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Optimizing building design to contribute to value creation

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Abstract

The objective of the paper is to present the findings from research project “Oscar – Value for User and Owner of Buildings”, where the main intention is ‘developing competences, methods and analysis tools for optimizing building design to contribute to value creation for owner and end-user throughout life time’. Competent actors and proper decision making tools are necessary in order to achieve a desired value creation process. Life Cycle Aspect is essential as an input in Early Design Phase, and the processes through the following phases have to assure its inclusion in a way that value creation is complied with the user phase. It also contributes to extension of building total life and sustainability in Facility Management and Real Estate sector. The methodology and tools are a result of research project and are based on qualitative and quantitative research methods, as: literature review, case studies, questionnaire interviews, survey and workshops. The research findings are a result of cooperation with 22 project partners from three countries from academic, private and public sector representing all stakeholder groups. It is presented how it is possible to achieve more efficient buildings by collaboration of stakeholders from early design phase with the same goal to maximize value for owner and user over building’s life time which also creates value for society. The method and tools cover a need to use Life Cycle Models (LCM), which includes the integration of investment cost, FM cost and core business cost.

Keywords: value creation, costs, sustainability, user, owner

1. Introduction

The principles of property evaluation are distinguished into subjective and objective, yet intertwined categories and both linked to the market environment. Value can be attributed to property at any given moment of its lifecycle: planning, initiation, growth, renewal, decay and demise. The value of the property, as same as its usage, should be important for all stakeholders in the Real Estate (RE) and Facility Management (FM) fields. From the moment a property is positioned as the leading element in the mental process cycle, the process of planning begins. It is then followed up with design and construction and later on with renovation and refurbishment activities. Planning and development are important elements of this process, similarly as the past, present and future development of the entire micro- and macro-environment. Better understanding of the value principles leads us to optimize the building design to contribute to value creation through the whole Life Cycle (LC) of the building and thereof Life Cycle Cost (LCC).

Value creation is not a clearly defined concept yet, but it includes value contribution orientation in every project or process. In RE and FM fields it goes in line with added value ability of real estate decisions, processes and inputs to create shareholder’s wealth (Jensen et al., 2012). Similar, Hjelmbrekke and Klakegg (2013) state that value creation is the result of human activity and this is the only source of new value, where they define different values, like: value creation, use value, exchange value, captured value and value proposition. From psychological focus we derive from basic value system defined by Rokeach (1960) that is relatively robust organization and

structure of beliefs that pertain to the more desirable individual and social forms of behavior and finite states of existence in the continuum of relative significance.

Through the literature review study we found the value elements which assure the increasing of value contribution of RE and FM to attractiveness and stickiness of the built environment, from user's and business perspective. From the user perspective, they are connected with: better living condition, like: sustainability, adaptability, reliability, perceived value for benefits (Sarasoja&Aaltonen, 2012, Valen et al, 2014, Menon et al, 2005, Zeithaml, 1988), and for business the focus is in the harmonization of the resources and provisions (Coenen et al, 2012, Per Anker et al, 2012, Boge, 2012, Huovila, 2012).

According to Norwegian definition (NOU: 22:2004) 'good property management is to give the users satisfactory and efficient buildings at the lowest possible costs/use of resources'. In addition to this a white paper STM 28:2012 points out the sustainability element in properties and states that 'sustainable properties create the best usability for the core business over time and meet the demands of the owners, property managers and society'. To clarify in Oscar project 'cost' is integration between investment cost, management-operation-maintenance-enhancement (MOME) cost and core-business cost. From Oscar project's perspective, value creation of RE /FM is the process: i) to fulfill sustainability over time, ii) to maximize value for owner and user over time and, iii) to achieve value by increasing competences within LC Model and the processes of stakeholders in the project.

From the many conferences in the area of LC planning and economics during the years 1995-2015 (CIB W70, EFMC, IALCC, ICCREM, CEN, ISO) it is seen that the knowledge is emerging within academic area, but is still largely absent in the construction industry. The classification of LCC was supported in Nordic countries (Bjorberg et al., 2005), on European level (Langdon, 2007) and within ISO (15868, part 5 'Whole Life Costing'). All mentioned levels include LCC approach for new buildings and existing ones.

