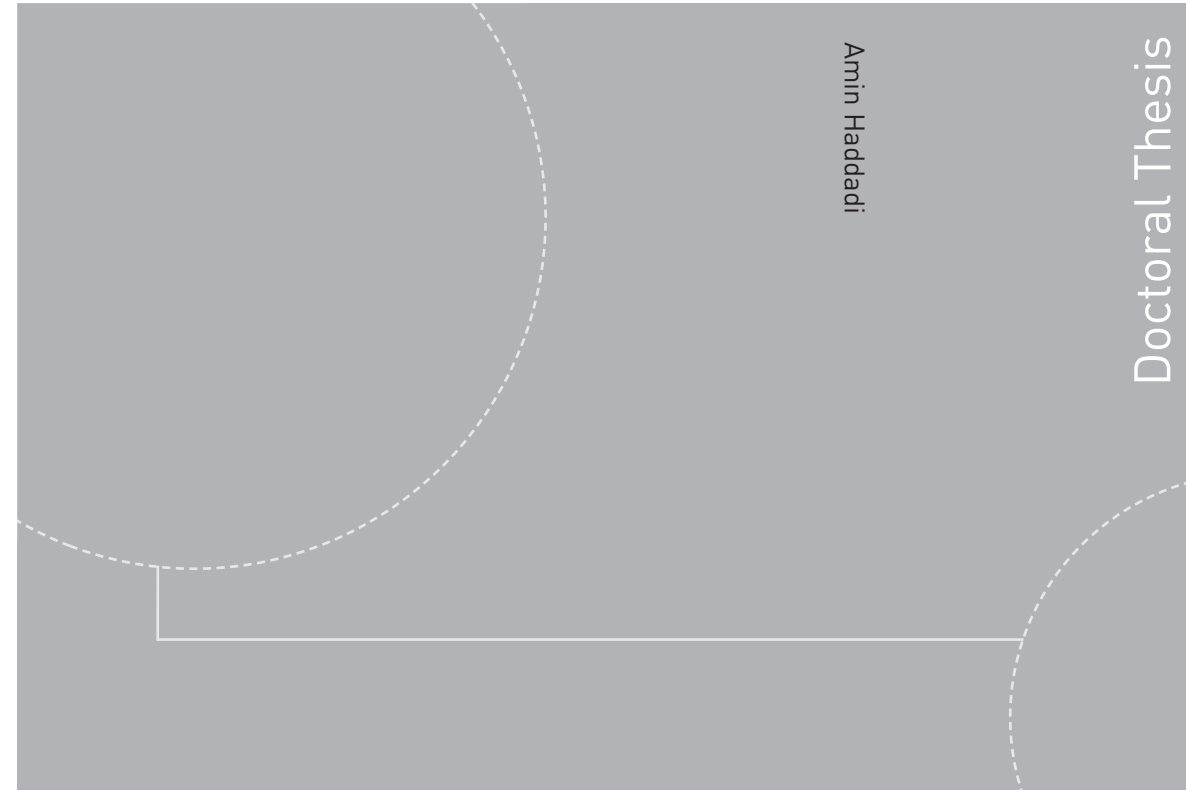


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Amin Haddadi

Value creation as a means to success

- Creating value for owner and users in construction projects

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Value creation as a means to success

- Creating value for owner and users
in construction projects

Thesis for the degree of Philosophiae Doctor

Trondheim, April 2019

Norwegian University of Science and Technology
Faculty of Engineering
Department of Civil and Environmental Engineering



Norwegian University of
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NTNU

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Preface and Acknowledgments

Looking back to the past years makes me realize how many great people I am surrounded by. This PhD would not be a reality without their help, and I would like to express my sincere gratitude to them all!

I would like to start with the people who made it possible for me to take the step and start the PhD. Thanks to Dr. Anne Kathrine Larssen (Multiconsult) and Professor Svein Bjørberg (Multiconsult) for their support all the way, especially during the initial phases of this PhD. I would also like to thank Multiconsult and Norwegian Research Council (NFR) for funding this project. Thanks to my managers at Multiconsult Ina Aspestrand, Stein Christiansen and Grethe Bergly and my contacts at Norwegian Research Council (NFR) Siri H. Hollekim Haaland and Marie Haaland for their support in administrative matters.

The research projects OSCAR and SpeedUp have provided great arenas for research and discussions, and I would like to thank both projects for their help. Thanks go to my co-authors for their help in conducting the research and publishing the results. The fruitful discussions and cooperation opened up new doors to knowledge for both our world and me.

Thanks go to Professor Iris Tommelein and Professor Glenn Ballard at the University of California Berkeley for creating the opportunity for me to experience the research environment at UC Berkeley, and thanks go to my great friend and colleague Allen Tadayon (NTNU) for making the time in the USA special, productive, and memorable.

I would like to thank my supervisors, Associate Professor Olav Torp and Professor Ole Jonny Klakegg, from NTNU for their advice, comments, and support, especially through the final stages of this work.

Special thanks go to my mentor, supervisor, and great friend Dr. Agnar Johansen. He is a true role model who has changed my life with his ideas and advice on more than one occasion. Your energy and positivity were priceless gifts to me through the whole race.

I would also like to express my deepest gratitude to my family, my parents, and my sisters for the support and encouragement.

Summary

The focus on delivering the project goals and objectives is a critical aspect in the management of any project. In the context of management, delivering in accordance with the contract is still an essential issue in defining the success in the project. However, during the past decades, the long-term effects of projects have gained more attention as measures for success in a project.

Any project has its origin in the identified needs. This implies that the value creation of a project should be measured in terms of how these needs are satisfied. At the same time, how efficiently and to what cost these needs can be satisfied is of importance. Value in its simplest form is defined as the relationship between the cost and benefit or a measure of what one gains for what is given. Premises and decisions during the project will directly affect the benefits when the building is in use. The operation phase of a building's life cycle is the longest phase. Hence, knowledge regarding what contributes to a higher benefit and maximizes the creation of value in the operation phase is essential for success in a project. Considering that a great share of the premises and critical decisions are determined during the early phases of a project, transferring the knowledge about what creates value to this phase could have a positive effect on the success of the project. Research has revealed that there is a lack of understanding users' and owners' strategic needs and a lack of methodology for transferring them into functional buildings. Consequently, this PhD aims to identify what creates value for owners and users of the building and how this knowledge can contribute to better processes for maximizing value creation in projects.

Three research questions are being addressed through this thesis.

1. *How are value and value creation conceptualized and defined in relation to construction projects?*
2. *What are the characteristics of value in construction projects?*
3. *How can value creation be enhanced in construction projects?*

As the definitions of value and value creation were unclear and inadequate in the context of construction projects, the first research question is answered through a literature study of the conceptualization of value and value creation in four other contexts (psychology, manufacturing and production, facility management (FM), and real estate and marketing).

As value has been defined differently in different contexts over the years, this PhD work attempted to investigate whether there is a common ground in the conceptualization of value in

different contexts. The study revealed that the focus on users and how users perceive value is the common ground. Hence, the focus on satisfying the various needs of the users, as the most important source of value creation is emphasized. At the same time, the owner has his or her own strategic objectives for initiating a project. Aligning these strategies with the user needs is revealed to be of great importance for maximizing value creation.

The next question is how value is created in construction projects. To answer this question, I examined what the characteristics of value are and the means for value creation for users and owners. A workshop with two workgroups contributed to the creation of a long list containing elements that can either directly contribute to creating value or indirectly function as a means to value creation. Later, elements from this long list were used as the basis in developing questions for the interview and questionnaires in three separate studies. These three studies investigated value and value creation in three different types of buildings: office buildings, hospital buildings, and university campuses.

The characteristics of value and the means to value creation can be divided into several essential groups. They are preeminently related to user requirements, owner requirements/strategies, and management issues. As value was defined to be dependent on the perception of users, finding a unanimous answer to what creates value for users is a difficult task. The fact that users of different types of buildings can have contrasting needs reinforces this argument. However, conducting a questionnaire and asking users of different types of buildings to rank a long list of value-creating elements revealed some interesting findings. The findings can be used as a tool to identify value-creating elements in different projects. The findings revealed that the user requirements that had the highest ranking also had the lowest standard deviation in both the study of university campuses and office buildings. This indicates that, even though users can have different perceptions of value, there is a convergence in the perception of the most important value-creating factors in the conducted research. However, the lower ranking factors should not be disregarded, as the high standard deviation expresses that these factors are of high importance for some of the users, while others might not need them. As an example, parking facilities for bicycles are very important to cyclists and should not be disregarded as a value-creating factor, although it might have a low mean since those who are not cyclists would give it a low ranking.

Owners consider factors such as FM, life-cycle cost, and adaptability of the buildings as value-creating elements. Both user and owner requirements are input to the design process that transfers them into functional buildings through the project. In this regard, some management

issues were identified to have an effect on the value creation of the project. Issues such as multidisciplinary focus and early involvement of the resources, the power in organizations, and user involvement are identified as value-creating management issues and are investigated further in this thesis.

To enhance value creation, two large and complex hospital projects were studied as case projects to identify challenges and opportunities regarding value creation in each phase of the project. A knowledge base regarding what can create value or affect value creation in projects is provided by this research through findings related to the following:

- Conceptualization of value and relating it to the context of construction projects;
- Identifying the characteristics of value and the means to value creation;
- Identifying challenges and opportunities regarding value creation in each phase of the project.

The results of this research is used to provide a framework for enhancing value creation in construction projects. The framework contains eight steps. The first step stresses the importance of thorough strategic analysis to provide complete strategy documents containing the most essential information for the project team. The second step substantiates the multidisciplinary focus and early involvement of resources. The third step concerns identifying the needs and value-creating elements and creating ideas for the fulfillment of the requirements and aligning owner strategies with user needs. The fourth step includes using the information from the third step and suggesting solutions, alternatives, and descriptions for how to achieve the objectives. A plan for action evolved through validating these suggestions during the fifth step by the production suppliers before the production phase starts. Production starts in the sixth step, where the plan for action is implemented, and the building emerges. The seventh step substantiates the importance of commissioning and transitioning the building from the project to the operation phase. The delivery of the building should be structured and planned with accuracy, and the systems should be tested and optimized over time. The last step concerns the evaluation of the results. As a substantial part of value creation is revealed as the building is put to use, the long-term effects should be measured over time. A systematic approach for measuring these effects at the right time is essential for successfully conducting this step. The analysis and evaluation over time forms the foundation for new projects and the further development of the building throughout its life cycle.

Abbreviations

BIM	Building Information Modeling
BVA	Best Value Approach
BVP	Best Value Procurement
DB	Design Build
DBB	Design-Bid-Build
FM	Facility Management
IPMA	International Project Management Association
LCC	Life-Cycle Cost
LCP	Life-Cycle Planning
NFR	Norwegian Research Council
NOK	Norwegian Kroner
NTNU	Norwegian University of Science and Technology
PMI	Project Management Institute
PP	Project Partnership
PPP	Public Private Partnership
PRINCE2	Projects in Controlled Environments, Version 2 (UK)
RQ	Research Question
SBHF	SykehusBygg HelseForetak
VALPRO	Value Driven Procurement in Building & Real Estate
VM	Value Management
WG	Work Group

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Chapter 1

Introduction

“A cynic is a man who knows the price of everything but the value of nothing.”

Oscar Wilde

Chapter 1 Introduction

I was introduced to project management in construction projects in 2005 when I chose to specialize in the field as a part of my Master of Technology program at the Norwegian University of Science and Technology (NTNU). I wrote my master thesis in collaboration with the research project Practical Uncertainty Management in a Project Owner Perspective (*Praktisk styring av usikkerhet i et eierperspektiv*) in 2008 with focus on uncertainty management of the projects from an owner's perspective.

In 2008, I started working as a consultant in a firm in Oslo Norway where I did uncertainty analysis and later became a project manager. The project startup and early phases of the project, particularly concept assessments and studies, were of particular interest for me since I realized the significance of the decisions and processes at this stage for the final results of the projects. I later changed my job and became a consultant for developing methods and tools within property management of large portfolios. Consequently, I was introduced to challenges in the operation phase of the buildings and the importance of lifetime thinking in managing projects.

In 2014, the idea of a research project was launched in the company I worked at. The idea was simply to focus on value creation as a holistic effect of construction projects and determine how it can be maximized. One of the first questions that appeared in the discussions was "Value creation for whom?". Further discussions revealed the necessity of focusing on the stakeholders that are influenced by the project longer than the others. Although construction projects, from initiation of the idea to complete building, can take some years and include many stakeholders, the operation phase of the building usually is the longest phase of its lifetime. This acknowledgment implies that the owner and users of the building should be in focus in the discussion of value creation in construction projects. Although the construction project might have created some value for the vendors and suppliers, a building is not creating any value unless it is used and properly maintained and operated.

The research project OSCAR was initiated by Multiconsult in Norway to develop knowledge, methods, and analytical tools for optimizing the design of a building so the building can contribute to value creation for its owner and users over its lifetime. The project was started in January 2015 with a planned duration of 3 years. I accepted the challenge of starting a PhD work as a part of this project since I had experience and interest in the early phase of projects, while I also had knowledge and experience of challenges in the operation phase of the building.

This PhD work is funded as an industrial PhD by Multiconsult and the Norwegian Research Council (NFR) as part of the OSCAR project with a connection to another research project Shorter Execution Time in Building and Construction Projects, called “SpeedUp.” SpeedUp is initiated in the Norwegian construction industry and aims to develop and test the knowledge that can contribute to reducing the planning and execution time in complex projects by 30% to 50%. Besides being a part of the research environment involving PhD and master students, OSCAR and SpeedUp contributed by providing seminars, conferences, workshops, interview contacts, data, supervision, and guidance throughout the whole process. Both projects have been tremendously valuable for this PhD work.

Section 1.1 Background and Rationale for Research

Examining the development of value management (VM) presented by Kelly et al. (2015), the discussion of value in the context of construction projects seems to be a relatively new topic. Value management (practiced as value engineering), as a tool to optimize the cost/benefit of solutions in a project, has been used since 1940 in manufacturing and later in defense. Although the global development of VM started during the 1960s, VM in construction projects, as practiced today, was brought to attention and developed in Europe during the 1990s and 2000s (Kelly et al., 2015). This PhD work acknowledges the ideas and models that are already provided by VM and does not attempt to create a new model for VM. However, VM can be beneficial as a tool to provide input to increase the understanding of what creates value for users and owners.

A 15-year-long research involving 600 projects has revealed that 85% of projects failed to produce the intended effect or to achieve the expected results (Shenhar and Dvir, 2007). As the degree of success in a project is dependent on the achievement of the intended effect and expected results, *Guide to Project Management Body of Knowledge*, already in its first edition, referred to project success as meeting or exceeding stakeholder needs and expectations by balancing competing demands among i) scope, time, and quality; ii) stakeholders with different needs and expectations; and iii) identified requirements (needs) and unidentified requirements (expectations) (PMI, 1996).

Müller and Jugdev (2012) pointed out three main periods of time in the development of understanding project success. During the first period (1960s to 1980s), success was defined regarding the iron triangle (time, cost, and quality) with a focus on the project implementation. In the second period (1980s to 1990s), success was typically defined as a single measure for the

project rather than multiple measures over the life cycle. In the third period (1990s to 2000s), the integrated frameworks on project success emerged, and project success was suggested to be measured according to factors related to the project and factors related to the management, organization, and external environment. Views on success have gradually changed over the years from a focus limited to the implementation phase to the project life cycle and further to including subjective measures, such as satisfaction and even further to include core business (user) success (Müller and Jugdev, 2012).

Moreover, PMI (1996), and later Müller and Jugdev (2012), pointed at two significant aspects in the development of how success is defined in construction projects: first, the importance of the satisfaction of requirements and expectations and, second, the development toward life-cycle thinking rather than project thinking.

In the European research project, value driven procurement in building and real estate (VALPRO), a lack of understanding of the strategic objectives of the project owners/users and the lack of methodology for translating them into functional buildings under traditional project management is stressed (Arge and Hjelmbrække, 2012). These aspects generate unnecessary high expenses for operation and maintenance, increased replacement frequency, and negative effects on core businesses in the building by disturbing the activities and, at worst, incidents related to health, safety, and the environment. For example, a significant portion of Norwegian buildings (nearly 31%) are in unsatisfactory condition with low usability and high reconstruction costs (Larssen and Bjørberg, 2013). Although the focus on life-cycle planning (LCP) in construction projects seems to be increasing, a variety of comprehensive studies, in both the public and private sectors in Norway, revealed that the scope of poor technical solutions, inadequate detail design, and weak choice of material are still significant (Bjørberg et al., 2014). However, recent findings show a development toward moving the main project target from a finished building to the achievement of the desired effects of owning and using the building over its lifetime (Bjørberg et al., 2015).

Thomson et al. (2003) argued that there is a common claim in contemporary literature that delivering value should be a fundamental objective of projects. Value creation as a scientific discipline seems to have a variety of definitions and associations in different contexts. In real estate and facility management (FM), value creation is associated with the contributions that decisions, processes, and information have on creating returns on investment (Jensen et al., 2013). Hjelmbrække and Klakegg (2013) built on the work by Bowman and Ambrosini (2000) on the resource-based view and argued that value creation is a result of human activity and that

it is the only source of new value. There are elements that contribute to value for the user of buildings and the core business in the buildings. These elements, from a user perspective, are related to conditions such as sustainability, adaptability, reliability, and perceived benefit (Zeithaml, 1988, Menon et al., 2005, Sarasoja and Aaltonen, 2012, Støre-Valen et al., 2014). From the perspective of the core business in the use phase of the building, the social perspectives for human resources and economic aspects are of importance (Boge, 2012, Coenen et al., 2012, Huovila and Hyarinen, 2012, Jensen et al., 2013).

The discussion so far indicates that there is a lack of understanding of the strategic objectives of the project owners and users and a lack of methodology for realizing these objectives through traditional project management. On the other hand, the development toward moving the main project target (from finished building to achieving the desired effects of owning and using it over its lifetime) demands knowledge about value creation and lifetime planning as well as new execution models and processes.

Essential guidelines for the design of a building are determined during the early stages of planning. There is also a need to consider how to ensure that intentions and aspirations to achieve value are maintained through planning, design, engineering, construction, commissioning, and operation.

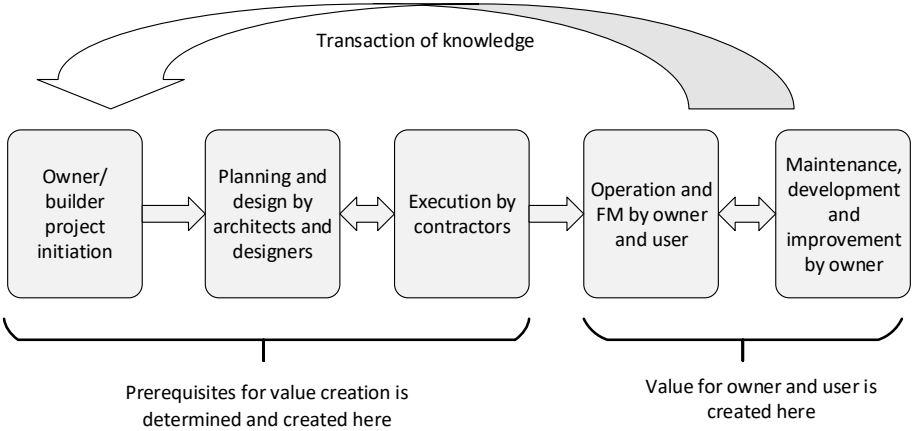


Figure 1-1 Life-cycle thinking and transaction of knowledge.

As indicated in Figure 1-1, value creation for owners and users of a building starts when the building is put into use. An abandoned building does not create any value. The most prolonged

phase of a building's life cycle is usually the operation phase. Although a project can have a duration of many years, the owners and users of the building are the stakeholders affected by the building over the longest time. Hence, considering the concept of value and value creation from the perspectives of the owners and users should be prioritized in projects. Terms and premises for the operation of the building are decided during the initiation, planning, and design phase of the building project. This implies that transferring knowledge about what creates value for users and owners to the planning and design phase to determine the concepts and solutions could improve the results of the project and provide a higher optimization in the design of the building. Meanwhile, the knowledge about what creates value should be systematically applied, and the plans and design should be sustained throughout the project.

Section 1.2 Research Objectives

The background and rationale for the research led to acknowledgments regarding the necessity of new knowledge about the following:

- How to consider value from the perspectives of the owner and user of construction projects;
- What creates value and how value can be created in construction projects based on the objectives of owners and users;
- How to enhance value creation by understanding what creates value for owners and users and how to transfer this knowledge to the planning of the building.

The research questions for this PhD work were developed considering these acknowledgments.

RQ1: How are value and value creation conceptualized and defined in relation to construction projects?

The point of departure for the work was to determine how value is defined and conceptualized and how it is related to the context of construction projects. As the concept of value was not clearly defined in the literature for construction projects, I decided to study other contexts wherein the value is conceptualized to determine whether there is common ground that I could use to define value and value creation in the context of construction projects.

RQ2: What are the characteristics of value in construction projects?

After defining and conceptualizing value, the characteristics and means for value creation in different types of buildings are investigated. This will help identify what creates value for owners and users and whether there are measures that can help projects achieve these value-

creating elements. Answering this question would facilitate filling the gap in understanding the strategic needs and objectives of users and owners for different types of buildings.

RQ3: How can value creation be enhanced in construction projects?

This research question assessed by structuring the findings from the research. Answering this question aims fill the gap in understanding the objectives of the owners and users and in transferring this understanding into functional and value-creating buildings.

Section 1.3 Research Scope and Limitations

The focus in this PhD work is the perspectives of the owners and users. In this matter, the perspective should not be misinterpreted as the role. While the roles of the owners and users are limited to their contributions to the project, their perspectives concern the effects that the project has on them as individuals or organizations. The dimension that is studied in this PhD is the long-term effects of the projects on the users and owners of the buildings and the processes and means involved in creating these effects. The perspective of the owner in this research is limited to the long-term effects that the project has for the owners and users of the building during its operation phase, not on the project itself as a business case.

The research included three main parts directly related to the three research questions. The first part concerns elaboration of the concept of value and relating this to the context of construction projects. As the conceptualization of value in the context of construction projects seems inadequate, other relevant contexts were studied to investigate whether there is a common ground that can be related to the context of construction. The chosen contexts were marketing and consumer economics, production and manufacturing, sociology and human behavior, and real estate and FM. These contexts were chosen because the literature review revealed that the concept of value has been particularly in focus for research in these contexts during the past decades.

The second part concerns the characteristics and means to value creation. This part includes both an investigation of what creates value in different types of buildings and the management aspects that can influence the value creation in a project. The research was limited to three types of buildings (hospitals, office buildings and university campus buildings). These building types represent different levels of complexity, different demands for flexibility, different business propositions, and different owner perspectives. Hospital buildings are complicated buildings with a large variety of functions. Offices are more straightforward in the context of design with

few required functions, and university campuses represent a mixture of complex and simple functions. The demand for flexibility is high in almost every function in hospital buildings due to the improvement in medical technology and treatment processes. Although flexibility is appreciated in office buildings, the simplicity of the functions and the increase in flexibility of the workspaces generates a lower demand for flexible solutions. University campuses contain both complex and developing functions and simple functions. The owner perspective in hospital buildings is more integrated with the operation of a hospital, and the development of this type of building usually involves demanding tasks organized by the owner. Office buildings are more streamlined in operation, and the expenses for changes and development are usually integrated into the rent. Hence, the strategic level of office buildings is not as complicated as it is for hospital buildings or university campuses. There are other types of buildings, such as hotels, shopping malls, schools, etc., that could have been studied during this research, but these three were chosen due to the limitations of time and resources and the fact that these types of buildings can represent a large variety of building types.

The third part is structuring the developed knowledge base through research findings towards developing a framework and through testing and refining the framework by an independent study of two hospital projects as case projects. The projects that were studied in this part of the research were limited to hospital buildings, as hospitals were assumed to be one of the most demanding and complex type of building and because they encounter challenges that can be related to a wide range of construction projects.

Section 1.4 Structure of the Thesis

The body of the thesis is presented in 7 chapters including introduction, research methodology, theoretical background, findings, and conclusions. Publications as listed in Table 1-1. The numbering sequence indicates the significance of the publication for this thesis.

The results of this PhD work have been consecutively published and presented in conferences and journals. During the three years of work, 12 papers and one journal article were published through collaborative research with colleagues, students, and fellow researchers. One journal article is submitted and accepted for publication (Publication 2). Both journal articles and seven of the papers have been used in the composition of this thesis. Table 1-1 presents the publications. Figure 1-2 presents how the publications are used in different chapters of this thesis and

Table 2-3 illustrates where the publications are presented or published.

Table 1-1 Publications used in the composition of this thesis.

No.	Authors	Title
1	Amin Haddadi, Agnar Johansen, Svein Bjørberg (2017)	“Best Value Approach (BVA) - Enhancing Value Creation in Construction Projects”
2	Amin Haddadi, Agnar Johansen (2018)	“Value Proposition in Different Types of Buildings- Characteristics and Means”
3	Amin Haddadi, Agnar Johansen, Bjørn Andersen (2016)	“A Conceptual Framework to Enhance Value Creation in Construction”
4	Amin Haddadi, Alenka Temeljotov Salaj, Margrethe Foss, Ole Jonny Klakegg (2016)	“The Concept of Value for Owners and Users of Buildings -A literature study of value in different contexts”
5	Amin Haddadi, Ali Hosseini, Agnar Johansen, Nils Olsson (2017)	“Pursuing Value Creation in Construction by Research - A Study of Applied Research Methodologies”
6	Amin Haddadi, Olav Torp, Jardar Lohne, Ola Lædre (2016)	“The link between stakeholder power and value creation in construction projects”
7	Svein Bjørberg, Anne Kathrine Larssen, Alenka Temeljotov Salaj, Amin Haddadi (2015)	“Optimizing building design to contribute to value creation”
8	Ola Bråten Lund, Amin Haddadi, Jardar Lohne, Svein Bjørberg. (2016)	“Sustainable Planning in Refurbishment Projects – An Early Phase Evaluation”
9	Jon Harald Bremdal, Amin Haddadi, Svein Bjørberg, Jardar Lohne, Ola Lædre (2017)	“Value Creation in Design-Build Projects - The Role of the Designers”

The first part of the thesis contains seven chapters. Chapter 1 is the introduction, which discusses the background and rationale for the research, objectives, and scope and presents the structure of the thesis. Chapter 2 includes a presentation of the theory of research methodology, a study of research methodology within the field of value creation, and a presentation of the research design and methodology of this PhD work. Chapter 3 presents the literature review of the research and the knowledge front within value and value creation. This chapter attempts to present findings associated with the first research question (RQ1) by discussing how value is conceptualized and the link between value creation and project success. It also represents a study of the existing approaches to value management.

Chapter 4 presents the results of the research regarding the second research question (RQ2) by investigating the characteristics of value in construction projects. The chapter presents general characteristics of value and means to value creation as well as discussing value creation in office buildings, university campuses, and hospitals. Chapter 5 continues to present findings with regard to RQ2 by discussing the means to value creation that involves management of the projects. This chapter builds on the results from Chapter 4 and elaborates on the multidisciplinary focus and partnership in projects, the power in project organizations, and the user involvement as a means to value creation related to the management aspects of the projects.

Chapter 6 presents findings associated with the third research question (RQ3) by suggesting a framework for enhancing value creation in projects. The framework is developed by structuring the findings from Chapters 3, 4, and 5 with independent, comprehensive research conducted to improve and verify the framework. Chapter 7 presents the conclusions and answers to the research questions and a discussion of the need for further research.

Figure 1-2 indicates how the publications are used in different chapters of the thesis.

Chapter in thesis	Publications		
1 Introduction	Background, rationale and scope of the research		
2 Research methodology and approaches in value management	Publication no. 5		
3 The concept of value for owners and users of buildings	Publication no. 4	Publication no. 1	Publication no. 3
4 Characteristics and means to value creation	Publication no. 2	Publication no. 5	Publication no. 7
5 Value creation and management of projects	Publication no. 6	Publication no. 8	Publication no. 9
6 Best Value Approach- Enhancing value creation in construction projects	Publication no. 1	Publication no. 2	
7 Conclusion and further research	Conclusions and suggestions for further research		

Figure 1-2 Publications used in different chapters of this thesis.

Part 2 is an appendix where the publications used in developing this thesis are enclosed, consisting of nine papers and articles. As mentioned earlier, the numbering sequence represents

the significance of the publication for composition of this thesis. The timeline for the production work of the publications is presented in Figure 1-3.

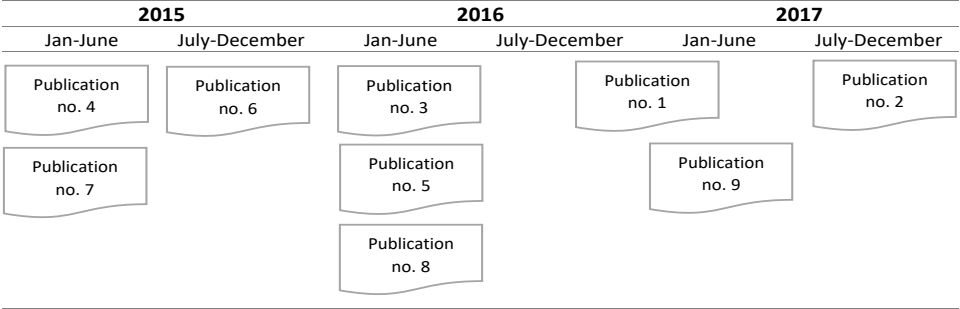


Figure 1-3 Timeline of production of the publications.

Chapter 2

Research Methodology

“Highly organized research is guaranteed to produce nothing new.”

Frank Herbert

Chapter 2 Research Methodology and Research Design

Scholarly literature offers a wide range of definitions and descriptions of what research is. Although there is no lack of diversity in how the definition of research is formulated, the understanding of what research is, seems to be quite united. Research is a systematic approach to acquire data and information and analyze this information to increase knowledge around a specific topic. However, the wide range of approaches can lead to confusion regarding how the research within a field is supposed to be executed. This chapter investigates the theory of research methodology and positions this research according to the theory.

Section 1 of this chapter provides an introduction to research methodology and research theory in general. Theoretical elements of research such as research purpose, research logic, different processes, methods of data collection and research philosophies are presented in this section.

Section 2 presents the results of the research methodology within the field of value and value management. The purpose of this section is to position the methodology of this PhD work in relation to the trends in the field. This section presents how the philosophical worldviews and research approaches are within the field and how it has developed over the past three decades.

Section 3 describes the research design for this PhD work. This section also provides an overview of the publications that are produced, their focus, their objectives and my contribution to the publications. At the end of the chapter, the reliability, validity, and generality of the findings through this PhD work are discussed.

Section 2.1 Research Methodology and Theory in General

The common objectives of research according to Collis (2013) can be summarized as follows:

- To review and synthesize existing knowledge,
- To investigate existing situations or problems,
- To provide a solution to a problem,
- To explore and analyze more general issues,
- To construct or create a new procedure or system,
- To explain a new phenomenon,
- To generate new knowledge, and
- A combination of any of the above.

Although the overall objective of the research is to increase knowledge, there are other elements of research such as the purpose, logic, process, and method of the research that are varying in different contexts and should be planned and determined prior to conducting the research.

Research Purpose

The purpose of the research is the reason the research is conducted. According to Yin (2013), the research purpose can be exploratory, descriptive, explanatory, or policy-related. Explanatory and policy-related are also featured as, respectively, analytical and predictive as well (Yin, 2003). These purposes are presented in

Table 2-1.

Table 2-1 Purpose of research (Yin, 2013).

Exploratory	Descriptive	Explanatory (Analytical)	Policy-related (Predictive)
Fulfills the need for better understanding of a phenomenon. Conducted when few or no studies exist. Typically forms the basis for further research.	Seeks to provide an accurate description of observations of a phenomenon. Can be utilized to identify and classify the elements or characteristics of the phenomenon.	Looks for explanations of the nature of certain relationships. Explaining why or how something is happening by, for example, locating and identifying the variables involved.	Focuses on approaches to solving or preventing a specific problem. Speculating on possible future outcomes based on analysis of available evidence of cause and effect.

In some cases, more than one of these purposes can be related to the research since research is developing over time. As an example, identifying and classify the characteristics of value had a descriptive purpose. However, exploratory research was conducted to gain an understanding of how value is conceptualized in different contexts before the descriptive research identified and classified the characteristics.

Research Logic

The research logic can be either deductive or inductive. Deductive logic is referred to the approach in which the researcher starts with general ideas and theories and uses them to analyze and comprehend a specific problem or idea (Tjora, 2012). This implies that deductive research is a study in which particular instance is deduced from general inferences. In deductive studies, a conceptual or theoretical structure is developed and then tested by empirical observations (Collis, 2013).

Tjora (2012) described inductive research as studies where theories are developed based on observations of a particular situation. This suggests that the opposite of deductive approach occurs during inductive studies, meaning that the general inferences are induced from particular instances. The theory is developed from observation of empirical reality during inductive studies (Collis, 2013). Figure 2-1 illustrates inductive and deductive logics within research.

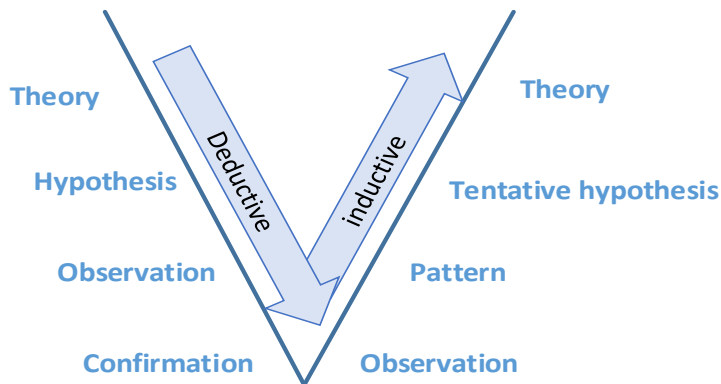


Figure 2-1 Inductive vs. deductive research based on (Tjora, 2012, Collis, 2013).

In some cases, the observations are incomplete or surprising, and the reasoning cannot provide a certain conclusion. The conclusions are then based on the researchers' best explanation among several alternatives. This is referred to as abductive logic (Bryman and Bell, 2015).

Research Process

The research process, also known as a research approach in the literature, refers primarily to the way the data are collected and analyzed. Research methodology literature advance three main approaches to research:

- Qualitative,
- Quantitative, and
- Mixed methods.

Creswell (2014) described qualitative research as an approach for understanding individual or group meaning on a social or human problem. Fellows and Liu (2015) have a more general description of qualitative approach, saying it seeks to gain insight and to understand people's perceptions of the world both as individuals and as groups.

Payne and Payne (2004) stressed that *qualitative* is an umbrella term and refers to a set of approaches that share the following common features:

- Seeking out and interpreting the meaning that people ascribe to their own actions,
- Seeing actions as contextualized, holistic, and part of a social process,
- Seeking to encounter social phenomena as they naturally occur,
- Working with smaller samples looking for depth and detail of meaning with a less general and abstracted level of explanation, and
- Using inductive as opposed to deductive logic, allowing ideas to emerge as they explore the data.

According to Creswell (2014), the process of qualitative research has several characteristics. First, it involves emerging questions and procedures. Second, the data are collected in the participants' setting. Third, the data analysis is built inductively from particulars to general themes. Finally, the researchers interpret the meaning of the data. Creswell stressed the increased visibility of this type approach during the 1990s and into the twenty-first century and pointed out the following designs, among others, as conventional methods of conducting qualitative research:

- Narrative research, where the researcher retells the information collected by an inquiry from the lives and stories of the participants who are the sources of data by turning them into a narrative chronology.
- Phenomenological research, in which the researcher describes the experiences of individuals about a phenomenon as described by the participants. This design typically involves conducting interviews.
- Case studies in which the researcher develops an in-depth analysis of a case, such as a project, event, program, or process, using a variety of data-collection methods.

Interviews, case studies, and literature reviews are typical methods for collecting data in qualitative studies. Methods of data collection are explained later in this section.

Quantitative approaches, on the other hand, tend to relate to positivism and seek to gather factual data to study relationships between facts and how the facts and such relationships accord with the theories and findings of any previous research (Fellows and Liu, 2015). Characteristic features of the quantitative research, according to Payne and Payne (2004), are as follows:

- The core concern is to describe and account for regularities in social behavior.

- Patterns of behavior can be separated into variables and be represented by numbers.
- Explanations are expressed as associations (usually statistical) between variables, ideally in a form that enables prediction of outcomes from known regularities.
- Social phenomena are explored through systematic, repeated, and controlled measurements.
- They are based on the assumption that social processes exist outside of an individual actor's comprehension, constraining individual actions, and are accessible to researchers by their prior theoretical and empirical knowledge.

Creswell (2014) simplified the definition of quantitative research by expressing it as “an approach for testing objective theories by examining the relationship between variables.” He explained further that these variables can be measured, and the numbered data can be analyzed using statistical procedures. He focused on two main designs within the quantitative approach:

- Survey research, which provides a quantitative description of trends, attitudes, or opinions of a population by studying a sample of the population, and
- Experimental research, which seeks to determine whether a specific action or treatment influences an outcome.

Experiments and questionnaires are normal data-collection methods in quantitative studies.

Mixed method is another research approach that involves both qualitative and quantitative data. The primary assumption of this approach is that the combination of both qualitative and quantitative approaches provides a more comprehensive understanding of the research problem than either approach alone (Creswell, 2014). Fellows and Liu (2015) used the term “triangulated studies” for comparing different datasets and pointed out that this approach may be employed to reduce or eliminate disadvantages of each approach by employing two or more research techniques. However, McLaughlin (2011) stressed that the researcher still has a responsibility to ensure that the methods work together in such a way that they address the research questions. That means generated data must still be analyzed rigorously and methodically. Creswell (2014) described three primary designs within mixed methods as follows:

- Convergent parallel mixed methods, where the researcher merges the qualitative and quantitative data (which are typically collected roughly simultaneously) to provide a comprehensive analysis of the research problem.

- In explanatory sequential mixed methods, the researcher starts with conduction of quantitative research, analyzes the results, and then explains the results further in more detail by qualitative research.
- In exploratory sequential mixed methods, the researcher begins with qualitative research, and after analyzing the data, the information is used to build a quantitative phase. The qualitative phase is, for example, used to identify appropriate instruments or questions in the follow-up quantitative study.

Research Methods

Research methods refer to the method of collecting data and information for the research. Literature studies (literature reviews), questionnaires (surveys), interviews, and case studies are among the variety of methods of data collection in management research.

Literature study

Literature study is a well-defined qualitative method of collecting information in research. Research methodology literature provides numerous definitions of literature study. The common ground is the fact that this method consists of a systematic search of published work to identify the state of the art and what is already known about a research topic. Aitchison (2007) explained that a literature review allows the researchers to determine the existing terms of the issue that is being investigated, hence ensuring that duplication is avoided. Hart (1998) pointed out that a literature review also allows researchers to acquire an understanding of the research topic, of how research has been conducted on the topic, and of the key issues. According to Creswell (2014), a literature review has the following three contributions to the research:

- It shares with the reader the results of other closely related studies.
- It relates the study to more extensive ongoing dialog about the topic, filling the gaps and extending prior studies.
- It provides a framework for benchmarking the importance of the study as well as a foundation for comparing the results of the study with other findings.

Johansen (2015) pointed out that, although the literature is more accessible and available via the Internet, conducting a useful and relevant literature study is still not a simple task. Considerations such as right place to search, the relevant period, and the search terms for the inquiry, are still necessary to conduct a proper literature study.

Case study

A case study is a research strategy that focuses on understanding the dynamics present within single settings (Eisenhardt, 1989). Yin (2012) defined the case-study research as an empirical inquiry that investigates a phenomenon within its real-life context in which multiple sources of evidence are used, and the boundaries between phenomenon and context are not clear. In another publication, Yin (2013) argued that case studies can involve both a single case or multiple cases, and they typically combine data-collection methods, such as archives, interviews, questionnaires, and observations. Case studies can also be utilized to achieve various objectives, such as providing descriptions and testing, generating, and formulating theories. Hence, this approach is particularly well suited to new research areas or research areas for which existing theory seems inadequate (Eisenhardt, 1989).

Case study, as a research method, has been criticized with different arguments. Rowley (2002) referred to the lack of objectivity as an issue in case studies compared to other research methods within the field of social science. However, she argued that case studies are often viewed as a useful tool for the preliminary, exploratory stage of a research project. This corresponds with the argument from Abercrombie et al. (1984), stating that, although case studies may not provide reliable information about the broader class, they can be useful in the preliminary stage of research since they provide a hypothesis that may be tested systematically with a more substantial number of cases. According to Flyvbjerg (2006), some scholars have been skeptical of the case study as a research method in project management since analyzing and summarizing the data can be biased by the researcher's views, especially in single-case studies, and falsification can be an issue as well. Flyvbjerg (2006) claimed that there are five misunderstandings about case-study research:

1. That general context-independent knowledge is more important than concrete, context-dependent knowledge. This is argued to be a misunderstanding since universals in the study of human affairs cannot be found. Human activity is situated in the context of practice. Hence, the context-dependent and practical knowledge are more valuable than theoretical predictive knowledge.
2. That one cannot generalize based on studying a single case. Hence, the single-case study cannot contribute to scientific development. Flyvbjerg pointed out some cases, such as Galileo's repudiation of Aristotle's law of gravity, in which it has been possible to generalize from a single practical experiment.

3. That case studies are most useful for generating a hypothesis. Following the example in the second misunderstanding, there is an argument that can be used to test and falsify hypotheses rather than just generating them.
4. That case studies contain a bias toward verification. Flyvbjerg argued that this is a misunderstanding by citing researchers who report that their preconceived ideas were proven wrong by case studies and claimed that it seems to be a bias toward falsification rather than verification.
5. That it is often difficult to summarize and develop general theories on the basis of specific case studies. Flyvbjerg argued that qualitative research with a small number of samples is often at the forefront of developing theories. He also mentioned examples, such as Freud's research, that are some of the most influential work in current educational research and have contributed to significant developments in learning theory.

The misunderstandings that Flyvbjerg (2006) stated confirm some of the arguments of Eisenhardt (1989) regarding the skepticism around case studies. Eisenhardt (1989) substantiated the benefits of using case studies for generating novel theory and argued that the likelihood of valid theory is high since the theory-building process is closely linked to the evidence. This implies that it is likely that the resulting theory will be consistent with the empirical observations. However, Eisenhardt (1989) pointed out some weaknesses in theory building through case studies as well. Building theory through case study is typically a bottom-up approach, meaning the specifics of the data produce the generalizations of the theory. The risk is that the theorist is incapable of rising the generality of the theory to the optimized level and instead describes a distinctive phenomenon.

Surveys

Surveys are quantitative methods of collecting data involving a selection of unbiased respondents answering questions as representatives for a more extensive group that is being studied. Using surveys as a method of data collection is usually associated with a deductive approach where theories are built based on observations (Saunders et al., 2012). Pinsonneault and Kraemer (1993) defined survey research as a quantitative method that requires standardized information about the involved topics in the studies, while the subjects might be individuals, groups, or organizations as well as projects, applications, or systems.

Saunders et al. (2012) pointed out that surveys can be conducted by a questionnaire, structured observations, or by structured interviews and argued that, since surveys are frequently used to

answer questions of who, what, where, how much, and how many, they tend to have exploratory or descriptive purposes. Surveys can also have analytical purposes. Analytical surveys attempt to gather data to analyze the relationship between different variables in a sample, while descriptive surveys aim to identify and calculate the frequency of a specific response among the group (Kvale et al., 2015, Marshall and Rossman, 2016).

Although a survey allows the researcher to gain an understanding of a phenomenon or suggest possible reasons for relationships between variables, there are some drawbacks. For instance, the sample should be representative for the whole population to generate valid data. Analyzing the results can be time-consuming, and the progress can be delayed by the dependence on respondents for information (Saunders et al., 2012).

Interviews

Yin (2012) acknowledged that the interview is one of the most critical sources of collecting data in case studies and claimed that it is commonly found in case-study research. He categorized case-study interviews into three main groups: prolonged interviews, shorter interviews, and survey interviews. Prolonged case-study interviews are either conducted in a single sitting or multiple sessions and might take over 2 hours. In this type of interview, the respondents are asked about their opinions and interpretations of circumstances or people or for their descriptions and ideas related to certain situations. The results can then be used for further inquiries, to suggest other people for new interviews, or for other sources of evidence. Shorter interviews are more focused and aim to validate specific findings that are already established without asking further about the broader and more open-ended topics. Survey interviews are typically conducted by applying a structured questionnaire. This type of interview can be part of a case study and produce quantitative data as part of the evidence in the case study.

Gill et al. (2008) presented another categorization of different types of interviews in research. They argued that there are three fundamental types of research interviews: structured, semi-structured, and unstructured. Structured interviews, like Yin's "Survey interviews," are verbally administered questionnaires where predetermined questions are asked. Consequently, they are relatively quick and easy to administrate. However, they naturally limit the participants' responses and are therefore not suitable when in-depth information is required. On the contrary, unstructured interviews are performed with little or no organization. Hence, they are usually time-consuming and can be challenging to manage and participate in. The use of this type of interview is limited to situations in which the knowledge of the area is strictly limited or a significant depth is required.

Semi-structured interviews contain some fundamental questions that help define and guide the topic/area that is being explored. However, they allow the respondent or the researcher to deviate from the main direction to explain an idea or response in more detail. This interview format provides participants with some guidelines on what to talk about, which is often found to be helpful. The flexibility of this approach also advances the opportunity for discovery or elaboration of information that may not have been thought of as relevant by the researcher.

Kvale et al. (2015) introduced seven stages in which the interviews should be conducted:

1. Determination of the purpose of the interview (Why is the interview taking place?).
2. Planning the interview by developing the interview guide and clarifying how and when the interview will be conducted and who will be present.
3. Conducting the interview.
4. Summarizing the interview and transcribing the data.
5. Analyzing and coding the data by topics and deciding what can be learned or extracted.
6. Verification and evaluation of the results and investigate if the findings can be generalized.
7. Reporting and presentation of the findings and discoveries.

The interviews are typically audio, or video recorded. A full transcription of an interview is a time-consuming task although it provides “rich data.” A solution is to write down keywords and short sentences during the interview and later supplement this with more data by going through the recordings. The risk here is that the researcher notes his or her interpretation of what is being said based on what he or she thinks might be interesting and relevant to the research. Although the data might not be as accurate as a full transcription, this process would be more efficient and less time-consuming. To avoid misinterpretation and increase the reliability and validity of the data from the interview, it is possible to allow the respondent to go through and comment on the results to correct the misunderstandings or misinterpretations.

Reliability, Validity, and Generalization of Research

Reliability and validity are two decisive factors in the quality of research and widely discussed in research methodology literature. Validity refers to the research’s ability to measure what it intends or claims to measure while reliability involves the consistency of a measure, meaning whether the results would be similar if another sample group with different respondents were used. According to Bryman (2015), if a measure is not reliable, it cannot possibly be valid either. Golafshani (2003) pointed out that, although these terms are treated separately in

quantitative research, they are not viewed separately in qualitative research. Cooper and Schindler (2003) stressed that both validity and reliability should be present at the same time to ensure sound research, and they illustrated the relationship between these two terms as in Figure 2-2 using shots at a target as a metaphor

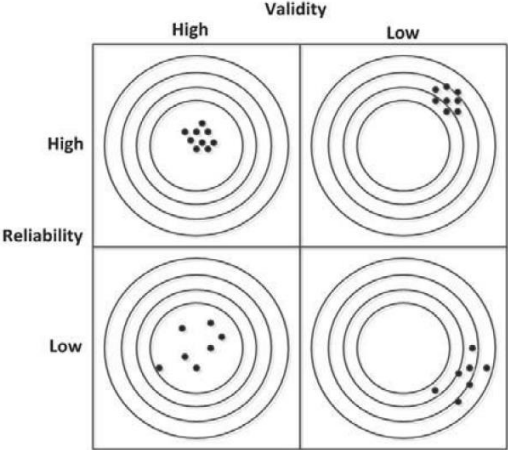


Figure 2-2 Validity and reliability of research (Cooper and Schindler, 2003).

