the furry friends that have cheered me up. Especially Sohvi, you gave me positive distraction every evening while conducting this research. I miss you. I am also grateful for all my friends from childhood to the present for staying in my life. It means a great deal to me!

I would like to thank my parents and sister for never stopping believing in me and for showing how to be persistent. I am also grateful that my family has been growing with brilliant parents-in-law, Ilse and Mikko. Mummi, thank you for your fantastic attitude towards life and still beating us at the age of 91 in card game Canasta. I have also learned how to play it and I have learnt it from the Master!

Finally and importantly, I am most grateful to my husband Antti. You have been my private linguistic support 24/7 but most of all you have been my rock and support for the past 11 years and every day I love you more!

In Helsinki, 16th September 2013
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Papers of the dissertation

Paper I

Jylhä, T. & Junnila, S. (2012) Using the Kano Model to Identify Customer Value, in *the proceedings of the 20th Annual Conference of the International Group for Lean Construction*, July 2012, San Diego, CA.

Paper II

Jylhä, T. & Junnila, S. (2013) Learning from Lean Management – Going beyond Input-Output Thinking, *Facilities*, Vol. 31 No.11/12, pp. 454-467. Available at <http://www.emeraldinsight.com/journals.htm?articleid=17089085> (16 September 2013)

Paper III

Jylhä, T. & Junnila, S. (2011) The End-Customer Value Loss in a Construction Project, *Lean Construction Journal*, special issue 2011, pp. 69-81.

Paper IV

Jylhä, T. & Junnila, S. (2014) Partnership Practices and their Impact on Value Creation – Reflections from Lean Management, *International Journal of Strategic Property Management*, Vol. 18 No. 1, forthcoming. Accepted to be published 27 December 2012.

Paper V

Jylhä, T. & Junnila, S. (2014) The State of Value Creation in the Real Estate Sector – Lessons from Lean Thinking, *Property Management*, Vol. 32 No. 1, forthcoming. Accepted to be published 16 April 2013.

The author's contribution to the papers

Paper I

Tuuli Jylhä is responsible for initiating, executing and writing the paper. Seppo Junnila provided comments and suggestions on the paper.

Paper II

Tuuli Jylhä is responsible for initiating, executing and writing the paper. Seppo Junnila provided comments and suggestions on the paper.

Paper III

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Paper IV

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Paper V

Tuuli Jylhä is responsible for initiating, executing and writing the paper. Seppo Junnila provided comments and suggestions on the paper.

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1 Introduction

1.1 Motivation and background of the thesis

The trend of purchasing non-core activities from external service providers has strengthened as companies have increasingly focused on their core business. This has also been the case with real estate and related services. Until the 1980s, the unavailability of professional real estate service providers was one of the main reasons for companies to own and control their own real estate and provide all of the real estate services in-house (Krumm 2001). For example, Scandinavian organisations began to outsource so-called traditional services, such as cleaning, maintenance, catering and security, in the 1980s and 1990s (Tuomela and Puhto 2001). Due to the existence of professional service providers, it is now common that users utilise the services of external providers.

Along with the developed real estate service markets, the way companies treat real estate and related services has also evolved. The discussion was initiated in 1993 by Joroff et al., who stated that real estate is the fifth resource of organisations, in addition to capital, people, technology and information. Later research related to the added value of real estate has shown that real estate is not only a necessary cost for companies, but that it can actually add value for their users, for example by supporting knowledge-sharing (Appel-Meulenbroek 2010), sustainability (Sashan and Pitt 2009) and innovations (Lindholm 2008).

Researchers in the field of added value have done ground-breaking research when broadening the focus of corporate real estate management. Currently, the focus is not solely on cost minimisation but also on the more holistic components of value (Jensen et al. 2012). However, the current discussion has not addressed the phase where the value is actually created, i.e., the production phase of the real estate services, later in this thesis referred to as the value creation phase, which includes value creation processes and practices.

Management research has generally tended to neglect the value creation phase. For example, Koskela and Ballard (2012) concluded that production, i.e., the value creation phase, has been excluded from mainstream management theories for more than 50 years. It is reasonable to assume that research in real estate management has followed the overall trend of not addressing the value creation phase.

The exclusion of the actual value creation phase has narrowed the scope of added value research in real estate. The limited perspective can be explained through *the transformation view*, which was presented by Koskela (2000) in his transformation-flow-value model (TFV). In the transformation view, input is transformed into output; however, this view treats the actual transformation phase, i.e., the value creation phase, as a black box (Figure 1). Therefore, in the transformation view productivity is not increased by improving the value creation phase, but by managing the ratio of output to input. In the real estate sector, the transformation view guides us to assume that the quality of real estate services can be increased by increasing the quality of inputs without changing the value creation phase.

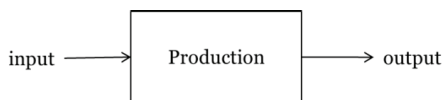


Figure 1 Transformation view (Koskela 2000).

Koskela (2000) suggests that the transformation view should not be totally rejected, but that a balance between transformation and the other two views, flow and value, should be found. If a balance is found, the value creation phase will no longer be treated as a black box, because the flow view suggests enhancing the flow by waste minimisation and the value view prescribes avoiding value losses.

Because of the underlying logic of the transformation view, the added value studies do not show how the value is actually created in real estate services. In this doctoral thesis, the focus is on the black box, i.e., on the value creation phase of the real estate services.

1.2 Research questions and scope

The aim of this thesis is to contribute to the knowledge on the value creation phase of real estate services. The examination of value creation in this doctoral thesis is limited to one theoretical discipline: value creation is studied by using lean thinking as a framework. Since the TFV model is characterised by lean thinking, the lean framework was also involved in identifying the research gap. While the TFV model provides a conceptual framework for understanding production, the study of value creation requires a practical focus that lean thinking can offer.

Lean thinking is a management philosophy that emphasises value creation for customers. Lean has three key concepts: (1) customer value, (2) waste and (3) continuous improvement. First, customer value is a complex term, although it is widely used in the existing lean literature. In this thesis, customer value refers to how the customer subjectively perceives the value of a service or product. It does not solely include the monetary value of the service or product. Woodruff (1997) clarifies that customer value originates from our learned perceptions, preferences and evaluation of a particular service or product. In lean thinking, the aim is to capture customer value in the value creation phase (Koskela 2000).

Second, in lean thinking customer value is produced through efficient production processes (Pasquire and Salvatierra-Garrido 2001) and waste minimisation plays a key role in creating this value. In lean, activities in the value creation process are divided into three categories: (1) activities that do create value, (2) activities that do not create value, but that are necessary (also called support activities), and (3) activities that do not create value. The aim is to make the value creation process flow by minimising all activities that do not create value for the customer, i.e., waste. Waste and sources of waste interrupt production (e.g., Imai 1997, Womack and Jones 2003 and Liker 2004) and sometimes even cause value losses (Koskela 2000).

Third, continuous improvement maintains waste elimination and customer value delivery. Because customer perceptions about value are constantly evolving, and new waste and sources of waste are formed at every turn, companies should constantly improve their processes and operations (Shingo 1989).

In this thesis, the three key concepts of lean thinking are used as an assessment framework to answer in two research questions. The first research question studies the current capability of value creation to deliver customer value.

RQ 1: How capable is the current value creation phase in customer value delivery from the lean thinking perspective?

To assess the capability of current value creation to deliver customer value, the research question is divided into two sub-questions. The first sub-question addresses the customer value aspect, i.e., what the value creation phase should generate for customers. The second sub-question focuses on the current value creation processes and practices in the value creation phase from a lean thinking perspective:

RQ 1.1 How do customers perceive the value of real estate services?

RQ 1.2 How is customer value generated in the current value creation phase?

Based on the first and initial research question, limitations in the current value creation processes and practices were found. Therefore, the second research question deals with the interruptions, i.e., waste in the value creation.

RQ 2: How is value creation interrupted from the lean thinking perspective?

To summarise, the focus in this thesis is first on customer value and how customers perceive the value of selected real estate services. After this, it is studied whether or not the value is created in the value creation phase. Finally, the attention is aimed at waste that interrupts the value creation.

The scope of this thesis is presented via three points. First, in this thesis the focus is on commercial real estate services. The scope of real estate services is wide. In this thesis, real estate services cover the services aimed at the end-user, the owner, or the property itself. Typically, the owner pays for the services even though the end-user might gain the practical benefits of the service. For example, maintenance services are usually directed at the property itself even though the end-user benefits from the service while the

owner pays for the service. Facility services are usually aimed at the end-user and asset management services at the owner. The services can be strategic, such as workplace services or operational, such as call centre services.

Second, the focus of this thesis is on lean that is used as a framework to assess value creation. However, the scope does not include practical lean implementations, although lean thinking has been applied in many sectors, such as in car manufacturing (Ohno 1988), construction (Ballard 2002) and health care (e.g., Kim et al. 2006).

Third, the focus in the second research question is on waste. Based on the first research question, limitations in the current value creation phase were found, and thus the findings gave a reason to focus on the interruptions in the value creation.