In Norway, there has been an increasing interest and focus on LCC in recent years, especially after the public procurement law was revised (Listerud et al, 2012), in which the net present value (NPV) calculations of the consequences of the investments over a defined period of time is required. From the perspective to make better decisions, client can calculate different alternatives of investments.

Nordic ongoing project 'Sustainable refurbishment' (2013-2015) shows that building adaptability in terms of possible reconstruction/refurbishment for changed use is one of the most important measures for achieving the effective framework for the business in a long term. From hospital sector it was often seen (Valen et al, 2005) that neglecting the adaptability perspective can lead to higher costs for core business in the long term. It can affect the possibility for different modifications and therefore organization's efficiency.

Through many years working with strategic analyzes, development planning and feasibility studies for real estate portfolios and existing buildings, both in public and private sectors (Bjorberg et al. 2012), it was found that the scope of unfortunate technical solutions, detailed design and materials are remarkably large, even within new buildings. This leads to unnecessarily high operating and maintenance cost, increased replacement rate and negative impact on core business, in terms of disruption and in the worst cases HSE (Health, Safety, Environment) related issues. A large proportion of the buildings, 31% (Larsen and Bjorberg, 2013), is evidenced as ill-suited, inefficient from operational level, with poor usability, and is too expensive for adjustments. These factors substantially reduce the functional life of the buildings. The most striking is the fact that too many examples are relatively new buildings. There is a lack of systematic studies and empirical data to document the cost/benefit of different solutions.

In VALPRO project (Arge & Hjelmekke, 2012) a lack of understanding the project owner's/users strategic objectives and lack of methodology for translating them into functional buildings is stressed. The new findings from that research shows the movement of the main project target from finished building toward the effect of owning and using it over its lifetime. In the construction industry, both in Norway and internationally, this is a new approach that requires in-depth knowledge of the owner, core business, user and LC planning to prepare new models and processes.

The concept and function of "Value Management" (Shen, 2013) is important to coordinate various actors' values before early planning the project. The project has to look at the needs, so the content should be in function with "Property Management" including "Value Management" from the early analyzing phase through all phases of building lifecycle. The function should ensure that defined owner's/user's added value requirements in the early

phase are ensured and secured through the design/build/delivery phase and monitored in the ‘use phase’. International trends also show that increasing the clarification between the distinctions ‘Architectural and Engineering Early Phase Plan’ and ‘Architectural and Engineering Detailing Design’ can strengthen the integrated approach in the early stages as the basis to deepen the project's value over time.

The use of Building Information Modelling (BIM) is rapidly increasing in design and construction field. The possibilities for better ‘relay exchanges’ by using BIM from early planning phase on, is therefore a particularly interesting topic. For achieving added value in the use phase, the initial phase should be focused in "BIM-requirements" and in the operational phase in ‘BIM-MOME’.

2. Research

The aim of the research Oscar is to develop knowledge, methods and tools that enable the optimization of the building design. In this way the building can contribute to good value creation for owners and users through its lifetime. The name Oscar is given by Oscar's Wilde statement from the book ‘The picture of Dorian Gray’: *A fool is a man who knows the price of everything, but value of nothing.*

Four objectives are put to achieve the outcome to:

- obtain the knowledge of needs to be addressed in the early phase to maximize the values for user and owner of building;
- identify how can existing execution models (planning, construction and commissioning) be used to achieve the goal of value creation in all phases;
- develop methods and tools;
- increase the knowledge and competences about value creation.

The project takes into consideration a clear connection between the design and operation of the buildings and values for the owners and users. Competent actors with proper decision and communication tools are needed to obtain good, adaptable and usable buildings over time. Life Cycle Aspect is essential as an input in Early Phase Planning, and the processes through the following phases have to assure its inclusion in a way that value creation is complied with the user phase. In accordance with the objectives of the project, the relevant stakeholder group are: owners, users, planners/designers, consultants and contractors, FM providers and society. The research is conducted by 22 project partners from three countries (Norway, Slovenia, Germany) from academic, private and public sector. All over mentioned stakeholder groups are covered.

2.1. Research model

The mind-map model (Figure 1) is designed on the basis of European standard EN15221, which includes two headings ‘space and infrastructure’ and ‘people and organization’. Value creation mind-map shows the inclusion of all stakeholders within the processes to maximize the value.