Assuming the center of the target is what the researcher aims for and intends to measure, shots close to the target indicate high validity. However, the reliability of the shooter depends on how close the shots are to each other, as shots close to each other indicate high reliability. Using this metaphor where shots symbolize the registered data points implies that data points that are close to each other can be considered reliable data, while data points measuring the correct measures (close to the center) are considered valid data. Although the metaphor illustrated in Figure 2-2 can be easy to understand in quantitative research, it might be quite hard to relate it to qualitative methods, such as interviews.

According to Kvale and Brinkmann (2009), the reliability of interviews as a qualitative method for data collection pertains to the consistency and trustworthiness of the findings. This is often treated in relation to the reproducibility of the findings, meaning whether the respondents would give a different answer in another setting or to a different interviewer. Validity in interviews refers to the truth, correctness, and strength of a statement. Although measuring what research intends to measure is claimed to be the benchmark for the validity of the research, measuring is not the only source or the only objective for new knowledge. In the context of qualitative

research, validity pertains to the extent to which our observations indeed reflect the phenomena or variable of interest to us.

Neuman (2003) divided the validity of research into internal and external validity. While internal validity concerns few or no errors in the design of the study, external validity refers to whether the results can be generalized or not. Low external validity means that the results apply only to a specific situation, while high external validity means that the results can be generalized to many groups and many projects. Kvale and Brinkmann (2009) further discussed generalizing the findings from interviews. If the findings are evaluated to be reliable and valid, the next question would be whether they are primarily of local interest or whether they can be transferred to other settings and situations. Yin (2012) added construct validity to the list and introduced four tests to judge the quality of the research design by evaluating its construct validity, internal validity, external validity, and reliability. This approach is described further in the last section of this chapter in which the validity and reliability of this PhD work are discussed.

Philosophical Worldviews (Paradigms) in Research

Methodology literature includes several categorizations of various research philosophies. Creswell (2014) proposed four different worldviews, which are widely discussed in the literature: post-positivism, constructivism, transformative, and pragmatism.

Post-positivism holds a deterministic philosophy where causes determine effects or outcomes. The knowledge developed by post-positivists is based on measurements of objective reality that already exist in the world. There are also laws and theories that must be tested or verified so the world can be understood. This worldview has similarities to positivism, which has a long intellectual history. Howell (2012) concluded that the objective of both positivism and post-positivism is an explanation, control, and prediction. While positivists looked for the verification of hypotheses, facts, and laws, post-positivists pursued falsification. The quality of knowledge is measured by internal and external validity, reliability, and objectivity. Value is denied, and scientists are removed from the research. However, both positivist and postpositivist research can be involved in policymaking and change. Giddens (1977) described four claims made by positivists:

- Reality consists of what is available to the senses,
- Science is the primary discipline,
- The natural and social sciences share a collective unity of method, and
- There is a fundamental distinction between fact and value.

Constructivists, according to Creswell, believe that individuals develop *subjective* meanings based on their experiences toward specific objects or things. These meanings are varied, leading the researcher to look into the complexity of views rather than narrowing meanings into a few ideas. This means that the researchers intend to make sense of the meanings others have and inductively develop a theory rather than starting with a theory. Howell (2012) referred to Lincoln and Guba (1985), who stated that, in the constructivist paradigm, the researcher and the researched continually interact and influence one another and that the research project has limited possibilities for generalization. Only temporal and context-bound working hypotheses are possible, and it is impossible to distinguish causes from effects. Finally, the inquiry is value bound. Overall, the axiological position involves subjectivity and the inclusion and acceptance of values and bias.

Neuman (2006) characterized constructivism as a part of *interpretivism* and pointed out that interpretive social science differs from positivism concerning the choice of method but is related to positivism concerning value; hence, interpretative social sciences have a relativistic understanding with “no single point-of-view or value position.” This indicates that interpretivist research can both be value neutral and value laden. The interpretive tradition has its roots in the seventeenth century with Vico (1668–1744). Vico stressed that human and society could not be studied in the same way as inanimate nature is studied. Study of humans and society implies subjective understanding and thus requires a different method of inquiry than that of the natural sciences. Society was not only intellectually different but also subjective and emotional, requiring different models of explanation (McLaughlin, 2011).

The *transformative* worldview arose from researchers who felt that the constructivist stance did not go far enough in advocating for an action agenda to help marginalized people. The research contains an action agenda for social reform and change. This philosophical worldview focuses on the needs of groups and individuals that may be marginalized. Neuman’s critical and feminist philosophies also have similarities to Creswell’s descriptions of transformative worldview. Neuman stated that critical studies of social reality “necessarily contain a moral-political dimension, and moral-political positions are unequal in advancing human freedom and empowerment.” According to (Neuman, 2006) feminist research is “action-oriented research that seeks to facilitate personal and societal change.” This means that the research contains an action agenda for social reform and change as Creswell suggested. Common for all these philosophies is that they all seem to be value laden, and the reality is only knowable through the human mind and has no absolute existence. This brings us further to the discussion on

idealism. According to McLaughlin (2011), idealism asserts that “reality is only knowable through the human mind and socially constructed meanings.” The “ideas” that are confined to the mind is the reality.

Pragmatism has many forms, but for many, pragmatism arises out of actions, situations, and consequences rather than antecedent conditions. In the pragmatism worldview, the researchers use all available approaches to understand the problem rather than focusing on methods. In pragmatism, the truth is what works at the time, and pragmatists have believed in an external world independent of the mind as well as that lodged in the mind. This is in accordance to how McLaughlin (2011) described realism. McLaughlin (2011) explained that realism is based on the assumption that there is an external reality that exists independently of our views and understanding about it. According to Klungseth and Olsson (2013), “Realism is interpreted as problem-oriented, and aims to be value-neutral and real-world oriented without any underlying consciousness.” The term *realism* has therefore been used as an approach in cases where reality has absolute existence, independent of thoughts and ideas.

Section 2.2 Research Methodology Within Value and Value Management

There have been numerous research streams within value in construction, where economic issues, sustainability, and customer satisfaction have been in focus. Value creation, value engineering, and value management are topics that have received increasing interest lately, and a substantial amount of research has been carried out within these fields (Kelly et al., 2015). The first part of this section aims to provide an overview of the available research related to value, value creation, and VM in construction projects with a focus on the research methodology. A literature study was conducted to identify the philosophical worldviews and research approaches in the field and how they have developed over the past three decades. The results of analyzing 47 relevant papers out of several thousand search hits are presented.

In addition to the four mentioned worldviews (constructivism, interpretivism, transformative, and pragmatism) in Section 2.1, other types of “isms,” such as positivism, objectivism, and so on, are discussed in the literature of research methodology. Despite the wide range of definitions and distinctions of philosophical views, a profound look reveals that there is some established common ground. Objectivism and subjectivism have been described as opposites on a continuum with varying philosophical positions aligned between them (Holden and Lynch, 2004). Positivism and all its related definitions have objectivity in common while

interpretivism, constructivism, and their related views primarily have a subjective perspective. At the same time, both objective and subjective research can be value neutral or value laden. They can be issue oriented or problem centered. In both subjective and objective research, the reality can have absolute existence or not.

Alexander (2010) described researchers’ philosophical views in the four categories of positivism, interpretivism, realism, and idealism. These four categories are illustrated in Figure 2-3. This framework will be applied in this thesis to categorize the research philosophies in the field of value creation in construction projects.

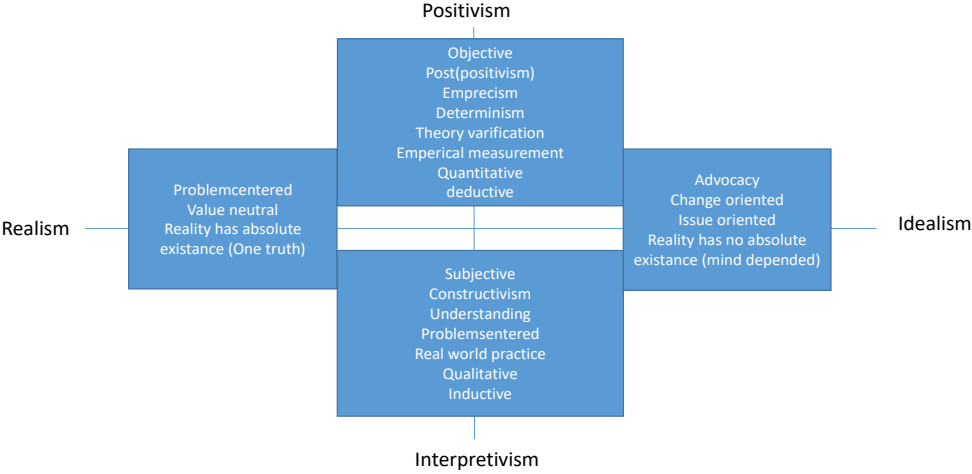


Figure 2-3 Major philosophical worldviews and their characteristics (Haddadi et al., 2017).

The framework in Figure 2-3 is used to map how the philosophical worldviews have been used within the field of value creation in construction. The research was based on a review of scientific articles. The articles are chosen among several thousand articles from the following databases: Emerald, ScienceDirect, Scopus, Google Scholar, and ORIA (a Norwegian search engine for university libraries and numerous publication databases). To identify the articles, search words such as “value creation construction;” “value measurement, buildings;” “buildings, value, clients;” “value, construction projects;” “value creation, buildings;” “value management, construction projects;” and “value measurement, buildings” were used. Relevant publications were chosen using the following criteria:

- Only published scientific articles in the databases mentioned above.
- All publications were in the English language.

- Publications were limited to the period from 1990 to 2016.
- Focus on what creates value in construction projects and how it can be measured.
- Life cycle and sustainability focus was included.
- No focus on production and manufacturing (lean production).
- No focus on infrastructure projects unless the research was relevant for construction projects.
- No books since books can be a combination of research publications and contain several research approaches and philosophies.

The database search using the keywords resulted in several thousand hits. Fifty-five articles were selected by reviewing titles and abstracts based on the mentioned criteria. Five publications turned out to be irrelevant after reviewing the articles, and three had an unclear research methodology. Consequently, the final number of articles that created the basis for the study is 47. Figure 2-4 illustrates the number of publications within each category in this study.

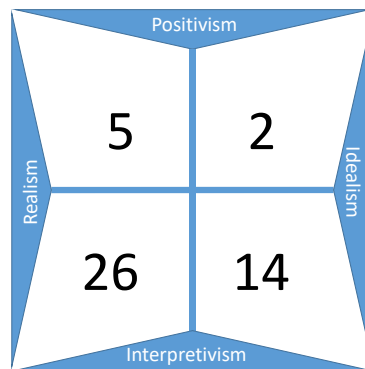


Figure 2-4 Research philosophies within value creation in construction projects (Haddadi et al., 2017).

Although the search was open from 1990 to 2016, the first publication found in the area is from 1994. Figure 2-5 shows the number of publications in each category over the years.

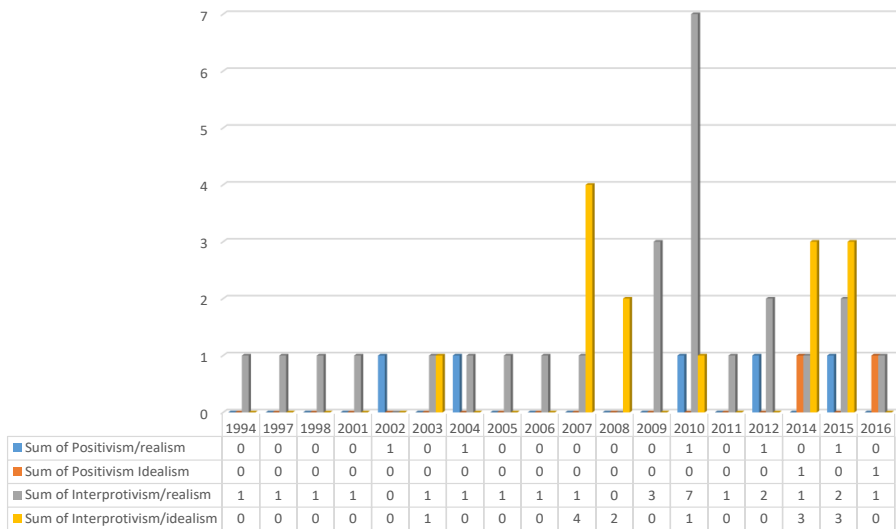


Figure 2-5 Development of research in value and value management (Haddadi et al., 2017).

The results indicate an increasing interest in research within this field, in particular for the last decade. The graph also shows that interpretivism is the dominating philosophical worldview. From 1994 until 2003 and even further until 2007, the central portion of the research within the field was based on interpretivism and realism. After 2007, the idealism worldview in combination with interpretivism increased dramatically.

The results show that 26 out of 47 publications only used one method (17 qualitative and nine quantitative) to conduct the research. Before 2007, 4 out of 9 quantitative research studies were conducted. Twenty publications had two methods, and one publication had three different methods for collecting data. Twenty-one publications used two or more data-collection methods. Case studies are by far the dominating source of data in the field combined with literature reviews. Table 2-2 shows the frequency of utilization of each method in the research of the publications that were studied.

Table 2-2 Methods of data collection in value/value management research (Haddadi et al., 2017).

Data collection	Main Method	Second Method	Third Method	Total
Case-study document and observation	6	1		7
Case-study action research	3	2		5
Case-study interviews	4	2		6
Case-study survey	3	1		4
Interviews	3	1		4
Literature reviews	17	10	1	28
Survey	11	4		15

The results clearly indicate that interpretivism is the dominating philosophical worldview in publications in English within the field of value and VM. This implies that researchers in the field of value creation in construction projects are trying to make sense of a problem within real-world practice and develop a theory or present their subjective understanding of the results. However, it is interesting that the authors of these publications are mainly not social scientists but engineers who are trained to think objectively and are expected to choose positivistic approaches. Although positivism is the stereotypical philosophy within engineering sciences, it is not represented as the fundamental view within the field of value creation in construction projects. The positivist view verifies the theory, generally through empirical measurements. As Figure 2-5 reveals, the research field is still young, and established theories are inadequate in the field to be verified. Even the researchers who have attempted to define the concept of value are not entirely agreeing over a common definition of what value is. Considering that value has been conceptualized as a perception, it is reasonable to believe that studying the concept of value requires a mindset that seeks to understand the meaning that individuals have and make sense of it. This is probably the reason interpretivism is the dominating philosophical view in this field.

As Figure 2-4 illustrates, the vast majority of the publications are based on the interpretivism/realism worldview. This implies that the research is mostly value neutral and problem centered, while seeking to understand real-world practices. However, Figure 2-5 also shows that the idealistic worldview with its issue orientation and advocacy for change has entered the research and escalated over time. A profound look at this type of publication reveals that the escalation has started, as sustainability has become an issue related to value creation. The advocacy for change in these publications is primarily associated with environmental issues and sustainable development of buildings. Another interesting finding is that the positivism in the research is primarily associated with assessment, measurement, and evaluation of processes, partially to increase productivity, rather than with testing and verifying theories.

The interpretivist research philosophy consequently results in an overuse of qualitative approaches of data collection. A case study is the dominating strategy of data collection in the field. One of the characteristics of interpretivist philosophical view is the fact that it addresses real-world problems. Hence, it is not a surprise that case studies are a prominent way of collecting data. The data collecting methods within case studies (interviews, action research, document studies, and surveys) are more or less evenly distributed.

The results show that the research in this field started with the interpretivist view based on realism. This implies that the research has been attempting to deal with real-life problems by understanding the concepts. Publications from the 1990s and early 2000s are mostly about understanding customer value and developing or improving processes to increase project success and the satisfaction of customers. After 2007, the idealistic base has increased in line with increasing interest for sustainability and environmental issues. Interestingly, almost 40% of the publications from 1994 to 2006 have used purely quantitative methods. The number of publications after 2006 with purely quantitative methods is reduced to less than 20% of the total. In addition, the number of publications with mixed methods has increased over the years. This reveals that, due to the increasing interest around the subject and the increase in research publications, the philosophical view around how to do research has also changed. This might indicate that the understanding of value and value creation started as a deterministic approach. The researchers have attempted to determine what value is and what creates value, but over time, the questions have moved toward how to define value and how to create it.

Section 2.3 Research Design of the Thesis

According to Creswell (2014), the approach to research consists of three main elements:

- Philosophical worldview,
- Research design, and
- Research methods.

The general theory explained and discussed in the previous section is used as a reference for explaining the research design of this PhD work. The purpose, my philosophical worldview, and the overall research design for this thesis are discussed and explained in this section. The publications, their publication channels (journals and conferences), the research method for each publication, and the research design for answering each research question are also presented in this section. At the end of the section, the reliability, validity, and generality of my research are discussed and reflected over.

Purpose of This Research

The purpose of research can be exploratory, descriptive, analytic, or predictive. The exploratory approach aims to provide a better understanding of phenomena. This approach has been utilized for gaining a better understanding of what value is, how it is created and what creates value for users and owners of the buildings to answer RQ1. The descriptive approach has been utilized to explain and discuss the findings to identify and classify the elements or characteristics that

create value. Using the explanatory approach, I identified the elements that value creation depends on for how value is created to answer RQ2. Finally, the predictive approach is utilized to structure the provided knowledge base and suggest the value enhancing measures to answer RQ3.

My Philosophical Worldview and Research Design

The philosophical worldview (paradigm) of this research relates to the views from constructivism. Additionally, this research is value neutral and problem centered, meaning it contains evident elements of realism. Accordingly, the researcher is attempting to subjectively make sense of the collected data and deduct a theory rather than starting with a theory. This also implies that qualitative and mix methods are the dominant research process in my work. None of the studies during this PhD work are merely quantitative research, although quantitative approaches have been utilized in some studies in combination with qualitative methods. Using the approach suggested by Blumberg et al. (2011), the overall design of the research is illustrated in Figure 2-6.

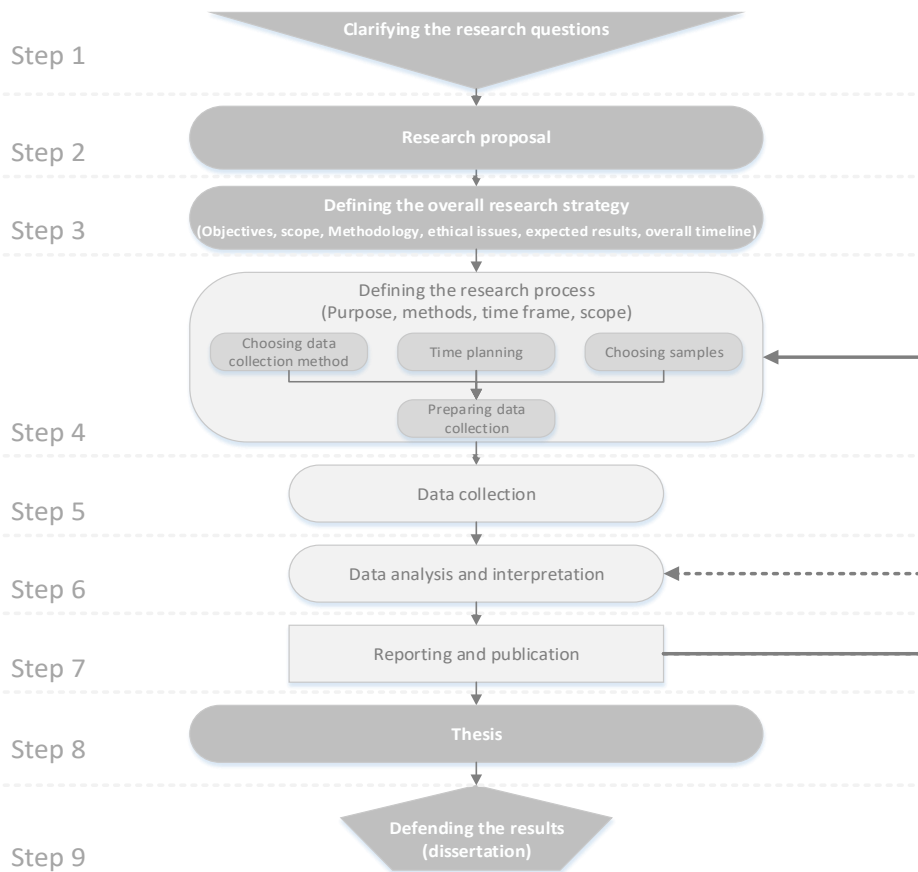


Figure 2-6 Overall research design of this PhD (based on Blumberg et al., 2011).

The overall research questions of this work were anchored in the identified knowledge gap and classified as a result of discussions between me, the managers of the research projects OSCAR and SpeedUp, and my supervisors. The background for this PhD work and how the research questions were defined is discussed in Chapter 1 “Introduction,” and they have formed the research strategy for this thesis.

The conducted studies resulted in 14 publications throughout the PhD work. A large number of publications are a result of the strategy on involving master students for collecting data and developing ideas. This strategy was selected to:

- Increase the amount of data;
- Increase the reliability of data since higher capacity enabled using different sources and methods of data collection for triangulation;

- Increase the validity of data by dividing the research into smaller and more specific pieces.

Moreover, 9 of the 14 publications are used in composing this thesis. These are the publications in which I had an active role throughout the whole research. The actual act of collecting data, such as the data collection through interviews or the questionnaires, was performed by master students in Publications 2, 8 and 9. However, I have had an active role in designing the research, selecting sources of literature, making the questionnaires, preparing the interview guides, analyzing the results, and drawing conclusions in the publications. Table 2-3 these nine publications, the authors, and the titles of the publications in addition to where they were presented and published.

Table 2-3 Publications used in the thesis.

No.	Authors	Title	Journal/ Conference	Publication Channel	Status
1	Amin Haddadi, Agnar Johansen, Svein Bjørberg	“Best Value Approach (BVA) - Enhancing Value Creation in Construction Projects”	<i>Business System Research</i>	<i>Journal of Business System Research</i> Double-blind review	Published
2	Amin Haddadi, Agnar Johansen	“Value Proposition in Different Types of Buildings- Characteristics and Means”	<i>The Journal of Modern Project Management</i>	<i>The Journal of Modern Project Management</i> Double-blind review	Accepted for publication
3	Amin Haddadi, Agnar Johansen, Bjørn Andersen	“A Conceptual Framework to Enhance Value Creation in Construction”	<i>Projman2016</i>	<i>Procedia Computer Science</i> Double-blind review	Published
4	Amin Haddadi, Alenka Temeljotov Salaj, Margrethe Foss, Ole Jonny Klakegg	“The Concept of Value for Owners and Users of Buildings -A literature study of value in different contexts”	<i>IPMA2015</i>	<i>Procedia - Social and Behavioral Sciences</i> Double-blind review	Published
5	Amin Haddadi, Ali Hosseini, Agnar Johansen, Nils Olsson	“Pursuing Value Creation in Construction by Research -A Study of Applied Research Methodologies”	<i>Projman2017</i>	<i>Procedia Computer Science</i> Double-blind review	Published
6	Amin Haddadi, Olav Torp, Jardar Lohne, Ola Lædre	“The link between stakeholder power and value creation in construction projects”	<i>IGLC 2016</i>	Conference proceedings Double-blind review	Published
7	Svein Bjørberg, Anne Kathrine Larssen, Alenka Temeljotov Salaj, Amin Haddadi	“Optimizing building design to contribute to value creation”	<i>IPMA2015</i>	<i>Procedia - Social and Behavioral Sciences</i> Double-blind review	Published
8	Ola Bråten Lund, Amin Haddadi, Jardar Lohne, Svein Bjørberg	“Sustainable Planning in Refurbishment Projects – An Early Phase Evaluation”	<i>SBE2016</i>	<i>Energy Procedia</i> Double-blind review	Published
9	Jon Harald Bremdal Amin Haddadi, Svein Bjørberg, Jardar Lohne, Ola Lædre	“Value Creation in Design-Build Projects The Role of the Designers”	<i>IPMA2017</i>	<i>Computer Sciences and Information Technologies</i> Double-blind review	Published

The research process was iterative. Steps 4 to 7 illustrated in Figure 2-6 were repeated for each study. Each study had its objective, definition of the research process, method of data collection, and plan for analyzing data and presenting the results. Table 2-4 shows the research method and objective for each publication, and Figure 2-7 illustrates which one of the three research questions is being addressed through each publication. The detailed description of the research methods is found in each publication.

Table 2-4 Research method and objectives of each publication.

No.	Research Method	Objective/Focus
1	Two questionnaires (837 and 1,034 respondents); focus groups with 6-8 practitioners, 8 semi-structured interviews; 2 case studies with 11 semi-structured interviews combined. Literature study	Offering a framework for enhancing value creation in construction projects by addressing: <ul style="list-style-type: none"> - The principles that must be considered in the front end of the project to secure maximum value creation for stakeholders in a project lifetime perspective; - How these principles can be structured in a framework to maximize the project's value creation.
2	Three studies were conducted: Study of office buildings: literature study, questionnaire (378 respondents), 13 interviews, Study of university campuses: literature study, questionnaire (879 respondents), 15 interviews Study of hospitals: literature study, case study of four Norwegian hospitals.	Understanding and identifying the elements that contribute to value creation in hospitals, offices, and university campuses and the similarities and differences in elements that create value for each of these building types.
3	Literature study	Using the findings from the research so far to outline a framework for identifying and understanding the strategic objectives of owners and users and using this knowledge to optimize the design of buildings to enhance the value creation of projects.
4	Literature study	Identifying how value is defined in different contexts and how it can be related to buildings and construction projects.
5	Literature study	Provide an overview of the available research related to value, value creation, and value management in construction projects with a focus on research methodology by assessing which philosophical worldviews (paradigms) the research is based on, what the research methods were, and how this has been developing over the years.
6	Literature study Five semi-structured interviews	Understanding what the sources of power are in a construction project, how different stakeholders relate to these sources, and which affects the sources of power have on value creation in a project.
7	Literature study Focus group interviews (workshops with two different workgroups of 10-12)	Identifying and categorizing the general characteristics that contribute to value creation and means that motivate value-creating solutions in construction projects.
8	Literature study Case study using questionnaire (44 respondents and 10 semi-structured interviews)	Obtaining an understanding of what the early phase of a construction project is and what it should include for achieving success in projects (in particular for refurbishment projects).
9	Literature study Case study using document studies and nine semi-structured interviews and one focus group interview	Providing an understanding of how designers contribute to value creation in design-build projects and how their contribution to value creation can be maximized.

Table 2-5 explains my contribution to each publication.

Table 2-5 Published paper and my contribution.

No.	Authors	Title	Contribution in Publication
1	Amin Haddadi, Agnar Johansen, Svein Bjørberg	“Best Value Approach (BVA) – Enhancing Value Creation in Construction Projects”	First author Defining the research objectives, planning the research, collecting data, analyzing data, draw conclusions together with the co-authors, write publication.
2	Amin Haddadi, Agnar Johansen	“Value Proposition in Different Types of Buildings- Characteristics and Means”	First author Defining the research objectives, planning the research, collecting data, analyzing data, draw conclusions together with the co-author, write publication.
3	Amin Haddadi, Agnar Johansen, Bjørn Andersen	“A Conceptual Framework to Enhance Value Creation in Construction”	First author Defining the research objectives, planning the research, collecting data, analyzing data, draw conclusions together with the co-authors, write publication
4	Amin Haddadi, Alenka Temeljotov Salaj, Margrethe Foss, Ole Jonny Klakegg	“The Concept of Value for Owners and Users of Buildings – A literature study of value in different contexts”	First Author Defining the research objectives, planning the research, collecting data, analyzing data, draw conclusions together with the co-authors, write publication
5	Amin Haddadi, Ali Hosseini, Agnar Johansen, Nils Olsson	“Pursuing Value Creation in Construction by Research – A Study of Applied Research Methodologies”	First Author Defining the research objectives, planning the research, collecting data, analyzing data, draw conclusions together with the co-authors, write publication
6	Amin Haddadi, Olav Torp, Jardar Lohne, Ola Lædre	“The link between stakeholder power and value creation in construction projects”	First author Defining the research objectives, planning the research, collecting data, analyzing data, draw conclusions together with the co-authors, write publication
7	Svein Bjørberg, Anne Kathrine Larsen, Alenka Temeljotov Salaj, Amin Haddadi	“Optimizing building design to contribute to value creation”	Co-author Contribution to collecting data, participating in defining the objectives, and participating in outlining the conclusions together with the co- authors, quality assurance of the publication
8	Ola Bråten Lund, Amin Haddadi, Jardar Lohne, Svein Bjørberg	“Sustainable Planning in Refurbishment Projects – An Early Phase Evaluation”	Co-author Contribution in defining the objectives, supervising the research design and data collection, participating in discussions for analyzing the data with the co-authors, quality assurance of the publication.
9	Jon Harald Bremdal Amin Haddadi, Svein Bjørberg, Jardar Lohne, Ola Lædre	“Value Creation in Design – Build Projects The Role of the Designers”	Co-author Contribution in defining the objectives, supervising the research design and data collection, participating in discussions for analyzing the data with the co-authors, quality assurance of the publication.

Research Design for Answering Each Research Question

Different studies and publications have been planned and conducted to answer each of the three research questions. The design and methodology for each publication are clearly described in enclosed publications. Figure 2-7 illustrates how the publications are used to answer the three research question.

Research question	Publications				
1	Publication no. 3	Publication no. 4	Publication no. 5		
2	Publication no. 2	Publication no. 6	Publication no. 7	Publication no. 8	Publication no. 9
3	Publication no. 1	Publication no. 3			

Figure 2-7 Publication used to answer each research question.

RQ1: How is value conceptualized and defined in construction projects?

To answer this research question, a deductive logic was applied. Data were gathered through observations and the study of the existing knowledge and theory was developed through finding a pattern in the observations and making a tentative hypothesis. The main part of the data was collected through literature studies since the goal was to gain an understanding of how the value is conceptualized. Three publications (Publications 3, 4, and 5) had significant contributions in answering the first research question.

First, a literature study was conducted (Publication 4) to gain an understanding of how value is conceptualized in different contexts. Marketing and consumer economics, manufacturing and production, sociology and human behavior, and real estate and manufacturing were the studied contexts. The purpose of this research was to explore whether there is common ground in the definition of value in these contexts and how this common ground can be related to construction projects.

Another extended literature study was conducted to position the state of the art in research on value and value creation (Publication 5). This research intended to provide an understanding of how research is being conducted in this field and how other researchers are approaching this

field from their philosophical worldviews and perspectives. The study also provided an overview of the development of the research in the field over the past years.

A further understanding of the prerequisites for value creation was obtained through a literature study that attempted to relate the results of the research so far and the concept of success in a project to investigate how value can be created (Publication 3). This study also explored the field of VM and positioned my research in relation to this field.

RQ2: What are the characteristics of value in construction projects?

A wide range of studies was conducted to answer this question. Two working groups of 10-12 practitioners, researchers, and students were selected to participate in workshops (Publication 7). Work Group 1 was asked to provide value-creating elements within each of the four identified categories in the literature (economics, social, environmental, and physical). Work Group 2 was asked to work on identifying the significant means to value creation and categorize them into groups. After this workshop, the research was split into two streams. The first stream focused on characteristics and means of value creation in different types of buildings (Publication 2), the second one assessed the project management aspects that were identified to have a contribution in value creation (Publications 6, 8, and 9). Figure 2-8 illustrates this.

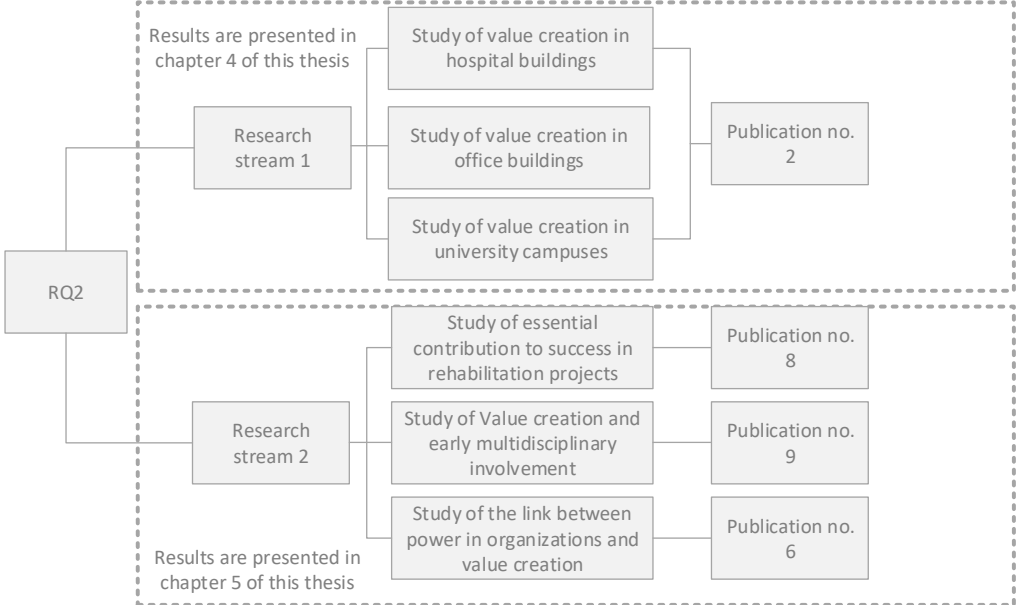


Figure 2-8 Studies and publications associated with answering RQ2.

The first stream resulted in three studies where hospital buildings, university campuses, and office buildings were studied. There are other types of buildings that could have been studied during this research, but these three were chosen due to the limitations of time and resources and the fact that these types of buildings can represent a large variety of building types with regard to complexity, business purpose, required flexibility, and strategic owner perspective.

The study on hospitals was conducted between January and June 2015 (Publication 2). The focus of this study was to identify what creates value for users within hospital buildings and which strategies should be present to create value. Data were collected through a case study of four Norwegian hospital projects and an administrative governmental organization “*Sykehusbygg*” (SBHF) established in 2014 for planning and building hospitals. The hospitals were selected on the basis of their completion dates, spanning from 2000 to 2015 with the predesign phase starting 12 to 15 years earlier. The literature review aimed to create a theoretical framework within the topic. Internet queries through library databases and search engines constitute the primary source of information in this literature study. Conducting a questionnaire for identifying value-creating qualities was considered but discarded as the end users of the hospitals are patients and healthcare personnel with a large variety of needs. Moreover, hospital buildings contain a substantial number of functions with different needs and user requirements. The case study contained a document study, four interviews, and a workshop. The document study aimed to identify the background for each project and the strategies for value creation. At three of the hospitals and SBHF, open-ended semi-structured interviews were conducted. For the last hospital, four employees from the FM department were invited to participate in a workshop. The objective of the workshop and four in-depth interviews was to map the understanding of the concept of value and what creates value as well as gathering experiences regarding strategies for value creation. The respondents had backgrounds from design and project management, FM services, and the predesign phase of projects. The interviews were recorded, transcribed, organized, and analyzed.

Between January and June 2016, a study to investigate the value creation in university campuses was conducted (Publication 2). The data were collected through a literature review, two questionnaires, and semi-structured interviews. The literature review was conducted with two purposes in mind: First, to identify the existing research and knowledge within the topic of value and value creation in general and within value creation in university campuses in particular and second, to create a theoretical framework for the research.

Seven Norwegian universities participated in one of the questionnaires, resulting in a total of 879 respondents (337 students and 541 staff). The universities distributed the questionnaire through different channels. This prevented us from knowing the exact number of people who received the questionnaire, which does not influence the results nor the conclusions of the research since the number of respondents is high. The questionnaire, which also provided data for this article, aimed at collecting data about value enhancing elements from two different user groups regarding university buildings: students and employees (staff). As the literature pointed out, the general picture of what users need in a university campus is complicated since different student groups, such as medical students, need different facilities than civil engineering students, for instance. Thus, the focus of this questionnaire has been on campus facilities rather than individual buildings. The data were analyzed by reviewing the answers and calculating the mean and standard deviation for quantitative data.

The semi-structured interviews were an in-depth investigation of the two universities that had the highest number of respondents in the questionnaire. Both universities had been through major construction projects during the past 15 years. The objective of the interviews was further assessment and evaluation of the results of the questionnaire. Fifteen experts who had participated in the construction projects of the two universities were identified and interviewed. The interviews were recorded and afterwards transcribed. The transcriptions were organized and later analyzed, and the results were presented and compared to the results of the questionnaire.

The study of office buildings was conducted between January and June 2016 and the data were collected through a literature study, a questionnaire and semi-structured in-depth interviews (Publication 2). The questionnaire had 378 respondents. Thirteen key actors in moving or office refurbishment projects of three office buildings were interviewed. The questionnaire aimed to identify how the end users perceive value-creating elements and what is essential for them to have a productive day. The questions were determined based on findings from the literature study considering what could be of interest to users in an office context.

While the questionnaire had its focus on user requirements and the attractive qualities that enhance value in office buildings, the interviews focused on the processes in recent construction, refurbishment, or moving projects in those office spaces that can contribute to value creation.

The quantitative data from the questionnaire were analyzed by calculating the mean and standard deviation. These values would indicate how the respondents evaluated the qualities and how divided the perceptions are.

The interviews were recorded and transcribed later. The transcriptions were analyzed and organized and the relevant data were extracted as a result of the qualitative part of the study.

The study of university buildings and office buildings contained data elements in semi-structured interviews regarding the user-involvement processes. These data were later used in the second stream.

For the second stream, three studies were conducted to investigate three aspects of management that can influence value creation in projects. These aspects were identified during the research on the first stream and included the following:

- i) Focus on multidisciplinary project teams in early phases of a project;
- ii) Power in organizations and its link to value creation;
- iii) User involvement.

The first study in Stream 2 was conducted between January and June 2016 (Publication 8). The primary purpose of the study was to identify the essential contributions to project success in the early phase of a project. Rehabilitation projects were chosen as cases in this study since these projects have a complicated early phase tangled with uncertainty and inadequate information about the scope. The data were collected through a literature study, a questionnaire with 44 respondents, and a case study of two cases involving 10 semi-structured interviews.

The second study in Stream 2 was conducted between January and June 2017. The overall purpose of the study was to investigate the value creation in projects, with a focus on the role of the design team, where the contractors are involved from the early phase, such as in design-build (DB) projects. The data were collected through a literature study and a case study of three case projects through document studies, nine semi-structured interviews, and one focus group interview. The whole study is presented in Publication 9.

The third study of Stream 2 was conducted between January and June 2016. This study's objective was to investigate the distribution of power between the main stakeholders in a project, which sources of power are most common in construction projects, and the effects these sources have on value creation in a project. The data were collected through a literature review and five semi-structured interviews. The whole study is enclosed in Publication 6.

User involvement was also investigated as part of the management aspects in the second stream. The data were provided by the same studies that investigated value creation in university campuses and value creation in office buildings. The data were collected by asking questions regarding user involvement to the interview guides.

RQ3: How can we enhance value creation in construction projects?

This research question required structuring the findings so far and the development of a sophisticated research design that can test the validity and reliability of the findings. The spinoff was developing a conceptual framework. The conceptual framework was developed through the following steps based on Jabareen (2009).

1. Identifying the concepts;
2. Mapping the selected data source and extensive reading and categorizing of the selected data;
3. Deconstructing and categorizing the concepts;
4. Synthesis, resynthesize, and make it clear by constructing the framework;
5. Validating the conceptual framework.

This approach can constitute reasonable insight and understanding of the concepts (Publication 3). It was essential to anchor the theory into reality by validating the framework. Elements such as how intuitive the framework is, whether it contains all the required elements, the practitioner's perception of the effect of the framework, and its usability were of significant concern. Van de Ven (2007) presented the engaged scholarship diamond model, an adaptable iterative approach to research design. The approach involves developing a research design to build a theory, testing the theory in reality by formulating a problem, and engaging expert with experience and knowledge to solve the problem. Figure 2-9 is adapted from Van de Ven (2007) and illustrates this approach, starting with research design.

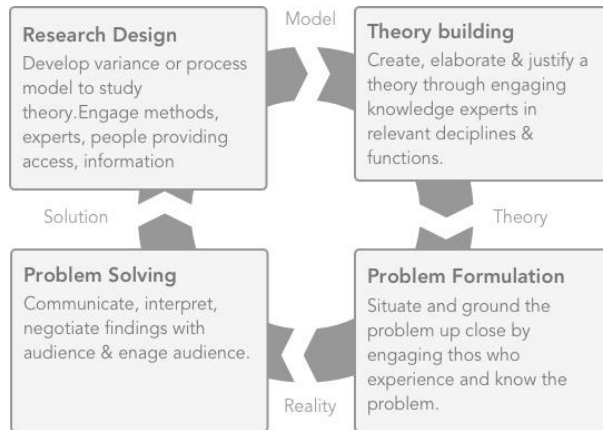


Figure 2-9 Engaged scholarship diamond model (Van de Ven, 2007).

This research strategy is an iteration between inductive and deductive logic and can therefore be considered as an abductive approach. Inductive theory building from cases produces new theories from data, where deductive theory testing completes the cycle using data to test the theory (Eisenhardt and Graebner, 2007). During this part of the research, the theories are developed by defining different drafts of the framework. The drafts of the framework are verified in two steps. The first draft was verified using methodological triangulations using questionnaires, interviews, and focus groups. The second draft was thereby developed and verified after that using two case projects. The case projects were two large hospital projects, one in San Francisco (USA) and one in Tønsberg (Norway). Figure 2-10 illustrates the design of this part of the research toward answering RQ3.

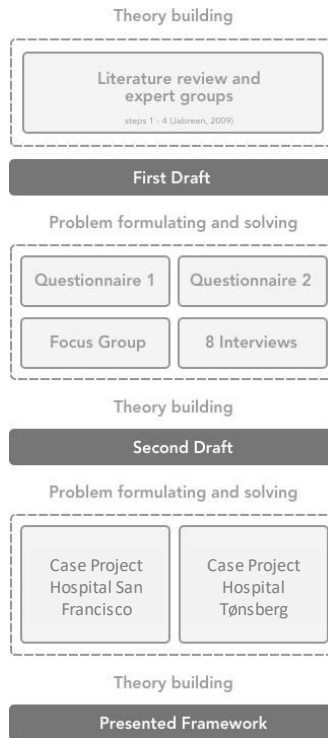


Figure 2-10 Research design for answering RQ3.

As the quantitative part of data collection, results from two questionnaires were analyzed. The first questionnaire focused on the front end and early phase of the projects, while the second investigated the delivery models and their effects on projects. The qualitative part involved an in-depth study of the results from the questionnaires through a workshop with two teams of six to eight practitioners and researchers and interviewing eight practitioners within different trades. The focus group workshop was used to get feedback on results from the first questionnaire. Eight semi-structured interviews were conducted to verify the results from the second questionnaire.

Two large hospital projects were used as cases in testing the first draft of the framework. The final framework is presented in Chapter 6 and Publication 1. The aim of engaging these projects was to evaluate and improve the framework and to investigate what challenges the projects encountered during the early start and production phases. The data collection included semi-structured interviews and document studies of reports, plans, and documents that could shed light on the design, engineering, and execution phases.

The first case was the Van Ness and Geary Campus project, which is a hospital project in San Francisco. With a total cost of over 1 billion USD and a total area of approximately 92,000 m², the project is considered one of the most significant hospital projects in the Bay Area. The project was executed as an integrated project delivery, where the contractor, design team, and suppliers were involved together during the early stages of the project. During this research, the project was going through its execution phase. Seven key resources of the project were interviewed throughout the study, including the owners, designers, and contractors. The interviewees were asked different questions based on their areas of expertise. The primary objective of the interviews was to identify which challenges were encountered during the project, how the goals and priorities were set, how they were steering toward them, how active the involvement of different stakeholders had been, what they would do differently, and what the success factors were considered to be in the project. Relevant findings from the interviews were used to improve the framework.

The second project was Tønsberg Sykehus in Norway, which is the first public project in Norway executed as an integrated project delivery as execution model. The hospital was planned to have a total area of 42,000 m² with a total cost of 2.5 billion NOK (approximately 300 million USD). During the research, the project successfully completed the concept phase. The contractor and design team were procured, and early stages of the design/feasibility phase had already started. The focus in the interviews for this case was on the challenges that the team encountered in the early phase and how they evaluated the results from the concept phase and feasibility phase so far. Four resources were interviewed, including the head of the architecture team, the head of the design team, the project manager for the owner, and a user representative.

Chapter 3

Value in the Context of Construction Projects

“Strive not to be a success but rather to be of value.”

Albert Einstein

Chapter 3 Value in the Context of Construction Projects

This chapter provides an overview of the existing concepts, literature, and theories that are relevant to this PhD work. Section 3.1 provides an introduction to definitions and conceptualization of value in different contexts. At the end of the section, the theoretical knowledge from these contexts is related to the concept of value in the context of buildings and construction projects. Section 3.2 follows up the definition of value and relates it to value creation and project success by presenting theories regarding how value can be created, how success in projects is achieved, and the relationship between project success and value creation. Section 3.3 discusses value creation in different types of buildings, and Section 3.4 provides an overview of existing VM models and standards. Finally, Section 3.5 summarizes the theoretical background and synthesizes the findings in the literature.

Section 3.1 Concept of Value in Different Contexts

One of the oldest documented definitions of value points to Aristotle (fourth century BC) who distinguished between two meanings of value: “use value” and “exchange value” (Fleetwood, 1997). The conceptualization of value was brought further in manufacturing and economics by Adam Smith (1700s), who introduced “productive activities” as a concept. His focus was on activities that contribute to exchange value through the manufacturing and distribution of tangible goods. The exchange value of a good is represented by the price that consumers are willing to pay (Vargo et al., 2008). This implies that productive activities are those that increase the consumers’ willingness to pay for a good (more buyers) or activities that result in a consumer’s willingness to pay more for a product (higher prices). There has been extensive research on what these productive activities can be during the last century. Henry Ford confirmed the significance of focus on customer value and its importance for industrial manufacturing in 1926 by stating that focusing on organizing the industry to serve people is not in conflict with the profitability of the industry (Ford and Crowther, 1926).

Research has pointed in different directions on how to streamline production processes based on value. Although this can suggest streamlining toward higher productivity, it seems that the conceptualization of value in manufacturing has its emphasis on what consumers need and how to reduce waste, which is defined as “non-value-creating” activities.

Womack and Jones (1996) stated that value can only be defined by the ultimate customer. Moreover, it is only meaningful when expressed in terms of a specific product (a good or a service, and often both at once) which meets the customer's need at a specific price at a specific time.

The importance of the customers in the conceptualization of value led me to a review of research in the field of marketing and consumer economics.

Although the value concept frequently appears in services marketing, the most basic and precise definition of the value concept is found in the literature on pricing (Ravald and Grönroos, 1996). Khalifa (2004) pointed out that many authors have acknowledged the difficulty of defining value since customer value is a dynamic concept and evolves.

