



# Best Value Approach (BVA): Enhancing Value Creation in Construction Projects

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## Abstract

**Background:** Research has revealed an inadequate understanding of the owners' 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) what means and principles should be considered in the front end of a project to secure value creation?; and 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 users' needs and owners' 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 and Hjelmbrekke, 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 and Berg-Johansen, 2016).

As Womack and Jones (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 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 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 and Crowther, 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 and Hjelmbrække, 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 and Shane, 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, p. 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 and Thomson (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.

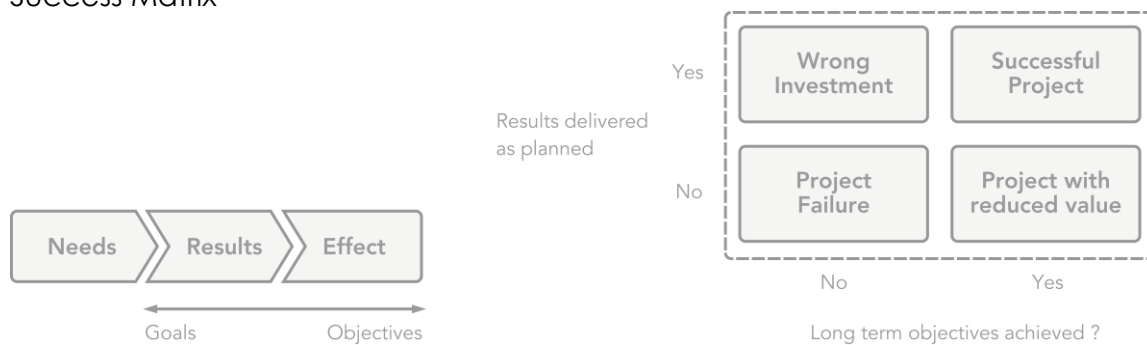
Besides what is found in literature within academia, UK, USA and Australia, among others, have introduced Value Management standards to construction projects with practitioners focus approach. Value management is defined as a style of management by the European standard for value management (British Standards Institution, 2000). The European standard argues that the intention and goals of Value Management is to reunite the differences among the stakeholders and customers 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 and Turner (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.

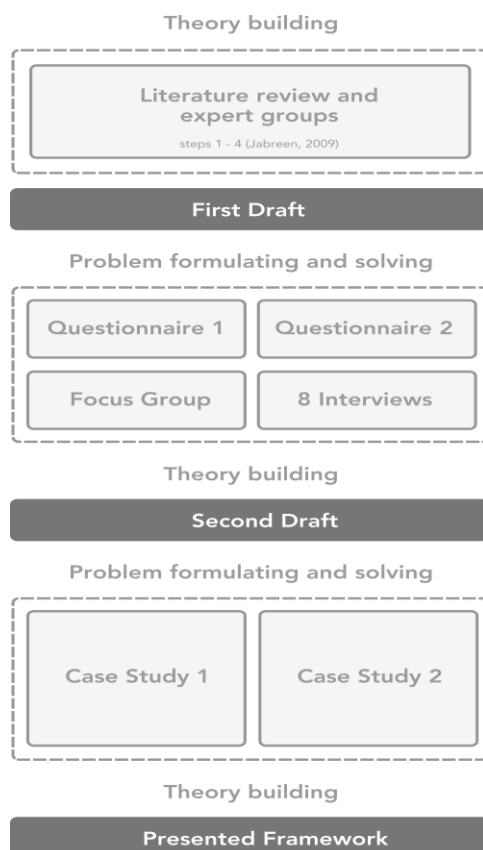
The result of the literature study was deconstructed and categorized, and the concepts were linked together. Thereafter, the results were synthesized and analysed by authors and experts and the initial conceptual framework was developed and presented in Projman conference in 2016 (Haddadi et al., 2016).

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



Source: Authors' work

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 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 m<sup>2</sup>, 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 m<sup>2</sup> 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 develops 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.