Project contains four main project working groups (WG), with a goal to:

- define the knowledge how to contribute to value creation in user phase as input in Early Plan Phase – WG1;
- define execution models and processes which contribute to value creation – WG2,
- design methods and tools on cost benefit evaluation simulation model and interactive guideline - WG3,
- disseminate the results and create a library on value creation aspects– WG4.

The first three working groups are closely interlinked (Figure 2), the fourth one is collective and supportive one and it works in parallel from the beginning of the project. For the purpose of this paper to show the first results, the WG1 and WG2 are presented more in details.

The focus of WG1 and questions discussing in it, are:

- Characteristics on buildings and solutions which contribute to value creation for different stakeholders during the Life Cycle.

- Characteristics on buildings and solutions which do not contribute to value creation for different stakeholders during the Life Cycle.
- Are contributions to value creation of different solutions context dependent?
- Circumstances where different solutions are advantageous or not.
- What kind of competences should stakeholders have for value creation?

The WG2 is interested in:

- Which means in different phases will motivate solutions for value creation in user-phase? (contract, economy incentives and process)
- Which means can work against?
- How can means that motivate value creation be incorporated in execution models within different projects and what demands will be put on different stakeholders?
- How can execution process with regard to transmission of information ('relay baton') between stakeholders and phases take place to ensure that premises from earlier phase live up to the next?
- What methods and tools are needed to ensure a good execution process and goal-achievement regarding value creation for owner and end-user?

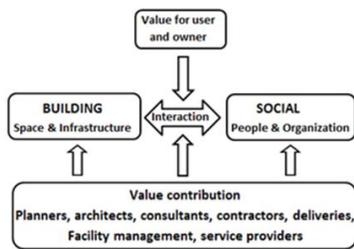


Fig. 1. Value contribution mind map

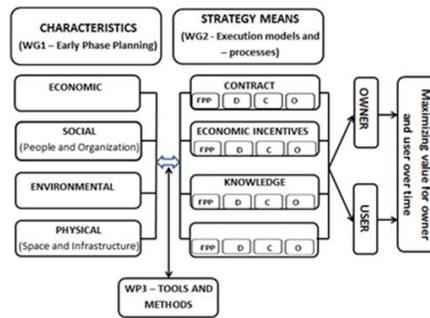


Figure 2. Value contribution model

(EPP – Early Plan Phase, D – Detail Design Phase,
C – Construction Phase, O – Operation (Use) Phase)

The research is led by Anne Kathrine Larssen from Multiconsult, Norway. The research methodology is based on qualitative and quantitative research methods, as: literature review, case studies, questionnaire interviews, survey and workshops.

2.2. Research results

Within the first phase of the project a list of characteristics, which contribute to value creation, and means, which motivate value creation solutions, is prepared, based on literature review conducted in autumn 2014 (Table 1). Characteristics which were mentioned in the literature in connection with value creation, are divided in 4 subgroups: economic, social, environmental and physical. Also means are divided in 4 subgroups: economic incentives, knowledge, contract, process, and quality assurance

Table 1 – Characteristics and means of value creation from Literature review (Oscar project)

Project group focus	Subgroups	Characteristics or Means
WG 1 – Characteristics which contribute to value creation	Economic (MOME, core business cost, investment cost, economic value)	Energy consumption, optimum FM organization, maintenance plan / cost (predictability), outsourcing /price of services, transparency of costs, cost of ownership, running / operational cost, cleaning cost, space efficiency cost, rental cost, interaction of costs (best solutions not lowest costs), project cost, cost reduction, green accounting, potential income, strong brand, market value, payback time, profitability for the core business, productivity in construction phase, environmental portfolio, long term commitment partnership, financial situation
	Social (People and organization)	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, security,
	Environmental	Renewable energy, energy efficiency, recycling and reuse of materials, waste management, minimize contamination, environmental friendly products, life time materials, green roofs
	Physical (Space and Infrastructure)	Technical condition, space distribution / logistic 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, innovative solutions
WG2 – Means which motivate value creation solutions	Economic incentives	Environmental funds, financial support for testing new trends, branding, rewarding, cost productivity, orientation, investment loan for enhancement / replacement, changing energy consumption, combining different energy resources, emission reduction, support for maintenance and technical upgrading, support for refurbishment, tax reduction, competitiveness
	Knowledge	Good planner, good management, changing regulations, new demands from society, 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 KPI, knowledge on sustainable efficient building, open for new technical solutions supporting innovative ideas, establishing creative technical teams,
	Contract	Contract process with dialogue, 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, clear specification of deliverables, performance targets, measurement methods and standards, active partnership dialogue, organizational measures, developing strategic SLA,
	Processes and assurance quality	Process management ability, communicating value, political support, user's participation, performance requirements for each phase, mechanisms and procedures for ex-ante evaluations, mechanisms for ex-post evaluations, monitoring, inspecting, evaluating, success / failure factors, key performance indicators