1.3 Research methodology and data collection

According to Creswell (2009), each particular research problem requires a particular type of research logic. Similarly, Edmondson and McManus (2007) refer to a methodological fit, by which they mean a consistency between the research elements. In general, research approaches can be divided into deductive, inductive and abductive approaches. With deductive research, theories are tested or verified by studying hypotheses or questions that are based on an existing theory. With inductive research, the logic is the other way round: theories are developed based on gathered data (Creswell 2009). Research can also be a combination of deductive and inductive approaches: abductive research allows the researcher to go back and forth between the theory and empirical data (Tuomi and Sarajärvi 2009). In this research, the aim is to contribute to the knowledge on the value creation of real estate services from the lean thinking perspective. Therefore, the logic is based on abductive reasoning: the theory here refers to lean thinking and the empirical data refers to the value creation phase of real estate services from the real world.

According to Yin (1994), the case study is a relevant strategy when seeking answers to *how* and *why* questions, such as the research questions in this thesis. Case study as a strategy also allows research of contemporary events and it does not require having control over the studied events. In this research, the contemporary value creation processes and practices from the real world were assessed and thus not controlled.

As described in Paper V, Yin (1994) has divided case study research design into four types: there are single-case and multiple-case designs with either a single unit of analysis (holistic) or multiple units of analysis (embedded). In this thesis, the multiple-case design was selected in order to find patterns through replication, as Ying (1994) suggests. Because several datasets needed to be collected to answer the research questions, this research falls into the embedded multiple-case design category. According to Robson (2002), multiple case studies provide a way to do analytic generalisation as pursued in this thesis. Table 1 illustrates the connections between the research questions, methods, data sources and outcomes.

Table 1 The research questions, related data collection and subsequent outcome.

	Research question	Discussed in papers	Research methods	Main data sources	Outcomes
RQ 1: How capable is the current value creation phase in customer value delivery from the lean thinking perspective?	Q 1.1: How do customers perceive the value of real estate services?	I	– Lean literature review – Within case studies A-D	– Interviews – Questionnaire – Workshops	– Customer value analysis
	RQ 1.2: How is customer value generated in the current value creation phase?	II III IV	– Lean literature review – Within case studies A-D	– Interviews – Workshops	– Visualisations and analyses of the current processes – Analyses of the current practices
	RQ2: How is value creation interrupted from the lean thinking perspective?	II III IV V	– Lean literature review – Within and cross-case studies A-D	– Interviews – Workshops – Individual case reports A-D	– Identification of sources of waste

As can be seen from Table 1, the same case studies were used for all of the research questions and related sub-questions. The first research question (RQ 1) is answered via two sub-questions. The first sub-question (RQ 1.1) focuses on customer value analyses in order to understand how customers perceive the value of real estate services. The second sub-question (RQ 1.2) on how customer value is generated is answered by visualising and analysing the current value creation processes and analysing the current value creation practices. Based on the two sub-questions, the capability of current processes to deliver customer value is assessed. The answer to the second research question (RQ 2) on how the value creation is interrupted is provided by identifying the sources of waste in the value creation phase from the lean thinking perspective.

The multiple-case study design used in this research consists of four cases referred to as *Nursing homes* (Case A), *Energy management* (Case B), *Workplace management* (Case C) and *Property management* (Case D). The case studies have been described in detail in Papers I-IV, but brief summaries of the case studies are presented in the next paragraphs and finally summarised in Table 2.

Case Study A – In the *Nursing homes* case, an international construction company as a case organisation develops nursing homes for Finnish nursing home companies. The focus was on the phase during which time nursing home projects are initiated. Therefore, the studied phase does not include the actual construction phase. In the case, nursing home companies and their staff on the operational level, such as nurses, were defined as the customers. The actual occupants, i.e., the elderly could not be included in the research. The focus was on the value potentials that building information modelling (BIM) and improved environmental performance might provide for the customers.

Case Study B – In the *Energy management* case, an international facility service provider offers energy management services to its customers. In this case study, the value potentials of the energy management service were studied in a request process. A Finnish retail chain and its trade centre managers were selected as customers. Although only the retail chain had a contractual relationship with the case organisation, the individual trade centre managers also benefited from the service, so they were also considered customers.

Case Study C – In this case study, the focus is on a service called *Strategic workplace management*, which is provided by the case organisation. The organisation is a publicly owned property management organisation, and therefore, it is regulated by public procurement legislation. The aim of the service is not solely to provide workplace solutions, but also to support the strategies and activities of the customers. In this case study, the customers were a Finnish research institute and its employees in a specific building in the Helsinki Metropolitan Area.

Case Study D – In the *Property management* case, the value is created in a partnership of two partners, a real estate owner and its property management company. Both partners are major players in the Finnish real estate market. Together, the partners provide services for their common

customers, who in this case are the office tenants in the Helsinki central business district. The focus of the case was on the value that a request management service provides for the customer.

Table 2 Summary of the case study descriptions.

	Case A: <i>Nursing homes</i>	Case B: <i>Energy mgmt</i>	Case C: <i>Workplace mgmt</i>	Case D: <i>Property mgmt</i>
Case organisation(s)	International construction company	Globally operating facility management company	Public property management organisation	Private real estate owner and its property management company
Customer(s)	Private nursing home companies and their nurses	A retail chain and its trade centre managers	A Finnish research institute and its employees	Office tenants in the Helsinki business district
Service	Service to initiate nursing home project	Energy management service	Strategic workplace management service	Request management service

Table 2 shows that the case organisations varied from private to public owners and from facility and property service providers to a construction company. The customers included individual employees as users and private and public organisation as tenants. Also, the type of premises varied from office and retail premises to special premises, i.e., nursing home premises. Similarly, the real estate services varied from handling a single request to handling a request as part of an energy management service and from initiating a nursing home project to realising of a strategic workplace management service.

The case studies were selected and their scope defined so that they represent a wide array of different case organisations, customers and services. Instead of selecting cases with a similar research setting, the thesis builds on the work of Eisenhardt (1989) to argue that this kind of theoretical sampling can be used to enhance the generalizability of the emergent theory.

The multiple-case study design utilised in this research has been adapted from Yin (1994). Paper IV presents an illustration of the multiple-case study design (Figure 2). The design is divided into three phases: (1) *defining and designing*, (2) *data collection and analysis within the case studies*, and (3) *cross-case analysis*. Next, each phase is briefly presented.

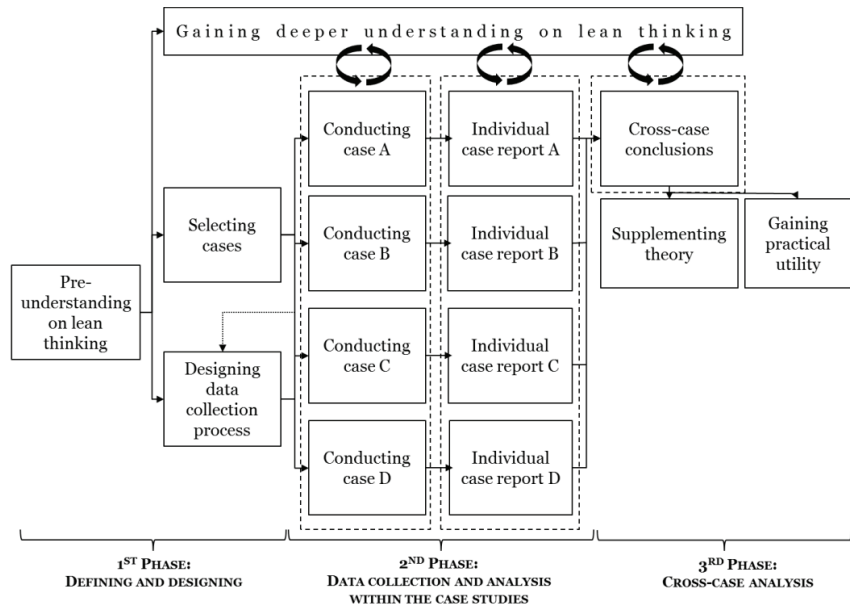


Figure 2 Illustration of the multiple-case study design (adapted from Yin 1994, from Paper V).

In the first phase, *defining and designing*, a preliminary understanding of lean thinking was obtained. After this, the cases were selected. At the same time, the data collection process with related analysis for all four case studies was designed and later elaborated based on the experiences with the earlier case studies.

In the second phase, *data collection and analysis within the case studies*, the case studies were carried out. In each case, the same data collection process was replicated. The data collection and analysis process is presented in detail in Section 1.3.1. The individual case reports A-D in Figure 2 consist of a broader scale of materials ranging from value stream visualisation to customer value identification. The actual reporting of the research findings in scientific papers is not included in Figure 2.

After collecting and analysing the data within the case studies, a *cross-case analysis* was done including all four cases to find common patterns. The cross-case analysis is presented in detail in Section 1.3.2. Based on the empirical evidence from the case studies, practical utility has been pinpointed and the theory has been supplemented with a deeper understanding of current value creation.