Price-based conceptualization of value seem to be a basic and simplified definition of value. Zeithaml (1988) pointed out that perceived value is subjective and individual and hence varies among consumers. She defined customer-perceived value as the customer's overall assessment of the utility of a product based on the perception of what is received and what is given. Zeithaml (1988) noted four types of consumer definition of value:

- Value as low price,
- Value as the quality obtained for the price paid,
- Value as what the customer obtains for what he or she sacrifices, and
- Value in whatever the consumer wants in a product or service.

Khalifa (2004) referred to this research stream as "benefit/cost ratio models" and pointed out that these models define value as the difference between the customer's perception of benefits received and sacrifices incurred. Sánchez-Fernández and Iniesta-Bonillo (2007) referred to the price-based research stream as "Monroe's research stream" and mentioned that this research stream led to the initial conceptualization of value by Dodds et al. (1991) as a "the cognitive trade-off between perceptions of quality and sacrifice."

Although the three latter notions are directly related to the price-based research stream, Zeithaml's embracement of "what consumers want in a product or service" points toward product attributes other than price and the contribution of these attributes to the perceived value. The last definition also reveals a focus on the utility and functional aspects of perceived value. This theory results in another research stream, which is referred to as the mean-end theory.

Means-end theory addresses the challenge in conceptualizing value only by attributes like quality, worth, benefit, and utility, considering that these terms are not well defined themselves. Woodruff (1997) illustrated that value can be perceived in three different levels. The lowest level is the product attribute and the performance of the product attribute. The desired consequence of the product in use is in the middle and goals and purposes are places at the highest level. This means-end theory is based on the customer value hierarchy proposed by (Woodruff and Gardial, 1996). The customer value hierarchy suggests the three hierarchical levels of value (attributes, consequences, and desired end state) and states that the higher levels are ends that are achieved by the lower level means. Figure 3-1 illustrates the different levels of perceived value according to Woodruff (1997).

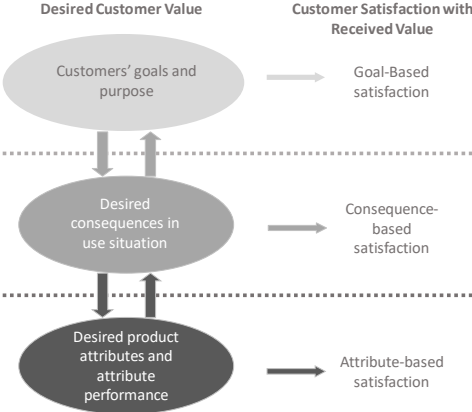


Figure 3-1 Hierarchical levels of perceived value (Woodruff, 1997).

Khalifa (2004) argued that mean-end models are based on the assumption that the customer’s reason for acquiring and using products or services is the achievement of favorable ends. The means-end theory is highly relatable to the construction industry and buildings. A building can possess attributes like quality, esthetics, and functionality, but the perceived value, based on Woodruff’s theory, would also depend on which consequences these attributes have for the user and whether these consequences can contribute to achieving the goals and objectives that the customer or owner have for the building.

Multi-component/multidimensional models conceive perceived value as a construct of several interrelated attributes or dimensions that result in a holistic representation of a complex phenomenon (Sánchez-Fernández and Iniesta-Bonillo, 2007). The *consumption value model* by Sheth et al. (1991), Babin’s *utilitarian and hedonic value mode* (Babin et al., 1994), the *want*,

worth, need model (Kaufman, 1998), and *Holbrook's three dimensions of value* (Holbrook, 1999) are among the acknowledged models and theories within the multidimensional models.

Sheth et al. (1991) introduced five consumption values that influence the consumer's choice. In addition to "functional value" and "emotional value," Sheth introduced "epistemic value," "conditional value," and "social value." Social value is acquired through association with, for example, positive or negative stereotypes, social images, and cultural groups. The product's ability to arouse curiosity, provide novelty, and satisfy a desire for knowledge creates epistemic value. Conditional value represents the fact that some choices depend on the circumstances and situation that a customer is facing at the time of making the decision (Sheth et al., 1991).

Babin et al. (1994) simplified the scale for assessing consumer's evaluation of value in two dimensions "utilitarian value" and "hedonic value." Utilitarian value, like Sheth's functional value, refers to functional, cognitive, rational, instrumental, and a means-to-an-end type of value. The hedonic value, on the other hand, reflects the emotional, experiential, and effective value of a good or service and can be compared to Sheth's emotional value.

Kaufman (1998) highlighted three elements as the principles for value: a) esteem value (want), b) exchange value (worth), and c) utility value (need). While esteem value or "want" is described as what invokes a buyer's desire to own only for the sake of ownership, the performance and physical characteristics of the product are described by the utility value or the need element. The reason the product is in the buyer's interest and how and when it will be used is the exchange value or worth (Kaufman, 1998). Esteem value refers to the same aspects as Babin's hedonic value and Sheth's emotional value, while utility value is comparable with Babin's utilitarian value and Sheth's functional value. Exchange value reminds us of the price-based theories where the relationship between what the buyers obtain for what they give is in focus.

Holbrook (1999) defined value in three dimensions:

- Extrinsic vs. intrinsic,
- Self-oriented vs. other-oriented, and
- Active vs. reactive.

While extrinsic follows the mean-end thinking and refers to an object's value as a means to achieve an end, intrinsic refers to an object's value for its own sake. Self-oriented vs. other-oriented involves whether one drives the value for its own sake, or it is sought for others. The third dimension refers to how a subject and an object, such as a consumer and a product or a

service interact with each other. Active implies that the consumer’s activity on a product or service results in value, while reactive means the product or service affects the consumer without the consumer’s active engagement (Holbrook, 1999). Holbrook’s approach is the most comprehensive approach since it captures the economics, social, hedonic, and altruistic components of perceived value, although the complex structure complicates capturing certain types of value, such as ethical value and spiritual value (Sánchez-Fernández and Iniesta-Bonillo, 2007). Table 3-1 summarized the mentioned multi-component/multidimensional models.

Table 3-1 Multi-component/multidimensional models of value.

Model	Source	Elements
<i>Consumption value model</i>	Sheth et al. (1991)	Functional Value Emotional Value Epistemic Value Social Value Conditional Value
<i>Utilitarian and hedonic value mode</i>	Babin et al. (1994)	Utilitarian Value (Functional Value) Hedonic Value (Emotional Value)
<i>Want, worth, need model</i>	Kaufman (1998)	Esteem Value (Want) Exchange Value (Worth) Utility Value (Need)
<i>Holbrook’s three dimensions of value</i>	Holbrook (1999)	Extrinsic vs. Intrinsic Self-oriented vs. Other-oriented Active vs. Reactive

Dittmar (1992) presented a comprehensive explanation of value that can be related to how users and owners of buildings perceive value from the standpoint of “Social psychology of material possession.” Dittmar’s explanation does not attempt to conceptualize perceived value as seen in marketing and consumer economics. However, almost every factor in his explanation can be related to the theories in marketing literature, especially Holbrook’s (1999) typology. Table 3-2 illustrates the factors to know.

Table 3-2 Value factors (Dittmar, 1992).

Factors	Examples
Intrusive qualities of objects	Permanence, economy, financial evaluation, rarity, esthetics
The instrumentality of the qualities of objects (what the object qualities can be used for)	Enabling social contacts, entertainment, relaxation, freedom, independence, financial safety, information, knowledge, privacy or loneliness
Effort needed for the acquisition and maintenance	Availability, reliability, cost
Emotional comfort related to the property	Emotional attachment, regulator of emotion, escapism, emotional 'therapy,' comfort in safety, self-confidence
Manner of self-expression	For oneself, for others, individuation, as a symbol of future personal aims or of personal skills and capacities
Personal values	Social, political, economic, cultural
History	In relation to events and places, in connection with the past, as a symbol of continuity or a symbol of the relationship with other people, companies, and groups

Research has also been conducted on the concept of value in the context of real estate and FM. From the FM focus on customer value in the business relationship, Eggert et al. (2006) described value as the trade-off between product, service, know-how, time-to-market, social benefits, price, and process costs in the supplier relationship. Although this description can remind us of price-based theories, it contains elements of both the multidimensional approach and adds the collaborative aspect of value creation to the discussion. Jensen et al. (2013) stated that the key learning point is that the success of a collaborative relationship leads to the success of value delivered to the stakeholders.

Coenen et al. (2012) have a multidimensional approach, as observed in the marketing literature. Besides the known concepts of exchange value and use value, he noted “environmental value,” “relational value,” and “financial value” as particular dimensions of value in FM. They also proposed the FM value network as a network of relationships that create perceived value among key stakeholders. From the concept of value- adding management, which focuses on the relationships between FM and the core business at different levels (strategic, tactical, and operational), they argued that the relationships with the stakeholders should be managed differently at each level. The strategic level has its focus on the whole corporation and should have a business orientation. This requires involving stakeholders at the highest management level in a call for joint decision making. At the tactical level, the orientation is toward the customer where the specific needs of each business unit are in focus. On the lowest level, there should be a service orientation where the individual user needs are in focus.

Although different theories and research streams are applied in different contexts to conceptualize value, the common ground is the focus on the customers and users. Womack and Jones (1996) stated that the real value of a good or service can only be defined by the ultimate customer. The ultimate customer in a construction project can be complicated to define. The owner of the building is considered the suppliers' customer in a construction project, but the businesses and their employees/clients who use the building can also be considered ultimate customers. How the value is perceived by the users also depends on whether the core business in the building is considered the user or the employees and clients of the core. Womack and Jones (1996) explained further that value is only meaningful when it is expressed in terms of a specific product that meets the customer's needs at a specific price at a specific time. Although this leads us to the individuals using the building as the end users, the fact that every stakeholder has his/her own value perception cannot be neglected.

According to Samset (2003), the owners should focus on the long-term perspective of the building, users focus on the effects of the project through using the product, and suppliers focus on deliverables or outputs from the project that are needed for the project to be successful. The owner's prerequisite to create value can be summarized in the profitable/optimal operation of the building and fulfilling the customer's needs. The suppliers, based on the literature on manufacturing processes, are required to minimize the waste (non-value-creating activities) and to fulfill the customer's (owner and user) needs to create value in the product they have manufactured. The ultimate objective of the project should then be to fulfill user needs to increase the value perceived by the customers.

The perspective of the supplier in value creation is thoroughly discussed in the field of project management, production management, and manufacturing. Research streams like lean construction have had a focus on production systems with a focus on customer value for decades. This PhD work has its focus on what creates value for owners and users of the buildings. Hence, the supplier's production perspective and their production system are not discussed nor investigated any further during this research. However, their participation in the project and the contribution of their knowledge to the overall value creation of the project has been considered.

Section 3.2 Value Creation and Project Success

As different stakeholders usually define value from their perspectives on a project, it is reasonable to assume that how their needs are satisfied is directly related to the ultimate creation

of value in a project. The user perspective can be linked to marketing literature where the consumer has been directly in focus. Manufacturing literature relates to the supplier perspective where, in addition to the consumers, the productive activities and reducing waste in production systems for increasing value for customers are in focus. The owner perspective was reflected mostly in FM and real estate literature where the optimal operation, maintenance, and development of the buildings are in focus for delivering value to the end users.

From the perspective of the business and the activities in the building, the social perspectives for human resources and economic aspects are of importance (Boge, 2012, Coenen et al., 2012, Huovila and Hyarinen, 2012, Jensen et al., 2013). Bjørberg et al. (2015) referred to the European standard EN15221 and illustrated a figure arguing that interaction between spaces and infrastructure and people and organizations with input from the project actors contribute to value creation for the users and owners of a building.

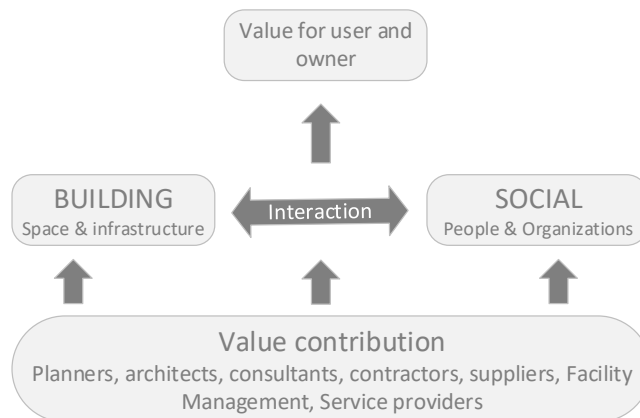


Figure 3-2 Value contribution through buildings and people (Bjørberg et al., 2015).

The Norwegian research project OSCAR conducted an extended literature review to map the characteristics and means for value creation of construction projects. The research showed that the characteristics that contribute to value creation could be divided into four groups (Bjørberg et al., 2015):

- Economic value (core business cost, investment cost, and economic value);
- Social value (people and organizations);
- Environmental value; and
- Physical value (space and infrastructure).

These elements can remind us of multidimensional theories in marketing literature. Despite the fact that these elements can contribute to the higher satisfaction of user's needs, Arge and Hjelmbrekke (2012) argued that projects also must have a reason for existence based on organizational business strategy and goals. Meanwhile, the trigger for any project is a predicted or existing customer need. This emphasizes the focus on the customer's definition of value to create value as well as the importance of aligning corporate strategies with customer needs to maximize value creation. According to Hjelmbrekke et al. (2015), project strategies are the missing link in project planning and execution. Hence, there is a need for clarifying all these requirements for value creation by performing a systematic approach to prioritizing, measuring and monitoring the fulfillment of these requirements throughout and even after the project.

Eikeland (2001) introduced two significant factors for value creation in construction projects: internal efficiency and external effectiveness. Internal efficiency refers to factors that directly affect cost, resource, and time consumption in a project. This suggests that internal efficiency corresponds to "doing things right" to enhance productivity and to achieve cost-effective deliveries. External effectiveness pertains to the ability of processes to realize goals and requirements that are described by the owner in synergy with future users, which indicates that external effectiveness addresses "doing the right things" in a project.

Samset (2010) used a similar approach and distinguished between the tactical and strategic performance of construction projects. Samset's "tactical performance" similarly to Eikeland's internal efficiency, refers to doing things right and delivering the project outputs within the agreed scope of cost, time, and resources. Samset's "strategic performance" corresponds with Eikeland's external efficiency and includes long-term perspectives of the project, such as sustainability, relevance, and generally doing the right things.

Shenhar and Dvir (2007) presented an extensive study involving 600 projects where the results revealed that 85% of the projects in the study failed to achieve the expected results and intended effects. The assessment of the success/failure of construction projects has been principally based on an evaluation of the extent of achieving the owner's objectives, such as cost, time, and quality (Ward et al., 1991). These three measures can provide an indication of success or failure of a project, but they do not in isolation provide a proper picture of the long-term performance of the project.

Müller and Jugdev (2012) pointed out three main periods of time in the development of how project success is defined and understood. During the first period (1960s–1980s), the success

was defined in terms of the iron triangle (time, cost, and quality) with a focus on the project implementation and time. In the second period (1980s–1990s), success was typically defined as a single measure for the project rather than multiple measures over the life cycle. In the third period (1990s–2000s), the integrated frameworks on project success were emerged, and project success was suggested to be measured according to factors related to the project as well as factors related to the management, organization, and external environment. Views on success have changed over the years from the focus limited to the implementation phase gradually over to life cycle and further to including subjective measures such as user satisfaction and even further to include core business (user) success (Müller and Jugdev, 2012).

Although success can be measured in terms of achieving the objectives, there is ambiguity in determining whether a project is a success or a failure. Every project has a set of goals to accomplish. There is a need for criteria to compare the goal level against the performance level, and project success consists of attaining project goals and participant satisfaction. Criteria such as profitability, technical performance, completion, functionality, health and safety, productivity, and environmental sustainability are also important aspects of evaluation. Attainment of goals such as satisfaction, the absence of conflict, professional image, aesthetics, and educational, social, and professional aspects are also considered indications of project success (Chan et al., 2002). Müller and Turner (2010) suggested that the measurement of success needs to focus on the following stakeholders and parameters:

- End-user satisfaction with the product or service,
- Supplier satisfaction,
- Project team satisfaction,
- Satisfaction of other stakeholders,
- Meeting the overall performance goals of the owner (functionality, budget and timing),
- Meeting user requirements,
- Fulfilling the owner's purpose of the project,
- Client satisfaction with the project results,
- Reoccurring business with the client,
- Meeting the respondent's self-defined success factor.

Chan et al. (2002) pointed out that project performance has been a topic of great interest for scholars and presented three trends in measuring project success:

- Meeting objectives: Achieving the client’s objectives for both tangible (time, cost, and quality) and less tangible criteria;
- Global approach: Considering project success criteria from both subjective and objective perspectives;
- Beyond project: Considering positive effects brought about by the project as well as the tangible means.

This brings the discussion further to examine the success in construction projects from a life-cycle perspective rather than just the project perspective. Spencer and Winch (2002) acknowledged that there has recently been an increased emphasis on lifetime costs of a building that can be heavily influenced using a VM approach during the design and development process. In the engineering tradition, the project is fundamentally about delivering an objective during a defined life cycle (Morris, 2004). According to Morris, the distinction between projects and non-projects is that all projects, no matter how complex or trivial, go through a common life-cycle development sequence. Whole organizations can be set up to achieve specific objectives within given time and cost constraints, and that will consume resources. However, it is the act of going from concept through definition, development, and build to handover that defines a project. In this respect, several different life-cycle models exist that distinguish projects from non-projects. Figure 3-3 illustrates the life-cycle project phases that Morris suggested.

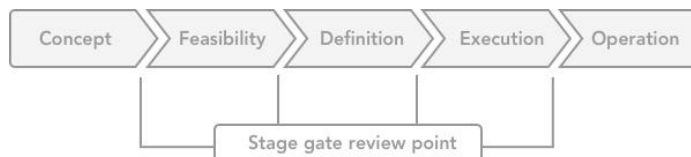


Figure 3-3 Life-cycle project phases (Morris, 2004).

Paul (2003), in PRINCE2, pointed out that projects are different from the normal operation of the organization when they:

- have specific objectives to deliver new benefits to the taxpayers, companies, public, government, sponsoring organizations, stakeholders, and delivery partners;
- introduce significant changes to the way the business operates;
- create new outputs and deliverables that will enable benefits to be realized;

- have a specific, temporary management organization and governance arrangement set up for the duration of the project that is susceptible to risks not usually encountered in the day-to-day operation of the work of the organization;
- involve a range of stakeholders from different parts of the organization and beyond; and
- use methods and approaches that are new or unfamiliar.

This tradition has placed a strong focus on project delivery and should be defined according to the triple constraints (i.e., time, cost, and quality) that are often referred to as the “iron triangle.”

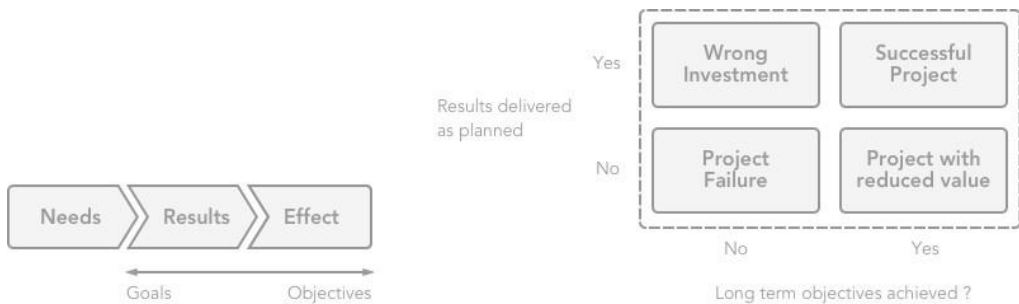


Figure 3-4 Success matrix (Rolstadås et al., 2014).

Rolstadås et al. (2014) argued that there should be clear links between the needs, results, and achieved effects and that both short-term goals and long-term objectives must be considered when the success of a project is determined.

Section 3.3 Value Creation in Different Types of Buildings

Bell (1994) claimed that the processes in the predesign phase of construction projects can appear to be hurried, resulting in customers’ expectations being unrecognized. Thomson et al. (2003) supported this claim by arguing that the construction industry’s current understanding of value routinely fails to contemplate the relationships between buildings and users. Hjelmbrekke and Klakegg (2013) emphasized that, traditionally, a building project is based on project organizations that leave the users in a half-excluded/part-included position. Considering that the value creation arises through future users and the importance of recognizing customer expectations in the predesign phase leads us to the importance of the predesign phase in creating value in projects.

Samset (2010) defined the predesign phase as all activities from when the idea of a building is conceived until an investment decision is made and introduced tactical and strategic performance in construction projects. Tactical performance concerns delivering the agreed

project outputs on time and within cost, while strategic performance includes longer-term perspectives, such as relevance, effect, and sustainability. Arge and Hjelmbrekke (2012) pointed out that working toward enhancing strategic performance, including usability, would enhance value for the project owner and user.

Sustainability and usability, as long-term strategical objectives of buildings, depend not only on the design of the building but also on how the building is operated. Facility management is supposed to create an environment to support the primary objective of the activity in the building using an integrated approach to operate, maintain, improve, and adapt the building and infrastructure (Atkin and Brooks, 2014). Atkin and Brooks (2014) also stated that understanding the organizational needs is the key to efficient FM regarding providing value for the money.

According to Anker Jensen (2010), the focus of FM has been on cost reductions for a long time. This has changed in recent years toward the need for FM to create added value. Life-cycle cost (LCC) analysis is a tool to estimate costs over the lifespan of a product. The focus needs to change from evaluating buildings using completion time, cost, and quality to the assessment of lifespan qualities, such as low operational costs, adaptability, and long-lasting materials, and on how the building supports the core business over time (Bjørberg and Verweij, 2009, Nedin, 2013).

Value Creation in Hospital Buildings

These buildings must be able to adapt to the requirements and technology of today as well as in the future. Adaptability will possibly generate a building ready for changing requirements in a sustainable way (Larsen and Støre-Valen, 2008, Nedin, 2013, Støre-Valen et al., 2014). Adaptability can maximize the efficiency of the core business in a building over the whole life cycle (Glanville and Nedin, 2009). Bjørberg and Verweij (2009) argued that adaptable buildings possess three essential abilities: flexibility, generality, and elasticity. Arge (2005) referred to the Norwegian Building Research Institute and defined these essential elements as follows:

- Flexibility is the building's ability to meet changes in the functional needs of the users and owners by changing its properties;
- Generality is the building's ability to meet changes in the functional needs of users and owners without changing its properties; and
- Elasticity is the building's ability to be extended or partitioned according to changes in the needs of the users and owners.

In architectural design terms, flexibility is defined as the built-in possibility to rearrange, add, or take away systems and elements as the user needs change. Generality means that the space and services in a building are designed to satisfy multiple functions, while elasticity involves the possibility of extending the building horizontally or vertically or dividing it into different functional units (Arge, 2005).

Another term used as a factor that contributes to value creation is “viability.” Larssen et al. (2012) suggested that an assessment of the usability and adaptability of the building is a significant contribution when considering the viability of the building. Usability expresses how well the building is suited for its purpose, while adaptability is how well the building can adapt to future demands. Good usability in buildings will lead to better effectivity for the core business as well as satisfied users (Larssen, 2011). Sufficient adaptability can, for instance, contribute to shorter reconstruction periods, a longer lifespan of the building, and reduced costs in the long run. Adaptability is therefore associated with satisfying owner needs and ensuring that the building can satisfy user needs throughout the building life cycle.

Even though LCC analysis is a recognized method in project management, few incentives have been present for project groups to utilize the tool. Consequently, initial costs have been the primary decision maker when designing hospital buildings in Europe over the decades (Bjørberg and Verweij, 2009). Støre-Valen et al. (2014) claimed that LCC and initial cost should be considered one total sum, as the operational costs usually already exceed the initial costs two to three years after completion. By designing the building after a comprehensive life-cycle analysis, the building costs typically increase 6% to 12%, but the costs over the lifespan of the building will be reduced (Rechel et al., 2009).

Facility management can be the link between the hospital building and healthcare services, contributing to value creation (Larssen, 2011). Støre-Valen et al. (2014) concluded that FM in hospital buildings needs to address a strategic function that aligns FM deliveries with strategic deliveries of the core healthcare service as well as the daily operation of the hospital. These are two fundamental functions that must be addressed. Aligning strategic functions and deliveries with the daily operation, which aims to satisfy user needs, is a requirement for creating value, as mentioned earlier in this chapter. This indicates the importance of FM as a service with high contribution to value creation in every building type and particularly in hospital buildings.

Value Creation in University Buildings

University facilities are learning environments, where the focus is the students and staff and their interaction with the built environment (Kärnä et al., 2013). Hence, university buildings are expected to support and facilitate the universities' core activities of teaching and research to contribute value. This general picture is complicated by the fact that there are student groups, such as medical students, that need different facilities from, for instance, a group of civil engineering students. A campus, defined as land and buildings used for university-related functions, contains several facilities with different purposes and therefore different user groups (Kärnä et al., 2013).

Regarding building facilities, the literature suggests that the factors that can influence user satisfaction within university facilities are the quality of the social areas, auditoriums, and libraries and the aesthetic aspects of the physical infrastructure (Wiers-Jenssen et al., 2002, Hanssen and Solvoll, 2015). A functional and aesthetic design can contribute to a pleasing first impression, motivate and support students both socially and academically, and increase the time that the students spend at the campus (Spiten, 2016).

The organization and activities of universities change rapidly. Hence, university facilities must be dynamic and adaptable to these changes. Furthermore, people should be encouraged to use the spaces in the university in a myriad of ways due to the development of technology and the learning landscape (Rytkönen et al., 2012).

Value Creation in Office Buildings

A physical environment that corresponds to employee needs and the work processes can positively affect the performance, health, and well-being of employees (Haynes, 2008, Feige et al., 2013). On the other hand, a poorly performing office environment can negatively affect employee health and productivity (Clements-Croome, 2015). Informal, unplanned meetings are also important (Brill et al., 2001, Leesman Lmi, 2015). According to van der Voordt and van Meel (2000), one of the central challenges in office innovation is finding a balance between privacy and interaction. While distractions are often referred to as the factor that has the highest negative influence on self-assessed productivity, interaction is often perceived as having the most significant positive effects (Haynes, 2007). Environmental conditions, such as temperature, air quality, noise levels, lighting, and access to daylight, are also of great value to users. Other factors that seem to be important are having information and communication

technologies equipment and enough individual space for storage (Brill et al., 2001, Leesman Lmi, 2015).

Section 3.4 Value Management as a Tool

The investigation of research methodology within value and VM in Section 2.2 revealed that, with the increasing interest around the subject and the increase in research publication, the philosophical view of how to research within this field has also changed. This could indicate that the understanding of value and value creation started as a deterministic approach, as the researchers have attempted to determine what value is and what creates value, but over the time, the questions have moved toward how to define value and how to create it.

Numerous models and approaches to managing value in construction projects have been attempted (Green, 1994, Male et al., 2007, Thyssen et al., 2010, Gransberg and Shane, 2015, Kelly et al., 2015).

Value management in construction was explained by Kelly (2015) as “the term used to describe the total process of enhancing value for a client in a project from the phases of concept to operation and use.”

Green (1994) differentiated between VM and value engineering and pointed out two primary concerns in VM when he introduced the SMART VM approach. The primary concerns are the need to improve communication and establish a joint perception of what is required. Green suggested two VM workshops in his approach. The VM1 approach contains six stages (identifying the stakeholders, identifying the design objectives, and constructing the value tree as well as creativity, evaluation, and development) and is supposed to be performed after the concept phase. The VM2 approach comprises seven stages (redefine design objectives, reconstruct, assign importance weights, evaluation, sensitivity analysis, cost/value reconciliation, and marginal value improvement) that should be conducted after the feasibility phase.

Austin and Thomson (2005) introduced a simplified approach for delivering value in construction design. This approach breaks down the process into three phases:

1. Understand values for stakeholders and the project so that compromises can be made in reaching solutions.
2. Define value by outlining criteria and targets for value delivery in the form of benefits, sacrifices, and resources.

3. Assess the value proposition for value delivery throughout the project life cycle from inception to obsolescence.

Kelly et al. (2015) referred to the North American value engineering process modified in accordance with construction projects and summarized it in a seven-phase process.

1. *Orientation* is where the initial project team communicates with the client to clarify what is to be accomplished, what the client needs and wants, and what the desirable characteristics are.
2. *Information* is the phase where all the information about client needs, project constraints, budgetary limits, time, and more are discussed and clarified.
3. *Creativity* is the phase where the team puts forward suggestions to answer the required functions, usually a few cost dominant ones.
4. *Evaluation* is the phase where the created ideas are verified. This stage reduces the generated ideas into a manageable number of scenarios for further study.
5. *Development* phase investigates the selected ideas from Phase 4 in detail for technical feasibility and economic viability. At the end of this phase, the team will verify the ideas that have been developed and dismiss the ones that do not comply with the value creation philosophy.
6. *The presentation* consists of displaying the refined ideas supported by drawings, descriptions, and calculations.
7. *Feedback* is developing an understanding of how the ideas that have been put into practice are performing, given the opportunity of testing the design.

Besides what is found in literature within research and academia, the UK, USA, and Australia, among others, have introduced VM standards to construction projects with a practitioner focus approach. Value management is defined as a style of management by the European standard for VM (British-Standards-Institution, 2000). The European standard argues that the objective of VM is to reunite the differences between stakeholders and costumers as to what creates value. However, the Australian/New Zealand standard defines VM as a structured, systematic, and analytical process that seeks to achieve value for money by providing necessary functions at the lowest cost with the required quality and performance (Male et al., 2007).

Section 3.5 Summary of Literature Review

The literature revealed that there is a common ground with emphasis on the satisfaction of the end-user needs in the conceptualization of value. The concept of value is also associated with

the relationship between cost and benefit. The end users are not always those who pay for the building. Office employees, students, and staff members of university campuses and users of hospitals are the typical examples of users that define value through their daily work/use, and they are not directly paying for the product (the building). The fact that buildings have a long lifespan, and for many buildings, the work processes and their use frequently change over time, suggests that value in the building context is not the same as in other products. In addition, buildings have complicated and long-lasting design and planning processes before they are in use, and this also distinguishes them from other products in the context of value. Value creation in a construction project depends on three principal roles whose needs should be assessed: the owners, suppliers, and users. Figure 3-5 summarizes and illustrates the relationship between the main stakeholders and their needs and objectives to create value.

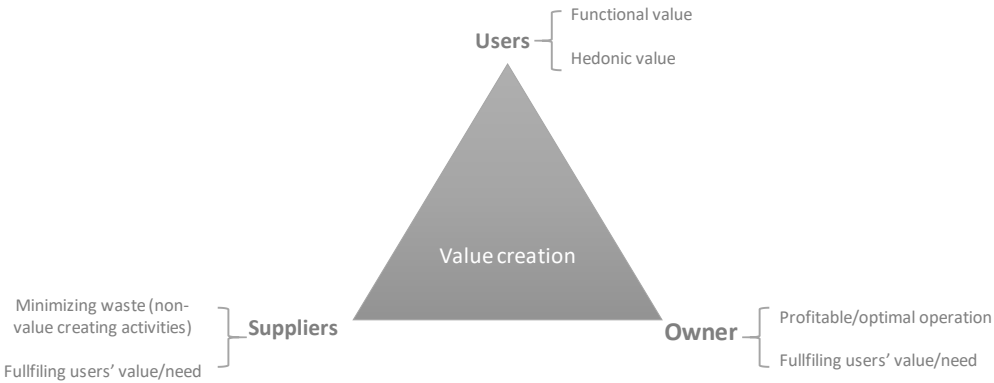


Figure 3-5 Construction project main roles and the needs to be fulfilled for creating value (Haddadi et al., 2016a).

Concerning owners and users of the buildings, the literature showed that, in addition to satisfying the user needs, the owner strategies should be aligned with these needs to maximize the value creation of a building. As the focus of this PhD is the owner and user perspective, the supplier perspective is no further investigated in this work.

The definition of success in projects has gone through development throughout the past decades. It has evolved from concerning the achievement of the project objectives, such as time, cost, and quality, to concerning the whole life cycle of a building, including the positive effects brought by the project and even the core business activities. As value creation also includes the positive effects of the project during the operation phase of a building by satisfying the intended objectives, the link between success in a project and its value creation seems to be quite strong.

Table 3-3 summarizes the synthesis of the literature and theoretical background.

Table 3-3 Synthesis and summary of the theoretical background.

Identified Concepts	Main Findings in the Literature
Value	Difficult to conceptualize and define. Different definitions in different contexts. Common ground is the fulfillment of needs and perception of users. Satisfaction of user needs will result in valuable products.
Value creation	Difficult to conceptualize and define. Fulfillment of user needs alone is not enough for value creation. User values and owner strategies must be aligned, project strategies must be clear, and suppliers must have effective and efficient production processes.
Success in project	Traditionally based on achieving objectives, such as cost, time, and quality (project perspective). Should be assessed from a lifetime perspective. Client and user objectives that are related to the operation phase should be included. Achievement of tangible and intangible objectives of the owners and users and the positive effects brought by the project in a life-cycle perspective.
Value creation in different types of buildings	Adaptability to change in needs has a significant contribution to value creation. Long-term strategical planning and life-cycle thinking. Providing and facilitating conditions for users so that they can perform their activities productively.
Value management (VM)	There are a number of VM models both in academia and as standards for practitioners. They have in common the focus on identifying functions to create value and optimizing the cost of obtaining those functions through collecting information; setting up a proper team; identifying, understanding, and defining value for the stakeholders; creating ideas to achieve defined values; evaluating and assessing the value proposition throughout the project life cycle; and presenting and implementing the solutions.

Value management as a tool for achieving value creation sets a range of premises for how to identify and understand value for the stakeholders. A variety of models exist already, both as standards for practitioners and frameworks and theories in academia. The focus seems to be on identifying the functions that create value and optimizing the cost of obtaining those functions rather than examining their effects on the life-cycle perspective.

Chapter 4

Characteristics of Value and Value Creation in Construction Projects

“We shape our buildings thereafter they shape us.”

Winston Churchill

Chapter 4 Characteristics of Value and Value Creation

The first section in this chapter provides a general overview of the characteristics of value-creating elements and means to create value. Characteristics are the elements and attributes of a building that contribute to creating value over the lifetime of the building. The means to create value refers to the processes, decisions, and factors that motivate choosing value-creating solutions. Sections 2, 3, and 4 contain the results of studies conducted to identify these characteristics and means (what creates value) and how value creation can be enhanced in particular for three essential building types (office buildings, university campuses, and hospitals). The last section of this chapter summarizes the findings and concludes the chapter contributions to the research.

The chapter is based on the findings from three different studies and an extensive workshop. The results from the workshop, regarding characteristics and means to create value, is published in Publication 7. The three other studies regarding hospitals, university campuses, and office buildings are published in Publication 2 (See Figure 2-8).

Section 4.1 Characteristics and Means to Create Value

One of the first steps toward providing an understanding of characteristics that create value and means to create value was reviewing the literature. The literature revealed that characteristics for creating value in construction projects could be categorized into four general sub-categories: economics, social, environmental, and physical (Bjørberg et al., 2015). The category of “economics” naturally refers to the monetary aspects of value creation. The identified elements are not only associated with the investment cost but apply to all costs in a lifetime perspective of the building. The social aspect affects people and organizations that are using the building and are affected by its design. The environmental part concerns the effects of the project or the building on nature and living environment. The physical part refers to the building structure, space, and infrastructure around the building.

Through a workshop, two working groups (WG1 and WG2) of 10-12 practitioners from the construction industry, researchers within project management and construction, and students with a background in construction or project management or FM were selected to participate in a workshop. I participated in preparations of the workshop and was one of the facilitators during the workshop. Work Group 1 was asked to provide value-creating elements within each of the four identified categories in the literature presented in the previous chapter (economics, social, environmental, and physical) from user and owner perspectives. Work Group 2 was asked to

work on identifying the significant means to create value and to categorize them into groups. Table 4-1 summarizes the results from the work of WG1.

Table 4-1 Characteristics and value-creating elements.

Subgroup	Characteristics and Value-creating Elements
Economic	Energy consumption, optimal FM organization and operation, maintenance plan/costs (predictability), outsourcing/price of services, transparency of costs, costs of ownership, running/operational costs, cleaning costs, space efficiency costs, rental costs, interaction of costs (best solutions not lowest costs), project costs, cost reduction, green accounting, potential income, strong brand, market value, payback time, profitability for the core business, productivity in the construction phase, environmental portfolio, long-term commitment partnership, and financial situation.
Social	Architectural value, satisfaction, indoor climate/comfort, individual control of conditions, aesthetic value, open view, layout (open/cell space), enough space, orientation, cleanliness, logistic service support, organizational value, social responsibility, location characteristics, historic value, usability (efficient workplace), accessibility, safety, and security.
Environmental	Renewable energy, energy efficiency, recycling and reuse of materials, waste management, minimized contamination, environmentally friendly products, lifetime materials, and green roofs.
Physical	Technical condition, space distribution/logistics for core business, quality materials, construction quality, architectural solutions, life-cycle design, environmental solutions, flexibility possibilities, elasticity possibilities, generality possibilities, designed for disabled persons, sufficient infrastructure, and innovative solutions.

The means to create value for users and owners, that is, factors that can contribute to choosing value-creating solutions, were categorized into four subgroups through the workshop through discussions within the group. These subgroups are economic incentives, knowledge and competency, contract and strategies, and assurance of quality. Economic incentives, as the name indicates, refers to the economic reward plan that is programmed into a project for different stakeholders for achieving project objectives. Knowledge and competency include the expertise, education, wisdom, proficiency, and ability that the project participant poses both as individuals and as a group or organization. Contracts and strategies include the contract and numerous strategic, tactical and legal decisions that can influence the outcome of a project. Assurance of quality concerns the systems and practices regarding how an activity should be executed and measured to assure the desirable results and effects. Table 4-2 summarizes the

means that can be a contribution to choosing value-creating solutions in a project based on the results from WG2.

Table 4-2 Means contributing to choosing value-creating measures.

Subgroup	Means that Contribute to Choosing Value-creating Measures
Economic incentives	Environmental funds, financial support for testing new trends, branding, rewarding, cost productivity, orientation, investment loans for enhancement/replacement, changing energy consumption, combining different energy resources, emission reduction, support for maintenance and technical upgrading, support for refurbishment, tax benefits for choosing sustainable solutions, and competitiveness.
Knowledge and competency	Good project planners and managers, changing regulations, social awareness, user satisfaction, communication ability, creating value with society, organizational development, best practice design, developing know-how training of employees, implementing new cooperation models, developing strategic key performance indicators, knowledge on sustainable efficient building, open for new technical solutions supporting innovative ideas, and creative technical work groups.
Contract strategies	Contract process with dialog, contract division, contract type, contract procedure, selection and award criteria, contracting plan, PPP practice, clear tasks and definitions, contract duration, financial capacity of contractor, allocation of responsibility and risks, precise specification of deliverables, performance targets, measurement methods and standards, active partnership dialog, organizational measures, and developing strategic service level agreements.
Quality assurance and performance measurements	Process management ability, communicating value, political support, user participation, performance requirements for each phase, mechanisms and procedures for ex-ante evaluations, mechanisms for ex-post evaluations, monitoring, inspecting, evaluating, success/failure factors, and key performance indicators.

The characteristics and means mentioned in Table 4-1 and Table 4-2 are general and can be applied in different phases of the project and benefit users and owners in various ways. Characteristics that concern user needs/requirements should be identified, and their fulfillment should be among the objectives of the project. There are means to create value that can have a significant contribution if they are considered during the predesign phase of the project. These aspects were identified through the workshop with WG1 and WG2. Table 4-3 represents the aspects that were identified.

Table 4-3 Means with significant contribution to value creation in predesign phase.

Means		Description
Product related	Planning for adaptability	Flexibility: Ability to rearrange, add, or take away systems; Generality: Ability to comply with different functions; Elasticity: Ability to extend or partition the building area is of exceptionally high importance in buildings with changing needs, such as hospitals.
	Facility management (FM) and operational solutions	The solutions that make the operation of the building easier and more cost-effective. These should be considered from the beginning by involving FM personnel and consultants with practical FM experience.
Process-related	Collaboration	Multidisciplinary focus and early involvement of different trades; Integration of architecture and technology (design team and contractors); A platform for quality assurance of information; A balance in stakeholder power in project organization.
	Life-cycle planning	Considering the costs and solutions for the buildings lifetime and not only the investment or project costs; Calculation of alternatives provides an opportunity to choose cost-effective solutions and avoid unnecessary maintenance costs.
	User involvement	Involving end users to identify their needs and requirements in a structured process.
	Owner involvement	Identifying owner requirements, ambition levels, and strategies through structured processes.

The research showed some of the general needs and strategies that can create value in construction projects. How to transform these needs and strategies into value-creating buildings a range of means and processes was also identified. These processes are of particular importance for the predesign phase of the project, as their effects will decrease over the development of the project and as the cost of changes that are required to implement them increases.

All the characteristics and means mentioned in this section are generic. Different types of buildings have different users with different requirements and are built to serve various purposes. During this PhD work, I have investigated three building types in particular to assess the similarities and differences in the context of value creation.

Section 4.2 Value Creation in Office Buildings

Both the literature review and the study of office buildings indicate that office building should support the user needs relating to well-being and productivity (Ravik et al., 2016). The overall results from the questionnaire reveal that the most critical factors that can enhance value for the

employees are fundamental qualities, such as good indoor climate conditions and areas being suitable for individual work, formal meetings, informal meetings, and sharing knowledge (Ravik et al., 2016). The literature also mentions technical solutions that support the execution of the work tasks and having enough space allocated for personal storage. For the employees in this study, the availability of public transport was rated as the most critical factor. This was supported and reemphasized by the fact that “parking facilities for cars” has the lowest ranking. This finding is highly situational and location dependent. The studies were conducted in Norway including cases from two different cities (Oslo and Trondheim). Norway has a strong culture for using public transportation, and the cities where the case buildings are both have tremendous and widespread public transportation systems.

Table 4-4 Results from the questionnaire in study of office buildings.

Quality	Mean	Standard Deviation
Availability of public transportation	3.56	0.69
Indoor climate and comfort	3.37	0.63
Areas suitable for individual work	3.33	0.69
Sharing knowledge and collaboration	3.27	0.66
Interior quality and well-being	3.11	0.75
Areas suitable for formal meetings	3.02	0.70
Safety and security	2.99	0.74
Areas suitable for informal meetings	2.83	0.82
Individual control of indoor climate	2.82	0.86
Workplace design that enables flexible working	2.80	0.87
Modern, forward-looking solutions	2.77	0.84
Contribution to pride in the workplace	2.75	0.78
Environmentally friendly energy-efficient building	2.66	0.82
Arrangements for effective waste management	2.61	0.82
Access to locker room and shower	2.55	0.99
User-friendliness, sense of direction	2.54	0.76
Parking facilities for bicycles	2.51	1.14
Flexibility (changing floor plan)	2.47	0.87
Accessibility and universal design	2.46	0.86
Exterior, architectural quality	2.41	0.80
Facilities for physical activity	2.25	1.04
Parking facilities for cars	2.01	1.05

Although the studied qualities can change over time, the questionnaire results indicate that several qualities are perceived to be better by the employees who sit in a partly activity-based

open-plan space compared to the employees who have individual cell offices. One of which is the suitability of the open-plan space for informal meetings. However, users who have cell office are more pleased with the suitability for individual work. Their concerns with the indoor environment seem to be mostly related to air quality and temperature, while people working in the open-plan space have more complaints about noise. This substantiates the challenge of finding a balance between privacy and interaction mentioned in the literature. In the case of office buildings, the results indicate a higher standard deviation for the low-ranking functions, revealing converging individual perceptions on the most essential functions.

The interviews pointed to some essential elements that could contribute to value creation in a project. Four critical elements identified during the interviews as factors for enhancement of value creation in projects are the following:

- A structured user-involvement process,
- Collection of information and identifying needs,
- Identifying who should be involved and when, and
- Structuring the collected information.

The importance of satisfying user needs and thereby the importance of identifying and understanding these needs during the early phases of the project was emphasized by most of the interview objects. Moreover, the significance of involvement of the management level of the company/business in the predesign phase was specified by the interviewees. By involving management, before the users, certain fundamental decisions can be taken before the users are involved. In addition, the management would be able to communicate the strategies and objectives of the project to the users. To maintain value creation after the project and through the operation phase, FM and operation personnel should be informed or involved. Moreover, a system for simple communication between users and FM should be established.

Section 4.3 Value Creation in University Campuses

The literature, the questionnaire, and the interviewees in the study of university campuses agree on the claim that value in a university campus context is a campus and buildings that create optimal conditions for teaching, learning, and research. A remarkable finding in the results of the questionnaire is a general trend in the standard deviation of the answers. The standard deviation is higher for the low-ranking functions, indicating more consensus in individual perceptions on the most essential (high-ranking) functions and qualities.

The literature signaled that value is subjective and depends on individual perceptions. Both value and customer perceptions change over time. Despite this, the findings from the questionnaire correspond with studies from the literature showing that rooms, such as workshops, laboratories, auditoriums, and libraries, and social elements, such as cafeterias and informal break facilities, are basic needs and of significant importance for the users.

The first part of the questionnaire asked the students and the staff to rank some selected campus qualities that were chosen based on the literature and discussions among authors. The second part asked the students and the staff to rank the importance of different types of rooms and support functions.

Table 4-5 Selected qualities of the university campuses (1 = low importance, 4 = high importance).

Qualities	Mean	Standard Deviation	Mean	Standard Deviation
	University Staff		University Students	
Areas suitable for work	3.69	0.49	3.47	0.60
Availability of public transportation	3.52	0.69	3.43	0.85
Sense of direction and orientation	3.31	0.62	3.40	0.64
Facilities for bicycles	3.13	0.92	2.84	1.08
Contribution to pride in the work/study place	2.97	0.83	2.80	0.89
Architectural qualities and aesthetic	2.90	0.81	2.67	0.85
Parking facilities for cars	2.66	1.07	2.44	1.17
Facilities for physical activity and sport	2.23	1.92	2.82	1.80

The highest-ranking quality “areas suitable for work” corresponds with the literature claiming that supporting the core activities of teaching, studying, and research contributes to value on university campuses. The availability of public transportation and sense of direction and orientation between the buildings and facilities for bicycles are also of high importance for both students and staff. In general, students and staff seem to agree on what campus qualities contribute to value for them. However, students seem to rank facilities for physical activity and sports higher than employees.

The ranking of room functions revealed relatively high consensus among students and staff. They were asked to consider their own perspective in answering the questions. Both “group/meeting rooms” and study hall/private offices are ranked highly by students and staff. This finding supports the claim that both students and staff find the highest value in what supports their core activity.

Table 4-6 Highest valued room functions (1 = highest value, 4 = lowest value).

Room Functions	Mean	Standard Deviation	Mean	Standard Deviation
	University Staff		University Students	
Study hall/Private offices	1.44	1.25	2.51	1.29
Group and meeting rooms	2.27	1.46	2.10	1.29
Auditorium	2.74	2.28	3.39	2.27
Library	3.10	2.40	3.44	2.05

During the interviews, the respondents were asked about their definition of value for university campuses. The response corresponded again with the literature by expressing that value for the end user is a campus that creates optimal conditions for teaching, learning, and research. When asked about whom they considered end users, the students, staff, facility and property managers and the community were mentioned.

The results from the interviews imply that the users agree on what elements would create value. However, the length of the project acted as an obstacle in communicating value for end users. The university campus construction projects are generally complicated and long-lasting. Consequently, the end users can change, and technology can advance, resulting in the loss of information and changes in value-creating elements for users.