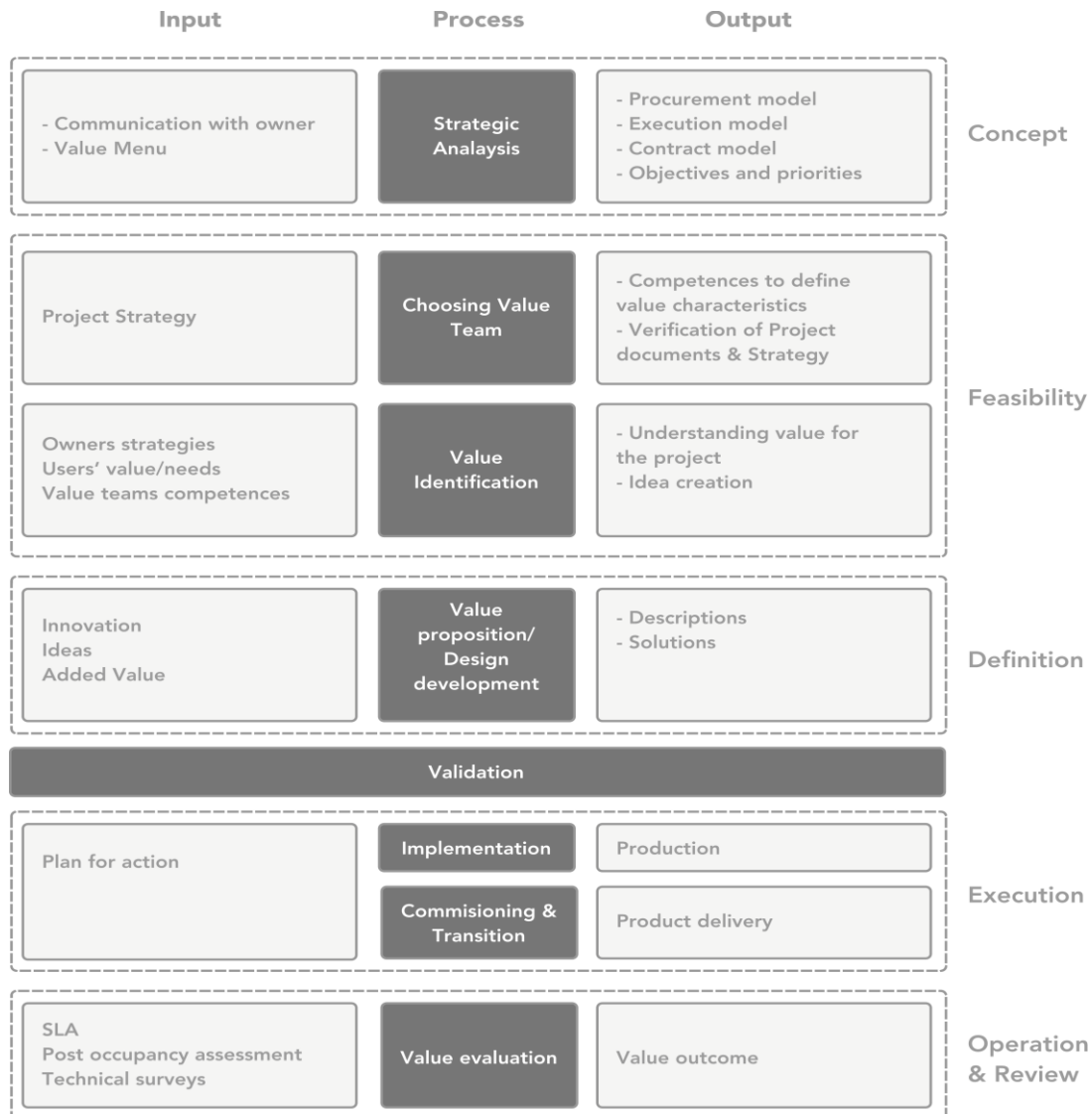
The research also indicated that value is created when owner's strategies are aligned with users' needs and they both are fulfilled. On the other hand users are often not aware of their own needs. Project team's competences and experience can have a positive contribution in identifying needs and value 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).

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 and Nedin (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 BVA, which 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 transition 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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