1.3.1 Data collection and analysis process within the case studies

In this thesis, the data collection was conducted via the four case studies (2nd phase in Figure 2). The collected data was first analysed within the case studies. Each case followed the same data collection and analysis process. The following description of the data collection and related analysis done within the case studies is based on the presentation provided in Paper V:

1. **A kick-off phase:** Each case started with a kick-off meeting(s) in which the aim and scope of the case were defined and a service process was selected.
2. **Background of the case:** A more general view of the power structures, responsibilities, and contractual relationships was gathered for each case via pre-interviews and written material, such as brochures and presentations.
3. **Defining customer value:** In order to understand what creates value for customers in each case, customers were interviewed and asked to respond to a Kano model-based questionnaire (e.g., Kano 1984 and Löfgren and Witell 2008). The Kano model is a theory of product development and customer satisfaction that classifies customer preferences into five categories: attractive, one-dimensional, must-be, indifferent, and reverse (for more information, see Paper I). One interview with the questionnaire survey lasted approximately one hour.
4. **Visualising the current value creation process:** In this phase, the employees who were creating the value were interviewed in order to understand how the value is created, i.e., how the work is actually performed. One value creation interview lasted approximately two hours. This phase and the previous phase were often conducted parallel to one another.
5. **Pre-analysis:** In this phase, the data from phases 3 and 4 were organised and analysed for the first time. First, the customer value data was analysed to understand what service attributes create value the most for the customers and what the customers expect. The Kano evaluation table (presented in Paper I) was used as the basis for analysing the quantitative questionnaire data, and content analysis was performed on the qualitative interview data to identify patterns between the customers. After this, a weight was usually given to either the

quantitative or the qualitative data; the other data assisted with the interpretation. For example, if a particular issue was discussed during the interviews, but was not directly included in the questionnaire, more weight was given to the qualitative data.

Second, based on the value creation interviews from phase 4, the first version of the detailed visualisation of current value creation was constructed. The visualisations constructed in this phase are not the same as those presented in Papers II and III. The detailed visualisations were condensed in the papers due to confidentiality issues. Figure 3 provides an example of how they were condensed. In the example, an activity called *Making investment proposal* is presented in more detail. The visualisation illustrates the activities that are taking place in this sub-process, the employee who is conducting the activity and the source of information used in the activity.

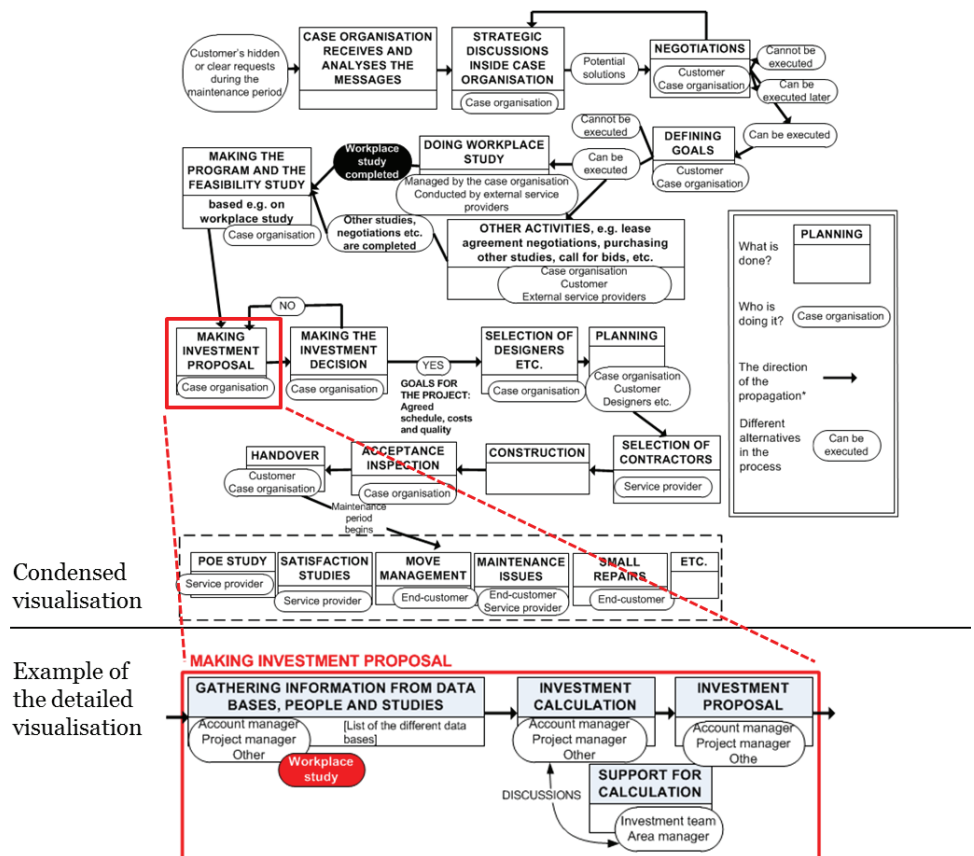


Figure 3 Example of the condensation of detailed visualisation in Case C.

6. Value Workshop I: The results from the previous phase were presented, supplemented and validated in a workshop with the

representatives from the case organisation. The workshop was structured around the following topics: (a) customer value, (b) role of the case organisation(s) in value creation, (c) current visualised value creation process and (d) future state of value creation. Each workshop lasted 1 to 1½ days. In three of four cases, a representative from the customer side also joined the workshop.

7. Analysis: Based on the previous phases, the customer value reports and detailed visualisation of the value creation processes were supplemented when necessary. After this, the researcher(s) conducted a more comprehensive analysis of the case. As a result, case-specific lean policies for the case organisation were formulated to assist in making improvements according to lean thinking. The analysis and policies were presented in the individual case reports, as is usually done in within-case analysis (Eisenhardt 1989).

8. Value Workshop II: In the next value workshop, the lean policies from the previous phase were presented and discussed. In two of the cases, some of the lean policies were clarified before the final case report was completed.

9. Post-analysis: In the final phase, the competence of the suggested lean policies was analysed by the research team and with the case organisations. In check-point meetings, the key people from each case organisation described how they have perceived lean thinking and the outcomes of the case.

As presented in Paper V, similar datasets were collected for all four cases according to the above-described process. However, the order and timing of phases 3 and 4 varied in the cases to some extent. In the energy management case, the interviews were conducted in the opposite order because of time constraints. Also, in the property management case additional data was collected after Value Workshop I in order to demonstrate in more detail some of the findings discussed in the workshop.

A summary of the interviews and workshops is presented in Table 3. In total, 122 interviews and eight workshops were conducted. Excluding the six post-interviews, all of the interviews were conducted with one interviewee. The workshops were structured similarly, with the same themes addressed in each case. In addition to interviews and workshops, written material, such as memos, brochures and presentations, were

collected in all cases and observations were conducted at the offices of two case organisations. Quantitative data on the value creation processes were also collected in three of the four cases.

Table 3 Data collection in the cases (adapted from Paper V).

Data collection method	Nursing homes	Energy mgmt	Workplace mgmt	Property mgmt	Total
Number of interviews	35	29	33	25	122
Pre-interviews with the process owner	2	5	6	4	17
Customer value interviews with the questionnaire survey	20	8	13	7	48
Value creation interviews	12	15	13	11	51
Post-interviews	1*	1	1**	3	6
Number of workshops	2	2	2	2	8
Value Workshop II	1	1	1	1	4
Value Workshop II	1	1	1	1	4
TOTAL					
Quantitative data on service requests	no	yes	yes	yes	
Written material, e.g., memos and brochures	yes	yes	yes	yes	

* One interview with two people

** One interview with three people

In addition to the main data analysis process, additional analyses, presented in Papers II-IV, were conducted to deepen the understanding of value creation within the case studies. In Papers II and III, the analysis was based on coding, whereas in Paper IV it was based on the existing lean framework. Next, these two analysis methods are described in detail using examples.

Coding – With coding, data is reviewed, dissected and synthesised, while the relations between different parts is maintained (Miles and Huberman 1994). In the analysis, the visualisations of the value creation processes helped maintain the relations between the different parts. Next, an example of how coding was conducted in this thesis is presented within the context of *Energy management* (Case B, Paper II).

In this case, the coding was done on a spreadsheet. Table 4 summarises the structure of this spreadsheet. The table presents two issues: the traceability of codes and the logic of coding. Special attention was invested in identifiers, as shown in Table 4, in order to be able to trace the codes all the way to the written interview documentations. Similarly, the table shows the logic of the coding: the analysis moved from codes to groups and from

groups to themes. In the analysis, the value creation interviews and Value Workshop I were first coded from five viewpoints, as presented in Paper II:

- the surroundings that put the information in context (abbreviated as context)
- the way things are conducted (abbr. process)
- relationships among people (abbr. relationships)
- the way people think (abbr. way of thinking)
- the non-value adding activities (abbr. waste).

Table 4 Example of the interpretation with coding in Case B.