The interviews reveal that facility managers have an ambiguous role in the design and construction process, while they are substantial resources of knowledge. The research indicates that facility managers are not considered a distinguished user group, although they, in fact, are an influential user group. Additionally, facility managers are resources with substantial knowledge about the operation, technical solutions, and building design. Therefore, they should be involved both as end users and as a resource for the design team during the predesign phase of a project.

Interviews also revealed that more time spent on innovative design in the predesign phase might contribute to creating the ability to adapt to the changes that could take place at the university in the future. The importance of adaptability in buildings is accentuated in the literature, as the spaces in a university campus should be used in different ways to adapt to the development of technology and the learning landscape.

Section 4.4 Value Creation in Hospitals

The quick development of the technology and the fact that there is a tremendous variety of functions in a hospital makes identifying what creates value for users of the hospital building a challenging task. Identification of the user requirements and needs should happen based on each function. Furthermore, healthcare personnel and patients, who have different needs, are both considered the end users of hospitals. Hence, the interviewees, in the study of hospital buildings, were asked to explain their understanding of what can create value in hospital buildings. Respondents pointed out factors that can contribute to the fulfillment of the user requirements, such as appealing light and air quality (indoor climate), intriguing and appealing holistic impression (interior quality, hygiene, and cleanliness), and attractive buildings (exterior and interior architectural qualities). Factors that can contribute to the improvement of healthcare services, such as the quality of the workplace environment, development of competencies, collaboration and knowledge sharing, and sense of belonging were also mentioned as value-creating elements. The interviewees mentioned other parameters, such as proper logistics, desirable functionality, efficient operation services, and environmental consciousness as fundamental elements of achieving value in hospital buildings.

The understanding regarding the definition of a value-creating hospital building was reasonably harmonized. Almost all the interviewees stated that value in a hospital context is created when optimal conditions for efficient delivery of healthcare services are achieved.

The literature defined value in different ways. A basic mathematical approach to defining value pointed to the relationship between function and cost. Although the nature of the function of a hospital building implies that this definition is hard to apply in this context, a broad awareness on considering LCC to be a strategic means to achieve more valuable building is advised by the respondents. As an example, during the planning and design of one of the studied hospitals, the investments were reduced. As a result, the project was postponed, and a more comprehensive analysis of the new hospital was conducted. Despite the initial adverse reactions, the extensive effort resulted in a better building than initially planned.

Correspondingly, the findings advise an extensive analysis to evaluate and define objectives describing how to add value to healthcare services, although this might be a challenging and demanding task. The criteria and specifications are unique for every project. Through the case studies, three useful questions to obtain and identify the required criteria and specifications were raised:

1. How do the healthcare services intend to develop capacity, reputation, and competences in the future?
2. How can the hospital buildings help healthcare services achieve these objectives?
3. What are the most critical requirements for the hospital buildings to fulfill future needs?

These questions are in correspondence with what literature defined as the tactical and strategic aspects of predesign planning for value creation. While the first question concerns the strategic aspects, the next two questions involve the tactical aspect where the means to achieve the strategic objectives are in focus.

The strategic objectives of a hospital involve the long-term effects of the project. In all cases in our study, the projects had predesign documents labeling LCC. However, 3 out of 4 cases admitted that LCC was not given adequate attention during the processes. According to the interviewees, this caused challenges, such as high cost and ineffective solutions in the operational phases.

Facility management services, including maintenance and development of the buildings, are the dominant part of the costs in the operation phase. Although the document study pointed at LCC as a priority in all the cases, the response from the interviews is in contrast with this finding. Achieving annual operation cost profits is stated as an objective for the project in the predesign documents of all four hospital cases. However, the respondents expressed concern regarding budget cuts and inadequate resources allocated to FM services. The long-term consequences of cutting FM funding is a decrease in usability and the resulting need for an increase in investments for the refurbishment of the buildings.

Another frequently used term observed in the document study, in particular in the most recent hospital projects, is adaptability. As in FM, adaptability is a term that seems to be in focus during the predesign phase of the hospital projects. However, like FM, the practical handling of this vital aspect is questionable. As the literature stated, adaptability involves flexibility, generality, and elasticity. A closer investigation of how adaptability is described and perceived in the most recent case reveals an emphasis on elasticity (future expansion opportunities). This finding can also be related to other hospital projects, as population growth and the need for larger hospitals and increased areas are of significant concern. A recent case hospital, for example, reached their full capacity quickly after completion, as the population prognoses took place faster than estimated. Another challenge regarding the design of elasticity is the communication of these design opportunities to those who can realize them in the future, such

as facility managers. In addition, accomplishing the potentials of adaptability is a complex task in operating hospitals. Although the possibilities of restructuring the use or expanding the areas are there, moving functions and making areas available for construction work is challenging.

The results of the first study imply that LCC, FM, and adaptability are all considered critical strategic objectives and can have a significant contribution to value creation. Despite this, the tactical aspects of exploiting these are still challenging and should be improved.

Through the second study, three factors were identified as being especially important in ensuring viable hospitals: setting realistic goals and ambitions that are aligned with the requirements and needs of users and owners, focusing on LCP, and ensuring strategic user involvement. Strategic user involvement will be addressed further in Chapter 5. Adaptability is also found to be an important factor in ensuring viable hospitals and is considered under 'life-cycle planning (LCP)' in this study.

The second study also revealed that, although aligning user requirements and owner strategies is considered fundamental for the creation of value, it seems that goals are seldom sufficiently aligned with user needs. Setting ambitious goals is important to motivate users, but the research conducted has revealed that goals must be realistic to motivate people involved with the project. Overly ambitious goals can affect the usability and adaptability of the project and, in this way, also affect the project viability. There is often a focus on low investment costs and short construction periods, which seems to be of limited importance to users.

Findings from both the literature review and the case studies highlight the importance of focusing on LCP rather than low investment costs. Focusing on LCP is a prerequisite for achieving adaptable hospital buildings. However, based on experiences from the cases studies of the hospitals, there seems to be a lack of competence associated with how LCP should be implemented. Another reason LCP is not prioritized enough in hospital projects seems to be the challenges regarding documentation and proof of achieving benefits when choosing adaptable solutions.

Section 4.5 Summary and Contribution to Research

The first section of this chapter revealed a broad range of elements that can contribute to creating value or enhancement of value creation in projects. Elements that could contribute to motivating the selection of value-creating solutions and the means with particular importance in early phase planning were identified. The identified elements seem to regard three different

aspects. They are either strategic owner requirements, user requirements, or processes that can contribute to higher tactical performance of the projects.

Owner requirements

As the literature study in Section 4.1 and the initial interviews and workshops on a general basis revealed, elements such as adaptability, LCP, and FM and operational solutions are significant strategies that owners should be aware of to achieve desirable long-term effects and create value.

Moreover, LCP considering LCC was acknowledged as an essential contribution to value creation particularly within the context of hospital buildings. Healthcare services are changing rapidly due to technological development in medicine and the efforts to optimize and increase the efficiency of these services. In addition, the majority of the buildings in a hospital are in constant operation and use. This results in a massive need for maintenance and reparations. Although choosing efficient, long-lasting, and heavy-duty solutions might increase the initial investment cost of a hospital project, it might also contribute to better long-term value creation and lower LCC during the lifetime of the hospital. This element was not emphasized by the respondents within the context of an office building. This can be explained by the nature of the core businesses in office buildings. Businesses typically have a leasing contract with the owners, and the expenses for maintenance and operation of the buildings are included in the leasing contract. The leasing contracts usually are shorter than the building lifetime, and the owner can adjust the income based on the costs during the building lifetime.

Facility management is one of the elements of concern in life-cycle thinking, as it is one of the leading parts of the operation cost. The studies, especially in the context of hospital buildings and university campuses, showed that this factor is highly acknowledged in projects but is now adequately prioritized during the planning. Respondents in office buildings did not have an emphasis on this factor as much as in hospitals or university campuses. It can be explained by a profound look at how FM influences the users in this context. The essential parts of FM in offices are managed by the owners, and FM in office buildings is not as comprehensive and complicated as building complexes, such as hospitals and university campuses.

Another highlighted value-creating element on the strategic level is adaptability. Owners in the study for both hospitals and university campuses pointed out this factor as an essential contribution to value creation. The core activities in hospitals and universities are changing rapidly. Technology and digitalizing changes both the way patients are being treated and the

way students are being educated. This results in changing functions and increases the demand for flexibility, generality, and elasticity of the buildings. The results from the office buildings were different in this case as well. The reason is that the core businesses in office buildings mostly lease the areas according to their needs; therefore, their perspectives are not as long-term as hospitals or university campuses. Despite this, adaptable office buildings will reduce the operation and development costs for the owner of the buildings. Therefore, considering adaptability in office buildings is strongly recommended, although the users are not accentuating it as a value-creating element.

User requirements

The initial literature review and results presented in Section 1 provided a wide range of characteristics and elements that contribute to value creation. A significant part of the elements regarded user requirements. These elements were further used in identifying what creates value in the three studied building types.

Over 1,000 users were asked about the qualities they consider creating value in their buildings in this research. Requirements such as indoor climate and comfort (noise, air quality, and temperature), access to public transportation, interior and exterior quality and impression, and rooms and areas that facilitate both individual and collaborative activities are among the examples of user requirements that are common for any building.

However, every type of building has unique users that require a unique set of demands. While elements such as facilities for physical activity and sports are considered a relatively highly ranked factor for students on university campuses, they are not acknowledged as essential factors for an office building or hospital users. Logistics and environmental consciousness are pointed out as fundamental parameters to achieve value in hospital buildings, while neither campus nor office users have ranked these as important factors.

Elements such as parking facilities for cars and bicycles, architectural quality and aesthetics, and access to shower and locker rooms are the qualities with the highest standard deviation, indicating disagreement among respondents on whether these elements are important for value creation or not. These qualities are highly appreciated by some people, while others do not consider them essential factors for value creation. Some people go to work by car and some by bicycle. Although everyone can appreciate the access to public transportation, parking facilities for cars are appreciated by those who drive, and facilities for parking bicycles and the locker room are appreciated by those who ride bicycles.

The value of a product is defined by the ultimate users and depends on the individual perception of the product. Although this can imply that determining what creates value for users is a difficult task, our most significant finding, regarding identifying value-creating elements for users, is that the standard deviation is higher for the low-ranking functions, indicating converging individual preferences on what the most critical functions and requirements are.

This finding indicates that user requirements in projects can be determined by conducting questionnaires, while the standard deviation can be a measure for identifying the most legitimate requirements. The elements with a low standard deviation are essential fulfill for everyone, while a higher standard deviation indicates the diversity in needs, meaning that these should be fulfilled but not designed to be utilized by everyone.

Although some of the significant user requirements were ranked and analyzed, identifying user requirements in each project is of importance. In the study of the hospitals, identifying critical user requirements was associated with the future development of the capacity, reputation, and competences and how the buildings can help healthcare services achieve these objectives. In the context of office buildings, the findings showed that a user-involvement process for identifying needs, collecting information, and structuring it in each case is necessary. In addition, it was remarked that the involvement of the core business management in the early phases of this process would be positive, as some fundamental decisions can be taken before the users are involved.

The literature review and questionnaire revealed that user requirements are either related to functional needs or emotional value, meaning that the elements are either perceived as creating value because they have functional value or because they elicit a positive emotion in the user.

Other factors related to the owner can also be related to either functional value or strategic performance regarding satisfying a long-term objective and effect. Owner strategies are related to the intention of the owner for the project. This implies the importance of satisfying the intention of the owner through the project. A project can satisfy functions that users require and achieve high emotional value, but if the intentions and strategies of the owner are not satisfied, the value creation is not maximized. As an example, a cancer treatment clinic is built with the intention of providing the best treatment facility in the country. Although the emotional value is achieved, and the required functions are provided, the potential value creation is not achieved unless the intention of being the best treatment facility in the country is obtained.

The research also revealed the importance of thinking toward identified or unidentified future needs. These needs cannot be fulfilled by previous experiences and require new thinking and innovation. The innovation can be both related to the working processes in the project (increasing efficiency, effectiveness, or productivity) or to the technical solutions provided for the product/building. Hence, innovation is also one of the fundamental aspects to be addressed in the context of value creation.

Consequently, the four main aspects that could be considered and addressed in the planning and design phase to create value are function, emotion, intention, and innovation. The results from the questionnaires revealed that function and emotion are aspects that users are mostly concerned with. Intention is merely related to the owner and the satisfaction of the owner strategies. Innovation can be related to the owner and user, as the focus of the owner on innovation can contribute to higher satisfaction of user needs, and the users can contribute to innovation by predicting their future needs during the user-involvement process.

Tactical performance

The results also imply that LCC, FM, and adaptability are all considered critical strategic objectives and can have a significant contribution to value creation. Although satisfaction of the strategic owner requirements and user requirements are essential to creating value, the importance of tactical performance, such as in managing the project toward achieving the objectives, is undeniable. Tactical performance, as mentioned in the introduction of this chapter, concerns delivering the agreed project outputs on time and within cost. This suggests that the owner requirements and user requirements function as input to the tactical performance of the project (Figure 4-1).

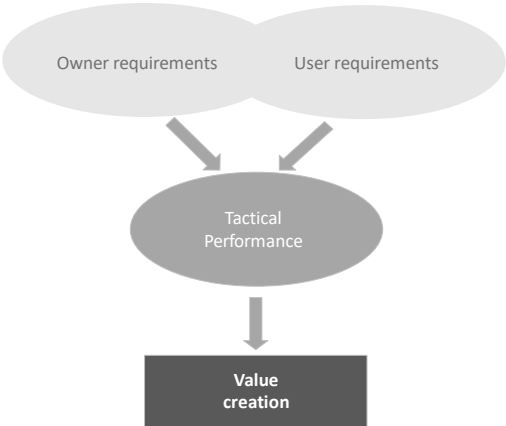


Figure 4-1 Owner requirements and user requirements as input to tactical performance.

Tactical performance including project delivery systems and project management with all its elements is a large field of research. My research pointed out some critical elements of management processes that can have a contribution to value creation. Elements such as a multidisciplinary focus; early involvement of the trades, contracts, and partnership; collaboration; organizational power; and user involvement, were among the management processes that were reflected through our data collection and analysis. These elements will be further discussed in the next chapter.

Chapter 5

Management and Organizational Aspects of Value

*“Coming together is a beginning. Keeping together is progress.
Working together is success.”*

Henry Ford

Chapter 5 Management and Organizational Aspects of Value Creation

The concepts of LCP, FM, and adaptability were discussed in Chapter 4 as strategic owner requirements. The economic aspects of the project and quality assurance are significant fields of research and, hence, outside the scope of this work.

Table 4-2 and Table 4-3 presented both the means that contribute to choosing value-creation solutions and the means with a significant contribution to value creation in the predesign phase. Table 5-1 summarizes the results as a reminder.

Table 5-1 Means to value creation, a reminder.

Means contributing to choosing value-creating solutions	Economic incentives, knowledge and competence, project delivery models and contracts, quality assurance, and performance measurements.
Means with significant contribution	Focus on multidisciplinary collaboration, adaptability, life-cycle planning, facility management, and user and owner involvement.

Observations through the research presented in Chapter 4 indicated that projects with early involvement of all trades and disciplines, such as those with relational contracts, presented higher achievement of goals. In addition, the participants were more satisfied with the project performance of these projects. Hence, I decided to investigate this observation further. Section 5.1 addresses the multidisciplinary focus and early involvement of different disciplines in the project. The studies presented in this section indicate how the main disciplines, such as architects, engineers, technical designers, contractors, and facility managers can have a positive effect on the project by being engaged early, and which responsibilities the owner has in this context. The effect of project partnering (PP) as a means for early multidisciplinary engagement is also addressed.

Section 5.2 presents the link between power in an organization and value creation. This section presents a study conducted as a result of acknowledging that working in a multidisciplinary environment under PP has its challenges caused by its transparent working culture and relatively flat organizational structure compared to traditional methods.

The users appeared to be a difficult stakeholder group to assess through the study of power, and the results presented in Chapter 4 indicated that user involvement appeared to be one of the means with a significant contribution to value creation. Hence, the involvement of users in the

project and the opportunities and challenges it generates were subject to exploration. The results of the studies regarding user involvement in projects are presented in Section 5.3.

Section 5.1 Multidisciplinary Focus and Early Involvement of Actors in the Project

During the initial studies described in Section 4.1, focus on involving relevant actors from different disciplines and trades early in the project was remarked on as a means to value creation. Lloyd-Walker and Walker (2015) introduced a project procurement taxonomy including three main sub-categories:

- Segregated design and delivery, design-bid-build (DBB), the most known transactional model, which separates the design and construction process and teams, is included in this cluster.
- The integrated design and delivery process by focusing on planning and control is a subgroup including Design-Build (DB) and public private partnership (PPP).
- Integrated design and delivery team by focusing on collaboration (relational contracts) includes partnering, alliance, and integrated project delivery.

The last two sub-categories (the last one in particular) imply the early involvement of different disciplines by integrating design and delivery and are therefore of interest in this context. In DB projects, the owner outsources the responsibility for most of the design process and the construction phase to a main contractor based on a functional description (Lædre, 2006, Toolanen and Olofsson, 2006). This implies that the main contractor withstands risks associated with time, cost, and quality related to the design process and construction, including relations between technical subcontractors and their appointed technical designers (Kristensen, 2015). The relational contract can intervene with the traditional distribution of roles and risk between the client and supplier through the involvement of particular information, communication, and decision making systems (Lloyd-Walker and Walker, 2015, Hosseini et al., 2017).

Hosseini et al. (2017) pointed at two reasons the owners choose relational contracts. The first is the need to improve the project culture and partners' attitudes to decrease the number of disputes, change orders, rework, unwanted incidents, etc. The second is that projects are changing, as they are becoming more complex and longer and have higher uncertainty and more need for technical innovation and innovative solutions. According to Hosseini et al. (2016), integrated design and delivery teams with a focus on collaboration (e.g., PP) can result in

positive effects, such as increased efficiency and quality, in addition to the reduction of litigation. Other identified benefits are innovation, increased customer satisfaction, and reduced risk and sustainability. Challenges related PP are related to creating a collaborative environment in building projects, like the need for thorough preparation and commitment from all participating actors. The significance of the creation of a collaborative environment as an essential factor for project success, in particular within the context of PP, is emphasized in the literature (Bresnen and Marshall, 2000, Sodal et al., 2014, Hosseini et al., 2016, Wøien et al., 2016). However, early involvement of the principal actors is identified as one of the most critical elements in PP, allowing the client to utilize the actors' competence at an earlier stage of development (Haugseth et al., 2014, Tune, 2015, Hosseini et al., 2016, Wøien et al., 2016).

As mentioned in Chapter 2, data from three studies were used to investigate the effects of the multidisciplinary focus in early stages of development. The results from the study of the early phase of rehabilitation projects (Study 1) surprisingly revealed that 100% of all the respondents to the questionnaire (44 respondents) indicated that they should be involved in the early phase of the project (Lund et al., 2016). The reason seems to lie in the respondent's recognition of their potential contribution with knowledge and skills that could be beneficial for the project. When asked which competences are essential to involve in the early phase of a project, contractors were brought forward as critical actors that usually are not sufficiently involved in the early phase of the projects. Their contribution was pointed out to be particularly in estimating costs, condition surveys, and requirement analysis.

The same study also investigated how different actors can contribute to project success during the early phases of the project. With regard to owners, their responsibility to fulfill user demands and express clear intentions and goals was pointed out. In addition, their responsibility to conduct sufficient strategic analysis to provide sufficient information for sound decisions was stressed. Architects are responsible for achieving the functionality that is required by contributing to the analysis for identifying the requirements. Their contribution to cost estimation and designing within the cost frames of the project was mentioned as well. Design engineers contribute to success by providing alternative solutions for the client that achieve the functionality goals of the project. Contractors contribute with their knowledge about the practical execution of the alternative solutions with the satisfaction of customer needs as their intention.

With a focus on the role of the design team (referred to as Study 2 in this chapter), the study used the framework from Eikeland (2001) to categorize the designer's contribution to value

creation in a multidisciplinary perspective (Bremdal et al., 2017). Eikeland (2001) introduced the expressions “external effectiveness” and “internal efficiency.” While external effectiveness concerns the project’s ability to realize the intended long-term effects of a project, internal efficiency is about factors that directly affect cost, quality, resources, and the time of the project. There is a consensus across all cases and the majority of the interviewees that architects have a unique position in contribution to the external effectiveness. Architects are to understand the client’s descriptions, while being the primary influence on a building’s level of functionality, adaptability, and aesthetics, providing the premises for all other design. The interviews pointed at technical engineers as the main contributors to internal efficiency during the design phase. The interviewees stated that engineers are supposed to contribute to value creation by understanding the conceptions, while developing solutions that are cost-efficient. Cost-efficiency is explained by the interviewees to be solutions that are well-defined, efficient for production and in accordance with building technology, regulations, and other subject-specific principles.

Study 2 also revealed that, although there are substantial elements of multidisciplinary focus contributing to value creation in DB projects, there are some contextual constraints preventing value creation as well. One of these constraints, expressed during the interviews, is short-term perspective among the owners because maintenance and operation are not of significant interest to a client who plans to sell the building after the project. Another identified element is an inconsistent relationship between the owner expectations and the owner’s responsibility, as the owner is only providing a functional requirement and not a detailed requirement specification in DB projects. As the interviewees stated, the required functionality will be covered, but the quality will not surplus what is specified. Moreover, the inadequacy of tender documentation was pointed out as an element of constraint by every interviewed contractor alongside the designers in this study. This can cause a gap in what the owner expects and what the results are. Furthermore, the main contractor’s opportunity to trim qualities, which was addressed on several occasions during the various interviews, can increase the gap between what the owner expects and what the results are. Another consensus among the interviewees was that the main contractor could restrain the line of communication between the clients and the designer since the main contractor subcontracts the designers. Consequently, some designers conclude that their opportunity to contribute to value creation in the detail design is limited as the main contractor would not communicate their proposed amendments to the owner unless the main contractor can get paid for the proposed change.

All interviewees in Study 2 identified PP as a possible measure to help designers in maximizing value creation. The literature pointed at a variety of benefits of PP, such as increased efficiency and quality, reduction of litigation, increased innovation, increased customer satisfaction, sustainability, and reduced risk. However, case studies in Study 2 pointed out other benefits like better communication between the owner and the project team and better collaboration between the design team and the contractor. Co-localization and building information modeling (BIM) were mentioned as a contribution to better communication and collaboration.

One of the considerable advantages of relational contracts that creates a cooperative working environment is its flat organizational structure, transparency, and absence of unnecessary exertion of organizational power. Hence, the link between stakeholder power and value creation in construction projects was investigated. Integrated organizations require transparency and reduce the significance of formal bindings between the participants. This might trigger the desire of some stakeholders to use power to impose a desired outcome. It is therefore essential to investigate how stakeholders use power to influence decisions. Equally, the sources of power to influence decisions need clarification to address what is at stake. Such clarifications are crucial to increasing transparency and, correspondingly, prevent the abuse of power.

Section 5.2 Power in Project Organizations and the Link to Value Creation

Although the concept of power has been subject to many definitions, a common notion is that power makes things happen by influencing the behavior of another social unit (Loosemore, 1999). Sources in the literature define a stakeholder as any person or organization that can influence, be influenced by, or be affected by the project (IPMA, 2006, PMI, 2008). As the definition of power implies influencing the behavior of other social units, the dynamics of power in stakeholder relations is interesting in the context of value creation since this influence can result in desired and undesired outcomes, both for the stakeholder exercising power and the one subdued by it. Consequently, the exercise of power can be both a challenge and an opportunity for stakeholders in construction projects.

Power in organizations has been a hot topic for researchers, especially within the fields of management over the last decades. Numerous researchers have conceptualized, defined, and evaluated the effect of power in organizations (Mechanic, 1962, Astley and Sachdeva, 1984, Pammer and Killian, 2003, Engelstad, 2005, Morgan, 2006, Ivancevich et al., 2011, Daft, 2012). Pammer and Killian (2003) described power as “one party’s attempt to impose an outcome on

the other party.” Morgan (2006) defined power as “the medium through which conflicts of interest are ultimately resolved. Power influences who gets what, when and how.” Morgan (2006) introduced 14 sources of power in organizations. Morgan’s categorization offers a comprehensive and explicit definition of the sources of power, which is highly applicable to construction project organizations. The categorization seems to cover a wide range of possible reasons a stakeholder should possess the ability or willingness to impose an outcome. Hence, I have evaluated this as the most relevant reference on which to base this research. The 14 sources of power according to Morgan (2006) are presented in Table 5-2.

Table 5-2 Fourteen sources of power (Morgan, 2006).

No.	Source	No.	Source
1	Formal authority	8	Control of technology
2	Control of scarce resources	9	Interpersonal alliances, networks, and control of “informal organization”
3	Use of organizational structure, rules, and procedures	10	Control of counter organizations
4	Control of decision processes	11	Symbolism and the management of meaning
5	Control of knowledge and information	12	Gender and gender relations
6	Control of boundaries	13	Structural factors that define stage of action
7	Ability to cope with uncertainty	14	The power one already has

During this study, interviews were conducted (Haddadi et al., 2016b). The interviewees were asked to first express their thoughts regarding the dynamics of power for each main stakeholder (owner, project manager, design team, and architects) and how they perceive their sources of power. Later, the framework presented in Table 5-2 was shown to the respondents, and they were asked to express who they thought would possess the source of power, how they thought the source of power can affect the value creation of a project, and how significant the effect of the source is. Representatives from the roles of architect, design manager, project manager, and project owner were interviewed. According to Samset (2010), these are the stakeholders that directly affect the project. The user is a significant stakeholder in the project. However, user groups in projects are usually formed as one-time organizations, which makes it difficult to find representatives with experience from several projects. Hence, the user as an important stakeholder is studied in a separate study presented in Section 5.3, although not from the perspective of power in the project organization.

The results from the interviews were synthesized from two perspectives: first, from the stakeholder (owner, architect, technical consultant, and project managers) perspective, revealing the dynamics of power for each main stakeholder and, second, from the perspective of the sources of power and contribution to value creation.

Dynamics of power for each main stakeholder

Owner: All the interviewees mentioned that the owner is the stakeholder with the highest power, although differences in the exertion of the power by the owners occur. Some owners transfer the power to the project manager and the management team. Some have a more “hands-on” approach to their projects. The owner’s competencies and knowledge are decisive factors on how much power they have, despite the formal authority. The owner representative mentioned that the owner has less power than presumed, especially in the public sector. As satisfying user needs is a significant matter, the owner has less power in choosing solutions than users and architects. The owner’s real power (especially in the public sector) is in managing the project regarding the economy, schedule, and quality. In the private sector, the owner has more power in choosing the desired solution.

Architects: There is an agreement that architects have far less power nowadays than they used to have some decades ago, at least in Norway. Different delivery models, more complex technical facilities, a higher degree of technical requirements, environmental issues, and new regulations were mentioned as the possible reasons. The fact that project management has been professionalized during the last decades was also mentioned among reasons architects now have less power in projects. Despite the reduced power, the architects are still one of the most influential stakeholders in projects because of their significant role in transforming the owner requirements into the functional description. Architects also feel a higher degree of ownership of the project due to the nature of their task, which is creation. This makes them more engaged in the project and increases their willingness to influence the project. They are consequently more willing to use the power sources that they are given to influence a project in which they feel ownership.

Technical consultants: Technical consultants have a significant influence on value creation due to the increasing complexity of technical facilities and more standardization and regulations. The recent focus on environmental issues has also increased the demand for technical personnel in project organizations. The design team is a complex and vital

organization within the project organization. Therefore, different roles and disciplines within the design team can exert power within the team as well as on the project in general.

Project management: Interviews show that different stakeholders have different perceptions of this stakeholder. The project management role as an integrated part of the owner's organization can be conceived as the owner's operational level and thereby as synonymous with the owner. It means project management takes decisions on behalf of the owner and therefore has almost the same power, although the mandate for some decisions can be limited. On the other hand, this stakeholder can be perceived as a layer in the communication between the design team, architects, and the project owner where there is a clear line between the owner and project management team. Being the owner's operational hand and a communication layer between the design team, architects, and owner gives this stakeholder massive power.

The distribution of power can vary between projects due to factors like the circumstances, complexity, owner and user involvement, management methods, etc. However, there is a consensus on how interviewees conceive the distribution of power.

Concerning common sources of power, the research revealed that, out of Morgan's 14 sources of power, only 10 are recognized as common sources of power in Norwegian construction projects. Sources that are not mentioned are either not acknowledged by the interviewees as a source of power in Norwegian projects or are considered the following consequence of another source of power. For example, the "use of organizational structure rules, regulations, and procedures" can be a result of other sources of power like "formal authority," "control of the decision processes," or "control of boundaries." Using any "power one already has" can be a source to acquire more power. This is dependent on individuals and cannot be considered a general challenge for construction projects. The same argument applies to "symbolism and management of meaning." This brings us further to the discussion on rhetorical skills as a missing source of power on Morgan's list.

Sources of power and value creation

One of the primary purposes of this study was to investigate the effect of the sources of power on value creation. The significance of each source of power is the subjective view of the interviewees. In this regard, all interviewees stressed the importance of "control of knowledge and information." Control of knowledge and information is considered the source of power with the highest effect on value creation in projects. The research reveals that "formal authority" is also a critical source. With a more open agreement where everyone is responsible for project

success, the effect of formal authority as a source of power is less than non-integrated organizations. This will also reduce the ability of a formal power relation to limit the possibilities of minority parties to present their knowledge. Several interviewees stressed that all sources of power could be abused and have an adverse effect on the project and value creation.

Table 5-3 summarizes the effects of the sources of power on value creation, assuming the source of power is not intentionally abused.

Table 5-3 Effects of the sources of power on value creation based on the study of power in organizations.

Source of power	Significance for value creation	Effects on value creation	Stakeholders who possess the power
Control of knowledge and information	High	Knowledge is appreciated, and those with knowledge have the opportunity to influence. This also includes contractors and facility managers if they are involved in the early phase. Positive for value creation.	Owner, PM, Architect, Design
Formal authority	High	Positive when it clarifies the roles and mandates in a project. Negative if the power and responsibility are not aligned.	Owner, PM, Architect, Design
Control of decision processes	Medium	Proper control of decision processes will shorten the decision time and have a positive contribution to value creation.	Owner, PM
Control of boundaries	Medium	Using this to organize the project with proper information flow and good cooperation will have a positive effect on value creation.	Owner, PM, Architect
Interpersonal alliances	Medium	Negative if it reduces transparency and gives the power to the minority. Positive if it contributes to better collaboration.	Owner, PM, Architect, Design
Control of technology	Medium	Positive if it stimulates innovation and new thinking. Negative for value creation if it ends up in a monopoly situation.	Architect, Design
Control of counter organizations	Medium	Positive if the counter organizations protect rights. Negative if they represent minor interests.	External
Coping with uncertainty	Medium	Can lead to better decisions. Positive for value creation.	Owner, PM, Architect, Design
Control of scarce resources	Low	This is a challenge for value creation that can have negative effects.	Architect, Design
Gender and gender relations	Low	Culture-related. In Norwegian construction projects, this is not considered a factor related to value creation. Can be different in other cultures and other types of projects.	Owner, PM, Architect, Design

By more democratic organization models, the formal authority will not interfere with the flow of information and knowledge. As a result, the control of boundaries and decision processes will have reduced effects as sources of power.

Section 5.3 User Involvement: Challenges and Opportunities

The satisfaction of the end users is not only based on the outcome but also on the process toward the achievement of the outcome (Pemsel et al., 2010). According to Dewulf and Wright (2009), involving users in the process may create more realistic expectations, as users become aware of the physical and financial constraints of the project. They also point out that user involvement may benefit not only users but also the design team. While the design team contributes with their technical knowledge, users can provide an understanding of how the buildings are supposed to work. By combining these two factors, the usability of the buildings can also be increased. This highlights the significance of a proper user-involvement process.

In general, the construction industry's traditional view on user involvement is that end-user interaction in the process is a nuisance (Arge, 2008). However, if client values are not fully understood in a construction project, it is likely to result in either low fulfillment of customer expectations or multiple design alterations during the project. Such changes typically lead to additional costs and frustration among the project participants (Thyssen et al., 2010).

In the context of user involvement, the users who are involved in the process are not likely to use the building over its whole lifetime. Users change over time, and so does their needs and perception of value. The participants in the process will hence represent the future value perception in limited ways. Spencer and Winch (2002) substantiated another challenge with user involvement by stating that end users find it difficult to define what creates value combined with the fact that value is difficult to measure.

As mentioned in Chapter 2, data regarding the user-involvement process was collected through the study of value creation in university campuses and office buildings by adding relevant questions to the interview guides instead of interviewing user representatives (Ravik et al., 2016, Spiten et al., 2016). As mentioned earlier, user groups in projects are normally a one-time organization. Consequently, it is a difficult task to find reliable sources in user representatives with experience from different projects.

Although these studies were conducted on different types of buildings, the data showed a clear alignment in opportunities the respondents see in the user-involvement process and the challenges the cases have met. In general, there is a consensus about the positive outcomes and necessity of a user-involvement process. It was highlighted that creating a mutual understanding of the terminology and design solutions is imperative to understand the end-user needs and improve communication. Involving users can lower the resistance to change and help users

express their needs, which provides a feeling of ownership and pride. However, the user-involvement process appeared to be flawed and challenging in all studied cases. The observations indicated that the process is time-consuming, complicated to structure, and exposed to conflicts. Users operate under the wrong impression of what the process means and start demanding instead of contributing with ideas primarily because of unsatisfactory communication. They show engagement at the start but feel their work is ignored if their ideas are not considered at the end. Moreover, users are not always aware of their needs and sometimes are unable to express them adequately. Their involvement too early in the project was also stated as a challenge, as the strategic decisions might not be clear yet, and this can cause confusion and diverging requests.

Through the interviews during the studies (office buildings and university campus buildings), a range of opportunities and challenges that the user-involvement process can create were identified. These are summarized in Table 5-4

Table 5-4 Opportunities and challenges of user involvement (Ravik et al., 2016, Spiten et al., 2016).

Opportunities	Challenges
The users feel that they have been involved in the process and that their needs have been considered. This results in a sense of ownership and pride.	User engagement can be difficult to control. There is a need to set clear guidelines and to be specific about factors, such as their role, when they can present the input, what has already been decided, and what they can affect. Not specifying the role and scope of influence may result in disappointment about what they did not receive from the process rather than satisfaction from what they did receive.
Users can have sound and/or innovative ideas. They often have a good understanding of what they need to do to perform effectively.	Users often want everything they currently have and find it difficult to visualize and imagine new solutions.
There is often uncertainty and fear associated with change, so by involving the users, the project has the opportunity to enhance the users' knowledge about different solutions. They understand more of what is happening and why; hence, the changes are easier to accept.	User involvement too early in the project can also be challenging, as the strategic decisions might not be clear yet, and this can cause confusion and diverging requests. Users often want more than they can have, and it is essential to distinguish between general and individual needs and wants and to align them with project strategies. Some input can come from a few people who speak the most assertively, and vice versa. This points to the need for good facilitation of user processes.
Development of new buildings or solutions is a maturation process, so it can be an advantage that more people in the organization than management alone talk about such a project.	It is usually sufficient to involve user representatives. However, they should be selected carefully, as it is difficult to satisfy all user needs by asking only a few users.
Positive users can promote and assist in the conversation about the project.	If users are involved, someone should be there to guide them.
Users who are critical of change can present their views early on. In this way, changes later in the project can be avoided. Involving and informing critical users can also make them be more constructive and feel more satisfied.	People often think that they are unique and that the general findings from research do not apply to them. There are some variations between employees, but these are rarely so large that they affect the outcome of floor plans.

Some measures were suggested as strategies to enhance the user-involvement process based on this study. First, it is crucial to ensure a systematic approach. This includes setting clear guidelines for how users should be involved and involving the right people at the right time.

Involving the users may lead to better understanding the user needs, discovering new solutions, increasing the knowledge of users, and making them more positive about change and the project outcome. However, as users are a multifaceted group whose motives can affect the project, proper stakeholder management is necessary to avoid time and cost overruns as well as to avoid inflexible solutions that only fulfill certain user needs. To achieve a successful process for user involvement, it is important to be clear about what the users can affect and when. Both the literature and the case studies indicate that communicating using the same terminology, translating client values into understandable design criteria, and creating a common understanding are important for successful end-user involvement (Ravik et al., 2016, Spiten et al., 2016). Another measure that could improve the process, and increase its effect, is establishing the building as a virtual model as a basis for discussion and taking enough time to explore end-user needs and make the changes before the start of the construction. A virtual model through a real size mock-up or BIM would allow the users to have a better understanding of the details and increase their potential for introducing new ideas or pointing out the flaws and ineffective solutions.

Section 5.4 Contribution to Research

Multidisciplinary focus and early involvement of relevant knowledge were referred to as significant contributors to value creation in construction projects. This claim was investigated further, initially through two studies and went even further by participating in a third study performed by fellow researchers in our research group. Participation in the third study included collaboration with an ongoing study using the relevant data and findings and discussing the results with fellow researchers working on the study. The studies confirmed the positive effects of early multidisciplinary involvement in the projects. A more profound look at how different disciplines can influence the process, five influential disciplines were identified:

- Owners can have a significant positive effect by conducting extensive strategic analyses early in the project to identify and express project strategies, goals, and objectives and provide legitimate tender documents, functional descriptions, and quality specifications.
- Architects contribute to the strategic performance of the project by being the driving force and by establishing the premises for the building and project based on the owner's descriptions and specifications.
- Engineers and other design disciplines contribute by designing cost-effective, sustainable, time-efficient, and well-defined solutions that can result in efficient production in accordance to technological regulations.

- The knowledge contributions of contractors (and suppliers) prior to the start of the production phase appear to be underestimated. Contractors possess solid knowledge about the feasibility of the solutions and the challenges regarding the execution of the suggested solutions.
- Facility managers are considered of high significance for a successful early phase. Facility managers are the most reliable sources of information about the operation of the building. They can evaluate the feasibility of a solution and its effect on the operation of the building. Complexity, efficiency, flexibility, and maintainability of the systems in operation are significant concerns in the LCC of the building.

Although delivery models, such as DB, have focused on multidisciplinary collaboration, some contextual constraints for exploiting the positive effects were identified. The economic incentives and the structure of sharing the risks and rewards in a DB project can affect the quality of the solutions, life-cycle thinking, and communication with the owner. Findings from the research further indicated that multidisciplinary focus and early involvement of relevant actors could contribute to value creation through relational contracts, such as PP, as a possible measure. Moreover, PP can contribute to improve the project culture and partners' attitudes to decrease the number of disputes, change orders, rework, unwanted incidents, etc. In addition to improving the organizational culture, PP can contribute to better handling the complexity in the projects, as construction projects are changing and becoming more complex and longer with higher uncertainty and an increased need for technical innovation and innovative solutions. Relational contracts create a better environment for collaboration and addressing the challenges by establishing a common goal for involved parties in the project compared to traditional contracts where competition and single-stakeholder value creation can get ahead of pursuing the common goal.

Fourteen sources of power were identified through the literature, and 10 appeared to be common in Norwegian construction projects, although the significance for value creation was not equal. In this regard, "control of knowledge and information" is considered the source of power with a substantial effect on value creation in projects. The research reveals that "formal authority" is also a critical source. With a more open agreement form in which everyone is responsible for the project success, the effect of formal authority as a source of power is less than in non-integrated organizations. This will also reduce the ability of the formal power relation to limit the possibilities of less powerful parties to present their knowledge. All sources of power can be abused and have an adverse effect on the project and value creation. A summary of the

common sources of power and their effects and significance is presented in Table 5-3. User groups were not presented as a stakeholder in the study of power. Involvement of users in a project has been investigated as a part of several conducted studies during this PhD work.

As the literature and research have revealed, satisfying user needs is a fundamental requirement for creating value. To create value for end users of buildings, it is essential to understand the end-user needs both at present and in the near future. Their satisfaction is not only based on the outcome but also in the process toward the achievement of the outcome, hence the process of involving users in the project is of importance.

The studies showed that there is generally an agreement concerning the positive outcomes and the necessity of a user-involvement process, although the construction industry's traditional view on user involvement is that end-user interaction in the process is a nuisance. During the studies, it was highlighted that creating a shared understanding of the terminology and design solutions is imperative to understand the end-user needs and improve communication. Hence, expectation management and clear communication about the objectives of the process are crucial. Table 5-4 summarizes the opportunities and challenges that lie in a user-involvement process. Some measures were suggested as strategies to enhance the user-involvement process. The approach should be systematic and include clear guidelines for how the users should be involved and when they should be involved and clear instructions about what the users can affect at which point of the process. Another suggested measure was establishing the building as a virtual model through, for example, a real size mock-up or a BIM model.

Chapter 6

Enhancing Value Creation in Construction Projects

“You must change your approach in order to change your results.”

- Jim Rohn

Chapter 6 Enhancing Value Creation in Construction Projects

Based on the research results presented so far, value creation of a building seems to be directly associated with the effect of owning and using that building over its lifetime. These effects define how successful the building is as a product but does not say anything about the effectiveness of the project management process or the design process on the front end. Considering this, it is possible to contribute to enhancing value creation by applying the knowledge about what creates value after the building is delivered into the design phase to optimize the design of our buildings.

The part of the research presented in this chapter has its focused on what can contribute to value creation in each phase of the project life cycle. Figure 2-10 illustrated the design of this part of the research toward answering RQ3. The research design is described in detail in Section 2.3.

The first section of this chapter presents my research findings regarding what creates value and how value creation can be enhanced in each phase of a project. The second section of this chapter presents the suggested measures identified through the research so far and the case study of two hospital projects.

Section 6.1 Value Creation in Different Phases

The literature on value creation, thoroughly described in Chapter 3, suggested that buildings must be seen in a broader perspective than just their functions. From user perspectives, elements like sustainability, adaptability, reliability, and perceived value for benefits contribute to how satisfied they are with the building, were identified. For owners or businesses, the focus was pointed out to be on harmonizing the resources and provisions as well.

This leads us to the concept of value in which ensuring the required functions is a contribution to value creation. On the other hand, the objectives of the owners and users are being translated into buildings throughout a project. The objectives of both owners and users must be understood and identified early in the project and be a part of the success criteria, which are measured after the project has been completed.

Concept Phase

The questions that were asked at the interviews and questionnaires for this stage focused on which challenges the projects have encountered during this phase and what they would do differently in the next project.

Inadequate or unclear project strategies and objectives are among the considerable obstacles for creating value in the early phases of the project. According to Hjelmbrekke et al. (2015), the management theories have identified that project strategies are among the main weaknesses in project planning and execution. Interviews confirmed this claim and revealed that this includes a flawed procurement model, delivery model, contract model and goals and objectives.

Findings from in-depth interviews after the second questionnaire (see Figure 2-10) also indicate that a significant amount of information is lost due to weak communication between the owner and the project team during the initial phases of the project. This challenge can escalate the problem regarding understanding the project strategy when there is an inconsistent interpretation of what the owner's expectations are and what the output should be. The interview results, hence, indicated the importance of a profound and extensive strategic analysis to develop a project strategy with clear objectives, priorities, and ambitions.

The ambition level for different value characteristics like esthetic, architectural character, environmental issues, and quality also often seem to be ambiguous as the future development of the needs is uncertain. A guidance tool as a "value menu" could be helpful for owners to make the right decisions. A value menu would be a tool that provides a research-based overview of the drivers of change and sustainability in different types of buildings and helps the owner to choose the ambition level based on what can create value in the future.

Feasibility Phase

As discussed in Chapter 5, the research reveals that the collaborative types of projects, where the project team is formed early and where execution competencies are involved in the design phase, have better chances of delivering successful projects. This was further confirmed by the interviews conducted after the second questionnaire in this research and the interviews in both hospital case projects. The respondents who were involved or had been involved in collaborative projects claimed that the collaboration and engagement of all competencies in the early phase were positive for project success.

The results from both Case project 1 and Case project 2 (Tønsberg sykehus and VNGC) also showed that the team must be able to verify the project documents and project strategies before identifying value-creating elements. Procurement of the team increases the information and knowledge in the project, and the team can look into the documents with a new perspective with more information. This can provide an opportunity to improve the underlying documents and decisions before the feasibility phase starts.

Literature, discussed in Chapter 3, showed that value creation was dependent on fulfilling owner strategies and user values/needs. At the same time, during both the hospital case interviews and the interviews following the second questionnaire, it was mentioned that, in many cases, it is difficult for the users and owners to express their needs and strategies. It was also a challenge that user-involvement processes during the concept phase sometimes happened to have contrasting results from the processes that the design team conducted. Architects, design teams, and contractors can have a great contribution to identifying value-creating elements using their experience from earlier projects. Hence, the team's competency combined with the identified user needs and owner strategies will form the best input to the value identification process. In this way, the value identification process will result in a better understanding of value for the project as well as the creation of legitimate ideas that underpin the expected long-term effects of satisfying needs and strategies.

Definition Phase

Through this step, the project team (designers in collaboration with the contractor and suppliers) develop a design that describes the feasible solutions on how the identified value elements can be achieved. The input to this step would be the ideas created from the previous phase combined with innovation and eventual suggestions that might not be necessities but can add value. The expected output of this step would be the descriptions and solutions through design. The primary challenge at this step of the project is that solutions and descriptions were not always validated before implementation and the design team was not adequately aligned with the contractor team.

Results from the first questionnaire, the workshop, and Case 2 indicated that innovation is not emphasized enough in the early phase of construction projects. Furthermore, both case studies confirmed that new thinking and innovation contribute to higher value creation in projects. The case studies also revealed that validation study is a requirement to align the team before the

ideas are implemented in a production system to verify the functions and requirements that the owner and users have.

Execution Phase

This phase is defined in this framework as the activities from plan verification and approval to product delivery. This phase includes implementing the plan for action, the production phase, and commissioning. Interviews and questionnaires revealed that commissioning is an underrated step in existing project models. Inadequate involvement of FM competencies in early phases of projects has been identified as one of the reasons the commissioning step is challenging. Meanwhile, those involved in the case project that included this type of knowledge in early phases of the project acknowledged that FM had been a significant contribution to streamlining the commissioning process and training the operation team.

Operation and Review Phase

Results from the interviews after the second questionnaire indicated that the knowledge and experiences in construction projects are not adequately structured and transferred to later projects. There is a clear need for a structure around the timing of reviewing different effects and aspects. Evaluation of the results should be defined in different periodic terms. Some effects can be evaluated right after project delivery while other aspects are expected to have short-term or long-term effects.

The research revealed a wide range of principles that should be considered to create value in construction projects as well as constraints and challenges that can limit value creation. In the early phase of the projects, the need for better communication with the owner, a value menu that helps decision makers in choosing the ambition level, and a clear project strategy indicates a profound need for thorough strategic analysis in the early phase. The research has also revealed that collaborative projects where the team is organized and assembled early and where contractors are involved in the design phase have better chances of success. Engaging the team as early as possible can have benefits, such as involvement in defining what creates value for the project and the opportunity to verify the project strategy and concept phase documents.

The research also indicated that value is created when owner strategies are aligned with user needs, and they both are fulfilled. On the other hand, users are often not aware of their own needs. The competencies and experience of the project team can have a positive contribution to identifying the needs and value-creating elements. Innovation and new ideas is also a

requirement for proposing better solutions and descriptions to fulfill the identified needs and thereby create value.