Name of the document	ID	Comment from the interviews or Value Workshop I	Viewpoint	Code	Group	Theme	
Service manager	B5a-b	The mechanic informs me and I inform the manager.	process	Information is chained	Aim to pass the information via manager.	Long information chains.	
Remote control centre	T2	The information goes maintenance man – manager – remote control centre – manager – maintenance man.	process	Information is chained			
Manager	B4e	Maintenance reports go through the manager.	process	Information via manager			
etc.							
Workshop I	F2	The manager is the only person who can see the entirety.	way of thinking	Depends on manager	Manager knows best.		
Helpdesk manager	F3	All big issues go to the manager.	strategy	Depends on manager			
Service manager	B1b	...in cases like this, permission should be asked from the manager.	relationship	Central role of manager			
etc.							

The viewpoint was documented in relation to each code. Although five different viewpoints were used, the coding labels were not predetermined. Connections between the codes were elaborated upon during the grouping phase, which also required adding and restructuring the codes. In the final version of the analysis, approximately 500 rows of codes formed 50 groups. Finally, the groups formed 20 themes and the interpretation of the connections within the themes is presented in Paper II.

In the example in Table 4, the development of the data from codes to themes is demonstrated. The first three codes were derived from the data while it was being reviewed using *the way things are conducted* viewpoint. In the first row, a service manager describe that (s)he gets the information from the mechanic and, after getting the information, s(he) informs the manager of the property. The comment was labelled under the *Information*

is chained code. Similarly in the second row, an employee from the remote control centre describes how the information moves from one end of the information chain to the other. This comment was also labelled under the *Information is chained* code. In the third row, a property manager generally explains that the maintenance reports go through the manager. This comment was labelled under the *Information via manager* code. In addition to these three comments, there were eight related comments that were labelled under the same or related codes. Together, these codes form the *Aim to pass the information via manager* group. The second group, *Managers knows best*, was formulated in the same way.

Existing lean framework – The deeper analysis in Paper IV was based on the existing lean framework, referred to as the *lean partnering* framework. In contrast to coding, in this type of analysis the issues being examined were predetermined and the case study evidence was reflected against the selected framework. Finally, the evidence was summarised in a table that was presented and discussed in Paper IV together examples. Next, an example of the analysis is presented.

The analysis was done within the context of *Property management* (Case D, Paper IV), in which the two partners, an owner and its property management company, created value for their customer. In the analysis presented in Paper IV, the focus was on the value creation practices and mechanisms between the two partners rather than on the visualisation of the value creation process.

Table 5 exemplifies the evidence behind the interpretation presented in Paper IV. The left column refers to the lean partnering framework that was used, while the middle column quotes from the evidence at hand. Both columns were presented in Paper IV. The right column is added here to present examples from the case study evidence.

For instance, in Paper IV it was presented that the heavy use of bidding did not support the value creation on an operational level. This statement was based on the value creation interviews and quantitative data (see Table 5). In the value creation interviews, the employees of the property management company working on the operational level described how they do their work. Related to that, they described how small projects follow the same bidding procedure as large projects. They also added that for small repairs, it can be challenging to get bids because the repair is too small. The evidence from the quantitative data confirmed that small repairs constitute

the majority of all repairs. Based on this information, it was concluded that bidding does not support value creation on the operational level. Each interpretation is based on a similar kind of logic.

Table 5 Examples of the interpretations made in Paper IV. The abbreviations refer to the data sources: ^(VC) value creation interviews, ^(QD) quantitative data, ^(VW1) Value Workshop I, ^(VW2) Value Workshop II and ^(PI) post-interviews.

The approach to...	Examples of interpretations from Paper IV	Examples from the case
...competition	<ul style="list-style-type: none"> - The heavy use of bidding did not support value creation on an operational level ^(VC, QD). 	<p>Presented in the value creation interviews ^(VC)</p> <ul style="list-style-type: none"> - Whether the task was big or small, the bidding followed the same procedure. - Sometimes service providers did not give offers for small repairs. <p>Evidence from the quantitative data ^(QD)</p> <ul style="list-style-type: none"> - In an example property, 25 projects were established during a 7 month period. 20 out of the 25 projects were estimated to cost less than 2500 euros.
...information exchange	<ul style="list-style-type: none"> - Everybody agreed that the information is not transparent ^(VC, VW1, VW2, PI). 	<p>Presented in the value creation interviews ^(VC)</p> <ul style="list-style-type: none"> - More precise instructions were said to be needed. - The information in the databases is not always updated. <p>Presented in Value Workshops I and II ^(VW1, VW2)</p> <ul style="list-style-type: none"> - The customers do not always know which partner to contact. - The information in the databases is not always updated. <p>Presented in the post-interviews ^(PI)</p> <ul style="list-style-type: none"> - There is a mismatch in the discussion, e.g., one interviewee is discussing a strategic partnership and the other the call centre. - The challenges in the transparency of information start already in the service contract.

1.3.2 Cross-case analysis

After the single case studies, a cross-case analysis was conducted (3rd phase in Figure 2). In the cross-case analysis, common patterns were found by combining case-oriented and variable-oriented approaches (adapted from Miles and Huberman 1994). In the analysis, the case-oriented strategy refers to the phase when evidence of interruptions in the value creation phase was searched and listed from each case. The listed interruptions of the case studies were completed by systematically cross-comparing the cases. After this in the variable-oriented phase, the observations were organised according to the common patterns that cut the case studies. At this point, some of the observations were left aside if they were not common across the case studies. Finally, patterns were identified.

The first interpretation of the patterns was discussed in small brainstorming and workshop sessions with lean and facility management experts. Based on the feedback given during the sessions, parts of the

interpretations were revised and the accuracy of the phrasing was improved. The final interpretation of the cross-case analysis was reported in Paper V. The case-specific evidence is displayed in Table 6 to present the logic behind the interpretation. The examples used in the table are related to the first source of waste, sub-process optimisation. For example, in all cases it was described why somebody performs particular tasks, i.e., the goal of the task in the particular phase, but the goal of the task was rarely linked to customer value (Table 6, row 2). Therefore, it was interpreted that *The doing is not aligned with customer value.*

Table 6 Example of the interpretation in cross-case analysis.

	Evidence from cases (Paper V)	Example from case study A	Example from case study B	Example from case study C	Example from case study D	Interpretation
1	The tasks are completed one after another, e.g., a work order is documented, a proposal is accepted, etc.	Architect is selected, contract is signed, information is given to the architect, sketching is done, etc.	An observation is made, the information is passed on, a decision is made, a work order is given, the work is done, etc.	An agreement is made, investment proposal is calculated, a decision is made, etc.	Bids are called for, bids are given, proposal is made, proposal is checked, proposal is accepted, etc.	The work is done in sub-processes without comprehensive management.
2	After completing a task, the doing is handed to the next employee, e.g., helpdesk-manager-maintenance man.	Project manager selects an architect, another manager signs the contract with the architect, architect makes the sketches, etc.	Maintenance man makes an observation, her/his supervisor hands it to the manager, who makes a decision and passes the issue back to the supervisor, etc.	After the account manager has negotiated the agreement, the project manager makes a proposal and another manager makes the decision.	Property manager calls for bids, service providers give bids, property manager makes a proposal, supervisor checks the proposal, owner accepts/rejects the proposal, etc.	
3	Each employee in a sub-process has a goal, e.g., to document the fault, to deliver a proposal, or to select the lowest bid.	Project manager's goal is to select a suitable architect, manager's goal is to sign the contract, project manager's goal is to inform the architect, etc.	Maintenance man's goal is to fix the machines and prevent them from breaking, supervisor's goal is to see that the work is done, manager's goal is to increase the energy efficiency of the property, etc.	Account manager's goal is to make an agreement, project manager's goal is to calculate a flawless proposal, and manager's goal is to make a decision based on the figures.	Property manager's goal is to select the lowest bid, service provider's goal is to win the bidding competition, supervisor's goal is to make sure the proposal has the right information, etc.	The doing is not aligned with customer value.

1.4 Structure of the thesis

This thesis consists of five peer-reviewed papers, published or accepted to be published in academic journals (4) and conferences (1), and a summary. The five scientific papers are based on the four case studies and their comparison.

Although the case studies in Papers I-IV followed data collection process, the papers address different phases of the research. Table 7 illustrates the relationship between the research questions, cases and papers. Paper I focuses on the method to define customer value, i.e., to understand what should be generated. The customer value theme is presented in the context of Case Study A. In order to understand how the value is currently generated, Papers II-IV highlight the capability of the current value creation to deliver customer value through visualisations of current value creation processes and analyses on the value creation practices. Paper II is built around Case Study B, Paper III around Case Study C, and Paper IV around Case Study D. Paper V presents a cross-case analysis on the sources of waste to pinpoint how the value creation is interrupted. Paper V is based on all four case studies.

Table 7 Illustration on what phase the papers focus on.

		Addressed in papers	Based on case studies
RQ 1	Identifying the customer value to understand what should be generated	I	A
	Analysing the current value creation processes and practices	II	B
		III	C
RQ 2	Identification of sources of waste	IV	D
		II	B
		III	C
		IV	D
		V	A, B, C, D

The summary of this dissertation is divided into three chapters. This chapter is an introduction to the research topic and motivation. The chapter also states the research questions, discusses the methodological choices made in this thesis, and presents the structure of the thesis. The second chapter summarises the five individual papers. The focus is on the key findings of the papers. Finally, the third chapter presents the conclusions and the contribution of this thesis and also discusses the construct validity, external validity, and reliability of this research, and suggests future research.

2 Summaries of the papers

This section presents the summaries of the scientific papers included in the thesis. The summaries focus on the aspects contributing to the research questions of this thesis.

2.1 Paper I: Using the Kano Model to Identify Customer Value

In this paper, the method to identify customer value was presented. The customer value was identified in order to analyse the capability of the current value creation process to provide that value. In this paper, the customer value identification phase is exemplified by Case A. The customers were private nursing home companies and its staff on the operational level, such as nurses. The aim of the paper was to define how customers perceived the potential value of building information modelling (BIM) and improved environmental performance. The Kano model was used to identify customer value.

The Kano model offers one way to identify customer value. The model includes five quality dimensions that, according to Matzler et al. (1996), discuss in which product or service features companies should invest in and features companies should pay less attention to. The quality dimensions are attractive, one-dimensional, reverse, must-be, and indifferent (Figure 4). Next, the quality dimensions are briefly presented.

According to Kano et al. (1991), attractive attributes provide satisfaction when they are fulfilled but do not cause dissatisfaction when not fully fulfilled (see Figure 4). Also one-dimensional attributes cause satisfaction when fulfilled, but these attributes can also cause dissatisfaction. According to Löfgren and Witell (2008), one-dimensional attributes are also called the-more-the-better attributes. Through fulfilling the other attributes – reverse, must-be, and indifferent – customer satisfaction cannot be increased. Kano et al. (1991) stated that must-be attributes are taken for granted and thus they do not increase satisfaction when fulfilled but result in dissatisfaction when not fulfilled. The reverse attributes are opposite to

the-more-the-better logic: the more there is such an attribute, the more dissatisfied the customer will be (Löfgren and Witell 2008). Indifferent attributes do not result in satisfaction or dissatisfaction (Kano et al. 1991). Therefore, the attribute is neither good nor bad (Löfgren and Witell 2008) and companies should pay less attention to such attributes.

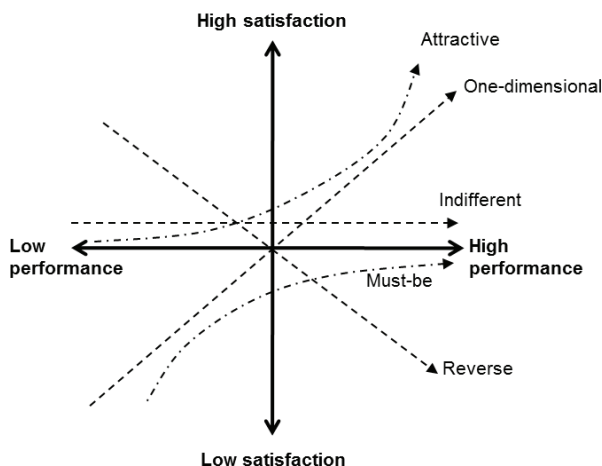


Figure 4 Kano model with five quality dimensions (adopted from Paper I).

The data for the Kano model was collected through a questionnaire. Related to each product or service feature, two questions were asked and the respondent chose an answer among five alternatives (an example can be found in Paper I).

In this paper, the Kano model-based questionnaire was developed in stages. The first draft of the questionnaire was developed based on literature and interviewing three specialists. The draft was then revised in a meeting with the case organisation. After the meeting, the questionnaire was supplemented and sent back for comments to the case organisation. Then the questionnaire was tested and the final modifications were made based on the comments of the testers.

The Kano model-based questionnaire was filled in during interviews. In total 20 responses were collected from 10 private nursing home companies: one from the management level and one from the operational level (e.g., nurses). In addition to the questionnaire, the interviewees answered open-ended questions related to the same themes asked in the questionnaire.

The conclusions based on the data analysis can be summarised in four points. The data showed that (1) technical and (2) functional details should be derived from the nursing processes. (3) BIM, with its visualisation possibilities, was seen as an attractive way to enhance communication in order to get the technical and functional details into the right places. (4) BIM was seen a great way to enhance the actual nursing processes, not just to optimise the premises.

Overall, the Kano model-based questionnaire was found to offer a new way to understand and define customer value. However, the Kano model also has limitations. First, the heavy structure of the questionnaire limits its use because each attribute in the questionnaire requires two questions. Second, the results from the questionnaire itself might be challenging to interpret and thus the open-ended questions in the interviews provided a more solid ground to make conclusions from the questionnaire.

2.2 Paper II: Learning from Lean Management – Going beyond Input-Output Thinking

In this paper, the value creation phase is illustrated in an energy management context (Case B). The case organisation, a globally operating facility management company, provides energy management services. The customers are a Finnish retail chain and its trade centre managers. The paper includes visualisation and analysis of the value creation and an assessment of the capability of the value creation to deliver customer value.

A visualisation of the case process is presented in Figure 5. The case process, a request process, is part of the energy management service. Due to confidentiality issues, the visualisation presented in Paper II is a condensed version of the visualisation used in the analysis.

The request process has four routes (see Figure 5); the route used depends on three issues. The case organisation and the customer have signed (1) an energy management service contract and (2) a maintenance contract. Both contracts instruct which route from the first three routes to take for each request. (3) The scope and nature of the request also affects route selection. If the scope of the request exceeds the authority of the manager, the request is handled through Route 4.

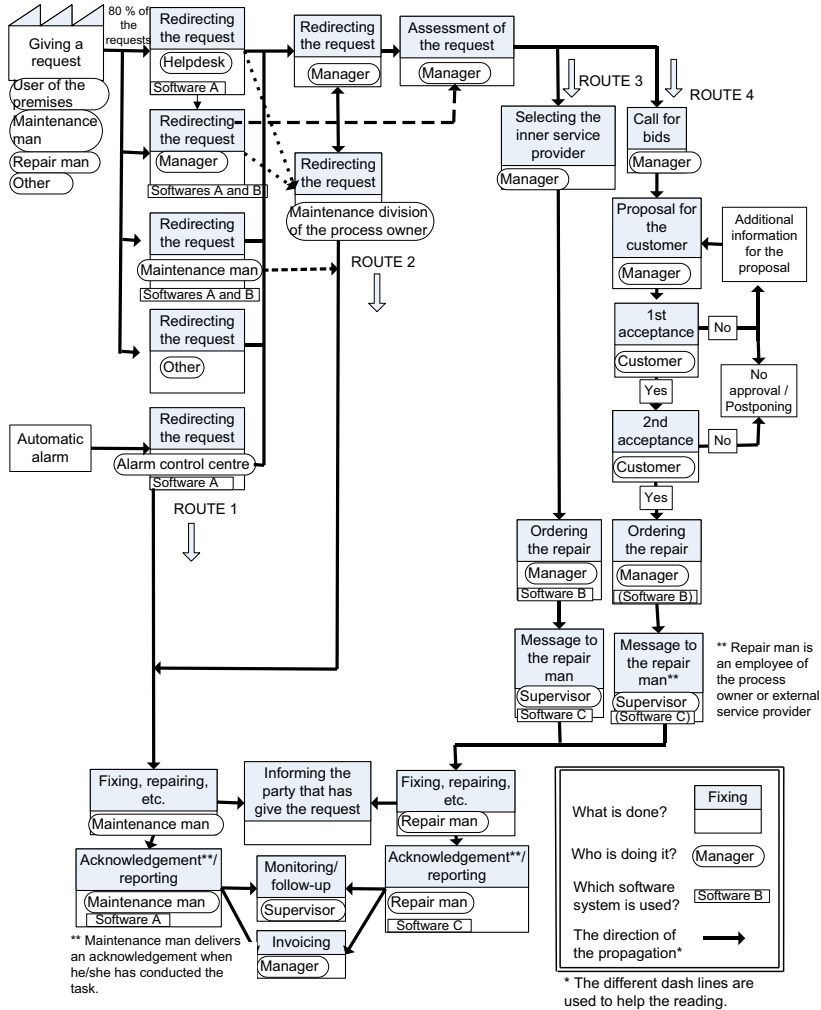


Figure 5 Visualisation of the request process as part of the energy management service (adapted from Paper II).

In addition to the visualisation of the value creation process, coding was used in the analysis in this paper. The coding procedure was adapted from Miles and Huberman (1994). First, the interviews and workshops were coded according to five viewpoints: (1) the surroundings that put the information in context, (2) the way things are conducted, (3) relationships among people, (4) the way people think, and (5) waste.

After this, the codes were revised by adding, restructuring and grouping codes. After several rounds of further analysis, 20 themes were formed. These themes were then composed into four value creation practices according to the connections between the codes. A more detailed description of the coding and examples are provided in Section 3.1.1. Three

of these themes represent practices that were blocking the value creation and one theme represents a practice that was found to support the value creation process. These practices are presented next.

First, the current process was divided into sub-processes. The sub-processes were found to cause waste and value losses. In the case, the value creation was conducted by the same organisation, but the work was handed over several times in the case organisation: from one division to another, from one system to another, and from one employee to another. Second, lack of power made it difficult to fulfil value delivery responsibilities. In the case, managers had the responsibility to ensure value delivery, but they did not have enough power or efficient tools to ensure the value delivery. Third, the same service was not the same for all the customers. In the case, different impressions of who the customer is led to serve the customers in a non-standard way.