Section 6.2 Suggested Measures for Enhancing Value Creation

One of the primary objectives of this research was structuring the knowledge regarding what creates value to enhance value creation in construction projects. This section presents suggested measures that were identified through two hospital case studies. The first case was a hospital project in San Francisco California, which was at the end of the production phase by the time of the study. Case 2 was a hospital project in Tønsberg Norway. This project was at the beginning of its feasibility phase by the time the study was conducted.

Strategic Analysis

One of the central question at the concept phase of the project is what is needed before the design team and contractors (the value team) are engaged. Although the research revealed that this step is different in every project, there is an agreement on what the minimum expected output from this step should be. In Case 2 (Norway), the value team has been involved in significant parts of developing the contract. The results indicate that the team expected that the owner had progressed the contract to a clear stage before engaging the value team. The indisputable output is the owner's business case, including priorities and objectives. It is also expected that the owners should have a clear strategy for the procurement model, execution model, and contract model before the value team is engaged. The lack of adequate communication with the owner to identify the owner strategies and user needs was also identified as one of the primary obstacles in achieving the desired outputs at the concept phase of a project.

Choosing the Value Team

Choosing the proper project team is extensively emphasized as a crucial prerequisite for success and value creation during the interviews. What type of competences should be involved and at what point of the project are the most significant questions here.

Factors such as the extent of management's prior experience, the project strategies, contract models, procurement models, owner strategies, and, of course, the project needs are identified as elements that can influence the selection of the team. However, some findings indicate what successful projects have in common to handle this challenge. First, the research shows that the sooner the team is assembled, the better it is for project outcome. The respondents who had

been through collaborative types of projects (e.g., integrated project delivery), claimed that engaging all the necessary partners and competences early in the project resulted in better identification of the value-creating elements, improved the accuracy of the design, motivated better collaboration in the team, and provided outcomes that even exceeded the expectations.

Another interesting finding was the need for resources with profound knowledge of the operation phase during the early design phase and throughout the project. This type of resource can contribute to the functional design of the systems, verification of the design, implementation of the design, deployment of the commissioning phase, and training the operation crew.

Value Identification

As the literature revealed, value creation is a result of the satisfaction of needs and the fulfillment of the expected effects. To efficiently create value, owner strategies and user value must be aligned. These elements must be identified to understand value for the project. This understanding is necessary for creating ideas for how to fulfill the needs and strategies.

Identification of user needs and owner strategies can be a challenging task. Although VM models suggest various processes for identifying value in projects, one of the most common methods for identifying user needs is the user-involvement process. The process includes structuring the users in different ways to identify their needs and expectations for the project.

One of the significant issues in user-involvement processes is the users' lack of ability to recognize, formulate, and balance their needs and demands. The research also implies that too-early involvement of users might not be advantageous. Users should be actively involved when the project team (architects, designers, owner and suppliers who are involved) is formed. The project team, including the owner, can significantly contribute to identifying and aligning user needs and owner strategies based on their experience and knowledge. This involvement is notably a requirement for life-cycle thinking within project development. Value management processes offer approaches, such as different types of workshops, for identifying user needs and owner strategies.

Value Proposition/Design Development

Design development using the identified value-creating elements is directly associated with the "definition" phase of a project. The identified elements with the innovative thinking of the project team are transferred into specific descriptions, drawings, and solutions.

Another discovery through the case projects was the solutions, ideas and measures that are not a requirement for success in the project but can contribute to higher value creation. These are so-called “added-value” elements. Both case projects operated with “an added-value list” or “predefined options,” which is a directory for featured added-value elements. Elements from these lists can be promoted and actualized if the financial situation of the project allows it.

Validation of Solutions

The design is developed by proposing descriptions and solutions. At this stage, there may be more than one alternative solution for a particular function. Validation will be necessary to choose the right alternative. Throughout validation, the suggested solutions would be evaluated with respect to the identified values. The proposed design should be verified by focusing on the feasibility and whether it satisfies the owner strategies and user needs.

The proposed descriptions and solutions define a plan for action or a new revision of the existing project plan. This plan is the input to the next phase of the project, which includes implementation of the suggested and verified descriptions to start the production.

Implementation

The execution phase is the phase where the plans, solutions, descriptions, and drawings are implemented and transformed into the product. This step contains a complicated production system that attempts to conduct this transformation efficiently and productively. As the literature suggested, users need to have their functional and hedonic values fulfilled. Owners should be able to fulfill the user value while experiencing a profitable/optimal operation, and suppliers must fulfill the user value and produce effective and efficient outcomes. The suppliers have a responsibility to focus on what creates value for both end users and the owner, while their production system focuses on reducing waste and increasing productivity and efficiency. As an example, applying lean production methods was suggested in both studied case projects as beneficial throughout the execution phase.

Commissioning and Transition

By the end of the execution phase, the commissioning and transition will start. The technical facilities are tested, and the operation phase starts. The research reveals that, particularly in hospital projects, this transition is demanding and seldom seamless. One of the measures to improve the process is to involve those with knowledge of building operation early in the project. The case project in San Francisco has so far experienced a smoother commissioning

process partly because they dedicated a resource with operations competence to the project. The resource has been involved in testing the design solutions, testing the execution of the design and training the operations team who will be in charge of the operation phase.

Value Evaluation

The frequent omission of structuring and transferring knowledge and experience after product delivery to other projects leads to the need for a final step after product delivery that contains an evaluation and assessment of the project. The interview results from the case projects also revealed that evaluation of the results should be defined in different periodic terms. Some aspects and effects can be assessed and evaluated shortly after project delivery, while some outcomes might take time before they can be detected and assessed.

Section 6.3 Contribution to Research

The literature study revealed that value creation in a life-cycle perspective of a building depends primarily on two factors: i) fulfillment of the user needs ii) fulfillment of corporate owner strategies. Further research revealed that these two factors combined with innovative thinking can add further value to the project. Project success in a lifetime perspective depends on meeting objectives (both tangible, such as time, cost, and quality, and less tangible criteria) as well as the achievement of the long-term effects brought about by the project. This requirement implies that identifying the needs and strategic goals, intangible criteria, and achievement of the long-term effects are fundamental contributions to value creation in a project. A systematic evaluation of the value creation and achievement of the objectives after project delivery is necessary for transferring the knowledge of what creates value in the operation phase and exploiting that knowledge in the design of future projects. In addition, the need for a competent team and early involvement of the key resources to define value characteristics is clear. The team should be able to verify the project strategy and documents from the concept phase as well as contributing to the identification of value-creating elements for the project.

Many VM models have been developed during the past decades to improve the accuracy of identification of appropriate objectives for projects and to choose the best solutions. However, a lack of a holistic methodology for transferring objectives and the chosen solutions into functional buildings with a lifetime perspective beyond the existing VM models is already acknowledged. The findings and results presented in this chapter, including the challenges for each phase of the project and the suggested measures, can be summarized in the framework illustrated in Figure 6-1.

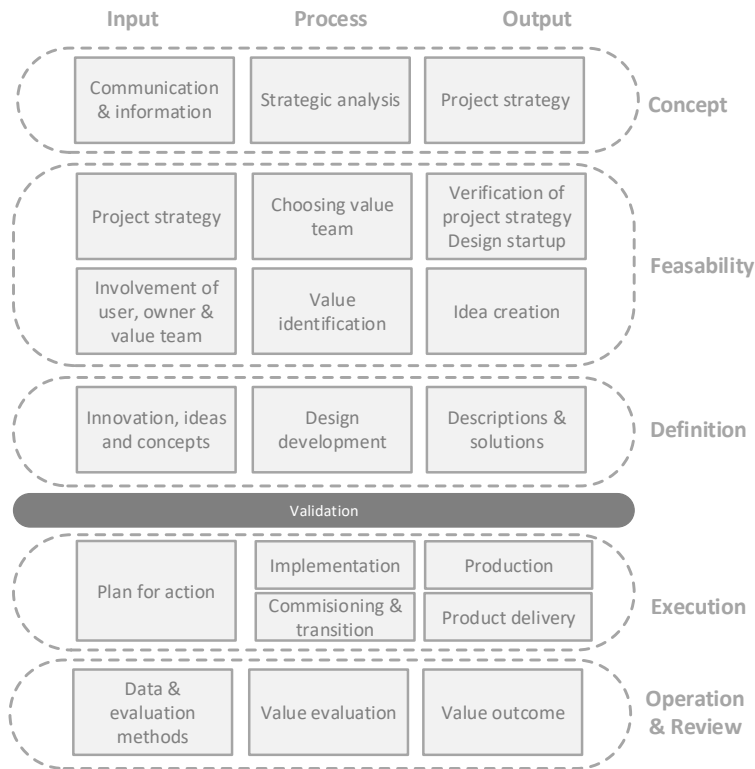


Figure 6-1 Framework for enhancing value creation in construction projects.

The framework is a spinoff from the findings of the research and suggests a structure using the principles that must be considered to increase value creation in each phase of a project, including the operations phase. The framework also presents a method that enables the project to move the focus from the building completion perspective to the building lifetime perspective. Implementing such a methodology will help decision makers to move the focus from what is best for the project to what is best for the users and owners.

Chapter 7

Conclusion

“A conclusion is the place where you got tired of thinking.”

-Martin H. Fischer

Chapter 7 Conclusion

This chapter presents the contributions to knowledge through this PhD work by answering the three research questions and evaluating the results of the research. The following three research questions are the foundation of this PhD and will be addressed in their respective sections:

- *RQ1: How is value conceptualized and defined in relation to construction projects?*
- *RQ2: What are the characteristics of value in construction projects?*
- *RQ3: How can we enhance value creation in construction projects?*

Section 4 of this chapter presents an evaluation of the validity and reliability of the presented results. The last section of this chapter (section 5) contains a reflection on the research, implications of the research in theory and practice, and my ideas on further research and improvements.

Section 7.1 How is Value and Value Creation Conceptualized and Defined in Relation to Construction Projects?

My research showed that value is conceptualized and defined differently in different contexts. Aristotle (fourth century BC) introduced the first evident conceptualization of value by distinguishing between “use value” and “exchange value” (Fleetwood, 1997). During the last centuries, the discussion was brought further within manufacturing and economics by Adam Smith introducing “productive activities” that contribute to a higher exchange value in tangible goods, where the exchange value is defined as the price that consumers are willing to pay (Vargo et al., 2008). Henry Ford brought the discussion further and involved customer value and its importance for industrial manufacturing (Ford and Crowther, 1926).

The study of value in different contexts revealed that the broadest approach to conceptualizing value is conducted in the field of marketing and consumer economics, closely followed by manufacturing.

Price-based conceptualization of value is the most basic definition and points at the perceived a benefit for what customers sacrifice. Within this stream of conceptualization, value as low price, value as quality obtained for the price paid, value for what the customer receives for what he or she gives, and value in whatever customers want in a product or service is outlined (Zeithaml, 1988, Dodds et al., 1991). The last one, regarding what customers want in a product or service, brings the discussion to attributes other than price and the contribution of these attributes to perceived value as well as focus on utility and the functional aspects of perceived

value. This acknowledgment resulted in a new stream in the conceptualization of value (means-end theory) where the effects of the attributes on different levels were considered as well. This stream was consequently based on the assumption that a customer's reason for acquiring and using a product or service is to achieve a favorable end (Khalifa, 2004). The means-end theory is highly relatable to the construction industry and buildings, as a building can possess attributes like quality and esthetics, but the perceived value would also depend on which consequences these attributes have for the user and whether these consequences can contribute to achieving the objectives that the customers or owners have for the building.

Multi-component/multidimensional models were among the other attempts to conceptualize value by defining it as a construct of several interrelated attributes or dimensions that result in a holistic presentation of a complex phenomenon (Sánchez-Fernández and Iniesta-Bonillo, 2007). Components such as emotional value, functional value, social value, epistemic value, hedonic value, utilitarian value, esteem value, exchange value, and use value are presented in this regard.

Although different theories and research streams are applied in different contexts to conceptualize "value," the common ground seems to be the focus on the customers and users. However, the ultimate customer in a construction project is complicated to define. The owner of the building is considered the suppliers' customer in a construction project, and the users of the building are the owner's customers. Womack and Jones (1996) explain that value is only meaningful when it is expressed in terms of a specific product that meets the customer needs at a specific price at a specific time. Although this leads us to the individuals using the building as end users, the fact that every stakeholder has his or her own value perception cannot be neglected.

Prerequisites for value creation in the context of construction projects seems, therefore, to rely on the perception of value from the three central stakeholders perspective. According to Samset (2003), owners focus on the long-term perspective, users focus on the effects of using the products, and suppliers focus on deliverables or outputs from the project that are needed for the project to be a success. The owner's prerequisite to create value can be summarized in profitable/optimal operation of the building and fulfilling the customer needs. The suppliers, based on the literature on manufacturing processes, are required to minimize the waste (non-value-creating activities) and to fulfill the customer (owner and user) needs to create value in the product they have manufactured. The ultimate objective of the project should then be to fulfill the user needs to increase the "customer's perceived value" (Figure 3-5).

Although the focus on customers and end users seem to be essential in delivering value, Arge and Hjelmbrække (2012) argued that projects must have a reason based on organizational business strategies and goals, admitting that the trigger for any project is the predicted or existing customer need. This emphasizes the importance of aligning corporate strategies with customer needs to maximize the value creation and leads us to the next research question regarding the characteristics of value for users and owners and the means to create value.

Section 7.2 How Is Value Created in Construction Projects?

Characteristics for creating value in construction projects could, principally, be categorized into four general sub-categories: economics, social, environmental, and physical (Bjørberg et al., 2015). Through a study in collaboration with the OSCAR project, a wide range of characteristics and value-creating elements associated with these sub-categories were identified. These elements were investigated further in three types of buildings (hospital buildings, university campuses, and office buildings). The studies corresponded with earlier findings regarding aligning corporate strategies with customer needs. The characteristics of value could be divided into either users or owner requirements. However, as expected, there are similarities and differences in these requirements for different types of buildings.

Over 1000 users ranked the qualities that they consider create value in their buildings. Requirements such as indoor climate and comfort (noise, air quality and temperature), access to public transportation, interior and exterior quality and impression, rooms and areas that facilitate both individual and collaborative activities are among the examples of user requirements which are typical for any building. However, every type of building has its unique requirement as well. While elements such as facilities for physical activity and sport is considered as a relatively highly ranked factor for students on university campuses, they are not acknowledged as essential factors for an office building or hospital building. Logistics and environmental consciousness are pointed out as fundamental parameters to achieve value in hospital buildings, while neither campus nor office users have ranked these as important factors.

As literature revealed, the value of a product is defined by the ultimate user and depends on the individual perception of the product. Although this can imply that determining what creates value for users is a difficult task, our most significant finding, regarding identifying value creating elements for users, is that the standard deviation is higher for the low-ranking functions, indicating converging individual preferences on what the highest ranking functions and requirements are. The elements with a low standard deviation are essential to be fulfilled

for everyone while higher standard deviation indicates the diversity in needs meaning that these should be fulfilled but not designed to be utilized by the whole user mass.

Although some of the significant user requirements were ranked and analyzed, identifying user requirements in each project is of significance. In the study of the hospitals, identifying users' critical requirements were associated with the future development of the capacity, reputation and competences and how the buildings can help the healthcare services to achieve these objectives. Considering the user requirements in association with core business strategies and its requirements is a smart strategy that would disregard the requirements, to a certain level, from individual perceptions. In the context of office buildings, the findings showed that a user involvement process for identifying needs, collecting information and structuring it in each case is necessary. In addition, it was remarked that the involvement of the core business management in the early phases of this process would be positive as some fundamental decisions can be taken before the users are involved.

From the owner's perspective, the value-creating elements are more associated with long-term strategic decisions and accepting that needs will change over time. Life-cycle thinking and considering LCC was acknowledged as an important contribution to value creation, particularly within the context of hospital buildings. Facility Management is another one of the elements of concern in life-cycle thinking, as it is one of the leading parts of the operation cost. The studies, especially in the context of the hospital building and university campuses, showed that this factor is highly acknowledged in projects but is now adequately prioritized during the planning. Another highlighted value-creating element on the strategic level is adaptability. Technology and digitalization change the way people work, the way patients are treated, and the way students are being educated. This results in changing functions and increases the demand for flexibility, generality, and elasticity of the buildings.

The research also revealed that user requirements are generally either related to functional needs or emotional value, meaning that the elements are either perceived as creating value because they have functional value or that they elicit a positive emotion in the users. Factors related to the owner requirements can be related to either functional value or strategic performance regarding satisfying a long-term objective and effect. Owners strategies and requirements are strongly related to the intention of the owner with the project. Satisfying these intentions through the project would contribute to value creation. The study also revealed the significance of thinking toward identified or unidentified future needs. These needs cannot be fulfilled by previous experiences and require new thinking and innovation. Hence, innovation is also one

of the fundamental aspects to be addressed in the context of value creation. Consequently, the four primary aspects that should be considered and addressed in the planning and design phase to create value are function, emotion, intention, and innovation. These can be referred to as the four pillars for value creation.

Although LCC, FM, and adaptability were all identified as strategic objectives and significant user requirements, the tactical aspects of exploiting them are still challenging, as they are not adequately prioritized and delivered during the project. As a result, even though identifying the owner and user requirements is essential to create value, the significance of tactical performance for delivering these objectives through the project is undeniable. This suggests that strategic owner requirements and user requirements function as input to the projects tactical performance to create value (Figure 4-1).

The inputs and prerequisites for value creation in the early phase of the project are identified. However, there is still a need to identify the elements that can contribute to optimizing the tactical performance of the projects. Project delivery systems and project management with all its elements is a large field of research. My research pointed out some critical elements of management processes that can have a contribution to value creation, such as multidisciplinary focus and early involvement of the trades, contracts, and partnership. Collaboration and organizational power and user involvement were among the management processes that were reflected through our data collection and analysis.

Multidisciplinary focus and early involvement of relevant knowledge were referred to as a significant contributor to value creation in projects. This claim was investigated further, initially through two studies and later by participating in a third study. The studies confirmed the positive effects of early multidisciplinary involvement in the projects. Traditional execution models like DB have some limitations for exploiting multidisciplinary involvement because of the economic incentives and the structure of sharing the risks and rewards in the project. Project delivery models involving relational contracts can create a better environment for collaboration and can address the challenges by establishing a common goal for involved parties in the project compared to traditional contracts where competition and single-stakeholder value creation can get ahead of pursuing the common goal.

Relational contracts appeared to have advantages, such as a cooperative working environment, relatively flat organizational structure, transparency, and absence of unnecessary exertion of organizational power. Hence, the link between stakeholder power and value creation in

construction projects was investigated. Fourteen sources of power were identified through literature where 10 appeared to be common in Norwegian construction projects, although their significance for value creation was not equal.

As the literature and research have revealed, satisfying user needs as an effect of the project is a fundamental requirement for creating value. To create value for end users of buildings, it is essential to understand the end-user needs both at present and in the near future. Their satisfaction is not only based on the outcome but also in the process of achieving the outcome; hence, the process of involving users in the project is of importance. Creating a common understanding of the terminology and design solutions is imperative to understanding the end-user needs and improving communication. Some measures were suggested in Table 5-4 as strategies to enhance the user-involvement process. The approach should be systematic and include clear guidelines for how the users should be involved and when they should be involved and should include clear instructions about what the users can affect at which point of the process. Another measure is establishing the building as a virtual model through, for example, a real-sized mock-up or a BIM model. The new Virtual Reality technologies can have significant contribution to improve the user's understanding of how their new work environment would appear to be. This will improve their perception of the project and what they can expect as a result

Section 7.3 How Can We Enhance Value Creation in Construction Projects?

The findings regarding value and value creation in construction can be related to different phases of the project. The focus of this PhD work has been to enhance value creation by providing knowledge about what creates value for users and owners, and how this knowledge can be transferred to the early phases of the projects. Despite this focus, the findings could be extended to other phases of projects as well. Throughout the research, theories were developed regarding what creates value and how value can be created. These theories and the new knowledge should be structured to express how value creation can be enhanced.

The findings from the research are used to suggest the activities and measures that should be in focus during each project phase. These activities and measures are systematically structured based on the results of the research, both findings from existing literature and findings through questionnaires and interviews. It can be applied as a conceptual framework for enhancing value creation in projects.

Strategic analysis: A structured and clear communication with the owner and an overview of the value-creating elements in the project that can set the proper ambition level is a necessary first step. Further strategic information and decisions in the project should be developed through strategic analysis, such as a stakeholder analysis, uncertainty analysis, objective and goal analyses, and so on. The project strategy should be developed, including the procurement model, project delivery model, contract model, and objectives and priorities of the objectives of the project.

Choosing the value team: “Value team” is referred to the project team procured by focusing on value creation. Multidisciplinary focus and involvement of trades, contractors, and suppliers in the design of the building is of significance for value creation. There are a variety of existing approaches to procuring the project team with focus on value creation. Best value procurement (BVP) is an approach focusing on value rather than price and is a suitable tool in this setting.

Value identification: By choosing the value team, the project would have sufficient competencies to define the initial value characteristics of the project (what creates value in the project), and the team can and should verify the existing project documents and strategy. The team, in collaboration with the owner and users, should then start a value identification process to develop an understanding of what creates value for the project and to create ideas for how to achieve these value objectives. Existing VM models can contribute to this process.

Value proposition/design development: The created ideas and identified needs and requirements should be discussed, and alternatives to solutions are proposed in this phase. Through this process, the elements of innovation and new thinking are necessary, and a list of “added-value” elements can be provided as a supplement to what is needed. These elements are value-creating elements that are not prioritized but can be added to the project if the scope of the project allows it. The proposed alternatives go through a design development process where the best solution is chosen, and the descriptions and solutions are developed.

Validation: There are usually no structures around the verification of the solutions suggested by the design team, as the contractor either builds as designed or verifies the solution right before it is implemented, and that can be too late. Hence, a step where the proposed descriptions and solutions should be thoroughly verified and validated by the contractor, vendors, and suppliers before they are implemented in the project is recommended. This should preferably occur before the execution phase starts.

Implementation: After the validation, the contractors develop a plan for action and production. Delivering value through production systems is discussed and explored through study fields such as lean construction. The suppliers should focus on efficient production by focusing on what creates value for the customer. This PhD work has not investigated value creation in production systems any further, but the models and theories developed through management fields such as lean construction can be applied.

Commissioning and transition: The findings pointed at commissioning and transitioning the building as an essential stage in the process that has not been given enough attention. Commissioning and transitioning should be planned progressively, especially by involving and training the team in charge of operation, FM, and maintenance of the building.

Value evaluation: A project can create value for the involved stakeholders, but the value creation of a building starts when it is taken in use. Through the operation phase, the value creation of the building should be assessed over time to monitor whether the long-term strategic objectives of the project are achieved. As the long-term effects are expected to arise on different time horizons, these assessments should be structured and planned through different stages of the operation phase. The assessments should also be followed up by continuous measures that improve any lacking performances.

Section 7.4 Validity and Reliability of this Research

This research has been majorly based on case studies and a literature review. Although the case study as an approach to generate new knowledge has been criticized from a positivistic worldview, the discussion Chapter 1 pointed to some misunderstandings regarding case study as a research method (Flyvbjerg, 2006). However, the quality of the research design should be evaluated based on its validity and reliability and whether it is possible to generalize the findings or not. Yin (2012) introduced four design tests for judging the quality of research design. Table 7-1 summarizes these criteria.

Table 7-1 Tests for judging the quality of research design. Based on Yin (2012).

Tests	Case-Study Tactic	Phase of Research: Tactic Occurs	Tactics in My Research
Construct validity	Use multiple sources of evidence	Data collection	Multiple sources for collecting data in every case study. Review the analysis with co-authors and supervisors. Presenting the results for interviewees.
	Establish a chain of evidence	Data collection	
	Have critical informants review draft case-study report	Composition	
Internal validity	Do pattern matching	Data Analysis	No explanatory research was conducted.
	Do explanation building	Data Analysis	
	Address rival explanations	Data Analysis	
	Use logic models	Data Analysis	
External validity	Use theory in single-case studies	Research design	Iterative research design where developed hypothesis/theories were tested on two different hospital projects in two different countries.
	Use replication logic in multiple-case studies	Research design	
Reliability	Use case-study protocol	Data collection	All data is gathered and documented in a database. Triangulation (see Table 7-2)
	Develop case-study database	Data collection	

Construct validity

One of the criticisms of case studies is that they fail to develop a sufficiently operational set of measures and that subjective judgments are used in collecting data. To meet the test of construct validity, the researcher must be sure to cover the following two steps (Yin, 2012):

- Define the concepts that are being studied and relate them to the original objective of the study, and
- Identify the operational measures that match the concepts, preferably citing published studies that make the same matches.

With regard to construct validity, the various case studies during the research were focusing on particular concepts within value creation in construction projects. These concepts were defined as the research evolved with the intention of developing knowledge to answer the research questions. Every case study in this PhD work applied multiple sources of evidence for collecting required data.

To avoid subjective judgments or influencing the results, the raw data, such as interview recordings and questionnaire results, were systematically saved in a database and later analyzed and evaluated in cooperation with supervisors and co-authors. The results from the interviews were presented to the respondents to receive confirmation before moving further with the analysis. All data from the literature studies are appropriately cited and documented.

Internal validity

According to Rowley (2002), this type of validity pertains to explanatory studies only and not to descriptive or exploratory studies since the essence of internal validity is in the extent to which the researcher can demonstrate that the identified variables caused the observed effects. Yin (2012) suggested pattern-matching, explanation-building, and time-series analyses to improve internal validity of the case studies.

None of the case studies conducted during this PhD work has been of explanatory nature. Hence, the internal validity of this work is merely associated with systematic error in research such as statistical calculation. To increase the internal validity in quantitative parts of the research, the statistical calculations were quality checked by at least one person beside the original researcher. In two of three studies conducted in Publication 2, I made the calculation tool, fellow researchers verified the tool, the calculations were conducted and the results were again quality assured by both a fellow researcher and me.

External validity (generalization)

External validity is related to the ability to generalize findings from a specific setting. High external validity indicates that the findings can be generalized to other settings, such as other groups or projects, whereas low external validity implies that the findings apply only to a specific situation.

To increase the external validity of the research, Yin (2012) suggested applying the replication logic in which two or more cases are used within a multiple-case study. This technique is applied to all of the case studies in this research, meaning more than a single case is investigated during the study. There are several concerns regarding the generalization of this PhD work:

- The majority of the cases in this research are in Norway. Many aspects of value and value creation are individually and culturally dependent. This implies that the findings concerning what creates value may not be applicable in other countries. However, the

construction industry has advanced simultaneously in developed countries, and the studied literature from different countries has revealed similarities in how value is conceived. Thus, it is possible to generalize the research findings regarding what creates value to a certain extent, at least to the developed countries.

- Achieving external validity in the question of “what creates value in different projects” was a challenge, as the value is conceptualized to be based on individual conceptions. However, studying different types of buildings helped us to realize what value characteristics were typical for different types of buildings and could be generalized and which ones concerned only the studied building type and should not be further generalized.

As a result, the external validity of each case study is evaluated separately and discussed in each publication. However, the overall external validity of the research is not consistent over the whole work. The findings regarding the first question are based on an explanatory approach where the data are collected through literature studies in several contexts. Using international sources from different contexts increases the external validity of the findings from this part of the research.

The second research question has lower external validity since the cases are mostly Norwegian. What creates value and the means to value creation can vary in different settings and countries. To increase the external validity of findings regarding this part of the research, I studied several types of buildings and used more than one case in each case study. External validity has not been the primary objective of this part of the research since the findings from this part were meant to create a foundation for one of the main objectives of the research, which is “how to enhance value creation in construction projects.” The findings from this part of the research are generalized to a level that could be used in structuring the framework and developing the approach presented in Chapter 6 of this thesis.

The findings regarding the third research question about how to enhance value creation in construction projects required high external validity since the framework was intended to be generic. The external validity of this part was increased by conducting the research in several iterations and testing the developed theory in different settings. The theory was first developed through a literature study and by summarizing the results from previous studies in this PhD work and was then evaluated through interviews, workshops, and questionnaires and later tested in both a Norwegian and American case project.

Reliability

As mentioned earlier in this chapter, reliability is a measure of the extent to which the research is consistent and can be repeated with the same findings, or the same findings would be achieved with another sample or group of people. One of the main strategies discussed in the literature that improves the reliability of the research is triangulation. Triangulation is defined in the literature as using more than one method or source of data so that the findings can be cross-checked (Miles and Huberman, 1994, Golafshani, 2003, Yin, 2013, Bryman, 2015).

Miles and Huberman (1994) introduced five kinds of triangulation in qualitative research. These five methods, their definitions and the approaches that are used in case studies during this PhD work are summarized in Table 7-2.

Table 7-2 Triangulation approaches for this PhD work.

Triangulation Methods	Definition	Approaches
Triangulation by data source	Data collected from different people, different times, or different places	None of the case studies in this research are based on data from a single interview or a single project or case.
Triangulation by methods	Data collection via interviews, observations, documents, etc.	In all case studies, a minimum of two sources of data are utilized, often a literature review or document studies in combination with interviews, questionnaires, or both.
Triangulation by researcher	Using more than one researcher's perspective in analyzing data	All of the publications are a result of collaboration with co-authors.
Triangulation by theory	Using different theories to explain the results	Identifying the theoretical background as a point of departure has been the protocol in all case studies. Where different theories are applied, the results are discussed and related to the existing theories.
Triangulation by data type	Combining qualitative and quantitative research	Where it has been possible to conduct questionnaires, the quantitative findings from the questionnaires are always combined with qualitative in-depth research to test the findings and increase the reliability of the results.

The general philosophy of this research has been based on interpretivism and realism. This implies that the research is value neutral and problem centered and seeks to understand real-world practices. Although this approach can have some limitations and weaknesses, a study

presented in Section 3.2 revealed that it is the most common approach in the context of value and value creation in construction projects. To concur the limitations and weaknesses, all the findings and results have been analyzed and evaluated together with fellow researchers, co-authors, and supervisors. In addition, the papers and articles are all published in journals and proceedings with a double-blind review process where other scholars evaluated and commented on the results. Although the findings cannot be considered the objective “truth,” the applied approaches created a foundation for testing the results, improving them, and testing them again.

Section 7.5 Reflections, Implications and Ideas for Further Research

As I started my career as a project manager in 2008, my understanding of project success was limited to how the project is managed and planned for the set of goals and objectives that were defined. Later, when I became involved in the operation phase of the buildings, I realized that, when the operation starts, the success or failure in the management of the project is forgotten and the focus changes to how the building is performing in relation to the required function and the ongoing activities in the building. Acknowledging that the operation phase is normally substantially longer than the project phase, I came to the conclusion that the focus on the long-term effects of the decisions during the project phase was often inadequate in the industry I was a part of. During this PhD work, I have attempted to address this challenge and examine the way projects are planned and designed from a perspective that is more connected to the reality of why we build the buildings.

Implication of My Research

The theoretical implications of this research can start with using the conceptualization of value and value creation. The terms and concepts of value and value creation was ambiguous in the context of construction projects. The conceptualization of the concepts resulted in an understanding that a construction project is anchored in identified needs. Hence, satisfying these needs, in the best possible way, should be the highest priority of the project for long-term success. Furthermore, what the process toward satisfying these needs should contain to maximize the effect is of importance. The overlap between the concept of value and the satisfaction of needs led us to the possibility of examining the management and delivery of our construction projects from a value perspective. Although this focus has existed for a long time, the research revealed that the processes are sub-optimized for part of the projects such as Value

Management models for identifying and understanding needs, Best Value Procurement for acquiring the project team or lean construction for production systems.

The practical implications of the research are related to the emphasize on lifecycle thinking, a need for adaptability and substantiation of owner's ambiguous ambition level. The framework presented in chapter 6 as a systematic approach can be beneficial to help the owners and managers to enhance value creation in projects by lifecycle thinking and focus on long-term effects to achieve success. The framework emphasizes, and provides guidelines for defining the user needs, owner's strategies and ambition level, acquiring the project team in early stages, evaluation and validation at critical stages and assessment of the results and optimization after the building is taken in use.

Further Research

Multidisciplinary focus and early involvement of the actors was substantiated through the literature and confirmed by my research. However, questions such as what characteristics makes a project suitable for a collaborative delivery model, what elements are needed in such a model and why these elements are essential for success is still unanswered and should be further investigated.

Although management elements such as multidisciplinary focus, project delivery models, contracts, user involvement processes and power in the organization were studied through this Ph.D., there are other related means to value creation and processes in the management of a project which is left behind and could be addressed in further research. This includes management elements such as uncertainty management, budget, pricing and cost optimization, and culture development of both the industry and the project organizations.

The framework presented in Figure 6-1 should be tested in case projects to evaluate whether it contributes to enhancement of value creation in projects or not. However, it can be a challenging task to determine the effects since the outcomes if the framework wasn't used is hard to predict. Even so, the perceptions of the experienced owners and users, that have been involved in several projects, can be assessed through interviews and case studies.

The framework establishes a ground for developing practical tools that can be used by owners, users or even suppliers such as consultants. Different analysis methods and tools can be developed and utilized during the strategic analysis phase, or assessment tools for evaluation of the outcomes during the operation phase. The framework can also present opportunities for new roles in the project such as a "value manager".

In a broader perspective, the value creation of buildings for the society and value creation in urban development could be of interest. I have had my focus on the value creation of a project and a building in a long-term perspective but is there a relationship between several projects and how their effects interact in a broader context? Would we design an office building differently if it was in a financial district than if it is in a private neighborhood? Would the decisions regarding what creates value in a university campus in an urban area be different than if the campus is on the countryside? Looking into value creation of buildings and the social interaction between buildings, from the perspective of urban development, could, therefore, be a natural next step in expanding the discussion on value creation even further.

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Appendix

-Publications

Publication 1



Best Value Approach (BVA) - Enhancing Value Creation in Construction Projects

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Abstract

Background: Research has revealed inadequate understanding of the owner's and users' strategic objectives and a lack of methodology for translating these objectives into functional buildings. Fulfilment of owners and users' objectives is fundamental in creating value through a project. Management and design processes can be decisive in achieving the desired objectives. Hence, knowledge about what creates value applied into a management framework will enable higher value creation.

Objectives: Providing a framework to enhance value creation in projects by addressing: i) which means and principles should be considered in the front end of a project to secure value creation? ii) How can these principles be structured in a framework to maximize the project's value creation?

Methods/Approach: A literature study, two questionnaires, a focus group workshop, 8 interviews, and two case studies

Results: Fulfilment and alignment of user's needs and owner's strategies combined with innovative thinking is required for value creation. Challenges and obstacles for value creation are identified, and a framework is suggested. **Conclusions:** The framework suggests principles that contribute to value creation in each phase of a project. Implementing this methodology will help decision makers towards a better understanding of the objectives and translating them to functional solutions.

Keywords: Value creation, conceptual framework, value management, construction project management, life cycle thinking

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Introduction

Various stakeholders in a project have different views on what is valuable. The differences are a consequence of particular knowledge, goals, context and conditions that influence the conception of the value and how the value assessed by each stakeholder. Different stakeholders may also have colliding interests and preferences on what is valuable (Lepak et al., 2007). However, according to Coenen et al. (2012), perceived value and value creation are the result of cooperation among all stakeholders and success in collaboration between actors contributing to value creation for all stakeholders.

In the European research project, Value Driven Procurement in Building & Real Estate (VALPRO), a lack of understanding of the project owner's/users strategic objectives and lack of methodology for translating them into functional buildings under traditional project management is stressed (Arge et al., 2012). The new findings from that research show a development towards moving the main project target from finished building to achievement of the desired effects of owning and using it over its lifetime (Bjørberg et al., 2015). We believe that value creation of a building is directly associated with the effect that owning and using that building has over its lifetime. These effects define how successful the building has been as a product, but does not say anything about the effectiveness of the project management process or the design process on the front end. Considering this, we will be able to contribute to higher value creation by developing a process where knowledge about what creates value after the building is delivered is applied into the design phase to optimize the design of our buildings. The ultimate goal of the research is to offer a framework for understanding owner's and users' strategic needs and translating them into buildings that create value, by addressing i) What are the principles that need to be considered in the front end of the project to secure maximum value creation for stakeholders in a project life time perspective? ii) How can these principles be structured in a framework in order to maximize the project's value creation?

The first part of this article reflects the literature study, which embodies the theoretical background used for this research. The second part of the article will present the research methodology and details for the design of this research. A description of the methods of data collection, case studies that are conducted, and how the framework is developed are included in this chapter. Results, findings and the developed conceptual framework will be presented in part 3; and finally, the conclusions, reflections and thoughts for moving forward are presented in part 4.

Theoretical background

The ultimate goal of this research is to offer a framework for understanding owners' and users' objectives and translating these objectives into functional buildings. In many cases, especially for public projects, it can be hard to identify the project owner (Olsson et al., 2007). The rights and responsibilities of the project is carried by the owner (Olsson et al., 2008) and the project owner should accept the risk for to the cost and future value of the project (Olsson et al., 2016).

As Womack et al. (1996) stress, "The real value of goods or services can only be defined by the ultimate customer". Although this leads us to focus on the individuals who use the building as the end users, the fact that every stakeholder has their own value perspective cannot be ignored (Haddadi et al., 2015).

According to Samsøe (2003), owners focus on the long term perspective, users focus on the effects of using the products, and suppliers focus on deliverables or outputs from the project that are needed for the project to be successful. Users need to have

their functional and hedonic value fulfilled. Owners should be able to fulfill the users' value while experiencing a profitable/optimal operation, and suppliers must fulfill users' value and produce effective and efficient outcomes (Haddadi et al., 2015). In construction projects, different stakeholders define value from their own perspective. However, value creation depends on how needs are satisfied for the different stakeholders. Accordingly, we need to know how "value" and "Value creation" is defined. In addition, aspects of value management, as a tool for creating value, should be studied to include existing knowledge on how to identify value creating elements and how to steer the project towards achieving them.

Value and value creation

The discussions and pursuit of defining value has been ongoing since Aristotle. Aristotle was the first documented philosopher who differentiated between two meanings: "use-value" and "exchange value" (Fleetwood, 1997). Since then, Adam Smith and Henry Ford brought the discussion forward in the 18th and 19th/20th centuries. Adam Smith focused on "productive activities" that contribute to exchange value through the manufacturing and distribution of goods (Vargo et al., 2008). Henry Ford brought the consumer focus into the discussion by claiming that focusing on organization of industry to serve people is not in conflict with the profitability of the industry (Ford et al., 1926). A growing number of companies seem to have adopted value generation models since the beginning of the 1980s through various initiatives such as customer-driven company, customer orientation, mass customization and value-based management (Koskela, 2000). Value and value management have particularly been discussed in management and marketing literature during the last decades, especially since 1980s (Kelly et al., 2015; Holbrook, 1999; Kaufman, 1998; Woodruff, 1997; Parasuraman, 1997; Holbrook, 1994; Babin et al., 1994; Dodds et al., 1991; Zeithaml, 1988). Although different theories and research streams have been applied in different contexts to conceptualize "value", the common ground is the focus on the customers and users (Haddadi et al., 2015).

The reason for existence of the projects should be based on an organization's business strategy and goals (Arge et al., 2012). The trigger for any project is a predicted or existing customer need. The focus on the customer's definition of value in order to create value reveals the importance of aligning corporate strategies with customer needs in order to maximize value creation. According to Hjelmbrække et al. (2015), the missing link in project planning and execution is clear project strategies and objectives. Hence, there is a need for clarifying all these requirements for value creation by performing a systematic approach to prioritizing, measuring and monitoring the fulfillment of these requirements throughout and even after the project.

Value management models

Numerous models and approaches to deliver best value in construction projects have been attempted (Kelly et al., 2015; Gransberg et al., 2015; Thyssen et al., 2010; Male et al., 2007; Green, 1994). Value Management in construction is explained as "*the term used to describe the total process of enhancing value for client in a project from the phases of concept to operation and use*" (Kelly et al., 2015, 31).

Green (1994) differentiates between Value management and Value engineering and points out two primary concerns in Value Management (VM) when he introduces the SMART Value Management approach. The primary concerns are the need to enhance the communication and to establish a common understanding of the requirements. Green suggests two VM workshops in his approach. VM1 contains six

stages (identifying the stakeholders, identifying the objectives of design, establish the value tree, creativity, evaluation, and development) and is supposed to be performed after the concept phase. VM2 consists of seven stages (redefine design objectives, reconstruct, assign importance weights, evaluation, sensitivity analysis, cost/value reconciliation, and marginal value improvement) that should be conducted after the feasibility phase.

Austin et al. (2005) introduces a simplified approach for delivering value in building design. This approach breaks down the process into 3 phases. First, understanding values for stakeholders and the project so that compromises can be made in reaching solutions. Second, defining value by outlining criteria and targets for delivering value such as benefits, sacrifices and resources. Finally, assessing value proposition for delivering value throughout the project life cycle from inception to obsolescence.

Kelly et al. (2015) refers to the North American value engineering process modified in accordance with construction projects and summarizes it in a 7-phase process.

Orientation, where the initial project team communicates with the client to clarify what is expected to be achieved, what the client needs and/or wants, and which characteristics should be adhered.

Information, is the phase where all the information about client needs, project constraints, budgetary limits, time and more are discussed and clarified.

Creativity is the phase where the team puts forward suggestions to answer the required functions, normally a few cost dominant ones.

Evaluation is the phase where the created ideas are verified. This stage reduces the generated ideas into a manageable number of scenarios for further study

Development phase investigates the selected ideas from phase 4 in detail for technical feasibility and economic viability. At the end of this phase, the team will verify the ideas that have been developed and dismiss the ones that don't comply with the value creation philosophy.

Presentation consists of displaying the refined ideas supported by drawings, descriptions and calculations.

Feedback is developing an understanding of how the ideas that are utilized are performing and providing the arena for testing the design.

Besides what is found in literature within academia, UK, USA and Australia, among others, have introduced Value Management standards to construction projects with practitioners focus approach. Value management is defined as a style of management by the European standard for value management (British-Standards-Institution, 2000). The European standard argues that the intention and goals of Value Management is to reunite the differences among the stakeholders and costumers as to what creates value. However, the Australian/New Zealand standard defines VM as "a structured, systematic and analytical process that seeks to achieve value for money by providing necessary functions at the lowest cost with required quality and performance". (Male et al., 2007).

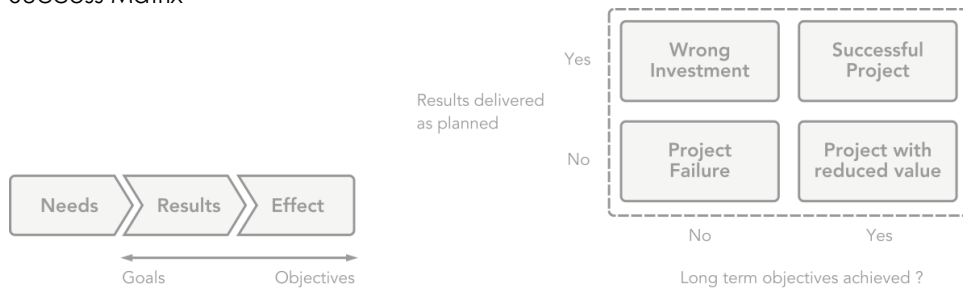
Project success

The evaluation of the success/failure of construction projects has been essentially based on assessment of the extent of achieving the client's objectives such as cost, time and quality (Ward et al., 1991). These three elements can provide an indication of success or failure of a project. Despite that they do not, by themselves, provide a proper picture of the performance of the project. Success can be measured in terms of achieving the objectives; however, there is ambiguity in determining whether a project is a success or a failure. Every project has a set of goals to accomplish. There is a need for criteria to compare the goals against the project performance. Project

success consists of attaining project goals and project partner's satisfaction. Criteria such as profitability and productivity, functionality, technical performance, environmental sustainability, health and safety are important elements in the assessment as well. Attainment of goals such as abstaining conflicts, professional image, user satisfaction, and social, aesthetical and educational aspects are also considered to indicate how successful the project is (Chan et al., 2002). Müller et al. (2010) suggest that the measurement of success needs to focus on factors such as end user and owner's satisfaction with the project's results, other stakeholder's satisfaction, meeting the project's performance goals, and fulfilling the project's purpose.

Rolstadås et al. (2014) argue that there should be clear links between need, result and the achieved effect and that both short-term goals and long-term objectives need to be considered when the success of a project is determined.

Figure 1
Success Matrix



Source: (Rolstadås et al., 2014)

Although there are numerous models, approaches and standards for Value Management, the common ground seems to be an attempt to create structure to identify the necessary functions for creating value and optimizing the cost to obtain these functions.

Methodology and research design

This chapter provides an overview on how the research has been designed in order to develop the conceptual framework (Best Value Approach).

Developing a conceptual framework

Jabareen (2009) provides a 7-step procedure for developing a conceptual framework. A modified version of this procedure with the following five steps was used in developing our conceptual framework:

1. Identifying the concepts
2. Mapping the data source that are chosen, reading and categorizing of selected data
3. Deconstructing and categorizing the concepts
4. Synthesis, resynthesize to achieve an understanding
5. Validating the conceptual framework.

The interlinked concepts in this article are the concept of value and value creation, together with value management as a tool and success in projects as an outcome. These concepts are investigated through literature review. Sources are selected by using search engines and databases for literature such as Google Scholar, SCOPUS,

Emerald, Science direct and NTNU (Norwegian University of Science and Technology) university library database. Sources that are chosen have either been in English or Norwegian language, and from 1988 to recent years. All sources that are references and citations in papers, articles and books have been further investigated for relevant data and information.

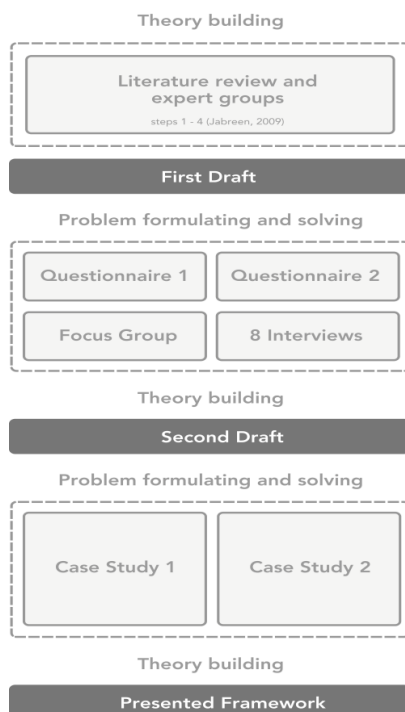
The result of the literature study was deconstructed and categorized, and the concepts were linked together. Thereafter, the results were synthesized and analysed by authors and experts and the initial conceptual framework was developed and presented in Projman conference in 2016 (Haddadi et al., 2016).

Although this approach can constitute a reasonable insight and understanding of the concepts, it was essential to anchor the theory into reality by validating the framework.

Data Collection

The initial data collection method to develop the first draft of the conceptual framework was the abovementioned literature study. The drafts are verified in two iterations. The first draft was verified using methodological triangulations by using data from questionnaires, interviews and focus groups. The second draft was thereby developed, and thereafter verified, using data from two case studies. Figure 2 illustrates the design of this research.