The fourth identified practice was seen to be aligned with lean thinking, thus supporting value creation. The idea was to manage the entire value creation process. In the case, the extent of a new service was planned to cover the entire value creation process and to integrate the value creation processes of different business divisions. However, at the time of conducting the research, the service idea had not yet been implemented so the real impacts of the planned service on waste generation cannot be estimated.

To summarise, the analysis showed three value creation practices – (1) sub-processes, (2) lack of power, and (3) not the same service for all customers – that were found to decrease the capability of the current process to generate customer value. However, a sign of a practice that was seen to improve the value creation was also found.

2.3 Paper III: The End-Customer Value Loss in a Construction Project

In this paper, the value creation phase is illustrated in the context of workplace management (Case C). In the case, the service is provided and delivered to a Finnish research institute and its employees by a public property management organisation. The service is called strategic workplace management. The paper includes visualisation and analysis of the value creation and an assessment of the capability of the value creation to deliver customer value.

A visualisation of the case process is presented in Figure 6. Due to confidentiality issues, the visualisation presented in Paper III is a condensed version of the visualisation used in the analysis. In the visualisation, the case organisation receives a request from the customer and decides which requests can and cannot be executed. When the request will be executed in the form of strategic workplace management, the process continues with defining goals for the project. After this, external service providers generate the actual workplace study. The completed workplace study will be adopted in program planning and a feasibility study. Based on the calculations and plans, an investment proposal and the related decision can be made. After this, the property can be designed and constructed. The completed building will then be handed over to the customer and the maintenance period begins. In the maintenance period, the case organisation and the customer have responsibilities to take care of, such as small repairs and move management.

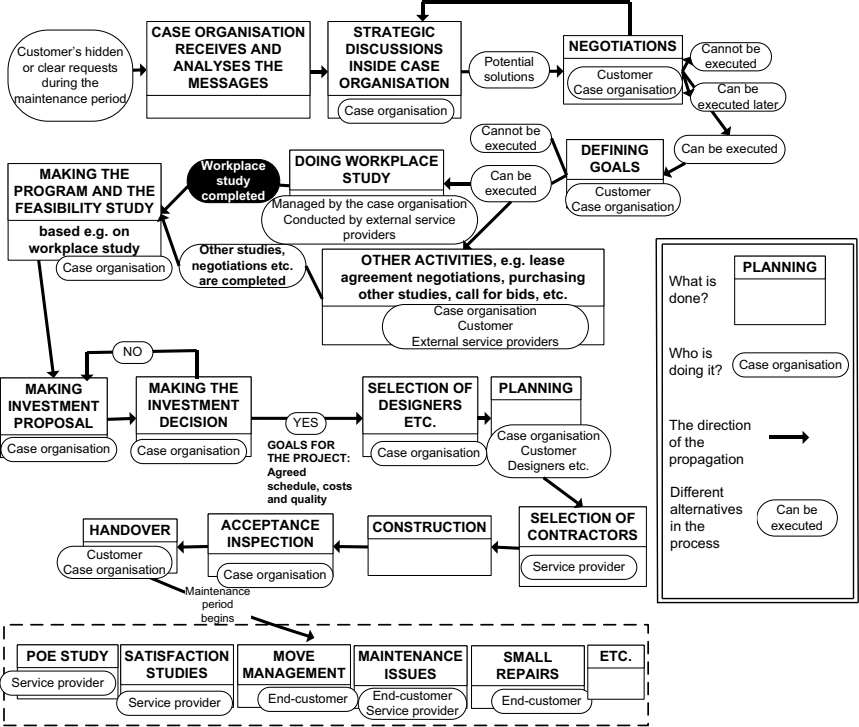


Figure 6 Visualisation of the strategic workplace management process (adapted from Paper III).

In addition to the visualisation of value creation process, coding was used in the analysis. The coding procedure followed the same procedure as in Paper II and is described in detail in Section 1.3.1. Based on the coding, four

issues were identified as discontinuations, i.e., practices that were blocking the value creation in the current service process. These practices are presented next.

First, sub-processes generated waste and value losses. In the case, value creation was organised through sub-processes. In each sub-process, an employee accomplished tasks. When the process moved on, the employee in charge also changed. Employees tended to optimise their own sub-processes, and there was nobody to optimise the entire value creation process.

Second, because customer value was not followed throughout the entire value creation process, waste was generated. In the case, the customer value was identified at the beginning of the value creation process. However, at the end of the process the aim was not to follow customer value but budgeted costs, project schedule and quality level. Unfortunately, these issues were not aligned with customer value.

Third, the results of the outsourced sub-processes were integrated instead of integrating the doing. In the case, most of the sub-processes in the value creation process were outsourced. The tasks in the outsourced sub-processes were conducted separately and thus the integration of the results from the sub-processes into one service was challenging.

Fourth, the value creation was not carried on after the service was delivered. In the case, the premises were handed over to the customer after the construction. Unfortunately, the customer did not use the premises as planned and, thus, the value of the service deteriorated significantly.

To summarise, the analysis showed four practices – (1) sub-processes, (2) unfollowed customer value, (3) non-integrated doing and (4) non-continued value generation after service delivery – that were found to decrease the capability of current value creation to produce customer value.

2.4 Paper IV: Partnership Practices and their Impact on Value Creation – Reflections from Lean Management

In this paper, the value creation phase is illustrated in the context of a partnership of a real estate owner and its property management company (Case D). In the case, the two partners serve their customers, the office tenants, through a request process. In this paper, the case process is not

visualised, but the paper includes analysis of partnership practices that had an impact on the value creation and an assessment of partners' capability to deliver customer value through the current partnership practices. A more detailed description of the analysis is provided in Section 1.3.1.

The analysis of the value creation practices is based on existing the lean partnering framework adapted from Lamming (1993). The framework consists of nine factors that describe what it takes to establish a lean partnership. The factors are the approaches to competition, prices, information exchange, sourcing, quality, research and design, delivery practices, capacity management, and pressure.

The comparison of the case partnership practices with the lean partnership factors showed that the case partners had challenges under each factor. In general, a lot of confidence was placed on bidding in the case partnership and, therefore bidding was related to four of the nine partnership factors: bidding was used in competition, price minimisation, sourcing, and to increase the quality of services.

First, in lean partnership competition through bidding is seen as inappropriate. It is considered that constant improvements maintain the dynamics between the partners instead of bidding competitions (Lamming 1993). In the case, bidding replaced continuous improvement. Bidding was seen as a key tool to create value for the customers, not improvements.

Second, in lean partnership true cost minimisation can be achieved through waste minimisation (Lamming 1993). In the case, bidding was used to attempt to minimise costs. However, because waste minimisation was lacking, mainly prices were minimised, not costs.

Third, in a lean partnership, sourcing is characterised with long-term relationships because they offer a way to enhance continuous improvements (Lamming 1993). In the case, sourcing was based on bidding.

Fourth, in a lean partnership, the guarantee for high quality is continuous improvement (Lamming 1993). In the case, because continuous improvement was replaced with bidding, the potential for ensuring high quality with continuous improvements was missed.

In addition to the issues related to bidding, partners also had challenges with other factors. For example, in the case, the information was not transparent. Due to the non-transparent information, misunderstandings led to wrong activities. Another example is related to delivery practices. According to Lamming (1993), just-in-time deliveries enhance value delivery in a lean partnership. In the case, the employees did not have the proper tools to manage just-in-time deliveries.

To summarise, the partnership practices were not supporting value creation. Therefore, the capability to provide customer value was decreased. In the case, lean thinking offered a platform for the partners to start dealing with the decreased capability to provide customer value.

2.5 Paper V: The State of Value Creation in the Real Estate Sector – Lessons from Lean Thinking

In this paper, the sources of waste in value creation of real estate services are identified. The identification of the sources is based on a cross-case analysis that includes four cases with their individual case reports A-D. Each case followed the same data collection process presented in Section 1.3.1 and after this a cross-case analysis was conducted. In the cross case-analysis, the evidences of interruptions were searched and listed from each case and patterns were formed based on the cross-case comparison. A more detailed presentation of the cross-case analysis is presented in Section 1.3.2 with examples.

The cross-case analysis identified six sources of waste from the current value creation phase. The identified six sources of waste are common and typical in the current value creation processes and practices, but they are not the only sources of waste; there are also case-specific sources of waste. In this paper, the focus is on the common sources of waste. Next, the identified sources of waste are presented in brief.

The first source of waste, *the sub-processes are optimised instead of the entire process being optimised*, refers to the dominant role of sub-processes. The cross-case analysis showed that in all the cases, the sub-process optimisation actually resulted in information losses, delays and waiting, i.e., in increased waste and value losses.

The second source of waste, *prices are minimised instead of costs*, points out three practices that were established to attempt to minimise costs:

bidding, separated decision-making and doing, and focus on financial figures. For example, in all the cases, bidding was a widely accepted practice to minimise costs. According to lean thinking, costs can be only minimised, if waste is minimised. The cross-case analyses showed that true cost minimisation was missing in all the cases, because of a lack of waste minimisation.

The third source of waste, *the process does not respond to customer value*, refers to the low capability of current processes to capture customer value. In all the cases, customer value kept on changing and remained misunderstood, to name a few, and therefore the processes had challenges to re-align the activities and operations with the new customer value.

The fourth source of waste, *the employees are constantly overloaded*, is a result of the waste activities. In all the cases, employees accomplished a great deal of waste activities, for example when searching for information or fixing errors. The waste activities were preventing them from focusing on value creation.

The fifth source of waste, *an inability to make improvements*, refers to the unused potential of doing improvements systematically. In all the cases, employees accomplished a lot of improvements in their daily working, but the ideas and solutions were not systematically shared. Due to the lack of systematic improvement, employees spent a lot of time solving the same problems. Improvements were also difficult to implement because the doing was not standardised. In other words, there was no common base on which to start building the improvements because employees were doing their tasks in their own way.

The sixth source of waste, *poorly managed information*, addresses waste activities that employees were accomplishing to find information. In all the cases, employees were wasting their time when searching for information. They were forced to search for information because information was constantly lacking, overflowing, and missing.

Many of the identified sources of waste have already been discussed in the lean literature. For example, Shingo (1989) and Koskela (2000) have described the common misunderstanding of improving the entire value creation process by optimising the sub-processes; and Lamming (1993) has noticed that bidding easily leads to minimising the margins of the service

providers instead of minimising the true costs. However, these aspects are not yet discussed in the context of real estate services.

To summarise, six sources of waste were identified as interrupting the current service processes. Waste thinking has not had a prominent role in real estate services, and thus the sources of waste have remained in the service processes. Minimising the sources of waste would enhance the business performance of real estate service providers.

3 Conclusions and discussion

3.1 Summary of the results

This dissertation focused on value creation. The current real estate studies have not addressed the actual value creation phase of real estate services. Therefore, the aim of this dissertation was to contribute to the knowledge on the value creation of real estate services by analysing the capability of current value creation to create customer value and by identifying issues that have been interrupting value creation.

Value creation was studied from the lean thinking perspective. The first research question (RQ 1) addressed how capable the current value creation is in customer value delivery from the lean thinking perspective. The research question was divided into two sub-questions. In the first sub-question (RQ 1.1), the focus was on customer value identification in order to understand how customers perceived the value of real estate services. After this, the second sub-question (RQ 1.2) focused on the current processes and practices by studying how they generated customer value. Based on the two sub-questions, the capability of current value creation to deliver customer value was assessed.

The second research question (RQ 2) addressed how value creation has been interrupted in real estate services from a lean management perspective. Based on the assessment, sources of waste that were interrupting the value creation in real estate services were identified.

Referring RQ 1.1, the customer value identification showed that customers perceive the value of real estate service subjectively. Other studies (e.g., Woodruff 1997, Khalifa 2004 and Salvatierra-Garrido et al. 2012) have found similar results. Therefore, in value creation a variety of customer value should be generated. Despite the subjective nature of customer value, it is crucial to measure and identify customer value: it is challenging to provide customer value without identifying it.

The analysis of the current value creation processes and practices of real estate services showed that the current value creation relies heavily on sub-processes. Sub-processes have a dominant role in current value creation. The sub-processes usually have their own goals that guide how to optimise the sub-process. Because of the sub-process optimisation, the entire value creation process is not optimised.

The sub-processes go well hand-in-hand with other widely used value creation practices. The fit between sub-processes and other value creation practices reinforces the assumption of the functionality of the sub-processes and does not pinpoint the drawbacks of the sub-processes. For example, typically an employee accomplishes only one type of tasks in a sub-process and then pushes the process and related information to the next employee in the next sub-process. Typically the results of the separate sub-processes are integrated at the end of the process, although the activity between the sub-processes is not integrated.

Other value creation practices also go well hand-in-hand with sub-processes. For example, in bidding, operations are outsourced. An operation is typically conducted in a sub-process. When an operation is outsourced, a sub-process is outsourced. Therefore, the sub-process coheres with outsourcing.

Another example demonstrates the aspect of value losses. Decision-making is usually conducted in a separate sub-process. Typically the decision is based on calculations prepared by the employee in the previous sub-process. Based on the calculations, a manager makes the decision. Unfortunately, the calculations are often made from the perspective of the owner or service provider, not from the perspective of the customer.

To conclude how capable the current value creation phase is in customer value delivery, the results indicate that the current capability to provide customer value is limited. Because the value creation process, with its several separate sub-processes, does not provide customer value coherently, the likelihood that the output of the value creation process is not in line with the case-specific customer value increases. Similarly, to deliver a variety of customer value is jeopardised if the goals of the sub-processes are not in line with the identified customer value.

The second research question (RQ 2) addressed how the value creation is interrupted from the lean management perspective by identifying the

sources of waste. The analysis identified six sources of waste that were interrupting the value creation (Paper V): (1) poor information management, (2) unresponsive processes, (3) adversarial bidding, (4) lack of systematic improvement, (5) overload of employees, and (6) separate sub-processes. Based on the cross-case analysis presented in Paper V, the identified six sources of waste were common and typical in all the four case studies. In addition to the common sources of waste, there are also case-specific sources of waste.

The six sources of waste can be presented one by one, but they can also be displayed by illustrating their interactions. The six sources of waste are divided into the following three groups: system-based sources of waste, overload of work as source of waste, and sub-processes as the root source of waste. Figure 7 displays the three interactions between the groups, (1) vicious cycle, (2) internal aggravation, and (3) root aggravation. These are presented next in more detail.

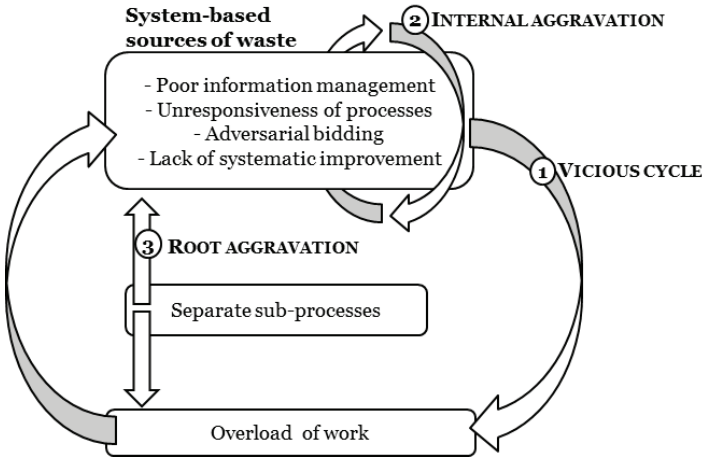


Figure 7 Illustration of the three interactions between the sources of waste in real estate service processes. The arrows refer to aggravation.

The first interaction is the vicious cycle between the system-based sources of waste and the overload of work: the waste generated by the system leads to an overload of work that aggravates the former (Figure 7). The vicious cycle was already mentioned in Paper V as part of the *muda, muri* and *mura* discussion (see Paper V). In the vicious cycle:

- poor information management with the lacking, overflowing, and missing information overloads employees, and the overload of work aggravates the poor information management.

- unresponsiveness of the processes overloads employees by rework, and the overload of employees aggravates the unresponsiveness of the process.
- adversarial bidding overloads employees with non-value adding activities, and the overload aggravates adversarial bidding.
- the lack of systematic improvement overloads employees when everybody is solving the same problems, and the overload aggravates the lack of systematic improvements.

The second interaction, the internal aggravation, increases the complexity of the vicious cycle. The internal aggravation refers to the four system-based sources of waste – poor information management, unresponsive processes, adversarial bidding, and lack of systematic improvement – and the way how the system-based sources of waste interact with and aggravate each other (Figure 7). For example, poor information management makes the process even more unresponsive, and the lack of systematic improvements prevents changing the bidding practices. A similar train of thought has already been followed by Seddon (2005) in the context of failure demand in command-and-control management: the failure to fulfil the demand in the first place, causes failure demand later in the value creation phase.

The third interaction, root aggravation, further strengthens the vicious cycle (Figure 7). Separate sub-processes as the root source of waste aggravate the vicious cycle. The aggravating role of the root source of waste to the other sources of waste is explained next.

First, the separate sub-processes stimulate poor information management. When information is passed from one sub-process to another, information does not remain the same but is lost and changed. Second, separate sub-processes aggravate the unresponsiveness of the process. When a sub-process fails to align itself with the customer value, the entire value creation is jeopardised.

Third, the separate sub-processes encourage cost minimisation through bidding: sub-processes are straightforward to outsource through bidding. Fourth, the separate sub-processes aggregate the lack of improvements: when activities are accomplished in separate sub-processes, it is consistent also to do improvements separately. Finally, the results indicate that separate sub-processes increase the overburden of employees: the workload

is challenging to level when one employee is responsible for one sub-process.

To conclude, the sources of waste in general illustrate how value creation is interrupted. The vicious cycle, internal aggravation and root aggravation present the complexity of the interactions: the vicious cycle is boosted by the internal aggravation and, especially, the root aggravation. To break the vicious cycle and minimise waste generation as lean thinking suggests, it is crucial to also minimise the root source of waste, the separate sub-processes, or at least develop tools for coping with the root source of waste. Otherwise, the results of the improvement actions may remain modest.