Figure 2
Research design



The first questionnaire had its focus on the front end and early phase of the projects in order to map the elements that contribute to value creation in construction projects. The questionnaire had 837 respondents where approximately half (49.6%) were working at private sector and the other half at public sector. Almost 70% of the

respondents had engineering or technical educational background while 11% had their background within organizational, management or economy. Almost 30% were answering the questions from a user's perspective while 70% were answering from owner's perspective. The questions were based on characteristics and means for value creation in construction projects provided by Bjørberg et al. (2015) which divides the characteristics that contribute to value creation into four major groups; i) Economic value (core business cost, investment cost, economic value), ii) Social value (people and organizations) iii) Environmental value iv) Physical value (space and infrastructure). The respondents were asked to express in which extend (scale of 1 to 4) they agree on each characteristic's contribution to value creation in a project they participated in. The qualitative part involved an in-depth study of the results from the questionnaires through a workshop with a group of 6-8 practitioners and researchers. A mind map, developed based on the results from the first questionnaire, was presented to the group. The presented mind map divided the elements that the first questionnaire indicated as value creating, into four categories of "user's perspective", "owner's perspective", "suppliers' perspective" and "authorities' perspective". The group was then asked to evaluate the presented elements and provide their suggestions. Then they were asked to present their opinions regarding the tools and means needed to fulfill the suggested value creating elements.

The second questionnaire investigated the execution models and their effects on projects in order to identify how the management processes and a project's execution model influence the outcome of the project. The questionnaire had 1034 respondents with a similar distribution of educational background as the first questionnaire. The majority of the respondents were owner's project managers, designers/consultant engineers and property owners. The questions were concerning what kind of execution models were used in projects that the respondents were involved in at that moment, why the particular model is chosen, what the owner's requirements have been focused on, and what the obstacles for and contribution to value creation has been. Eight semi-structured interviews, with duration of approximately an hour each, were conducted to verify the results from the second questionnaire. The second draft of the framework was thereby developed. This step of the process including the questionnaires, the interviews, and the workshop was part of the Norwegian research project Oscar.

The second version of the framework was then advanced further using two cases as data sources. The two cases gave more empirical insight to the value process and provided an arena for testing, synthesis, resynthesize and validation of the conceptual framework.

Case studies

Two major hospital projects have been used as cases in this research. These cases are used to investigate what challenges the projects encounter during the early start and production phases. The data collection methods include interviews and studies of reports, plans and documents that could shed light on the design, engineering and execution phases. In total, eleven key resources were interviewed during the case study. The resources included the owner's, designer's, users' and contractor's perspectives. The interviews had a duration of 1-1.5 hours each and were semi-structured. Interview guides were prepared so the questions could be responded to and followed up as discussions. The interviews were audio-recorded while the researchers took notes. The recordings were later used to transcribe the interviews, and the results were discussed and analysed qualitatively in meetings with the authors.

Case 1 Van Ness and Geary Campus (VNGC) project is a hospital project in San Francisco. With a total cost of over \$1 billion and total area of approximately 92 000 m², the project is considered as one of the largest hospital projects in the Bay Area. The project was executed by following the principles of Integrated Project Delivery (IPD). During this research, the project was going through its execution phase. Seven key resources of the project were interviewed throughout the study. The resources included the owner's, designer's and contractor's perspectives. The interviewees were asked different questions based on their areas of expertise. The main objective of the interviews was to identify which challenges were encountered during the project, how the goals and priorities were set and how they were steering towards them, how effective the involvement of different stakeholders has been, what they would do differently, and what the success factors were considered to be in the project. Relevant findings from the interviews were used to improve the framework.

Case 2 "Tønsberg Sykehus" A Norwegian hospital in town of Tønsberg is the first major public project in Norway executed as an IPD project. The hospital is planned to have a total area of 42 000 m² with a total cost of 2.5 billion NOK (approximately 300 million US dollars). During the research, the project successfully completed the concept phase. The contractor and design team was procured, and early stages of the design/feasibility phase had already started. The main focus in interviews for this case was on challenges that the team has encountered in the early phase, how they evaluated the results from the concept phase and feasibility phase so far. Four resources including the head of the architecture team, the head of the design team, the owner's project manager and a user's representative were interviewed. The head of the general contractor team was unfortunately not available for interview. However, a major part of the interviewees in case 1 represented the general contractor. Hence, it is reasonable to conclude that the contractor's point of view is highly taken into consideration through this research.

Results and findings

Projects and non-projects are distinct by the fact that all projects, regardless of their complexity, go through a common development sequence in their life cycle (Morris, 2004). Hence, the research has focused on what can contribute to value creation in each phase of a project's life cycle.

Concept

The questions that were asked at the interviews and questionnaires for this stage mainly focused on which challenges the projects have encountered during this phase and what they would do differently in the next project.

Inadequate or unclear project order is among the considerable obstacles for creating value in early phases of the project. According to management theories, project strategies are among the main weaknesses in project planning and execution. Unclear project strategy includes flawed procurement model, execution model, contract model and goals and objectives. Findings also indicate that a significant amount of information is lost due to weak communication between the owner and the project team during the initial phases of the project. This challenge can lead to inconsistent interpretation of what the expectations are and what the output should be. These misinterpretations are mainly around the goals, objectives and priorities of the project as well as the project's procurement model, execution model and contract model.

The ambition level for different value characteristics like esthetic, architectural character, environmental issues and quality also often seem to be ambiguous. A

guidance tool such as a “value menu” would be helpful for owners to make the right decisions and choose the appropriate ambition level from the start. The findings indicated the importance of a profound and extensive strategic analysis in order to develop a project strategy with clear objectives, priorities and ambitions.

Feasibility

The research reveals that collaborative type of projects where the project team is formed early and the execution competences are involved in the design phase have better chances of delivering successful projects. All the interviewees who were involved or had been involved in collaborative projects claimed that the collaboration and engagement of all competences in early phase was positive for the project's success.

Result from both case 1 and 2 also showed that the team needs to be able to verify the project documents and project strategies before identifying value creating elements. Procurement of the team increases the information and knowledge in the project and the team can look into the documents with a new perspective with more information. This can provide an opportunity to improve the underlying documents and decisions before the feasibility phase starts.

Literature showed that value creation was dependent on fulfilling owner's strategies and users' value/needs. At the same time, it was mentioned during interviews that in many cases it is difficult for the users and owners to express their needs and strategies. It was also a challenge that user involvement processes during the concept phase happened sometimes to have contrasting results from the processes that the design team conducted. Architects, design teams and contractors can have a great contribution to identifying value creating elements using their experience from earlier projects. Hence, the team's competency combined with the identified user needs and owner strategies will form the best input to the value identification process. In this way, the value identification process will result in a better understanding of value for the project as well as creation of legitimate ideas that underpin the expected long-term effects for satisfying needs and strategies.

Definition

Through this step, the project team develop a design that describes the feasible solutions on how the identified value elements can be achieved. The input to this step would be the ideas created from the previous phase combined with innovation and eventual value-adding suggestions. The expected output of this step would be the descriptions and solutions through design. The major challenge at this step of the project is that solutions and descriptions were not always validated before implementation and the design team was not properly aligned with the contractor team.

Results from both the questionnaire 1, the workshop and Case 2 indicated that innovation is not emphasized enough in the early phase of construction projects. Furthermore, both case studies confirmed that new thinking and innovation contribute to higher value creation in projects. The case studies also revealed that validation study is a requirement to align the team before the ideas are implemented in a production system in order to verify the functions, requirements and needs that the owner and users have.

Execution

This phase is defined in our framework as the activities from plan verification and approval to product delivery. This phase includes implementing the plan for action,

the production phase and commissioning. Interviews and questionnaires revealed that commissioning is an underrated step in existing project models. Inadequate involvement of FM competences in early phases of projects has been identified as one of the reasons why the commissioning step is challenging. Meanwhile, those involved in the case project that included this type of knowledge in early phases of the project acknowledged that FM has been a great contribution to streamlining the commissioning process and training the operation team.

Operation and Review

The literature study revealed that achievement of owner's and users' tangible and intangible objectives as well as the positive effects brought by the project will contribute to value creation. On the other hand, results from the interviews after questionnaire 2 indicated that the knowledge and experience after product delivery is inadequately structured and transferred to other projects. There is a clear need for a structure around the timing of reviewing different effects and aspects. Evaluation of the results should be defined in different periodic terms. Some effects can be evaluated right after project delivery while other aspects are expected to have short term or long-term effects.

Discussions and development of Best Value Approach

Regarding the first research question, the results of the research revealed a wide range of principles that should be considered in order to create value in construction projects as well as constraints and challenges that can limit the value creation. In early phase of the projects, the need for better communication with the owner, a value menu that helps decision makers in choosing the ambition level and the necessity of a clear project strategy indicates a profound need for a thorough strategic analysis in early phase. The research has also revealed that collaborative projects where the team is organized and assembled early and contractors are involved in design phase have better chances of success. Engaging the team as early as possible can have benefits such as their involvement in defining what creates value for the project and the opportunity to verify the project strategy and concept phase documents.

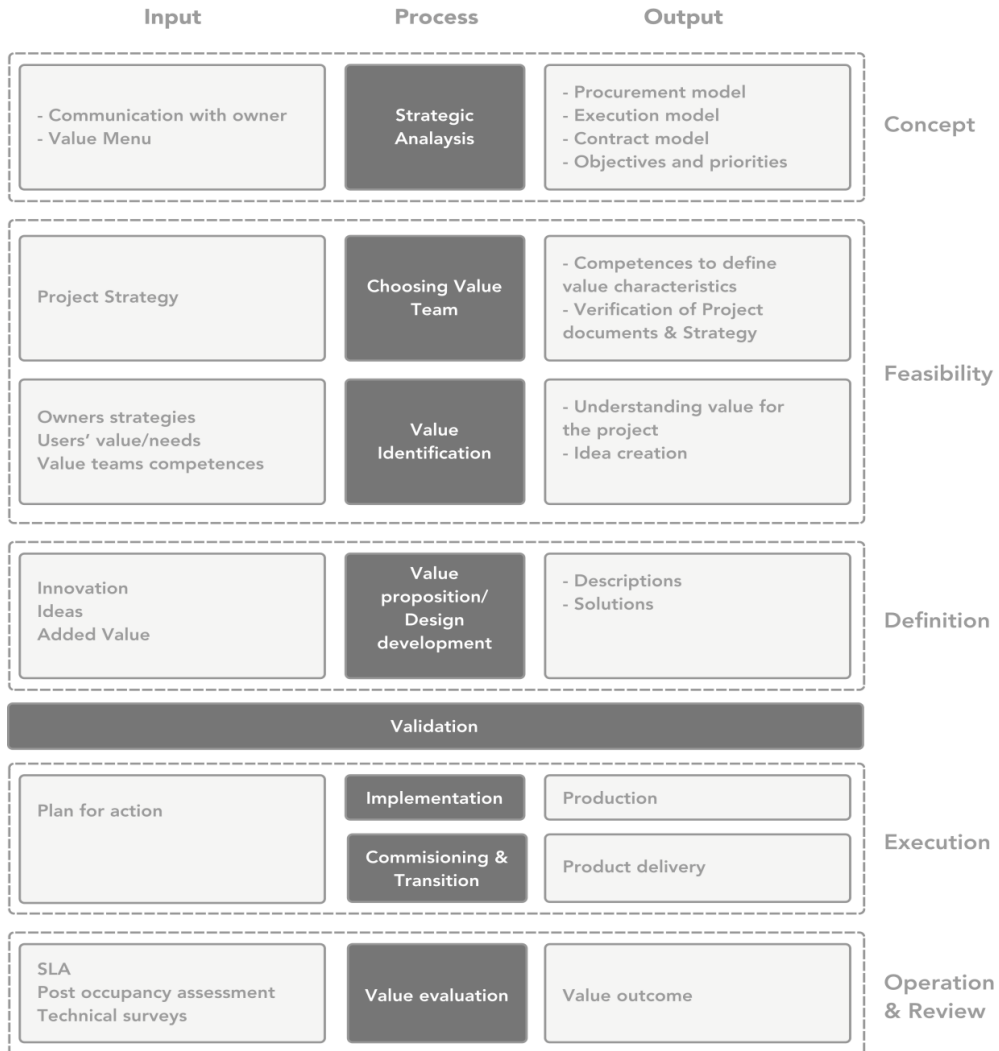
The research also indicated that value is created when owner's strategies are aligned with users' needs and they both are fulfilled. On the other hand users are often not aware of their own needs. Project team's competences and experience can have a positive contribution in identifying needs and value creating elements. Innovation and new ideas is also a requirement for proposing better solution and descriptions to fulfil the identified needs and thereby create value.

The second research question was pursuing to structure these principles in a framework to maximize the value creation. The research indicated, among others, that the framework should consider identifying and understanding what creates value for user and owner in the operation phase of the project and exploit this knowledge in the design phase (Feasibility and Definition). In addition to indicating the need for a step to identify the needs, this also reveals the need for a systematic evaluation of the projects after delivery. The framework should also contain a process for assessing the value propositions and value delivery so that the identified elements are evaluated and implemented as intended through the whole life cycle of the project from idea creation to obsolescence.

Best Value Approach (BVA) uses the mind set behind existing value management models described in chapter "Theoretical background", together with findings from collected data to describe a model for identifying the needs, creating ideas and

solutions to fulfil the needs, implementing the ideas into actions and evaluating the results. BVA consists of eight major steps. Figure 3 illustrates the framework.

Figure 3
Best Value Approach



Strategic Analysis

The main question at this step is what is needed before the design team and contractors (the value team) are engaged. Although the research revealed that this step is different in every project, there is an agreement on what the minimum expected output from this step should be. The indisputable output is the owner's business case, including priorities and objectives. It is also expected that the owners have a clear strategy for procurement model, execution model and contract model before the value team is engaged. In Case 2 (Norway) the value team has been involved in major parts of developing the contract. The results indicates that the team

expected that the owner had progressed the contract to a clear stage before engaging the value team.

The lack of satisfactory communication with the owner in order to identify the owner's strategies and users' needs is suggested as one of the major obstacles in achieving desired outputs of this stage. Owners need a tool to obtain a holistic picture of what can create value in their projects. Glanville et al. (2009) suggest a framework for the provision of a sustainable healthcare estate. The framework is generic and its application is not limited to healthcare buildings. Questionnaires from the Oscar projects resulted in identification of certain basic value creating elements in projects (Bjørberg et al., 2015). These elements are used in developing a "Value Menu" that is going to be available for projects in near future. In addition, there are existing methods for analysing the project opportunities and life cycle cost, setting proper goals, analysing uncertainty and identifying the project's focus points. These can all be a part of the strategic analysis of a project in early phase.

Choosing the Value Team

This step is extensively emphasized as a crucial prerequisite for success and value creation. What type of competences should be involved and at what point of the project are the most significant questions here.

The research has revealed that there is no framework to answer these questions. How the projects handle value team selection depends on factors such as the extent of management's prior experience, the project's strategies, contract models, procurement models, owner's strategies and of course project's needs. However, there are some findings that indicate what successful projects have in common in order to handle this challenge. First, the research shows that the sooner the team is assembled the better it is for project's outcome. The respondents who had been through collaborative type of projects, e.g., IPD (Integrated Project Delivery), claimed that engaging all the necessary partners and competences early in the project resulted in better identification of the value creating elements, improved the accuracy of design, motivated better collaboration in the team and entailed outcomes that even exceeded the expectations.

Another interesting finding was the need for resources with profound knowledge around operation phase during the early design phase and throughout the project. This type of resource can contribute to functional design of the systems, verification of the design, implementation of the design, deployment of the commissioning phase and training the operation crew.

Value Identification

As the literature has revealed, value creation is a result of satisfaction of needs and fulfilment of expected effects. In order to effectively create value, users' value must be aligned with owner's strategies. These elements must be identified in order to understand value for the project. This understanding is necessary for creating ideas for how to fulfill the needs and strategies.

Identification of users' needs and owner's strategies is a challenging task. One of the most common methods for identifying user's needs is the user involvement process.

One of the major issues in user involvement processes is the users' inadequate ability to recognize, formulate and balance their needs and demands. The research also implies that too early involvement of users' might not be advantageous. Users should be actively involved when the project team is formed. The project team, including the owner, can significantly contribute to identifying and aligning users' needs and owner's strategies based on their experience and knowledge. This involvement is

notably a requirement for life-cycle thinking within project development. Value management processes offer approaches such as different types of workshops for identifying users' needs and owner's strategies.

Value Proposition/Design Development

This step is directly associated with the "definition" phase of a project. During this step, the ideas created in the previous step, together with the innovative thinking of the project team, are transferred into specific descriptions, drawings and solutions. The outcome of this step is basically a plan of action that defines how the ideas should be executed and implemented through a production system in order to deliver the outlined product.

The significance of innovation in order to increase value creation is one of the major findings of the research regarding this step.

Another discovery through the case projects was the items and ideas that can contribute to higher value creation but are not a requirement for value creation. These are so-called "added value" elements. Both case projects operated with "an added value list" or "predefined options" which essentially is a directory for featured added value elements. Elements from these lists can be promoted and actualized if the financial situation of the project allows it.

Validation

The design is developed by proposing descriptions and solutions. At this stage, there may be more than one alternative solution for a particular function. Validation will be necessary in order to choose the right alternative. Throughout this step, the suggested solutions would be validated against the identified values in the "value identification" step. The proposed design should be verified by focusing on feasibility and whether it satisfies the owner's strategies and users' needs.

The proposed descriptions and solutions define a plan for action. This plan is the input to the next step, which includes implementation of the suggested and verified descriptions and solutions in order to start the production.

Implementation

The execution phase is the phase where the plans, solutions, descriptions and drawings are implemented and transformed into the product. This step contains a complicated production system that attempts to conduct this transformation in an efficient and productive way. As literature suggested, users need to have their functional and hedonic value fulfilled. Owners should be able to fulfill the users' value while experiencing a profitable/optimal operation, and suppliers must fulfill users' value and produce effective and efficient outcomes. The supplier's have thereby a responsibility to have focus on what creates value for both end users and the owner, while their production system focuses on reducing waste and increased productivity and efficiency. Principles of lean production can, among others, be beneficial throughout this step

Commissioning and Transition

By the end of the execution phase, the commissioning and transition starts. The technical facilities are tested and the operation phase starts in this step. The research reveals that in hospital projects, in particular, this transaction is demanding and seldom seamless. One of the measures in order to improve the process is to involve those with operations knowledge in the project in an early phase. The case project in San Francisco has so far experienced a smoother commissioning process partly

because they dedicated a resource with operations competence to the project. The resource has been involved in testing the design solutions, testing the execution of the design and in training the operations team who will be in charge of the operation phase. This step is considered to be an important step within the holistic value creation of a project and should be subject for further research in the future.

Value Evaluation

The frequent omission of structuring and transferring knowledge and experience after product delivery to other projects leads to the need for a final step after product delivery that contains an evaluation and assessment of the project. The interviews after questionnaire 2 also revealed that evaluation of the results should be defined in different periodic terms. Some aspects and effects can be assessed and evaluated shortly after project delivery while some outcomes might take time before they can be detected and assessed. Further research is needed in order to provide a holistic methodology for measuring the effects and evaluating projects.

Conclusion – reflections and ideas for moving forward

This research intended to offer a framework to enhance value creation in projects by addressing: i) which principles should be considered in the front end of a project to secure value creation? ii) How can these principles be structured in a framework to maximize the project's value creation? A comprehensive research design containing data collection methods such as questionnaires, workshops, interviews and case studies was composed in order to collect data, develop theories and verify them.

Identifying the required means and principles to maximize value creation was the first research question of this research. Value is created when needs are fulfilled and strategic goals are achieved. The literature study revealed that value creation in a life cycle perspective of a building depends mainly on two factors; i) fulfilment of the users' needs ii) fulfilment of owner's corporate strategy. Further research revealed that these two factors need to be combined with innovative thinking in order to add value to the project. Project success in a lifetime perspective depends on meeting objectives (both tangible, such as time, cost, and quality, and less tangible criteria), as well as achievement of the long-term effects brought about by the project. This requirement implies that identifying the needs and strategic goals, intangible criteria and achievement of the long-term effects are fundamental contributions to value creation in a project. A systematic evaluation of the value creation and achievement of the objectives after project delivery is necessary for transferring the knowledge of what creates value in operation phase and exploit that knowledge in design of the future projects. In addition, the need for a competent team and early involvement of the key resources to define value characteristics is clear. The team should be able to verify the project strategy and documents from the concept phase as well as contributing to identification of value creating elements for the project.

The second research question regarding structuring the identified principles to value creation in order to maximize value creation led us to Best Value Approach (BVA). BVA was developed with a focus on solving some of the practical challenges that projects encounter and obstacles for value creation. The framework suggests a structure using the principles that need to be considered in order to increase value creation in each phase of a project, including the operations phase.

The framework also presents a method that enables the project to move the focus from the building completion perspective to the building lifetime perspective. Implementing such a methodology will help decision makers to move the focus from what is best for the project to what is best for the users and owner.

Many Value management models have been developed during the past decades to improve the accuracy of identification of appropriate objectives for projects and choosing the best solutions. However, we acknowledge that there is a lack of a holistic methodology for transferring objectives and the chosen solutions into functional buildings with a life-time perspective beyond existing value management models. Yet, value management and its underlying processes can be used as a tool within the BVA. Although BVA is developed based on research conducted in Norway and USA, it follows a management mind-set that is independent from culture and country. We hope and believe that BVA can be beneficial in construction project, especially in projects with complex user picture with unclear and contrasting needs and objectives. Although BVA is a holistic approach to the whole project lifetime, this part of the research had its focus on early phase up until implementation/execution. Consequently, further research is required, especially regarding commissioning, transition and value evaluation.

Commissioning and transaction was mentioned as an underestimated stage of the projects. Our case study gave us an indication of how complicated this stage can be. Further research is needed to establish an understanding of where the challenges are and how they can be addressed.

Further research is also required to develop necessary tools for each step of BVA. Acknowledging that Value Management, Lean, and many other fields provide tremendous tools and methods that can be adopted into BVA, there is still a lack of structure around where and when these tools should be utilized and how well they function. This deficit includes methods for project evaluation and measurement of the effects after project delivery.

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Publication 2

Value Proposition in Different Types of Buildings - Characteristics and Means

(accepted for publication in The Journal of Modern Project Management)

Abstract

Purpose: The purpose of the research is to gain knowledge regarding what creates value in different types of buildings and how these identified value-creating elements can be linked to the development (design) and planning in order to increase the value creation of the project.

Design/method/approach: The paper is a result of three separate studies on value creation in hospitals, university campuses, and office buildings by using mix qualitative methods involving the study of cases through literature studies, document studies, questionnaires and semi-structured interviews.

Findings: Results indicate the differences in value propositions of different types of building and how it is directly related to the owner's and user's value proposition. The results also indicate that value creation in the operation stage is basically built upon life-cycle thinking and characteristics such as satisfying a function, creating a positive emotion, achievement of the owner's intentions and moving it forward by innovation.

Originality/value: The research relates findings from the literature and three extensive studies to explore the similarities and differences in what creates value in different types of building to provide a new understanding of what contributes to creating value in projects. This new understanding can contribute to better decision-making processes in the planning and design phase of the projects.

Introduction

Although the idea of defining value and conceptualizing it started in the field of philosophy (Fleetwood, 1997), the focus on how value can be created in modern time was initiated in economics and manufacturing of products (Kelly, Male, & Graham, 2015). Decades of research within different contexts such as Marketing, manufacturing, and economics pointed at the relationship between cost and benefit and customer's, or the end user's, perception of the product as the focal point for value and value creation (Babin, Darden, & Griffin, 1994; Bowman & Ambrosini, 2000; Dittmar, 1992; Ford & Crowther, 1926; Holbrook, 1999; Womack & Jones, 1996; Zeithaml, 1988).

Thomson, Austin, Devine-Wright, and Mills (2003) pointed out that projects should have value delivery as a fundamental objective. Arge and Hjelmbrække (2012) argued that projects must have their reason based on organization's business strategy and goals, admitting that the trigger for any project is a predicted or existing customer need. This emphasizes the importance of aligning corporate strategies with customer needs to maximize the value creation (Haddadi, Johansen, & Andersen, 2016), seen from the owners perspective.

Numerous models have been developed in the field of value management to identify, understand and define value for the stakeholders, and create ideas to achieve the defined value (Austin & Thomson, 2005; Green, 1994; Kelly et al., 2015; Male, Kelly, Gronqvist, & Graham, 2007; Thyssen, Emmitt, Bonke, & Kirk-Christoffersen, 2010). However, there is a focus on optimizing the cost of obtaining defined value rather than focus on achieving value elements as strategic objectives. Hjelmbrække, Klakegg, and Lohne (2017) pointed to strategic objectives as the ability to produce the intended effect. In the European research project, Value Driven Procurement in Building & Real Estate (VALPRO), a lack of understanding of the project owner's- and users' strategic objectives and lack of methodology for translating them into functional buildings under traditional project management is stressed (Arge & Hjelmbrække, 2012).

The purpose of the research is to gain knowledge regarding what creates value in different types of buildings during the operation phase and how these identified value-creating elements can be linked to the development (design and planning) in order to increase the value creation of the projects. This led us to the following research questions:

- What are the similarities and differences in value propositions in different building types?
- What are the aspects that should be considered in the early development of the project to maximize value creation in the operation phase of the life cycle after the project's completion

This research paper is presenting results from a long-term study of value creation in building projects from three different contexts - Office buildings, university campuses, and hospitals. These buildings have in common that they are large, expensive, and complicated buildings. In addition, the end users are not those who directly pay for the product (building) or the investment. The purpose of the building, seen from a user perspective, is to provide a condition so that the core businesses and activities happening there can achieve their goals. Also, the user's value creation process is not linked to owner's income (rent) in the operation stage.

The following article is divided into four main sections. A short introduction to the theoretical background regarding value and value creation in general and value creation, within the context of hospitals, university campuses and office buildings, in particular. Next, the methodology of this research is presented. Then the findings are presented for each type of building, and in the end, the results are discussed, and the conclusions are presented.

Theoretical background- value creation in building projects

The research is exploring what creates value for owners and users in the operation phase and whether there are similarities or differences between how users and owners of complex public buildings (hospital and universities) and complex private buildings (Office buildings) define and understand value. The intention is to exploit this knowledge in early phases of the construction projects to enhance and optimize the design process of buildings and ultimately contribute to higher value creation in the operation phase. As a result, the point of departure for the theoretical background is to identify how to define value and how value can be created.

Definition of value and value creation in literature is ambiguous although the documented discussions have been ongoing, at least, since Aristotle. Aristotle, as the first documented philosopher, branched value into “use value” and “exchange value” (Fleetwood, 1997). Since then, scientists, economists, and researchers have attempted to define and describe value in different contexts. Drevland and Lohne (2015) stressed the dependence of value on the theoretical context, as well as on subjective perception while referring to Womack and Jones (1996) as, arguably, the most common definition for value. Womack and Jones (1996) argued that the real value of a good or service could only be defined by the ultimate customer. Kelly et al. (2015) had a more mathematical approach to the concept of value defining it as the relationship between needs, functions, costs, and used resources. Value and value management is particularly discussed in management and marketing literature, especially since 1980s (Babin et al., 1994; Dodds, Monroe, & Grewal, 1991; Holbrook, 1994, 1999; Kaufman, 1998; Kelly et al., 2015; Parasuraman, 1997; Woodruff, 1997; Zeithaml, 1988). Although different theories and research streams have been applied in different contexts to conceptualize value, the focus on the customers and users can be considered as the common ground. This might lead us to the focus on the individuals who use the buildings, but the fact that different stakeholders have their own value proposition and perspective on value should not be ignored (Haddadi, Temeljotov, Foss, & Klakegg, 2015).

Bowman and Ambrosini (2000) use Aristotle’s conceptualization of value to define the process of value creation. They point out that use value is created by labor and an organization. At some point, the use value is exchanged as in a sale, and exchange value is thereby realized. The use value of the product can again be transferred by labor to a new use value, and the new use value can again be exchanged to create a new exchange value. Figure 1 illustrates this process.

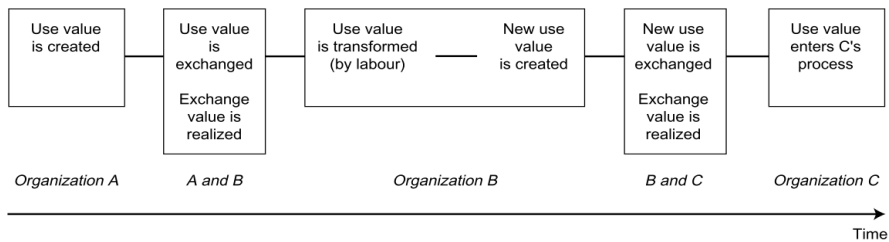


Figure 1 Value creation process (Bowman and Ambrosini, 2000)

Hjelmbrekke and Klakegg (2013) supported Bowman and Ambrosini (2000) by stating that value creation is a result of human activity (labor), and stress that human activity is the only source of new value. To evaluate value in a building context, Dewulf and Wright (2009) argued that value should be defined by in which degree a building is flexible and supportive of the core business activities in the operational phase. According to Eikeland (2001) value creation, in the operational phase, arises through the future users of the building. Consequently, the users’ perspective of value is essential to understand for achieving value creation in a project. Blanc-Brude, Goldsmith, and Valila (2006) and Smit and Dewulf (2002) presented comparable definitions, stating that inexpensive solutions to provide a quick and low-cost construction will decrease the lifetime value of a building.

Bell (1994) claimed that the processes in the pre-design phase of construction projects can appear to be hurried, resulting in customers’ expectations being unrecognized. Thomson et al. (2003) supported this claim by arguing that construction industry’s current understanding of value routinely fail to contemplate the relationships between buildings and users. Hjelmbrekke and Klakegg (2013) emphasized that traditionally a building project is based on project organizations that leave the users in a half-excluded/part-included position.

Samset (2010) defined the predesign phase as all activities from when the idea of a building is conceived until an investment decision is made and introduces tactical and strategic performance in construction projects. Tactical performance concerns delivering the agreed project outputs on time and within cost while Strategic performance includes longer-term

perspectives, such as relevance, effect, and sustainability. Arge and Hjelmbrække (2012) pointed out that working towards enhancing strategic performance, including usability, would enhance value for the project owner and user.

Sustainability and usability, as long-term strategical objectives of buildings, depend not only on the design of the building but also on how the building is operated. Facility Management is supposed to create an environment to support the primary objective of the activity in the building by an integrated approach to operate, maintain, improve and adapt the building and infrastructure (Atkin & Brooks, 2014). Atkin and Brooks (2014) also stated that understanding the organizational needs is the key to efficient FM in terms of providing value for money. According to Anker Jensen (2010), the focus of Facilities Management (FM) has been on cost reductions for a long time. This has changed in recent years towards the need for FM to create added value. The focus needs to change from evaluating buildings after completion time, cost, and quality, to assessment of life-span qualities such as low operational costs, adaptability, long-lasting materials and on how the building supports the core business over time (Bjørberg & Verweij, 2009; Nedin, 2013).

Adaptability will possibly generate a building ready for changing requirements in a sustainable way (Larssen & Støre-Valen, 2008; Nedin, 2013; Støre-Valen, Kathrine Larssen, & Bjørberg, 2014). Adaptability can maximize the efficiency of the core business in a building over the whole life cycle (Glanville & Nedin, 2009). Bjørberg and Verweij (2009) argued that adaptable buildings possess three essential abilities: flexibility, generality, and elasticity (F, G, E). Arge (2005) referred to the Norwegian Building Research Institute and defined these key elements as following:

- Flexibility is the building's ability to meet changes in user's and owner's functional needs by changing its properties
- Generality is the building's ability to meet changes in user's and owner's functional needs without changing its properties
- Elasticity is the building's ability to be extended or partitioned according to changes in user or owner needs

Value creation in hospital buildings

Initial costs have been the primary decision maker when designing hospital buildings in Europe for decades (Bjørberg & Verweij, 2009). Støre-Valen et al. (2014) claimed that life cycle cost (LCC) and initial cost should be considered as one total sum, as the operational costs usually

already exceed the initial costs two to three years after completion. By designing the building after a comprehensive life-cycle analysis, the building costs typically increase with 6-12 %, but the costs over the lifespan of the building will be reduced (Rechel, Wright, & Edwards, 2009) Facility Management (FM) can be the link between the hospital building and the healthcare services, contributing to value creation (Larssen, 2011). Støre-Valen et al. (2014) concluded that FM in hospital buildings needs to address a strategic function that aligns FM deliveries with strategic deliveries of the core healthcare service as well as the daily operation of the hospital. The theory pointed out that there are two fundamental functions that need to be addressed.

Value creation in University buildings

University facilities are learning environments, where the focus is on the students and staff, and their interaction with the built environment (Kärnä, Julin, & Nenonen, 2013). Hence, the university buildings are expected to support and facilitate the universities' core activities of teaching and research to contribute value. This general picture is complicated by the fact that there are student groups, e.g., medical students, which need different facilities from, for instance, a group such as civil engineering students. A campus, defined as the landscape and different buildings used for university-related functions, contains several facilities with different purposes and therefore different user groups (Kärnä et al., 2013).

Many scholars, such as (Hanssen & Solvoll, 2015; Wiers-Jenssen, Stensaker, & Grøgaard, 2002) have conducted studies focusing on how the university surroundings contribute to student and staff satisfaction. With regard to building facilities, these studies have found that the factors that can influence user satisfaction within university facilities are the quality of its social areas, auditoriums, and libraries, and aesthetic aspects of the physical infrastructure. A functional and aesthetic design can contribute to a pleasing first impression, motivate and support students both socially and academically and increase the time that the students spend at the campus (Spiten, 2016).

The organization and activities of universities change rapidly. Hence, university facilities must be dynamic and adaptable to these changes. Furthermore, people should be encouraged to use the spaces in the university in a myriad of ways, due to the development of technology and the learning landscape (Rytkönen, Nenonen, & Kärnä, 2012)

Value creation in office buildings

A physical environment that corresponds to the employees' needs and work processes can positively affect their performance, health, and well-being (Feige, Wallbaum, Janser, & Windlinger, 2013; B.P. Haynes, 2008). On the other hand, a poorly performing office environment can negatively affect the employees' health and productivity (Clements-Croome, 2015).

It is clear from studying lists of qualities that are of value to users that most employees highly value the possibility of doing focused work (individually and in groups) without many distractions. Informal, unplanned meetings are also important (Brill, Weidemann, & the BOSTI Associates, 2001; Leesman Lmi, 2015). According to van der Voordt and van Meel (2000), one of the central challenges in office innovation is finding a balance between privacy and interaction. While distractions are often referred to as the factor that has the highest negative influence on self-assessed productivity, interaction is often perceived as having the most significant positive impact (B. P. Haynes, 2007). Environmental conditions, such as temperature, air quality, noise levels, lighting, and access to daylight, are also of great value to users. Other factors that seem to be important are having information and communication technologies equipment and enough individual space for storage (Brill et al., 2001; Leesman Lmi, 2015).

Research design and methodology

Three separate studies were carried out to identify the elements of value creation for each type of building. The studies were a part of a larger research project and aimed to gather different types of data. Figure 2 illustrates the overall research design for this article

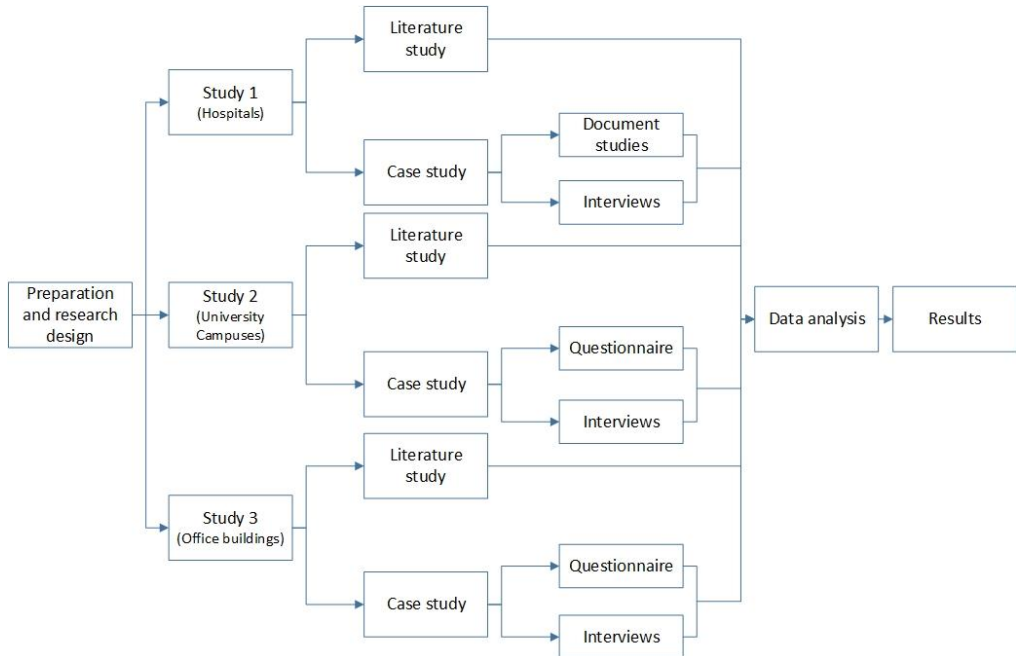


Figure 2 Research design

Each study contained its own literature study and a case study. The case study in Study 1 included documents studies of the case project and semi-structured interviews. The case studies in Study 2 and 3 consisted of questionnaires and semi-structured interviews.

Study 1 was conducted between January and June 2015 and collected its data through a literature review as well as case study of four Norwegian hospitals and an administrative governmental organization (SBHF) established in 2014 for planning and building hospitals

Study 2 was conducted between January and June 2016 and collected its data through a literature review, two questionnaires, and a case study with semi-structured interviews.

Study 3 was conducted between January and June 2016 and collected its data through a literature study and a case study of office buildings through a questionnaire and semi-structured in-depth interviews.

Study 1 (hospital projects)

The focus of study 1 was to identify what creates value for users within hospital buildings and which strategies should be present to create value. The literature review aimed to create a theoretical framework within the topic. Internet queries through library databases and search

engines constitute the primary source of information in this literature study. The hospitals for the case study were selected on the basis of their completion dates, spanning from 2000 to 2015 with pre-design phase starting 12-15 years earlier. The case study in study 1 contained a document study, four interviews, and a workshop. The document study aimed to identify the background of each project and strategies for value creation. At three of the hospitals and SBHF, open-ended semi-structured interviews were conducted. For the last hospital, four employees from the Facility Management (FM) department were invited to participate in a workshop. The objective of the workshop, and four in-depth interviews, was to map the understanding of the concept of value and what creates value, as well as gathering experiences regarding strategies for value creation. The respondents had backgrounds from design and project management, FM-services and pre-design phase of projects.

Study 2 (University campuses)

The focus of study 2 was to identify what creates value for users within University campuses. The literature review that was conducted as part of this study had two purposes: First, to identify the existing research and knowledge within the topic of value and value creation in general and within value creation in university campuses in particular and second, to create a theoretical framework for the research.

Seven Norwegian universities participated in the questionnaire, resulting in 879 respondents (337 students, 541 staff). The universities distributed the questionnaire through different channels. This prevented us from knowing the exact number of people who received the questionnaire, which in our opinion does not influence the results nor the conclusions of our research since the number of respondents is so high. The part of the questionnaire, which is benefited in this article, aimed at collecting data about value enhancing elements from two different user groups of university buildings; students, employees (staff). The focus of this questionnaire has been on campus facilities rather than individual buildings.

The case study in study 2 was an in-depth investigation, of the two universities that had the highest number of respondents in the questionnaire, through semi-structured interviews. Both universities had been through major construction projects during the past 15 years. The objective of the case study was further assessment and evaluation of the results of the questionnaire. Fifteen experts who had participated in the construction projects of the two university campuses were identified and interviewed.

Study 3 (Office buildings)

This study focused on how value is understood in office buildings. Data were collected through a literature study, a questionnaire and semi-structured in-depth interviews of users of office buildings. The questionnaire had 378 respondents and a response rate of 53%, and 13 key actors in moving or office refurbishment projects from three of businesses were interviewed.

The questionnaire aimed to identify how the end users perceive value-creating elements and what is essential for them to have a productive day. The questions were determined based on findings from the literature study considering what could be of interest to users in an office context. The questionnaire had five parts in total whereas data from two parts were relevant and are used for this article. These are:

- Part 1: What kind of office structure they have (Small 4-9 or large over ten open plan or cell offices) and how they work (mostly individual or in groups) and whether they spend most of their time inside or outside of the office
- Part 2: Ranking 22 qualities on a 4-point scale. The questions concerned structural, environmental and social qualities of the office building.

While the questionnaire had its focus on user requirements and the attractive qualities that enhance value in office buildings, the interviews focused on the processes in recent construction, refurbishment or moving project in those office spaces that can contribute to value creation.

The quantitative data, which was a result of the questionnaire, was analyzed by calculating the mean and standard deviation. These values would indicate how the respondents evaluate the qualities and how divided the perception is.

As it is evident in the description of the studies, all studies sought to improve the validation of their findings through triangulation suggested by Yin (2014). Study 1 tested the findings through the literature review and the documentation study of the cases by conducting interviews. Study 2 and 3 combined quantitative and qualitative approach, by testing the quantitative questionnaire through qualitative interviews. The results and finding are presented in the next chapter.

Findings from the three studies

The following chapter presents the findings from the three studies that have been conducted. First, the results of the investigation of what creates value for the end users is presented for each type of building. Then the findings regarding the strategic aspects of value creation are presented.

Hospital buildings

Identifying what creates value for users of hospital buildings is a difficult task. One of the main reason, besides the quick development of the technology, is the fact that there is a tremendous variety of functions in a hospital and identification of the user requirements and needs should happen based on each function. Furthermore, healthcare personnel and patients are both considered as the end users of the hospitals with different needs. Hence, the interviewees were asked to explain their understanding of what can create value in hospital buildings. Respondents pointed out factors that can contribute to the fulfillment of the users' requirements such as appealing light and air quality (indoor climate), positive and appealing holistic impression (interior quality, hygiene, cleanness), attractive buildings (Exterior and interior architectural qualities). Factors that can contribute to the improvement of healthcare services such as quality of workplace environment, development of competencies, collaboration and knowledge sharing and sense of belonging were as well mentioned as value creating elements. Other parameters such as proper logistics, desirable functionality, efficient operation services and environmental consciousness were mentioned by the interviewees as fundamental elements of achieving value in hospital buildings.

The understanding regarding the definition of a value-creating hospital building was reasonably harmonized. Almost all the interviewees stated that value in a hospital context is created when optimal conditions for efficient delivery of healthcare services is achieved.

A basic mathematical approach to defining value in the literature pointed to the relationship between function and cost. Although the nature of the function of a hospital building implies that this definition is hard to apply in this context, a broad awareness on considering LCC as a strategic means to achieve more valuable building is advised by the respondents. As an example, during the planning and design of one of the studied hospitals, the investments were reduced. As a result, the project was postponed, and a more comprehensive analysis of the new hospital was conducted. Despite the initial adverse reactions, the extensive effort resulted in a better building than initially intended.

Correspondingly, the findings advise an extensive analysis to evaluate and define objectives describing how to add value to healthcare services although this might be a challenging and demanding task. The criteria and specifications are unique for every project. Through the case studies, we managed to define three useful questions to obtain and identify the required criteria and specifications:

- 1- How do the healthcare services intend to develop capacity, reputation, and competences in the future?
- 2- How can the hospital buildings help the healthcare services to achieve these objectives?
- 3- What are the most critical requirements for the hospital buildings to fulfill future needs?

Strategic objectives of a hospital involve the long-term effects of the project. In all the cases of our study, the projects had pre-design documents labeling LCC. However, three out of the four cases admit that LCC was not given adequate attention during the processes.

Facility Management (FM) services including maintenance and development of the buildings are the dominant part of the costs in the operation phase. Although the document study pointed at LCC as a priority in all the cases, the response from the interviews is in contrast with this finding. Achieving annual operation cost profits is stated as an objective for the project in the pre-design documents of all four hospital cases. However, the respondents expressed concern regarding budget cuts and inadequate resources allocated to FM services.

Another frequently used term observed in the document study, in particular in the most recent hospital projects, is adaptability. As in FM, adaptability is a term that seems to be in focus during the pre-design phase of the hospital projects. However, like FM, the practical handling of this vital aspect appears to be questionable. A closer investigation of how adaptability is described and perceived in the most recent case reveals an emphasize on Elasticity (Future expansion opportunities). This finding can also be related to other hospital projects as population growth and need for larger hospitals and increased areas are of significant concern. A recent case hospital reached their full capacity quickly after completion as the population prognoses took place faster than estimated. Another challenge regarding the design of elasticity is the communication of these design opportunities to those who can realize them in future, such as facility managers. Also, accomplishing the potentials of adaptability is a complex task in operating hospitals. Although the possibilities of restructuring the use or expanding the areas are there, moving functions and making areas available for construction work is challenging.

University campuses

The literature, the questionnaire, and the interviewees' consent on the claim that value in a university campus context is a campus and buildings that creates optimal conditions for teaching, learning, and research. A remarkable finding in the results of the questionnaire is a general trend in the standard deviation of the answers. The standard deviation is higher for the low-ranking functions, indicating more consensus in individual perceptions on the most essential (high-ranking) functions and qualities.

Both value and customers' perception change over time. Despite this, the findings from the questionnaire correspond with studies from the literature showing that special rooms such as workshops, laboratories, auditoriums, and libraries, as well as social elements such as a cafeteria and informal break facilities, are basic needs and of vital importance for the users.

It was discovered in the case study interviews that more time spent on innovative design in the pre-design phase might contribute to creating an ability to adapt to the changes that could take place at the university in the future.

The first part of the questionnaire asked the students and the staff to rank some selected campus qualities that were chosen based on the literature and discussions among authors. The second part asked the students and the staff to rank the importance of different types of rooms and support functions.

Table 1 Selected qualities of the university campuses (1=low importance, 4=high importance)

Qualities	University Staff		University Students	
	Mean	Standard Deviation	Mean	Standard deviation
Areas suitable for work	3,69	0,49	3,47	0,60
Availability of public transportation	3,52	0,69	3,43	0,85
Sense of direction and orientation	3,31	0,62	3,40	0,64
Facilities for bicycles	3,13	0,92	2,84	1,08
Contribution to pride in the work/study place	2,97	0,83	2,80	0,89
Architectural qualities and aesthetic	2,90	0,81	2,67	0,85
Parking facilities for cars	2,66	1,07	2,44	1,17
Facilities for physical activity and sport	2,23	1,92	2,82	1,80

The highest-ranking quality "areas suitable for work" corresponds with the literature claiming that supporting the core activities of teaching, studying and research contributes to value on university campuses. Availability of public transportation, sense of direction and orientation

between the buildings and facilities for bicycles are also of high importance for both students and staff. In general students and staff seem to agree on what campus qualities contribute to value for them. However, students seem to rank facilities for physical activity and sport higher than employees do.

The ranking of room functions, as well, revealed relatively high consensus among students and staff. Both “Group/meeting rooms” and Study hall/private offices are ranked highly by students and staff. This finding, as well, supports the claim that both students and staff find the highest value in what supports their core activity.

Table 2 Four most valued room functions (1= highest value, 4= lowest value)

Room functions	University Staff		University Students	
	Mean	Standard Deviation	Mean	Standard deviation
Study hall/Private offices	1,44	1,25	2,51	1,29
Group and meeting rooms	2,27	1,46	2,10	1,29
Auditorium	2,74	2,28	3,39	2,27
Library	3,10	2,40	3,44	2,05

During the interviews, the respondents were asked about their definition of value for university campuses. The response expresses that value for the end user is a campus that creates optimal conditions for teaching, learning, and research. When asked about whom they considered as end users, the students, staff, facility and property managers and the community were mentioned.

The results from the interviews imply that the users agree on what elements would create value. However, the length of the project acted as an obstacle in communicating value for end users. The university campus construction projects usually are complicated and long-lasting. Consequently, the end users can change, and technology can advance resulting in loss of information and changes in value creating elements for users.

The interviews reveal that facility managers have an ambiguous role in the projects while they are substantial resources. Facility managers are not considered a distinguished user group although they, in fact, are an influential user group. Additionally, they are excellent resources with substantial knowledge about the operation, technical solutions, and building design. Therefore, they should be involved both as end users and as a resource for the design team during the pre-design phase of a project.

Office buildings

The overall results from the case study questionnaire reveal that the most critical factors that can enhance value for the employees are fundamental qualities such as good indoor climate conditions and areas being suitable for individual work, formal meetings, informal meetings, and sharing knowledge. For the employees in this case study, the availability of public transport was rated as the most critical factor. This was supported and reemphasized by the fact that “Parking facilities for cars” has the lowest ranking. This finding is highly situational and location-dependent. Norway has a strong culture for using public transportation, and the cities that the case buildings are located in have tremendous and wide-spreading public transportation systems.

Table 3 Results from the questionnaire in study 3

Quality	Mean	Standard deviation
Availability of public transportation	3,56	0,69
Indoor climate and comfort	3,37	0,63
Areas suitable for individual work	3,33	0,69
Sharing knowledge and collaboration	3,27	0,66
Interior qualities and well-being	3,11	0,75
Areas suitable for formal meetings	3,02	0,70
Safety and security	2,99	0,74
Areas suitable for informal meetings	2,83	0,82
Individual control of indoor climate	2,82	0,86
Workplace design that enables flexible working	2,80	0,87
Modern, forward-looking solutions	2,77	0,84
Contribution to pride in the workplace	2,75	0,78
Environmental friendly energy efficient building	2,66	0,82
Arrangements for effective waste management	2,61	0,82
Access to locker room and shower	2,55	0,99
User-friendliness, sense of direction	2,54	0,76
Parking facilities for bicycles	2,51	1,14
Flexibility (changing floor plan)	2,47	0,87
Accessibility and universal design	2,46	0,86
Exterior, architectural quality	2,41	0,80
Facilities for physical activity	2,25	1,04
Parking facilities for cars	2,01	1,05

The questionnaire results also indicate that several qualities are perceived to be better by the employees who sit in a partly activity-based open-plan space compared to the employees who have individual cell offices. One of these is the suitability of the open-plan space for informal meetings. However, users who have cell office are more pleased with its suitability for individual work. Their concerns with the indoor environment seem to be mostly related to air quality and temperature, while people working in the open-plan space have more complaints about noise. This substantiates the challenge of finding a balance between privacy and interaction mentioned in the literature. In the case of the office buildings, similarly to university campuses, the results indicate a higher standard deviation for the low-ranking functions, revealing converging individual perceptions on the most essential functions.

Case study interviews pointed to some essential elements that could contribute to value creation in a project. Four key elements were identified during the interviews as factors for enhancement of value creation in projects:

- A structured user involvement process
- Collection of information and identifying needs
- Identifying who should be involved when
- Structuring the collected information

The importance of satisfying user needs and thereby the importance of identifying and understanding these needs during early phases of the project was emphasized by most of the interview objects. Besides, the significance of involvement of the management level of the company/business in pre-design phase was specified. By involving the management before the users, certain fundamental decisions can be taken before the users are involved. In addition, the management would be able to communicate the strategies and objectives of the project to the users.

Discussions and conclusion

The fundamental similarity and common ground is in creating optimal condition for core business activities. However, the key for creating optimal condition for core business activities is in differentiating the value propositions of the users and the owners.

There is an overlap between these two, and although owner's value proposition can affect the business activities of the users, they are mostly related to, and taken care of, by the owner. The

user value proposition is the specific requirements that users request to be able to perform their tasks productively.

Similarities and Differences in User's value proposition in different types of buildings

Over 1000 users were asked about the qualities they consider as value creating in their buildings in this research. Requirements such as indoor climate and comfort (noise, air quality and temperature), access to public transportation, interior and exterior quality and impression, rooms and areas that facilitate both individual and collaborative activities are among the examples of user requirements that are common for any building.

However, every type of building has its distinctive value proposition as well. While elements such as facilities for physical activity and sport is considered as a relatively highly ranked factor for students on university campuses, they are not acknowledged as important factors for an office building or hospital users. Logistics and environmental consciousness are pointed out as fundamental parameters to achieve value in hospital buildings, while neither campus nor office users have ranked these as important factors.

Elements such as parking facilities for cars and bicycles, architectural quality and aesthetic, and access to shower and locker rooms are qualities with highest standard deviation, indicating that these qualities are highly appreciated by some people while others do not consider them as essential factors for value creation. Although everyone can appreciate the access to public transportation, parking facilities for cars are appreciated by those who drive and facilities for parking bicycle and the locker rooms are appreciated by those who ride bicycles.

As literature study revealed, the value of a product is defined by the ultimate user and depends on the individual perception of the product (Womack). Although this can imply that determining what creates value for users is a difficult task, one of our most significant findings, regarding identifying value creating elements for users, is that the standard deviation is higher for the low-ranking functions, indicating converging individual preferences on what the most important functions and requirements are.

This finding indicates that user requirements in projects can be determined by conducting questionnaires while standard deviation can be a measure for identifying the most legitimate requirements. The elements with a low standard deviation are essential to be fulfilled for everyone while higher standard deviation indicates the diversity in needs meaning that these should be fulfilled but not designed to be utilized by everyone.

Although some of the significant user requirements were ranked and analyzed, identifying user requirements in each project is of significance. In the study of the hospitals, identifying users' critical requirements were associated with the future development of the capacity, reputation and competences and how the buildings can help the healthcare services to achieve these objectives. Reflecting the process over to the core business is a smart strategy that would disregard the requirements, to a certain level, from individual perceptions. This strategy is not as expedient for office buildings since the core business strategies would depend on the occupying organization and strategies will change when a new organization leases the spaces. In the context of office buildings, the findings showed that a user involvement process for identifying needs, collecting information and structuring it in each case is necessary. In addition, it was remarked that the involvement of the core business management in the early phases of this process would be positive as some fundamental decisions can be taken before the users are involved.

Similarities and Differences in Owner's value proposition in different types of buildings

Life cycle thinking and considering LCC was acknowledged as an important contribution to value creation particularly within the context of hospital buildings. Although choosing efficient, long-lasting and heavy-duty solutions might increase the initial investment cost of a hospital project, it might contribute to better long-term value creation and lower LCC during the lifetime of the hospital. This element was, however, not emphasized by the respondents within the context of an office building. This can be explained by the nature of core businesses in office buildings. Businesses typically have a leasing contract with the owners, and the expenses for maintenance and operation of the buildings are included in the leasing contract. The leasing contracts usually are shorter than the buildings lifetime, and the owner can adjust the incomes based on the costs during the buildings lifetime.

FM is one of the elements of concern in life cycle thinking as it is one of the leading parts of the operation cost. The studies, especially in the context of the hospital buildings and university campuses showed that this factor is highly acknowledged in projects but is not adequately prioritized during the planning.

Another highlighted value-creating element on the strategic level is adaptability. Both hospitals and university campuses pointed out this factor as an essential contribution to value creation. The core activities in hospitals and universities are changing rapidly. This results in changing functions and increases the demand for flexibility, generality, and elasticity of the buildings.

Results from the office buildings were different in this case as well. Adaptable office buildings will reduce the operation and development costs for the owner of the buildings. Therefore, considering adaptability in office buildings is strongly recommended although the users are not accentuating it as a value-creating element.

Aspects to Consider in the Planning and Design Phase

The research revealed some major aspects with regard to value creation. The literature review and the questionnaire revealed that user requirements are either related to functional needs or emotional value, meaning that the elements are either perceived as value creating because they have a functional value, or they erupt a positive emotion in the user. Other factors related to the owner can also be related to either functional value or strategic performance regarding satisfying a long-term objective and effect. Owners strategies are related to owner's intention with the project. This implies the importance of satisfying the intention of the owner through the project. The study also revealed the importance of thinking towards future identified or unidentified needs. These needs cannot be fulfilled by previous experiences and require new thinking and innovation. Hence, innovation is also one of the fundamental aspects to be addressed in the context of value creation. Table 4 presents the aspects that should be considered in the early development of the project to maximize value creation in the operation phase of the life from both owner and user perspective.

Table 4 Aspects to consider in the early development of the projects to maximize value creation

	Hospital buildings	University campuses	Office buildings
Owner	<p>Design focusing on Life Cycle Cost (LCC) – long-lasting building with low FM cost</p> <p>Important design parameters are Logistics and environmental consciousness</p> <p>Design for adaptability</p> <p>High demand for innovation, fast-changing user needs increases the demand for flexibility, generality, and elasticity of the buildings</p>	<p>Design focusing on Life Cycle Cost – long-lasting building with low FM cost</p> <p>Important design parameters are Indoor climate and comfort, areas suitable for individual work and for charring knowledge and collaboration</p> <p>Design for adaptability</p> <p>High demand for innovation, fast-changing user needs increases the demand for flexibility, generality, and elasticity of the buildings</p>	<p>Design focusing on high rent</p> <p>More focus on short-term user needs</p> <p>The inner structure of the building usually changes cyclically</p>
User	<p>Users’ critical requirements were associated with the future development of the capacity, reputation, and competences</p> <p>Thinking towards future identified and unidentified needs</p>	<p>Users’ critical requirements were associated with the future development of the capacity, reputation, and competences</p> <p>Thinking towards future identified and unidentified needs</p>	<p>New occupying businesses usually have other needs and requirements than the previous one.</p> <p>User involvement process for identifying needs, collecting information and structuring. Shorter time perspective than university campuses and hospitals.</p>

Although the inputs and prerequisites for value creation in the early phase of the project are identified through this study, there is still a need for a systematic approach to optimizing the tactical performance of the projects. Value creating elements in the management of the projects should be identified in further research, and a structure that contributes to higher tactical performance should be suggested. LCC, FM, and adaptability are all considered as critical

strategic objectives and can have significant contributions to value creation, but the tactical aspects of exploiting it is still a challenging as they are not adequately planned and implemented. This is related to project governance and management of the project towards achieving its tactical objectives and should be investigated by further research.

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III

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A Conceptual Framework to Enhance Value Creation in Construction Projects

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Abstract

There is a clear link between the building design and the value creation by the businesses and users of the buildings. Measuring project success is a complex task and has traditionally been associated with criteria like time, cost and quality in the project society. However, modern project management literature has revealed that other objectives should be taken into consideration in order to achieve overall success in projects. Understanding the owner's and the users' strategic objectives and translating them into functional buildings seem to be an essential factor for understanding the true value of a project. Fulfilment of these objectives can primarily be assessed when the building is in use. Value creation of a building is therefore directly linked to the effects that owning and using the building have over its lifetime. This paper is aiming towards outlining a method to identify and understand the owner's and user's strategic objectives and use this knowledge to optimize the design of buildings in order to enhance the value creation of projects.

The suggested framework is the first step towards developing a method for enhancing value creation in construction projects. The framework is developed based on a qualitative research using literature studies and discussions with fellow scholars and experts. The research reveals that value in a life cycle perspective is created when needs are fulfilled and strategic goals are achieved. In a project perspective, the efficiency and effectiveness of suppliers is also of importance. The framework presents a method that enables the project to move the focus from the project perspective to lifetime perspective. Implementing such a method will help the decision makers to move the focus from what is best for the project to what is best for the users and the owner.

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1. Introduction

Measuring project success is a complex task and depends highly on which stakeholder is been asked. Traditionally the criteria of time, cost, and quality has been major indicators of project success in the project management society. Other factors such as profitability, technical performance, functionality, health and safety, productivity, and environmental sustainability, are also important aspects for evaluation in order to determine project success. Müller and Turner¹ suggest that measurement of success needs to focus on the following stakeholders and parameters:

- End-user satisfaction with the project's product or service
- Suppliers' satisfaction
- Project team's satisfaction
- Other stakeholders' satisfaction
- Meeting project's overall performance (functionality, budget and timing)
- Meeting user requirements
- Meeting the project's purpose
- Client satisfaction with the project results
- Reoccurring business with the client
- Meeting the respondent's self-defined success factor

Furthermore, attainments of other objectives like satisfaction, absence of conflicts, professional image, aesthetics, and educational, social, and professional aspects are also considered as indications of project success².

In the European research project, Value Driven Procurement in Building & Real Estate (VALPRO), lack of understanding the project owner's/users strategic objectives and lack of methodology for translating them into functional buildings is stressed³. The new findings from that research shows shifting the main project target from finished building toward the effect of owning and using it over its lifetime⁴. We believe that value creation of a building is directly linked to the effect of owning and using the building has over its lifetime. These effects define how successful the building has been as a product, but does not say anything about how good the project management process or the design process in the front-end has been carried out. This suggests that mapping of value creation of a building after it has been delivered might be (directly or indirectly) linked to how stakeholders perceive the project success. Considering this, we will be able to contribute to higher value creation by developing a process for gaining knowledge about what creates value after the building is delivered, and apply this knowledge into the design phase in order to optimize the design of our buildings.

The framework and methods outlined in this paper has been developed as a part of a research project that has special focus on the design process in the front end of a project – the Norwegian research project called "Oscar". Literature studies and several survey regarding value in construction projects have been conducted as a part of the Oscar project in 2015. The results from studies in Oscar project have given us valuable ideas throughout development of the model. The first version of the model has been developed based on literature study, the survey on value and discussions with fellow scholars and experts at Oscar project. The basis for the writing process of this paper has been discussions and analysis of the joint experiences of the involved individuals. This paper is therefore a product of a collective reflection of our experience and knowledge. The research is qualitative in the sense that we do not use any quantitative or statistical evidence or methods in our approach in this paper.

2. Point of departure

In order to be able to come up with a model for understanding the owner's and the users' strategic objectives and translating them into functional buildings we need some clarifications of concepts and terminologies. First, we have to be clear about what we mean by functional buildings. We also need to know how the concepts "value in project development" and "value in a project life time perspective" can be understood.

Through the literature review, we found that how users and owners perceive a building, must be seen in a broader perspective than just functioning. From users' perspective, elements like sustainability, adaptability, reliability and perceived value for benefits contribute to how satisfied they are with the building. From the owner's (or business's) perspective, the focus is on harmonizing the resources and provisions⁴⁻¹¹. This leads us to the concepts of value where ensuring required functions is a contribution to value creation.

On the other hand, the owner's and users' objectives are being translated into buildings throughout a project. These objectives have to be understood and identified early in the project and be a part of success criteria of the project, which is measured after the project. Therefore, an understanding of how project success can be defined is another essential requirement.

The theoretical background in this paper is a result of acknowledging the need for understanding the concept of value, value creation, and success in projects.

3. Methodology

According to Jabareen¹², conceptual frameworks are defined as a network, or "a plane" of interlinked concepts that together provide a comprehensive understanding of a phenomenon or phenomena and are products of qualitative processes of theorization. Jabareen¹² provides a 7-step procedure for developing conceptual frameworks. A modified version of this procedure with five steps is going to be used in developing our conceptual framework:

- 1- Identifying the concepts
- 2- Mapping the selected data source, extensive reading and categorizing of selected data
- 3- Deconstructing and categorizing the concepts
- 4- Synthesis, resynthesize and make it all make sense
- 5- Validating the conceptual framework

The interlinked concepts in this paper are the concept of value and value creation together with success in projects. These concepts are identified through literature review as explained in previous chapter. In order to be able to link these concepts, a proper understanding of these concepts is required. This understanding can be acquired by literature study of the concepts. Fink¹³ defines a literature review as a systematic, explicit, and reproducible design for identifying, evaluating and interpreting the existing body of recorded documents. Sources are selected by using search engines and databases for literature. References and citations in papers, articles and books have been further investigated for relevant data and information. The result of the literature study (theoretical background) is deconstructed and categorized and the concepts are linked together. Thereafter the results are synthesized and analyzed by authors and the presented conceptual framework is developed. Validation of the framework will occur by presenting it at a conference, for focus groups as well as future case studies and piloting.

Figure 1 illustrates the research design for developing the conceptual framework. The green parts show the steps that are conducted so far in the process and the blue parts are expected further research.

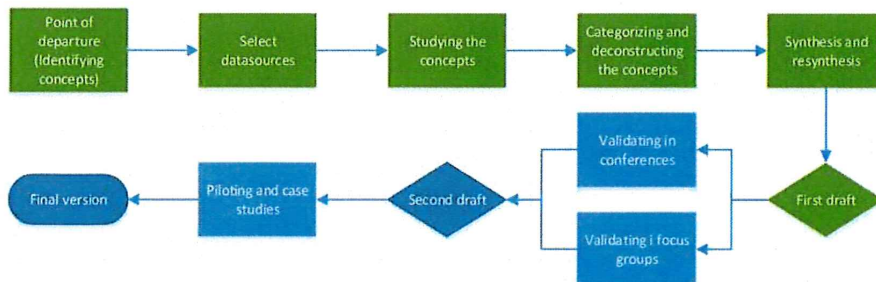


Figure 1 Research design

The first draft of our suggested model for value creation in project is presented in this paper. Our intention with this paper is to show our suggested solution and get some feedback on the ideas so that the model and the steps can be refined towards the final version.

4. Theoretical background

The discussions and pursuit towards defining value has been ongoing since Aristotle (4th century BC). Aristotle was the first documented philosopher who differentiated between two meanings; “use-value” and “exchange value”¹⁴. Since then Adam Smith and Henry Ford have, among others, brought the discussion further in 18th and 19th/20th century. Adam Smith focused on “productive” activities that contribute to exchange value through the manufacturing and distribution of goods¹⁵. Henry Ford brought the consumer focus into the discussion by claiming that focusing on organization of industry to serve people is not in conflict with the profitability of the industry¹⁶. A growing number of companies seems to have adopted the value generation models since the beginning of the 1980s by various initiatives like customer driven company, customer orientation, mass customization and value-based management¹⁷. Value and value management have particularly been discussed in management and marketing literature during the last decades, especially since 1980s^{8, 18-25}. Although different theories and research streams have been applied in different contexts to conceptualize “value” the common ground is the focus on the customers and users²⁶. As Womack and Jones²⁷ stress, “The real value of goods or service can only be defined by the ultimate customer”. Defining the ultimate customer in a construction project is a difficult task. The building’s owner is defined as the suppliers’ client and thereby customer, but the ultimate customer is the user of the building. Womack and Jones²⁷ point out that value is only meaningful when it is expressed in terms of a specific product that meets the customer’s needs at a specific price at a specific time. Although this leads us to the individuals who work in the building as the end users, the fact that every stakeholder has its own value perception cannot be neglected²⁶.

Value creation in a project depends on the relative amount of value that is subjectively realized by a target user who is the focus of value creation - whether individual, organization, or society²⁸. Various stakeholders in a project have different views on what is valuable. The difference is because of unique knowledge, goals, context and conditions that influence how the novelty of the value is conceived and evaluated. The stakeholders may also have competing interests and viewpoint of what is valuable²⁸. However, according to Coenen and Alexander⁷ perceived value and value creation are the result of cooperation among all stakeholders, and the success in collaboration between actors contributes to value creation for all stakeholders.

In construction projects, different stakeholders try to define value from their own perspective. Value creation depends however on how the needs are satisfied. There are three main roles whom the needs should be assessed in a project in order to maximize the value creation i) the owner ii) the suppliers iii) the users²⁶. According to Samset²⁹ owners’ focus on long term perspective, users’ focus on the effects related to using the products and the suppliers’ perspective focusing on the deliverables or outputs from the project are needed to have successful projects. Users need to have their functional and hedonic value fulfilled, owners should fulfill the users’ value and have profitable/optimal operation and suppliers must fulfill users’ value and produce effective and efficient²⁶.

Projects must have their reason based on organization’s business strategy and goals³. At the same time, the trigger for any project is a predicted or existing customer need. Strategies must be aligned with user’s needs. Although corporates can choose different strategies, the literature shows that there is a clear connection between the project owner or corporate strategies and value creation in projects. At the same time, the focus on the customer value in order to create value reveals the importance of aligning corporate strategies with customer needs in order to maximize the value creation. There is, however a need for clarifying all these requirements for value creation by performing a systematic approach to prioritize, measure and monitor the fulfillment of these requirements throughout and even after the project. The Norwegian research project “Oscar” conducted an extended literature review to map the characteristics and means for value creation in construction projects. The research showed that the characteristics which contribute to value creation can mainly be divided into four groups⁴.

- Economic value (Core business cost, investment cost, economic value)
- Social value (People and organizations)

- Environmental value
- Physical value (space and infrastructure)

Traditionally, the assessment of the success/failure of construction projects has been based on evaluation of the extent of achieving the client's objectives like cost, time and quality³⁰. Although these three measures can provide an indication of success or failure of a project they do not, in isolation, provide a proper picture of the performance of the project. Besides, the implementation of these measures are apparent at the end of the projects, and therefore they are rather "lagging" than "leading" indicators of performance³¹.

Although success can be measured in terms of achieving the objectives, there is ambiguity in determining whether a project is a success or failure. Every project has a set of goals to accomplish. There is a need for criteria to compare the goal level against the performance level, and project success is to attain project goals and participant satisfaction. Criteria such as profitability, technical performance, completion, functionality, health and safety, productivity, and environmental sustainability, are also important aspects for evaluation. Attainments of goals like satisfaction, absence of conflicts, professional image, aesthetics, and educational, social, and professional aspects are also considered as indications of project success².

Chan² points out that project performance has been a topic of great interest for scholars recently and present 3 trends in measuring project success:

- Meeting objectives: Achieving client's objectives. Tangible means (time, cost, quality), less tangible criteria.
- Global Approach: Considering project success criteria from both subjective and objective points
- Beyond project: Considering positive effects brought about by the project as well as the tangible means.

This brings the discussion further to looking into the success in construction project in a life cycle perspective rather than just project perspective. In engineering tradition, the project is fundamentally about delivering an objective during a defined life cycle³². According to Morris³², the distinction between projects and non-projects is that all projects, no matter how complex or trivial, go through a common life-cycle development sequence. Whole organizations can be set up to achieve specific objectives within given time and cost constraints, and that will consume resources. However, it is the act of going from concept, through definition, development, and build, to handover. In this respect, several different life-cycle models exist that truly distinguish projects from non-projects.

Figure 2 illustrates the life project cycle phases that Morris suggests.

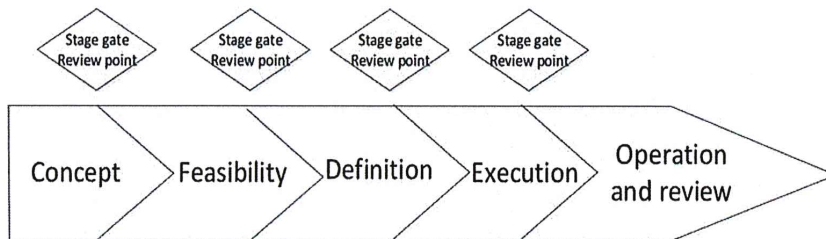


Figure 2 The Project Life cycle³²

PRINCE2³³ points out that projects are different from the normal operation of the organization when they:

- have specific objectives to deliver new benefits to the taxpayer, companies, the general public, the government, the sponsoring organization, stakeholders, and/or delivery partners
- may introduce significant changes to the way the business operates
- create new outputs and/or deliverables that will enable benefits to be realized

- have a specific, temporary management organization, and governance arrangements set-up for the duration of the project are susceptible to risks not usually encountered in the day-to-day operation of the work of the organization
- involve a range of stakeholders from different parts of the organization and beyond
- may use methods and approaches that are new or unfamiliar.

This tradition has had a strong focus on the project delivery and it should be defined according to the triple constraints (i.e. time, cost, and quality) that are often referred to as the ‘iron triangle’.

5. Analysis of theoretical background

This research has its focus on the three main stakeholders in the project (user, owner and suppliers). The success in the project, positive effect brought by the project and value creation for society is not in focus at this stage of the development process. Table 1 summarizes the authors’ synthesis of the literature review with the main findings about the concepts that are studied and keys to achievement of results.

Table 1. Analysis of the theoretical background

Identified concepts	Main findings	Keys to achievement
Value	Difficult to conceptualize and define. Different definitions in different contexts. Common ground is the fulfillment of needs and perception of users	Satisfaction of users’ needs will result in valuable products.
value creation	Difficult to conceptualize and define. Fulfillment of users’ needs alone is not enough for value creation.	User’s value and owner’s strategies must be aligned and suppliers must have effective and efficient production processes.
Success in project	Traditionally has been based on achieving objectives like cost, time and quality (project perspective) Should be assessed in a lifetime perspective. Client’s and users’ objectives related to operation phase should be included	Achievement of owner’s and user’s tangible and intangible objectives as well as the positive effects brought by the project.

The focus on value and value creation, the need for a tool that is “leading” rather than “lagging”, together with a systems as a tool for improving performance indicates that a value based model can be beneficial in a project. The model should focus on identifying what creates value for user and owner in the operation phase of the project and exploit this knowledge in design phase (Feasibility and Definition). The model should also contain a process for quality control so that the identified elements are evaluated and implemented as intended.

6. Conceptual framework for enhancing value creation

The conceptual framework described in this chapter provides a step by step model for identifying the needs, creating ideas and solutions to fulfill the needs and monitoring the implementation of the ideas.

The framework suggests a step by step process starting with identifying what is considered as value creating elements based on the users’ needs and the owner’s strategies in each project. The next steps intend to present how these elements can be transformed into descriptions, evaluated and implemented during the project. Evaluation of the ideas is followed up with a decision point where ideas which are approved will be implemented. Unapproved ideas will be either excluded or sent back to step 1 where they will be revised and go through the process again. The framework also provides an overview of what the objective of each step is and what the expected results of each step are. The process contains five main steps; i) Identification, ii) Idea creation, iii) Idea evaluation, iv) Implementation, v) Measurement of the results.

Evaluation and measurement process is highly complex and subjective. It involves a combination of basic assumptions underlying the activity being evaluated and of personal values on the part of both those whose activities are being evaluated and those who are doing the evaluation ³⁴. American Public Health Association ³⁵ defined

evaluation by “the process of determining the value or amount of success in achieving a predetermined objective”. Scriven ³⁶ stated that evaluation is “The process of determining the merit, worth or value of something”. These definitions are according to our concerns about ex-post evaluation of projects and suitable in out conceptual framework. However, parallel with this research, an extended research has been conducted by our fellow scholars at Norwegian research project SpeedUp on project evaluation. That research has resulted in a framework for project evaluation on strategic, tactical and operational levels (PESTOL model) which can be used in our model. The results of the research is an article in press to be published in International Journal of information systems and Project Management in 2016.

The framework based on the first stage of the development process is presented in Figure 3. The steps are independent from project phases. Some of the ideas/actions should be implemented during the early phases of the project; others might have to be implemented during the execution phase. It is however important to start the process as early as possible, preferably at the first stage gate right after the main concept is chosen (See Figure 2).

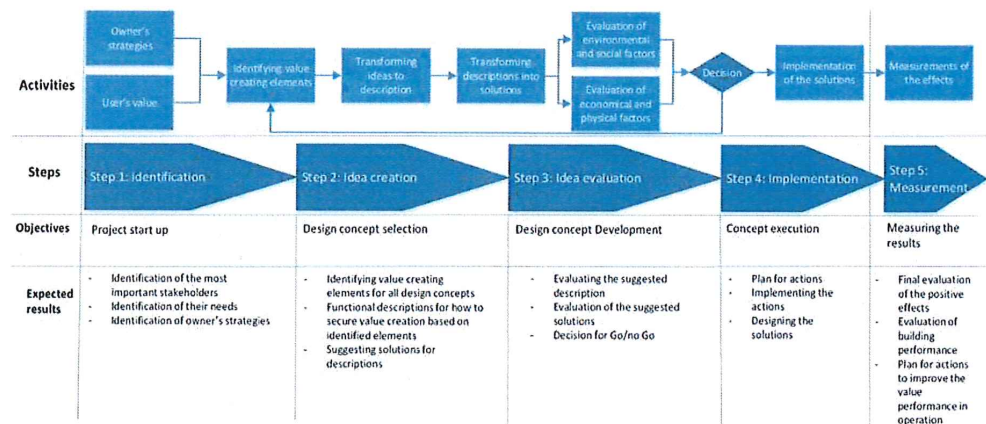


Figure 3 Conceptual framework for value enhancement in projects

7. Conclusion

Value is created when needs are fulfilled and strategic goals are achieved. The literature study reveals that value creation in a building in a life cycle perspective depends mainly on two factors; i) fulfilment of the users needs ii) fulfilment of owners and the corporate’s strategy. In a project perspective the efficiency and effectiveness of suppliers is also of importance. Increasing the value creation of a production system is another field of study with focus on execution phase of the projects. This paper has had its focus on early phase; hence, this field has not been in focus.

The framework presents a method that enables the project to move the focus from the project perspective to lifetime perspective. Implementing such a methodology will help the decision makers to move the focus from what is best for the project to what is best for the users and owner.

The process should start early in the project but the steps are independent from project phases. However, it should be clear when the actions and solutions are expected to start and finish. That means the actions should be transferred to the project time schedule after they have been through step 3.

There are already known tools and processes available for identifying environmental, economical and physical value elements. Classification systems like BREEAME or LEED can be used to cover the environmental issues. LCC analysis can be used to evaluate the economical elements. Multimap is an efficient tool for measuring technical condition as well as adaptability and usability of buildings ³⁷.

Different building types will have different value characteristics. Further research should be conducted to identify what creates value for owner and user in buildings. Oscar project is also attempting to create a guideline for project

startup in order to help the owner to determine proper ambition level for the building. This guideline will also be a great contribution to the first step of the process. The framework should be tested in case studies. Testing the methodology will provide information about how the process functions in projects. This information can help us improve and streamline the processes. Further research will also be conducted to investigate i) existing tools that can be helpful during the process, and ii) the need for new tools that should be developed.

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IV

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V



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Pursuing Value Creation in Construction by Research -A Study of Applied Research Methodologies

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Abstract

This paper presents the results of a study on research methodology applied within the field of Value and Value Creation in construction industry. The purpose of the paper is to give an overview of approaches that are used, and map which research philosophies and methods are most common within this field.

The research is based on an extensive literature review. Relevant research contributions from 1980 to 2016 were studied. The publications have been categorized based on their data collection method (literature review, interviews, surveys etc.), and which philosophical approach (positivism, interpretivism, realism and idealism) that is applied.

Research on value has been conducted in many different contexts such as marketing, psychology, manufacturing and construction. However, this research is limited to publications that are directly associated with buildings, construction projects and construction industry. The paper also presents the development of research methods on value and value creation.

The results, besides providing a knowledge status, give an overview that can be helpful for fellow researchers to improve the research quality, and see if there is a need to look into the topic from alternative perspectives.

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Keywords: Value management, Value Creation, Construction projects, Research methodology, Research philosophy

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1. Introduction

Value and Value Management have been discussed in management and marketing literature during the last decades especially since 1980s. A large number of researchers have attempted to conceptualize and define value¹⁻⁹. This has mainly been done in the context of marketing, production and manufacturing, as well as sociology and psychology.

There have been numerous research streams within value in construction where economic issues, sustainability and customer satisfaction have been in focus. Value creation, Value Engineering and Value Management are topics that have received increasing interest lately, and a substantial amount of research has been conducted within these fields. Some researchers have had their focus on defining and conceptualizing value, while others try to suggest processes to improve value management, and some have attempt to measure and optimize the processes. This paper aims to provide an overview of the available research related to value, value creation, and value management in construction projects with focus on research methodology by answering: i) What philosophical views has the research been based on? ii) What have the research approaches been? iii) How has the development of the research been over the years?

2. Data collection and limitation

The research is based on review of scientific articles. The articles are chosen among several thousand articles from databases Emerald, Science Direct, Scopus, Google Scholar, and ORIA (Norwegian search engine for university libraries and numerus publication databases)

In order to identify the articles, search words such as Value creation construction; Value measurement, buildings; Buildings, value, clients; Value, construction projects; Value Creation, buildings; Value management, construction projects; and Value measurement, buildings were used.

Relevant publications were chosen using the following criteria:

- Only published scientific articles in the databases mentioned above.
- All publications were in English language.
- Publications were limited to the period of 1980 to 2016
- Focus on what creates value in construction projects and how it can be measured.
- Life cycle and sustainability focus was included.
- No focus on production and manufacturing (lean production).
- No focus on infrastructure projects unless the research was relevant for construction projects.
- No books since books can be a combination of research publication and contain several research approaches and philosophies.

The database search using the keywords resulted in several thousand hits. Fifty-five articles were selected by reviewing titles and abstracts. Five publications turned out to be irrelevant after reviewing the articles and three had unclear research methodology. Consequently, the final number of the articles that create the basis for this paper is 47. These articles have been categorized and analyzed using the framework presented in

Figure 1.

3. Theoretical Background and Framework for Analysis

First part of this chapter presents a brief theoretical background on the concept of value and value creation. The main part of the chapter is a reflection of existing theories in research methodology including research philosophies, research approaches, and research design.

3.1. Value and Value Creation

Previous research revealed that the pursuit towards defining value is of ancient character¹⁰. The discussion and debate has been ongoing since Aristotle (4th century BC) who first distinguished between two meanings: “use-value”

and “exchange value”¹¹. Adam Smith brought the discussion further in the middle of the 18th century. He focused on “productive activities” that contributed to exchange value through the manufacturing and distribution of tangible goods. In 1926, Henry Ford indicated the significance of focus on customer’s value and its importance for industrial manufacturing¹².

Although different theories and research streams have been applied in different contexts to conceptualize “value”, the common ground is the focus on the customers and users¹³. As Womack and Jones¹⁴ stress, “The real value of goods or service can only be defined by the ultimate customer”. Earlier research led us to the fact that the researchers have had different approaches towards value¹⁵. Research has been conducted in different contexts with different philosophical worldviews.

Value creation in a project depends on the relative amount of value that is subjectively realized by a target user who is the focus of value creation- whether individual, organization, or society¹⁶. Stakeholders in a project seldom share the same views on what is valuable. Unique knowledge, goals, context and conditions that influence how the novelty of the value is conceived and evaluated can influence the perception of value. The interests and viewpoint of what is valuable can even be competing¹⁶. However, according to Coenen and Alexander¹⁷ success in collaboration between actors and cooperation among all stakeholder contribute to value creation for all stakeholders.

3.2. Philosophical Worldviews

Methodology literature includes several categorization of various research philosophies. Creswell¹⁸ pinpoints four worldviews, Post-positivism, constructivism, transformative and pragmatism.

Post-positivism holds a deterministic philosophy where causes determine effects or outcomes. The knowledge developed by post-positivists is based on measurements of objective reality that exists. There are also laws and theories that need to be tested so we can understand the world. This worldview has similarities to Positivism, which has a long intellectual history. Giddens¹⁹ describes four claims made by positivists; i) Reality consists of what is available to the senses; ii) Science is the primary discipline; iii) The natural and social science share a common unity of method; iv) There is a fundamental distinction between fact and value.

Constructivists believe that individuals develop subjective meanings based on their experiences towards certain objects or things¹⁸. These meanings are varied, leading the researcher to look into complexity of views rather than narrowing meanings into a few ideas. This means the researchers intend to make sense of the meanings other have and inductively develop a theory rather than starting with a theory. Howell²⁰ refers to Lincoln and Guba²¹ who state that in the constructivist paradigm, researcher and researched continually interact and influence one another and the research project has limited possibilities for generalization. Only temporal and context-bound working hypotheses are possible and it is impossible to distinguish causes from effects. Finally, the enquiry is value bound overall.

Neuman²² characterizes constructivism as a part of interpretivism and claims that interpretive social science differs from positivism concerning choice of method, but is related to positivism concerning value. Hence, interpretative social sciences have a relativistic understanding with “no single point-of-view or value position”. This indicates that interpretivist research can both be value-neutral and value-laden.

The **transformative** worldview arose from researchers who felt that constructivist stance did not go far enough in advocating an action agenda to help marginalized people. The research contains an action agenda for social reform and change. This philosophical worldview focuses on needs of groups and individuals that may be marginalized. Neuman’s Critical and Feminist philosophies have similarities to Creswell’s descriptions of transformative worldview. Neuman²² states that critical studies of social reality “necessarily contain a moral-political dimension, and moral-political positions are unequal in advancing human freedom and empowerment”. According to Neuman²² feminist research is “action-oriented research that seeks to facilitate personal and societal change”. This means that the research contains an action agenda for social reform and change as Creswell suggests. Common for all these philosophies is that they all seem to be value-laden and the reality is only knowable through the human mind and has no absolute existence. This brings us further to the discussion on idealism. According to McLaughlin²³, idealism asserts that “reality is only knowable through the human mind and through socially constructed meanings”. The “ideas” that are confined to the mind is the reality.

Pragmatism has many forms but for many, it arises out of actions, situations and consequences rather than antecedent conditions. In pragmatism, the researchers uses all available approaches to understand the problem rather

than focusing on methods. In pragmatism, truth is what works at the time and pragmatists have believed in an external world independent of the mind as well as that lodged in the mind. This corresponds with how McLaughlin²³ describes realism. McLaughlin²³ explains that realism is based on the assumption that there is an external reality that exists independently of our views and understanding about it. According to Klungseth and Olsson²⁴ “Realism is interpreted as problem-oriented, and aims to be value-neutral and real-world oriented without any underlying consciousness”.

Despite the wide range of definitions and distinctions of philosophical views, a profound look reveals that there are some established common ground. Firstly, there are mainly two types of research: Objective or subjective research. Positivism and all its related definitions have “objectivity” in common while interpretivism, constructivism and their related views have mainly a subjective perspective. Objectivism and subjectivism have been described as a continuum’s polar opposites with varying philosophical positions aligned between them²⁵. At the same time, both objective and subjective research can be value-neutral or value-laden. They can be issue-oriented or problem-centered. In both subjective and objective research, the reality can have or have not absolute existence.

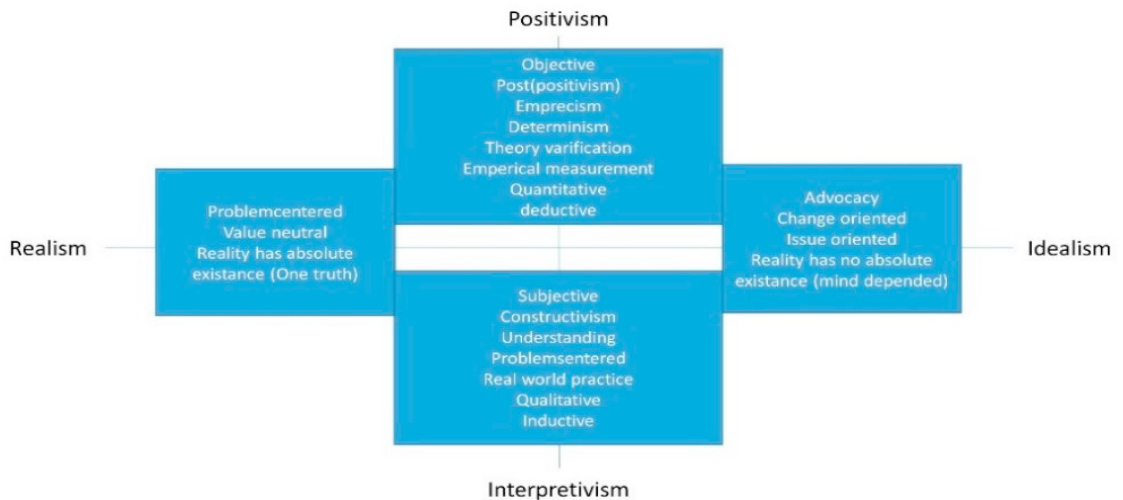


Figure 1. Major philosophical worldviews and their characteristics

Alexander²⁶ describes researchers’ philosophical views, especially within facilities management research, into four categories of positivism, interpretivism, realism and idealism. These categories correspond with our

Figure 1. Our research categorizes worldviews within the field of value creation in construction by applying this framework.

3.3. Research Approaches

Creswell¹⁸ defines research approaches as “Plans and procedures for research that span the steps from broad assumptions to detailed methods of data collection analysis, and interpretation.” Creswell points out that there are mainly three decisive elements in a research approaches: i) Philosophical worldview; ii) Research design; iii) Research methods

Philosophical worldviews have been described and discussed in previous chapters. This chapter contains a closer look at research design and research methods. Research design is basically the procedures of inquiry while research methods is about how the data is going to be collected, analyzed and interpreted. Qualitative, Quantitative and Mix Methods as three main approaches to research

Qualitative methods are mainly linked to the interpretivist perspective of philosophy²³. Fellows and Liu²⁷ has a general description of qualitative approach saying it seeks to gain insight and to understand people’s perception of the world both as individuals and as groups.

Payne and Payne²⁸ stress that “qualitative” is an umbrella term and refers to a set of approaches that share common features such as: i) Seeking out and interpreting the meaning that people ascribe to their own actions. ii) Actions are seen as contextualized, holistic and part of a social process. iii) Seek to encounter social phenomena as they naturally occur. iv) They work with smaller samples looking for depth/detail of meaning with a less general and abstracted level of explanation. v) They use inductive as opposed to deductive logic allowing ideas to emerge as they explore the data.

The process of qualitative research has several characteristics. First, it involves emerging questions and procedures; second, the data is collected in the participants setting; third, the analysis of data builds inductively from particulars to general themes and finally the researchers make interpretation of the meaning of data. Interviews, case studies and literature reviews are typical methods for collecting data in qualitative studies¹⁸.

Creswell refers to literature and increased visibility of this type approach during 1990s and into the 21st century and points out the following designs, among others, as common methods of conducting qualitative research:

- Narrative research, where the researcher retells the information collected by inquiry from the lives and stories of the participants who are the sources of data by turning it into a narrative chronology.
- Phenomenological research, in which the researcher describes the experiences of individuals about a phenomenon as described by participants. This design typically involves conducting interviews.
- Case studies, in which the researcher develops an in-depth analysis of a case like a project, an event, a program or a process by using a variety of data collection methods.

Quantitative approaches on the other hand, tend to relate to positivism and seek to gather factual data in order to study relationships between facts and how the facts and such relationships accord with theories and findings of any previous research²⁷. Common features of the quantitative research according to Payne and Payne²⁸ are: i) The core concern is to describe and account for regularities in social behavior. ii) Patterns of behavior can be separated into variables, and represented by numbers. iii) Explanations are expressed as associations (usually statistical) between variables, ideally in a form that enables prediction of outcomes from known regularities. iv) Social phenomena are explored through systematic, repeated and controlled measurements. v) They are based on the assumption that social processes exist outside of individual actor's comprehension, constraining individual actions, and accessible to researchers by virtue of their prior theoretical and empirical knowledge.

Creswell¹⁸ simplifies the definition of quantitative research by expressing it as “an approach for testing objective theories by examining the relationship among variables”. He explains further that these variables can be measured and the numbered data can be analyzed using statistical procedures. He brings the focus on two main designs within quantitative approaches. Survey Research, which provides a quantitative description of trends, attitudes, or opinion of a population by studying a sample of the population, and Experimental Research, which seeks to figure out if a specific action or treatment influences an outcome. Experiments, surveys and questionnaires are normal data collection methods in quantitative studies.

Mixed method is another research approach that involves both qualitative and quantitative data. The main assumption of this approach is that the combination of both qualitative and quantitative approaches provides a more complete understanding of the research problem than either approach alone¹⁸. Fellows and Liu²⁷ use the term “Triangulated studies” for this type of approach and points out that this approach may be employed to reduce or eliminate disadvantages of each individual approach by employing two or more research techniques. However, McLaughlin²³ stresses that the researcher still has a responsibility to ensure that the methods work together in such a way that they provide additionality and address the research questions. That means generated data must still be analyzed rigorously and methodically. Creswell¹⁸ describes three primary designs within mixed methods as following:

- Convergent parallel mixed methods, where the researcher merges the qualitative and quantitative data (which are typically collected roughly simultaneously) to provide a comprehensive analysis of the research problem.
- Explanatory sequential mixed methods, in which the researcher starts with conduction quantitative research, analyzes the results and then explains the results further in more details by qualitative research.
- Exploratory sequential mixed methods, in which the researcher begins with a qualitative research and after analyzing the data, the information is used to build into a quantitative phase. The qualitative phase is for example used to identify appropriate instruments or questions in the follow-up quantitative study.

The focus in this paper is on which data collection methods has been used for the research in order to get an overview of the typical research approaches in the field of value creation in construction project.

4. Findings and results

As mentioned earlier, total number of 47 publications were studied in this research. In the following results are presented both regarding worldviews and applied methods of data collection.

4.1. Philosophical Worldviews

The framework in

Figure 1 is used to map how the philosophical worldviews have been within the field of value creation in construction. Figure 2 illustrates the number of publications within each category.

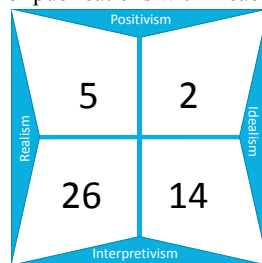


Figure 2 Research philosophies within value creation in construction projects

Five of the publications were based on a positivist/realist worldview. This means that the research has an objective and value-neutral approach and strives theory verification by using quantitative methods and empirical measurements. These papers are mainly trying to look into a problem and figure out how to solve it. Two papers were based on positivist/idealist philosophical view. These publications have also an objective approach with quantitative methods and empirical measurements, but they are issue-oriented and not value-neutral. They are advocating for change and believe that reality has no absolute existence. The major part of the publications had an interpretivist/realist worldview. This indicates that the research has a subjective approach where the researcher(s) attempt to collect data (mainly by qualitative or mixed methods) in order to understand a problem. These publications are mainly real world practice, are value-neutral and problem-centered. Fourteen publications were based on interpretivist/idealistic philosophical view. The research in these publications also has a subjective approach with qualitative and mixed methods. The research tries to understand a problem, but is not value-neutral. It is change and/or issue-oriented. Figure 3 shows the number of publications in each category over the years.

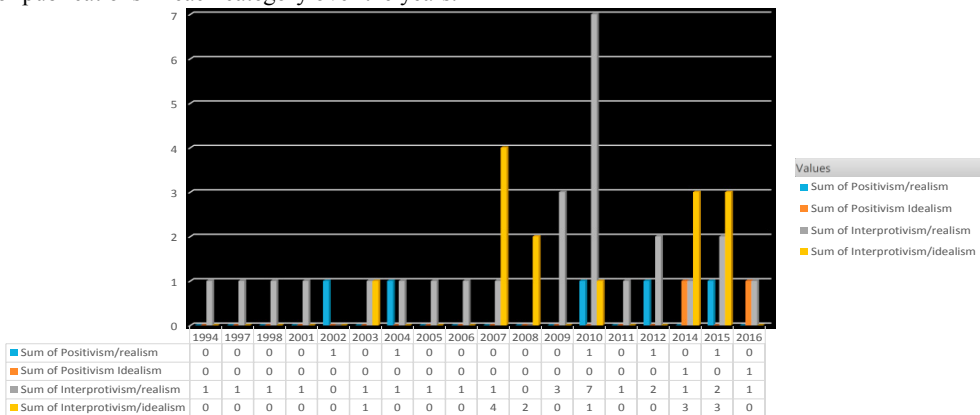


Figure 3 number of publications in each category over the years

The results indicate an increasing interest in research within this field, in particular for the last decade. The graph also shows that interpretivism is the dominating philosophical worldview. From 1994 up until 2003 and even further until 2007, the main portion of the research within the field has been based on interpretivism and realism. After 2007, the idealism worldview in combination with interpretivism has increased.