3.2 Contribution of the research

This thesis contributes to the field of real estate research by providing knowledge on the value creation phase of real estate services. The main academic value of this thesis is the new perspective of opening the black box of the traditional input-output model and to understand the actual value creation phase that the large body of real estate literature has not addressed before. The majority of real estate literature is based on the input-output thinking where the quality of services and productivity of the process are managed by adjusting the input-output ratio. The empirical studies of this thesis have shown a major lack in current thinking: it tends to forget the actual value creation phase. This research has demonstrated that in order to increase the quality of services and productivity of the processes and practices, it is crucial to understand what happens between the input and output instead of adjusting the input-output ratio.

To understand what happens between the input and output, this thesis proposes a framework – lean thinking – for real estate academia and practitioners. The utilisation of lean thinking in an empirical context has shown that the current value creation of real estate services is interrupted by six sources of waste. According to lean thinking, waste is one of the main reasons for inefficiency. In general, the majority of the real estate literature has ignored the concept of waste. Also, real estate service providers are often confined by their old practices. Therefore, this research provides an eye opener for real estate academia and practitioners.

The identified sources of waste provide suggestions for practitioners, such as real estate service providers, user organisations, investors and state authorities, on how to develop their service processes. In addition, for

academia the findings provide a foundation for future value creation research.

3.3 Evaluation of the research

Evaluation of the research can be done in several ways. In this thesis, the evaluation of the research follows the criteria described by Yin (1994). According to Yin (1994), the assessment of research design should include analysis of internal validity, construct validity, external validity, and reliability. Because the internal validity should be assessed only in causal case studies (Yin 1994), this criteria is left out of the assessment because this research falls into an exploratory case study research category.

According to Yin (1994), construct validity means that the researcher has established correct measures for the concept being studied. He continues that there are three strategies to increase the construct validity. In this research, all the strategies are utilised. The first strategy, the multiple sources of evidence, means that several data collection methods are used (Yin 1994). Robson (2002) calls this data triangulation. In this research, the main data collection forms have been interviews, questionnaires and workshops. The data for customer value assessment was collected through two methods: interviews and Kano model-based questionnaire. The data of the value creation was mainly collected through interviews and workshops, but also other data sources such as observations at the offices of the case organisations and quantitative data from the information systems of the case organisations, have been utilised. In addition, memos, brochures and other company documents have been collected for detailed information.

According to Yin (1994), construct validity can also be increased by investigator triangulation. In this research, a total of two investigators have been used to collect and analyse the data supported by a senior researcher. In Case D, the data collection and analysis was mainly collected and analysed by two researchers, and in Case B, the data was mainly collected by another researcher but analysed by the author.

The second strategy to increase the construct validity is to make the chain of evidence visible. This means that readers should understand which evidence the conclusions are based on (Yin 1994). In this research, the chain of evidence has been made visible through several techniques: the codes are chained from the written interview memos to the conclusions, the

examples are used to describe the connections between the case study evidence and conclusion, and references to the sources are mentioned.

The third strategy to increase the construct validity, to have a draft case report reviewed by informants (Yin 1994), was implemented in two ways in this research. The results of the case studies were first presented, verified and supplemented in Value Workshop I. In this first workshop, two peer groups were reviewing the results: a practical group and an academic group. The practical group had members from the case organisation(s), and the academic group included researchers and academics from the field of lean thinking and facility management. According to Creswell (2009), peer debriefing increases validity. After Value Workshop I, the first version of the case study report was written and its conclusions were discussed in the second value workshops with the practical group. After Value Workshop II, the final case report was reviewed by the two peer groups.

According to Yin (1994), the second assessment criterion, external validity, refers to the generalizability of the research findings. Robson (2002) divides generalizability into internal and external generalizability. He explains that internal generalizability refers to the generalizability of conclusions within the research setting, and external generalizability refers to generalizability beyond that setting. In this research, the internal generalizability has been enhanced by selecting the cases with different research settings, including different case organisations, customers, and services. In addition, the internal generalizability has been enhanced by interviewing several people about the same issue when possible, although the interviewees in this research were not randomly selected.

Regarding the external validity, this research aims for analytical generalisation, not for statistical generalisation. According to Robson (2002), the aim in case study research might be to understand what is going on. The analytical generalisation in this research means that the findings of this research assist in understanding other cases. However, analytical generalisation is not automatic but requires replications (Yin 1994), as conducted in this research. The replication logic has been illustrated earlier in Figure 2. The replications have been conducted in the Finnish context, and within two cases the value creation process has been owned by a globally operating case organisation. In addition to making analytical generalisations in the Finnish context, the results of the thesis may provide relevant findings outside the Finnish context because of the overall trend of organising real estate service production. However, the

external generalisation of the conclusions decreases when the way to organise real estate service production changes.

The third criterion in the assessment is the reliability of the research. According to Yin (1994), reliability means that if an external researcher follows the same procedures and conducts the same case study again, the same findings and conclusions could be made. This requires that the research process is well documented. In this research, the research process and the activities in the research process are documented to increase the reliability of the research. However, some of the documents, such as individual case reports (see Figure 2) with detailed visualisation of the current value creation process, are not public due to confidentiality issues. Robson (2002) suggested keeping records with an audit trail. In this research, the audit trail included audiotapes and notes from the interviews and workshops, responses from the questionnaires, processed data related to process visualisations, and analyses on the current value creation activities presented in the individual case reports. The materials of the audit are archived.

3.4 Future research

Based on this thesis, several possibilities for future research can be suggested. In general, the compelling results of this thesis inspire the continued utilisation of lean thinking in value creation research.

Because in this thesis only a limited number of case studies were conducted, the value creation research could be continued by including more real estate services in the assessment. In this research it was possible to include four services, so a more robust generalisation could be made if more case organisations and services were included in the research. After studying the service value creation in the real estate field, the generalizability of the findings could be compared with other service fields to challenge current value creation practices.

Similarly, it would be interesting to study value creation of similar real estate services. In this research, the cases were selected to represent a wide research setting, i.e., the cases did not have the same service. In order to more deeply understand the common characteristics and distinctions of value creation, more studies with similar services are required.

In addition to continue research with single organisations, it would be interesting to study value creation in service networks. In this research, the focus was on a value creation of a single service provider or partners, so the research could be continued by analysing the joint value creation of multiple service providers. This would give the possibility to do more robust generalisations.

Because the focus in the second research question of this thesis was aimed at waste, in the future the value creation research could study all three activities – waste activities, value creation activities, and supporting activities – in balance. This would offer a possibility to determinate the ratio between the different activities.

On the other hand, to continue the research on waste elimination, it would be interesting to develop a lean production control system for real estate service providers. The lean production control system would bring benefits for the entire real estate sector if the system could be used across the sector.

In this thesis, customer value identification was limited to two methods and to a specific group of customers defined together with the case organisation. In the future, the customer value identification could also cover the customer's customer. It was concluded that customers perceive the value subjectively. In the long term, it would be interesting to develop value creation processes and practices that allow the delivery of that subjective value. Long-term studies are also needed to recognise the dynamism of customer value and its relation to value creation in the real estate sector.

Because the findings of this study are bound by time, it would be appropriate to follow what kind of new sources of waste are formed in the future and how the sources of waste change. Similarly, in this thesis the sources of waste were identified, but the thesis does not specify how the sources of waste could be minimised. Therefore, research could be continued by recognising different ways to minimise the sources of waste or at least develop tools to cope with the sources of waste, especially the separate sub-processes. It would be interesting to compare the impacts of the waste elimination and coping techniques to understand more deeply the nature of waste.

In this research, the focus was not on lean implementations, but value creation was assessed by using lean thinking as a framework. Therefore, in the future it would be interesting to actually implement the ideas of lean thinking and the results of this research in real service processes. Both benefits and drawbacks of the implementations on the value creation should be measured and recorded in both short-term and long-term. This of course requires co-operation with real estate service providers. The short-term measurements with a service provider would specify the instant impacts of lean improvements. In the long-term, proper time series are needed to estimate how lean affects the long-term performance and success of real estate organisations and what kind of strategic benefits lean thinking can offer real estate service providers.

In this research, lean thinking was selected as an assessment framework. In the future it would be interesting to also use rival theories, for example systems thinking or total quality management, to understand value creation from several perspectives. This would also offer a possibility to recognise the benefits and shortages of the comparative theories.

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The aim of this thesis is to contribute to the knowledge on the value creation of real estate services. So far the real estate literature has not addressed value creation although it provides many opportunities. In this thesis, value creation is studied using lean thinking as a framework. The thesis includes four in-depth case studies with more than 120 interviews and workshops. The findings indicate that the capability of current value creation to deliver customer value is limited. In the analysis, six common sources of waste were identified as interrupting the value creation: (1) *poor information management*, (2) *unresponsive processes*, (3) *adversarial bidding*, (4) *lack of systematic improvement*, (5) *overload of employees*, and (6) *separate sub-processes*.



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