4.2. Research approaches

In addition to the worldviews, research approaches are mapped by investigating methods of data collection for the sample publications. The results show that twenty-six out of forty-seven publications only used one (seventeen qualitative and nine quantitative) method to conduct the research. Four out of nine quantitative research was conducted before 2007. Twenty publications had two methods and one publication had three different methods for collecting data. Twenty-one publications have used two or more data collection methods. Case studies is the dominating source of data in the field, combined with literature reviews. Table 1 shows how many times each method has been used.

Table 1. Methods of data collection

An example of a column heading	Main Method of data collection	Second Method of data collection	Third Method of data collection	Total
Case study document & observation	6	1		7
Case study Action research	3	2		5
case study interviews	4	2		6
Case study survey	3	1		4
Interviews	3	1		4
literature reviews	17	10	1	28
survey	11	4		15

5. Concluding discussions

How has the philosophical views of the research been and what philosophical views has the research been based on? The results indicate that interpretivism is the dominating philosophical worldview. This implies that researchers in the field of Value creation in construction projects are trying to make sense of a problem within real world practice and develop a theory or present their subjective understanding of the results. However, it is interesting that the authors of these publications are mainly not social scientists but engineers who are trained to think objectively and are expected to prefer positivistic approaches. Although positivism is the stereotypical philosophy within engineering sciences, it is not represented as the fundamental view within the field of Value creation in construction projects. The positivist view verifies theory, normally through empirical measurements. As Figure 3 reveals, the research field is still young and there is an inadequacy of established theories in the field to be verified. Even the researchers who have attempted to define the concept of value do not totally agree over a common definition for value. Considering that value has been conceptualized as a perception, it is reasonable to believe that studying the concept of value requires a mindset that seeks to understand the meaning that individuals have and make sense of it. This is probably the reason why interpretivism is the dominating philosophical view in this field.

As Figure 2 illustrates, the vast majority of the publications are based on interpretivism/realism worldview. This implies that the research is mostly value-neutral and problem centered while seeking to understand the real-world practices. However, Figure 3 also shows that the idealistic worldview with its issue-orientation and advocacy for change has entered the research and escalated over time. A profound look at this type of publication reveals that the escalation has started, as sustainability has become an issue related to value creation. The advocacy for change in these publications is primarily associated with environmental issues and sustainable development of buildings. Another interesting finding is that positivism in the research is mainly associated with assessment, measurement and evaluation of processes, partially in order to increase the productivity, rather than testing and verifying theories.

The interpretivist research philosophy consequently results in an overweight of qualitative approaches of data collection. Case study is the dominating strategy of data collection. One of the characteristics of interpretivist philosophical view is the fact that it addresses real world problems. Hence, it is not a surprise that case studies are popular way of collecting data. The data collecting methods within case studies (interviews, action research, document studies and surveys) are more or less evenly distributed.

What has the research approaches been and how has the development of the research been over the years? One of the objectives of this research was to look into how the development of the research has been over the years. The results show that the research started with interpretivist view based on realism. This implies that the research has been attempting to deal with real life problems by understanding the concepts. Publications from 1990s and early 2000 are mostly about understanding the customer value, and developing or improving processes to increase project success and satisfaction of the customers. After 2007, the idealistic base has increased in line with increasing interest for sustainability and environmental issues. Interestingly, almost 40 % of the publications from 1994-2006 have used purely quantitative methods. The number of publications after 2006 with purely quantitative methods is reduced to less than 20% of the total. In addition, the number of publication with mixed methods has increased over the years. This reveals that by increasing interest around the subject and a burst in research publication, the philosophical view around how to do research has also changed. This might indicate that the understanding of value and value creation has started as a deterministic approach. The researchers have attempted to figure out what value is and what creates value but over the time, the questions have moved towards how to define value and how to create it.

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THE LINK BETWEEN STAKEHOLDER POWER AND VALUE CREATION IN CONSTRUCTION PROJECTS

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ABSTRACT

This paper presents a study on what effect stakeholder power has on value creation in construction projects. Fourteen main sources of power in organizations, described by Morgan, form the analytic framework. The ambition is to identify 1) how the distribution of power between the main stakeholders is, 2) which sources of power are most common in a construction project organization, 3) which effect the sources of power have on value creation in projects.

The data is collected through semi-structured interviews. Experienced representatives from four main stakeholders in early phase of construction projects (owner, architect, design manager and project manager) were interviewed. The collected data through the interviews was coded, analyzed and linked to the literature study. The results reveals that 10 of 14 sources of power are identified as common sources of power in construction project organizations. Out of the ten, control of knowledge & information and formal authority are rated as the most influential sources of power. Apparently, all main stakeholders can possess these two sources. Rhetorical skills – which is not among the fourteen main sources described by Morgan – turn out to be an underrated and complex source of power.

The LCI triangle model suggests that all project delivery systems have three basic domains whining which they operate i) organization, ii) the project's "Operating system" and iii) the commercial terms binding the participants. These are equally important and should be aligned for the system to be coherent. Power is one of the main elements in organizational affairs that effect transparency and decision processes. There is a knowledge gap in how the power can affect the processes in project organization and which effects it can have on the projects' overall value creation.

KEY WORDS

Power, Organization, Value creation, Early phase, Rhetoric

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INTRODUCTION

This paper presents results from research on the link between power in organizations of construction projects and value creation. Although the concept of power has been subject to many definitions, a common notion is that power make things happen by influencing the behavior of another social unit (Loosemore, 1999). This influence can result in desired and undesired outcomes, both for the stakeholder exercising power and the one subdued to it. Consequently, the exercise of power can be both a challenge and an opportunity for stakeholders in construction projects. Eikeland (2001) stresses that improvements, either at the final product or in successful process, can result in value. Hence, the link between power in project organizations and value creation in the project needs to be understood.

Power in organizations has been a hot topic for researchers, especially within fields of management, over the last decades (Astley and Sachdeva, 1984; Daft, 2012; Engelstad, 2005; Ivancevich et al., 2011; Mechanic, 1962; Morgan, 2006; Pammer and Killian, 2003). Numerous researchers have conceptualized, defined and evaluated the effect of power in the organizations. Understanding the effect of power on value creation demands an understanding of value creation through project delivery systems. The LCI (Lean Construction Institute) triangle suggests that all project delivery systems have three basic domains within which they operate; i) the project organization, ii) the project's "operating system," and iii) the commercial terms binding the project participants (Thomsen et al., 2009) . Integrated organization as a tool in lean construction requires transparency and reduces the significance of formal bindings between the participants. This might trigger the desire of certain stakeholders to use power to impose a desired outcome. It is therefore important to investigate how stakeholders use power to influence decisions. Equally, the sources of power to influence decisions needs clarification in order to address what is at stake. Such clarifications are crucial to increase transparency and, correspondingly, prevent the abuse of power. According to the literature study leading up to the research presented here, there seems to be a certain knowledge gap in the lean construction literature concerning the relationship between sources of power in integrated organizations and their significance for processes and value creation. This leads us to following research questions:

- How is the distribution of power between the main stakeholders in a project?
- Which sources of power are most common in a construction project organization?
- Which effects do the sources of power have on value creation in a project?

RESEARCH METHODOLOGY

Value, value creation and power are the major concepts addressed in this study. A literature review was conducted according to procedures described by (Blumberg et al., 2014) by reviewing other studies that are closely related to the topics power, value and value creation in order to acquire a good understanding of the theory concerning these concepts. The literature review investigated existing descriptions and definitions of value, value creation, power and sources of power in organizations in order to attain an overview of what has been discovered before within aforementioned concepts.

This paper is a result of linking the literature study and interviews with representatives for four major stakeholders in a construction project (architect, design manager, project

manager and project owner). According to Samset (2010), these are the stakeholders that directly impel the project. The user is a stakeholder with significant importance in the projects. However, user groups are usually formed as one-time organizations, which makes it difficult to find representatives with experience from several projects. Hence, the user as a stakeholder has not been a part of this study but the significance of their power is undeniable.

Data was collected through four semi-structured interviews. The interviews were audio recorded, transcribed and then coded by marks, notes and memos of topics according to the procedures outlined by Yin (2014). Each interview lasted approximately 1.5 hours.

THEORETICAL BACKGROUND

The discussions and pursuit towards defining value has been ongoing since the antiquity. According to Fleetwood (1997), Aristotle (4th century BC) was the first philosopher documented to have differentiated between two meanings; “use-value” and “exchange value”. The term “use value”, denotes how customers according to their needs perceive specific qualities in a product. Judgments concerning use value are therefore subjective of nature. Exchange value, on the other hand, refers to the price, that is, the monetary amount realized at a certain point of time when the exchange of the good takes place (Bowman and Ambrosini, 2000). Value and value creation have particularly been discussed in management and marketing literature during the last decades, especially since the 1980s (Zeithaml, 1988; Dodds et al., 1991; Holbrook, 1994&1999; Babin et al., 1994; Woodruff, 1997; Parasuraman, 1997; Kaufman, 1998; Kelly et al. 2015, etc.). Although different theories and research streams have been applied in different contexts to conceptualize “value”, one general insight is that the term coins the focus on the customers and users and their perception of value in relation to satisfying their needs (Haddadi et al., 2015).

Value creation in a project depends on the relative amount of value that is subjectively realized by a target user who is the focus of value creation – whether this concerns an individual, an organization, or society as a whole (Lepak et al., 2007). Various stakeholders in a project have different views on what is valuable. The difference stems from particular knowledge, goals, context and conditions that influence how the novelty of the value is conceived and evaluated by the respective actors. They may also have competing interests and viewpoints of what is valuable (Lepak et al., 2007). This difference can result in a divergence in what stakeholders define as valuable outcome and hence attempts to impose their own favorable outcome (exert power) to other stakeholders or party. The overall value creation in a project will hence depend on which stakeholder’s value has been in focus and in which degree it has been realized.

Power has typically been investigated as an independent variable in research design. It has been used to explain decision making in small groups, and for explaining moral and alienation in studies of work organizations (Hickson et al., 1971). Pammer and Killian (2003) describe power as “*one party’s attempt to impose an outcome on the other party*”. To impose an outcome can be envisaged in multiple forms, such as by brute force, legislative measures or – most significantly within the context of this paper – by rhetorical means. Aristotle – the foremost theoretician of ancient rhetoric – defines rhetoric as the faculty of discovering or observing the possible and available means of persuasion.

According to him, modes of persuasion which strictly belong to what he mentions as “*the art of rhetoric*” has three divisions; i) power of evincing a personal character which will make the speech credible (ethos) ii) power of stirring the emotions of the counterparty or hearer (pathos), iii) power of proving a truth by arguments (logos) (Aristotle et al., 2014). Koskela (2015) argues that rhetoric is one of the fundamental aspects in management (in particular related to lean) by addressing elements like fundamental arguments in production management, compliance to plans, reinforcing common values, deliberating courses of action and inventing requirements and ideas.

“Sources of power” is extensively discussed and investigated in literature. There are numerous classifications, categorizations and definitions of sources of power. Despite the similarities, they address the issue in different ways. Some try to simplify the concept while others have more comprehensive categorization of sources of power (Astley and Sachdeva, 1984; Daft, 2012; Engelstad, 2005; Ivancevich et al., 2011; Mechanic, 1962; Morgan, 2006)

Morgan (2006) defines power as “...*the medium through which conflicts of interest are ultimately resolved. Power influences who gets what, when and how*”. He introduces 14 sources of power in organizations. Morgan’s categorization offers a comprehensive and explicit definition of the sources of power, which is highly applicable in construction project organizations. The categorization seem to cover a wide range of possible reasons for why a stakeholder should possess the ability or willingness to impose an outcome. Hence, the authors have evaluated this the most relevant reference to base this research on. The 14 sources of power according to Morgan (2006) are presented in Table 1.

Table 1: Morgan’s 14 sources of power (Morgan, 2006)

No.	Source	No.	Source
1	Formal Authority	8	Control of technology
2	Control of scarce resources	9	Interpersonal alliances, networks, and control of “informal organization”
3	Use of organizational structure, rules, and procedures:	10	Control of counter-organizations
4	Control of decision processes:	11	Symbolism and the management of meaning
5	Control of knowledge and information	12	Gender and gender relations
6	Control of boundaries	13	Structural factors that define stage of action
7	Ability to cope with uncertainty	14	The power one already has

FINDINGS AND DISCUSSION

The results are mainly the interviewees’ answers to the inquired research questions.

DISTRIBUTION OF POWER IN A PROJECT ORGANIZATION

The interview objects were asked to describe how they see the distribution of power between the main stakeholders in Norwegian construction projects. As expected, there are some differences in how the distribution of power is perceived among the stakeholders.

Owner: All the interviewees mentioned that the owner is the stakeholder with the highest power although differences in exertion of the power by the owners occur. Some

owners transfer the power to the project manager and the management team; some have a more “hands on” approach on their projects. The owner’s competences and knowledge is a decisive factor on how much power it actually has despite the formal authority. The owner representative mentioned that the owner has less power than presumed, especially in the public sector. Users’ needs are ought to be satisfied. This means that owner has less power in choosing solutions than users and architects. The owner’s real power (especially in the public sector) is in managing the project in terms of economy, schedule and quality. In private sector, the owner has more power for choosing desired solution.

Architects: There is an agreement that architects have far less power nowadays than they used to have some decades ago. Different execution models, more complicated technical facilities, higher degree of technical requirements, environmental issues and new regulations was mentioned as possible reasons. The fact that the project management has been professionalized during the last decades was also mentioned among reasons why architects have less power in projects nowadays. Despite reduced power, the architects are still one of the most powerful stakeholders in the projects because of their significant role in transforming owner’s requirements into functional description. Architects also feel a higher degree of ownership to the project due to the nature of their task, which is creation. This makes them more engaged in the projects and increases their willing to influence the project. They are consequently more willing to use the power sources that they are given in order to have an impact on the project they feel ownership towards.

Design team: Technical consultants have significant influence on value creation due to increasing complexity of technical facilities and more standardization and regulations. The recent focus on environmental issues has also increased the demand after technical personal in project organizations. The design team is a complex and vital organization within the project organization. Therefore, different roles and disciplines within the design team can exert power within the team as well as on the project in general.

Project management (PM): Project management here is defined as the professionals and consultants that are hired or engaged to lead the projects and are not employees of the owner organization. Interviews show that different stakeholder look differently into this stakeholder. PM role as an integrated part of the owner’s organization can be conceived as the owner’s operational level and thereby synonym with the owner. It means the PM takes decisions on behalf of the owner and therefore has almost the same power. On the other hand, this stakeholder can be perceived as a layer in the communication between the design team, architects and the project owner where there is a clear line between the owner and PM team. Being the owner’s operational hand and a communication layer between the design team, architects and owner gives this stakeholder a massive power.

COMMON SOURCES OF POWER AND THEIR EFFECTS

Morgan’s (2006) 14 sources of power is a comprehensive classification of the sources of power and used as baseline for this research. The research shows that not all 14 sources can be recognized as significant sources of power in Norwegian construction projects. The ones that seemed familiar to the interview objects were following:

Formal authority: Is a form for legitimized power that can consist of charismatic authority, traditional authority, and rational-legal authority and one of the most discussed

sources of power during the interviews. Formal authority is given through deals, contracts, laws and regulations. Although the project owner is at the top of the organization map and has the highest formal power, the owner distributes the responsibility and risk down to mainly two stakeholders, the architect and the design team. The PM receives mainly formal authority with almost no risk and no legal responsibility. PM has however a moral responsibility and integrity to deliver the project within the criteria which are agreed upon. The architect is normally the one with the overall legal responsibility for securing the fulfilment of the regulations, laws and required documentations to the building authorities. The design team is responsible for delivering the functional solutions according to descriptions, laws and regulations. Although contracts are signed and knowing the content of the contracts, as the PM representative mentioned, is considered as a necessity, the stakeholders seem to be cautious with implication of power because of formal authority. It is difficult to manage the projects through contracts according to the owner representative. In most of the projects, there are minor breaches of the contract from both parts. Goodwill in solving the conflicts is a necessity. Changes happen throughout projects and sanctions are not used unless they are necessary since the consequences can be huge for the projects.

Control of scarce resources: Is defined as control over resources such as money, materials, technology, personal and suppliers that the organization depend upon. Geotechnical engineers has been mentioned as an example of a scarce resource in Norwegian construction projects nowadays. Scarcity of resources is considered as a challenge for value creation and not a common source of power used in the projects.

Control of decision processes: Ability to influence decision premises, processes, and decision issues and objectives. Normally controlled by the owner. According to the owner's representative, it is positive for value creation that the owner can control these processes. The mandate for decisions is usually based on how much the decision is going to cost the project. However, the following consequences, which are not the direct cost for the decision, can be underrated or even forgotten. This can affect the value creation negatively. Hence, a stakeholder with overall view on the project should possess this source.

Control of knowledge and information: Involves systematically influencing the definition of organizational situation and creating patterns of dependency by controlling knowledge and information. All interviewees stressed the importance of knowledge and information as a source of power in projects. People who have been in the project for a long time, PM who has the overall view, consultants with special competences and experienced architects are all mentioned as examples of the powerful participants in a project where the power is provided by knowledge and information. Easy access to internet and information online has reduced the power provided by general information. At the same time, it has contributed to higher power to specialists, consultants and experts.

Control of boundaries: Represents monitoring and controlling transactions across boundaries by performing a buffering function that allows certain transactions while blocking others. This source of power is close to the previous one. Control of boundaries becomes a source of power by controlling the information flow between the groups. This is not considered as a big issue in Norwegian projects but using this source of power means limiting the information flow between groups and reducing transparency, which generally has a negative effect on value creation.

Ability to cope with uncertainty: Is defined as the ability to cope with the external influences that affect the project such as market situation, finance, raw materials etc. and/or the internal influences such as machinery break down, use of new methods, technology etc. Ability to cope with uncertainty is a source of power especially if it results in higher decisiveness. How uncertainty is managed and how the risk is distributed in projects varies. Hence, this source of power is ambiguous for the interviewees. However, better decisions will contribute to higher value creation and risk and uncertainty should be placed where it can be handled best.

Control of technology: The technology employed in a project provides the ability to achieve better results in productive activities, and it also provides an ability to manipulate this productive power as a source of power. This has mainly been related to two types of technology, BIM (Building Information Modelling), and technical instruments and facilities. Possessing the ability to use BIM is considered as a skill but this has not been experienced as a source of power in projects. Using BIM contributes, among others, to better transferring of information and has a positive contribution to value creation. Control over complicated facilities is considered as a power source that can have a negative impact on value creation. If one or a few suppliers has the technology to deliver a certain tool or facility, they have the power to price or affect other relevant facilities. This can reduce the options for the solutions and thereby effect the value creation negatively. The same is valid for people who have good skills of programming or using technological devices.

Interpersonal alliances: Throughout different networks, individuals can develop interpersonal relations and exert various forms of interpersonal influence to shape the decisions in a project based on their interests. Although some practitioners stress the importance of project staff knowing each other for better communication, there has been unfortunate examples of using interpersonal alliances as a source of power in Norwegian construction projects. The Norwegian construction industry is relatively small, meaning people happen to meet each other or work together and establish a personal or/and professional relationship. Although people seem to be aware of this fact and act deliberately, it can, at its worst, cause corruption and difficult situations for the project.

Control of counter organizations: Involves a group of people that manages to build a concentration of power in a relatively few hands and coordinate their action to create a rival power. Control of counter organization is also a source of power that can affect the value creation. However, its effect can be both positive and negative depending of what the counter organization's intentions are. Organizations with the right to get involved, like unions that are taking care of the people's rights, can contribute to value creation by influencing the project to satisfy the needs for a larger group of people. Interest organizations, which are protecting interests and not rights, can have a negative effect on value creation in a project, especially if they represent minor concerns.

Gender and management of gender relations: Is defined as gender-related issues that bias organizational life in favor of one sex over another. This source is culture-related. Although none of the interview objects considered this as a problem in Norwegian projects, the authors believe that this is a tabooed topic. That might be the reason why no one considered gender related power as a problem.

CONCLUSIONS

Regarding the first research question, the *distribution* of power can vary between projects due to factors like the circumstances, complexity, owner and user involvements, management methods etc. However, there is a consensus in how the distribution of power is conceived by interviewees.

With reference to the second research question about common sources of power, the research has revealed that out of Morgan’s 14 sources of power, only 10 are recognized as common sources of power in Norwegian construction projects. Sources that are not mentioned are either not acknowledged by the interviewees as a source of power in Norwegian projects, or are considered as a following consequence of another source of power. For example, “Use of organizational structure rules, regulations and procedures” can be a result of other sources of power like “Formal authority”, “Control of the decision processes” or “Control of boundaries”. “The power one already has” as a source of power to get more power is dependent on individuals and cannot be considered as a general challenge for construction projects. The same argument applies to “symbolism and management of meaning”. This brings us further to the discussion on rhetorical skills as a missing source of power on Morgan’s list.

Regarding the third research question about the effect of the sources of power on value creation, all interviewees stressed the importance of “control of knowledge and information”. Control of knowledge and information is considered the category with highest effect on value creation in projects. The research reveals that “Formal authority” is also a critical category. The effect of the “Formal authority” as a source of power equally indicates the importance of another domain of the LCI triangle (Commercial), which is the agreements and commercial terms between the participants. With a more open agreement form where everyone is responsible for project success, the effect of formal authority as a source of power is less than non-integrated organizations. This will also reduce formal power relation’s ability to limit the possibilities of underdog parties to present their knowledge. All sources of power can be abused and have a negative effect on the project and value creation. Table 2 summarizes the effects of the sources of power on value creation assuming that the source of power is not intentionally abused.

Table 2: Distribution of the common sources of power, and the effect on value creation

Source of power	Importance	The effects on value creation	Stakeholders who possess the source of power
Control of knowledge and information	High	Knowledge is appreciated and those with knowledge have the opportunity to influence. Positive for value creation	Owner, PM, Architect, Design
Formal Authority	High	Positive when it clarifies the roles and mandates in a project. Negative if the power and responsibility is not aligned.	Owner, PM, Architect, Design
Control of decision processes	Medium	Good control of decision processes will shorten the decision time and have a positive contribution on value creation.	Owner, PM

Control of boundaries	Medium	Using this to organize the project with proper information flow and good cooperation will have a positive effect on value creation.	Owner, PM, Architect
Interpersonal alliances	Medium	Reduces transparency and gives the power to minority. Negative effect on value creation.	Owner, PM, Architect, Design
Control of technology	Medium	Stimulates innovation and new thinking. In that case positive. Negative for value creation if it ends up in a monopoly situation.	Architect, Design
Control of counter organizations	Medium	Positive if they protect rights. Negative if they represent minor interests.	External
Coping with uncertainty	Medium	Can lead to better decisions. Positive for value creation	Owner, PM, Architect, Design
Control of scarce resources	Low	This is rather a challenge for value creation than a positive or negative contribution	Architect, Design
Gender and gender relations	Low	Culture-related. In Norwegian projects, this is not considered as a factor related to value creation.	Owner, PM, Architect, Design

Results reveal that more democratic organizational models that promote transparency, like IPD, can improve value creation in a project. This can be related to both the Organizational and Commercial sides of the LCI triangle. By more democratic organization models, formal authority will not interfere with the flow of information and knowledge. As a result, the control of boundaries and decision processes will have reduced effect as sources of power.

It is of interest that Morgan's classification does not include rhetoric as a separate source of power. This might be because the engineering disciplines are still strongly positivistic in their approach to human behavior. Within the context of rhetoric, this typically comes out as a firm belief in the impartial power of pure argumentation. Contemporary philosophical analyses, in particular the postmodern (Derrida, Deleuze, Foucault, etc.), typically express a deep skepticism to such idealized representation of argument as corresponding to inherent qualities of the life-world. Rather, in such thinkers, rhetoric is revitalized as expressing a necessary part of understanding how the world actually functions. Little research has been carried out to determine whether the influence of rhetoric is powerful enough to be established as a 15th source of power in classifications such as that of Morgan's. Further research is necessary to understand power dynamics and the influence of it on value creation in particular within Lean Construction.

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Publication 7

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VII

Publication 8

VIII



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Sustainable Planning in Refurbishment Projects – An Early Phase Evaluation

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Abstract

Approximately 80 % of the current Norwegian building stock is expected to still be in use in 2050. Norwegian government demands that the refurbishment and modernization of these buildings should be sustainable. According to the authors the early phase planning should therefore be improved in order to be able to fulfill the sustainability requirements. A great deal of the potential for a successful project lies in the early phase, but there seem to be no clear definition of when it starts or when it finishes. This paper investigates different definitions of “early phase” and what this phase of the project should contain to facilitate a successful rehabilitation. Economy is important when defining if a project has been successful or not, but budget overrun is an everyday problem in refurbishment projects. This paper will see if it is possible to determine a more secure economic framework in the early phase. The research has been conducted as a case study approach, based on a literature study, ten interviews and a survey. The first case study was a refurbishment with both technical and financial challenges. The other case study consisted of an investigation of how two municipalities in Norway decide whether to refurbish or demolish their school buildings. The interviews and the survey have been carried out with major stakeholders such as building owners, architects, consulting engineers and contractors. There seems to be no unanimous agreement of what the content of the early phase in refurbishment projects should be. The interviewees have individual definitions, depending on their role. Another notable finding is that all the respondents mean that they have more to contribute with, if they were contracted at an earlier stage in the project. The results will hopefully enable stakeholders in refurbishment projects to improve the structure of their activities. This will support the shareholders to get better and more sustainable end results.

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Keywords: Early Phase; Refurbishment, Sustainability, Project Success, Economy

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1. Introduction

On a worldwide basis, people use approximately 70% of their time indoors, and in the western world this number is closer to 90% [1]. Based on this information there is a demand for high quality buildings. According to Statistics Norway (SSB), Norway has 4.085.834 different buildings [2]. It is expected that 80% of these buildings will still be in use in the year 2050 [3]. In the upcoming years other challenges will also occur. Currently there are approximately 615.000 buildings in Norway which is located in areas with high risk of rot and mould growth. In the future the temperature is likely to increase, and it is anticipated that in year 2100 about 2.400.000 buildings in Norway might be in high risk areas [4].

Based on the amount of time we spend indoors, the upcoming challenges in context with the temperature and the ageing building stock there is interesting to see what has to be done to facilitate the work with existing buildings. This work must be done as satisfying as possible, and in the same time be sustainable for future generations.

A lot of the premises for a successful project lies in the early planning phase. It is in this phase of the project you can facilitate a great deal of the value creation [5-8]. At the same time there seem to be no clear definition of what the content in this phase should be.

Budget overrun is an everyday problem in refurbishment project, and the cost seems to be difficult to determine [9-12]. It will therefore be interesting to see if the professional actors believe it is possible to predict a budget which is more certain, and how.

In this paper the early phase of refurbishment projects will be evaluated to see how important this phase of the project is. The main research questions that this paper is trying to answer is:

- What should an ideal early phase in refurbishment projects contain to achieve successful projects?
- When does the early phase starts and when does it end?
- Is it possible to determine a certain financial secure framework for refurbishment projects?

2. Methodology

The research has been carried out with both a qualitative and a quantitative approach. The research process is shown in figure 1. A literature review of relevant themes such as refurbishment, sustainable refurbishment, early phase and project success was conducted in accordance with the procedures described by Blumberg et al. [13]. These themes were viewed relevant considering:

- Our 1st research question suggest that we need a better understanding of what success is, and what is special about refurbishment projects.
- The 2nd research question suggest that we try to identify whether there is a common understanding of when early phase starts and when it ends.
- Finally, our 3rd research question suggest that we should have a closer look on the financial aspect, and if it is possible to determine a secure financial framework for refurbishment projects.

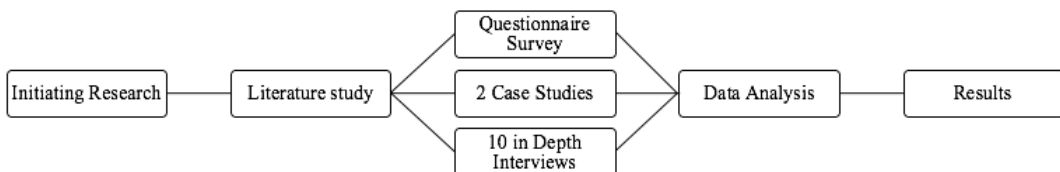


Figure 1: Research Process

A questionnaire was sent to actors within the Norwegian building industry who work, or have worked, with refurbishment projects. The questioner got 44 answers, with respondents from the whole specter of actors in the refurbishment industry represented. The purpose of the survey was to generate a broader data basis concerning refurbishment in general and to have a closer look upon the execution of refurbishment projects. The survey aimed further to reach out to more stakeholders in the building industry than the other research would do.

Two case studies were executed. The first case study was a refurbishment project (Case A) with both technical and financial challenges. The other case study (Case B) consisted of an investigation of how two municipalities in Norway decide whether to refurbish or demolish school buildings. Five semi-structured interviews with people with background in the cases was conducted. In Case A three persons involved in the project were interviewed. The building owner, the architect and the planning authorities. In Case B two interviews with the real estate department in the two municipalities were conducted. The purpose of the case study in Case A was to see how a complicated and unusual refurbishment project is done, and what they take into consideration. The goal of the case study in Case B was to map different decision processes in refurbishment projects, and what issues gets the highest priority. Some decisions lead to successful projects, while other choices seem poor after the project has been finished.

Ten semi-structured interviews on general basis were conducted with actors who have worked with refurbishment for a number of years. The interviewees consisted of two building owners, two architects, two contractors, two consulting engineers, planning authorities and a scientist from a leading Norwegian research institution. The goal of these interviews were to create an image of how refurbishment projects normally are executed today, and how it can be improved.

The interview procedures were completed according to the recommendations from Yin [14].

3. Theoretical Framework

In order to get better understanding of this study, key theory will be presented in this section. The theory is considered relevant to answer the research questions stated in the beginning of this paper.

3.1. Early Phase in Refurbishment Projects

Refurbishment sector is one of the most important sectors in many developed countries [12]. Concerning work on existing buildings more than 20 expressions are used with almost the same meaning to describe attempts to redress the effects of depreciation [15]. Refurbishment, renovation, rebuild and upgrade are just some of them. The European Standard uses the following definition of refurbishment; *“Modification and improvements to an existing building in order to bring it up to an acceptable condition”* [16]. In this paper Quah [17] definition of refurbishment has been used to cover the whole range of terms; *“Refurbishment refers to upgrade, major repairs work, renovations, alterations, conversions, extensions and modernization of existing building, but exclude routine maintenance and cleaning work.”*

When refurbishing a building there are several reasons to do it in a sustainable manner. Some of the benefits with a sustainable refurbishment is that it can contribute to preservation of the existing built environment and its protection for future generations. Sustainable refurbishment also contribute to a reduced environmental footprint and better adaption to climate change [18].

A common widely accepted definition of “Sustainability” is; *“Improving the quality of human life while living within the carrying capacity of supporting ecosystems”* [19]. While “Sustainable Development” is by the United Nations (UN) defined as: *“Development that meet the needs of the present without compromising the ability of future generations to meet their own needs.”* [20].

In these two definitions, the quality of life (social) and the ecosystem (ecological) seem to be the main focus. The economical aspect is however not specified.

According to the Brundtland Commission [20] the three main sections within sustainable development is; economic, social and ecological. Sustainable refurbishment has the same main foundation as sustainable development. When refurbishing a building the ideal will be to focus on the interaction between the three main pillars of sustainable development.

If the building owner decides to go thru with a sustainable refurbishment, the decision must be made in the trigger point of the project since a considerable part of the premises for a successful project lies in the early phase. [5-8]. There are numerous definitions for the term “early phase”. The expression is used equivalent with other phrases like front-end planning, preproject planning, front-end loading and conceptual planning [6]. One of the most common definitions is created by The Construction Industry Institute (CII) which has defined front-end planning as; “*The process of developing sufficient strategic information with which owners can address risk and decide to commit resources to maximize the chances for successful project*” [21]

Another definition of the expression is compiled by Arge and Hjelmbrække [22]; “*The pre-design phase as all project related activities executed before detailed design and construction.*” Although these definitions describe the nature of early phase, they do not include defined activities that should be conducted in this period of the project, and can therefore be hard to utilize.

In order to be capable of executing sustainable refurbishment of building successfully, we need to look into how success in these kinds of projects is defined. Project success can be characterized as ambiguous depending on the interest of the stakeholders [23], and the term project success have been studied by a numerous authors [23-25]. The following is a various collection of some definitions to the phrase success;

Ashley et al. [26] defines success as, “*results much better than expected or normally observed in terms of cost, schedule, quality, safety, and participant satisfaction*”. While Tuman [27] focuses on requirements and resources in his definition, “*having everything turn out as hoped...anticipation all project requirements and have sufficient resources to meet needs in a timely manner*”. De Wit [28] has a more comprehensive definition of success with focus on both performance and satisfaction and define success as, “*the project is considered an overall success if the project meets the technical performance specifications and/or mission to be performed, and if there is a high level of satisfaction concerning the project outcome among: key people in the parent organization, key people in the project team, and key users or clientele of the project effort*”. De Wit point out that a project can be a success for one party and a disaster for another, simultaneously success is time dependent [28]. Certain factors have been worked out as more critical to project success than others. These factors are often called Critical Success Factors (CSF), and they will vary from project to project [24].

There are divergent opinions on the definition of the term “project success”. Regardless of the definitions, they can be related directly to sustainable development. The focus on among others cost, safety, meet needs, technical performance can be linked to the three main elements in sustainable development: Economy, Social and Ecological.

3.2. Financial Framework

Refurbishment work is risky and uncertain, and the work is normally less well planned and more difficult to control than new build projects [29]. Shah et al. [10] remarked that refurbishment projects are often completed with high cost and time variances. One of the main factors contributing to this is late discovery of design information. To prevent this uncertainty one of Shah et al. suggestions is that the building owner should strengthen the information foundation ahead of the building start. Normally “Norwegian Standard 3424 – Condition survey of construction works” is being used when a condition survey is conducted. This report is often the groundwork for the further resolutions.

Table 1: Economical Challenges

<i>Challenges</i>	<i>Explanation</i>	<i>Consequence</i>
Detect building damages	Building damages are located too late	The estimated expense of refurbishing will increase
Satisfy antiquarian regulations	Local authorities set certain restrictions	Hard to satisfy without applying for exemptions, and they are therefore time consuming
Calculate risk	The contractor often calculates the risk inaccurate	The tender documents become miscalculated

When working on buildings in Norway there are different legislations and guidelines that have to be followed depending on how old the building is, and if the building has any antiquarian value. The Cultural Heritage Act and the Planning and Building Act are the key legislations when it comes to refurbishment. When a building is protected by Norwegian law the process of refurbishment can be extra resource intensive for the building owner and the contracted participants. The legislations put limitations on what is legal to do, both indoors and outdoors. All buildings and constructions which the Directorate for Cultural Heritage has reported as protected, cannot be changed without getting approval from the government. The permission to do these changes must be given ahead of construction start, and must therefore be done in an early phase of the project.

In 2012 the Norwegian government signaled a wish to prepare an own refurbishment regulation called Rehab. TEK. In many occasions, refurbishing according to the current regulation can be demanding, and sometimes even impossible. This new regulation was intended to reduce the scope of the application process for aberrations from the current regulation, TEK.10, and prevent in some cases needless bureaucracy. A Norwegian consulting engineer company delivered a report in 2012 that concluded that creating an own refurbishment regulation would be beneficial, and have a good social economic return [30]. In 2016 no refurbishment regulation is compiled by the Norwegian Directorate of Building Quality (DiBK).

Strict legislation, superficial condition surveys and the occasionally mistaken calculation of risk seem to be contributing factors to the high cost level concerning refurbishment projects. Table 1 shows some of the normal economic challenges associated with refurbishment works in Norway.

4. Result

The following paragraphs will present the results of the questionnaire survey, the case studies and the in depth interviews. The survey was answered by 44 respondents, and contained 15 questions. The survey was designed in two parts, where the first segment consisted of questions that deal with refurbishment in general. The second part consisted of questions dealing with execution of projects, from start to end.

Two case studies were completed by looking at two concrete situations. Case A was of a Swizz styled refurbishment project soon to be done, which have been technical difficult and have had big economical exceeding's. In Case B two municipalities were investigated to see how they manage their school buildings. In Case B it was attempted to find out why some schools are being refurbished while others are demolished and built up again, and what these decisions are based upon. The added value from the case studies were given as a better basis for the discussion and the final conclusion.

Ten in depth interviews have been conducted in a semi-structural manner. The respondents consisted of two building owners, two architects, two contractors, two consulting engineers, building authorities and a researcher.

All the results were collected from the Norwegian construction industry.

4.1. Early Phase in Refurbishment Projects

When asked to define the beginning and the end of an early phase, no-one of the respondents answered identically. Several of the respondents claimed it was determined by when they were contracted into the project. The consulting engineers meant that the phase started when a task was described in a certain project, while the researcher meant that it started when an idea for a change occurs. The contractors on the other hand associated the term early phase with the calculation part of the project. The interviewees had likewise different opinions when asked when the early phase ended. The researcher was the most concrete and answered that the phase ended when the developer determines if he want to refurbish, demolish or keep using the building in the same manner.

100% of the respondents from the questionnaire survey meant that they should be involved in the early phase of the project. Several of the respondents said that they could contribute with skillful competence that the other participants do not possess. A recurring answer from the respondents were that professionals with a wider competence in different subjects combined with experience should be involved earlier. In table 2 an overview of some of the answers from the survey is presented, and what the respondents meant that these elements could contribute to the project.

Table 2: Early Phase Competence, Input and Decision Base

<i>What competence is most important in the beginning of a project?</i>	<i>Input</i>	<i>Decision base</i>
Practical experience from the consulting engineers.	Identify needs, Condition survey, Requirement analysis, Opportunity analysis, Past experience, Alternatives, Cost estimate	Management and operation, Analysis, Evaluation
Involvement of more special subjects like fire, acoustic, ventilation and sanitation etc.	Condition surveys, Requirement analysis, Opportunity analysis, Past experience,	Analysis, Evaluation
The contractors experience concerning price, progress and creation of a progress plan.	Cost estimate, Condition survey, Requirement analysis,	
Antiquarian competence.	Requirement analysis, Opportunity analysis, Past experience, Alternatives, Stakeholder analysis	Analysis, Evaluation
Actors who are able to cooperate good with clients	Stakeholder analysis, Intentions	Analysis, Evaluation

Table 3: Elements for a successful refurbishment project

<i>Stakeholder</i>	<i>Element</i>	<i>Contribution to project success</i>
Building Owner	User involvement, Fulfill user demands, Keep your budget	Stakeholder analysis, Intentions, Cost estimate
Architect	Achieve functionality, Preserve antiquarian values, Reasonable cost	Requirement analysis, Cost estimate
Consulting Engineer	Present alternatives for the client	Alternative
Contractor	Satisfied customer needs	Intentions
Researcher	Economy, Social and Ecology	A sustainable project

In the interviews, the respondents were asked if they could name certain criteria or elements to achieve successful refurbishment projects, as seen in table 3. The interviewed researcher specified in his answer that a successful project would depend on which role the stakeholder had in the project. According to him a building owner would have a completely different answer than what a house buyer would have, and therefore project success must be a project that is sustainable.

4.2 Financial Framework

According to the interviewees, there will always be uncertainty associated with refurbishment work. The more comprehensive the project is, the more uncertain the respondents claim estimating a price will be. Several of the interviewees mentioned that an exact price could not be set before the project was finished because of the unpredictability in refurbishment work. The professionals that price the projects (the contractors) are seldom involved that early in the project. According to the respondents, the contractors are best qualified to estimate the financial framework and cost.

The budgets in refurbishing project are according to the respondents based on shifting matters like condition surveys of the building followed by pricing of either single elements, or pure square meter considerations. This is the foundation for the financial plan. It is normal to determine a certain risk into the calculations to avoid any unforeseen circumstances.

The research shows that most of the professionals working with refurbishment projects regularly participates in condition surveys themselves. The interviewees utter that a destructive and more comprehensive inspection would expose a greater amount of building damages. The way it is done today is insufficient for identifying damages and weak spots. The result is that damages are uncovered too late, often far out in the design phase.

From Case B it was found that a survey formed in such a manner would be tough to accomplish. The funds given to public projects are usual granted later in the project by the municipality council. This require the project to be developed further than just the outline. Some of the other interviewees explained that in most of their refurbishment projects the users were using the building until the refurbishment starts. It would therefore be hard to go into the building and start flattening walls.

During the interviews, the interviewees were asked if investing more resources into the early phase would have a positive effect on the outcome of the refurbishment. The response was that it in many occasions more resources could give a favorable development on the projects. A challenge stated by the interviewees, is that many building owners want to get started with the detailed engineering right away. They do not want to use too much of their allocated budget on planning. One negative consequence mentioned was that increased spending in the early phase could make the project too detailed, too early. This would, according to the respondent, not benefit the refurbishment.

5. Discussion

This paper strives to discuss the following research questions:

- What should an ideal early phase in refurbishment projects contain to achieve successful projects?
- When does the early phase start end when does it end?
- Is it possible to determine a certain financial secure framework for refurbishment projects?

5.1. Early Phase in Refurbishment Projects

Based on the conducted literature study and on the research presented in this paper, the term early phase, or varieties of the term, is widely used by both academics and by professionals in the building industry. Accordingly, there seem to be no clear definition of what this phase should contain to facilitate the way to more successful refurbish projects. The participants did not agree on a clear definition either. Generally, the later the stakeholders were contracted in the project, the later they meant that the early phase started.

The interviewees pointed out various aspects they consider important to help the shareholders achieve overall project success. Azlan et al. [12] identify that greater involvement of key design participants is one of the ways to achieve integration and obtain more information in the design process. This is also shown in the research in this paper, where several of the stakeholders say user involvement is important for project successes.

In the study, it was specified that it would be impossible to make good decisions without a satisfying foundation to make those decisions. Any decisions made at the early stage of design have major influence on the overall design performance [12].

When this research was initiated, it was assumed that challenges concerning the Norwegian legislation, and the process of applying to the authorities could be time consuming. Almost 60% of the participants in the questionnaire survey meant that an own rehabilitation regulation would make this procedure easier. The interviewees on the other hand meant that they generally had a satisfying relation with the planning authorities, and that such a regulation would be hard to accomplish. They said that the projects they had been involved in often were so special that a Rehab. TEK. would not be capable of picking up the challenges. This indicates that a Rehab. TEK. seem to be unneeded in many of the more complicated refurbishing jobs.

5.2. Economic framework

Several authors have written about uncertainty associated with refurbishment works [9-11]. Of all the participants in the research no one had been in a project, with a certain complexity, where they had established an economic framework in the early phase that was precise. One indicator was that the more complex the project were, the higher were the uncertainty concerning the budget. It was suggested that an earlier involvement of the contractor could reduce this challenge. They have experience considering constructability, products and risk management among others. An earlier involvement of the contractors would also make the risk assessments more reliable, and the final price could potential be more accurate. This is confirmed by Sødal et al. [31] where the authors point out advantages of early contractor involvement. According to Sødal et al. the negative points could be challenges concerning designer interest and reduction of innovation. In some cases, the contractor focus to much on schedule and cost, and therefore other elements could be downgraded.

Research conducted in this paper signals that a more far-reaching condition survey should be organized in an early stage of the refurbishment project. In some cases the design need to be revised totally when new information is discovered [12]. It could therefore be rational to manage a destructive condition survey where the analysis is executed in a fashion where more of the construction is taken down to detect more of the building damages. “The availability of design information would influence the quality of decisions made” [12]. A survey level at at least Level 2 or higher, according to Norwegian Standard 3424:2012, should therefore be the minimum. Norwegian Standard 16096:2012 on the other hand recommend not to make destructive measures on buildings with an antiquarian value [32]. Seen relative to the financial prospects and progress in the building phase this seem unreasonable according to the results of this study.

In table 4 challenges regarding refurbishment projects are presented. As well as the challenge the table contain a description of the challenge, the consequence of the challenge, and a proposal to how it could be solved.

Table 4: Refurbishment challenges

<i>Challenges</i>	<i>Description</i>	<i>Consequence</i>	<i>Proposal</i>
Unknown technical condition	In many cases hard to define a detailed technical condition of the construction	The insecurity increases, the contractors estimate more risk when calculating tender documents and surprises occurs when the construction is “opened”	Conduct a more comprehensive and destructive condition survey
Laws and regulations	If a building is listed or protected certain changes are not allowed	Limited room for technical equipment and bad solutions have to be used.	A better understanding for antiquarian values by the executors, and innovative solutions.
Processes	Not a clear approach when starting a refurbishment project	Failed financial estimates, and not sustainable buildings	More structure thru the whole process using analyses and different evaluation methods
Financial unsecure	Many of the projects costs more than first estimated	Not possible to trust the calculated budget, and decisions are made on the wrong premises	Comprehensive condition survey and earlier involvement of the contractor

6. Conclusion

The goal with this research was to examine what an ideal early phase should contain to organize successful refurbishment projects. The research also tried to define when an early phase start, and when it should end. Finally, the study wanted to investigate if a secure financial framework was possible to accomplish in an early stage of the project.

An early phase could start when a need for upgrading is identified with the construction. It is recommended that this early phase continue up to when a decision can be made. When the early phase is completed, a settlement based on the conducted measures should be possible.

The results in this study show that numerous assessments should be done in the early phase to give the building owner a better decision support. Today’s approach is not good enough, and many decisions are done on insufficient information. Based on the research conducted in this paper an early phase framework has been compiled, seen in figure 2.

The results of the study reveal that the building owner should consider doing a more comprehensive study before settling on an outcome for the building. This paper concludes that a more extensive and destructive condition survey should be done. This will expose more of the building failures, and at the same time give the performing stakeholders a more secure fundament for the further work. According to the research this will furthermore lower the uncertainty concerning the economic framework. Additionally, the research show that the building owner should implement more analyses in the early phase to better the decision backing. These analyses should consist of evaluations of the buildings requirements, opportunities concerning the building and stakeholder interests. The building owner should further evaluate the intentions with a possible refurbishment, before he continues with an alternative evaluation of the building. The contracted parties in the project should try to collect earlier experiences from similar projects if possible. If these analyses and evaluations are generated in the early phase, the authors of this paper mean that the building owner has a good decision foundation to come up with a valid conclusion. This will lead to a better chance of constructing a successful refurbishment project.

Results from this study determine that an exact economic framework for refurbishment projects would be difficult and it might even be impossible to assemble in the early phase. The study suggest it would be possible to compose a more certain budget with involvement of contractors in the early phase. The study further show that the more complex the refurbishment project is, the better it would be to involve experienced contractors in the initiate phase to remove insecurity.

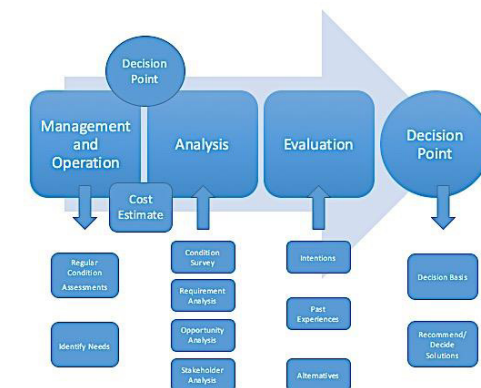


Figure 2: Early Phase Framework

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