Students from two faculties HiOA (High School University of Applied Sciences in Oslo and Akershus) and NTNU (Norwegian University of Science and Technology) were given a set of specific questions for bachelor or master thesis. Some results are highlighted in Table 2.

Table 2 – Characteristics and means of value creation from Students' works

Project group focus	Sub-focus	Characteristics or Means
WG 1 – Characteristics which contribute to value creation	Contribution to Early Plan Phase	<u>Cooperation</u> - integrated architecture and technology from the first day - good cooperation and communication - establish a platform for quality insurance of information <u>Adaptability</u> - is of high importance in buildings with changing needs (ex. hospital build.) <u>LCC</u> - an important part from the starting point - calculation of alternatives gives opportunity to choose cost effective solutions and avoid unnecessary maintenance costs
WG2 – Means which motivate value creation solutions	PPP role in the context of Value Creation	- reduced conflicts due to cooperation and life cycle perspective - introduces incentives and clearer content in contracts - has a need for SLA's in operation, maintenance and service deliveries, including condition at end of contract period - ensure MOME and quality level in user phase

WG1 work is based on workshops and meetings with the partners. Most of the partners in the group are professionals (architect, engineers, facility manager, etc.) and they have exposed uncertainty in discussions on defining and understanding 'value creation' in buildings. At the beginning of the work, questions put in discussion were like: what is the definition of value, how to quantify it, what is the correlation between value and cost, how to communicate value etc. Many of them have never thought of value as a factor to be considered in the projects, but are usually focused on costs. After a year working in the project, general understanding was created, using the findings of Literature review and professional experiences. Based on that knowledge, also a survey was prepared. In the table 3 some emphasis are stressed from their meetings.

Table 3 – Some emphasis from WG1 findings

Project group focus	Sub-focus	Characteristics or Means
WG 1 – Characteristics which contribute to value creation	Contribution to Early Plan Phase	<u>Operational solutions</u> - should be included from the early beginning <u>Users involvement</u> - is positive and important part from the beginning - to be aware that users which do not have economic incentives will try to override owners strategic level decisions (based on cost/benefit). <u>Multidisciplinary focus</u> - should be included from the early beginning on the equal based contribution (integrated architecture and engineering design) <u>Owner's behaviour</u> - to change the trend that it is more enticing to build new building than to refurbish old ones
	To prepare evaluation method and tool for ex-ante control	<u>Measuring value</u> - should be standardized, based on contribution to value creation for the core business. - should give the answers on connection between early stage of the project (including tenant management) and the results on core business value
	To increase professional competences in value creation	<u>Professional competences</u> - to understand and secure professional competences on client and supplier side (stating the requirements and professional management of processes) - to increase the knowledge about value creation

		<ul style="list-style-type: none"> - to find good mechanism to exchange the knowledge permanently - to develop multidisciplinary orientation
WG2 – Means which motivate value creation solutions	Project management role	<ul style="list-style-type: none"> - to define roles and mandates of participants from the beginning - balancing the roles from the early phase (owner, user, suppliers), - preparing good management strategy to involve the user in the early stage - creating good process control from the early phase - concentrating on value creation information and following them from EPP

WG2 work is based on workshops and meetings with the partners. Most of the partners in the group are experienced professionals, so they were mostly concentrated in the key problems which could be captured by the contractual level with the consequences on ensuring value through construction period. In the table 4 some emphasis are stressed from their meetings.

Table 4 – Some emphasis from WG2 findings

Project group focus	Sub-focus	Characteristics or Means
WG2 – Means which motivate value creation solutions	Contribution to Processes	<u>Functional requirements from the beginning</u> <ul style="list-style-type: none"> - putting the values from user and owner perspective into contractual model - understanding the decisions/guidelines that have been adopted in early phase
	Contract Assurance quality	<ul style="list-style-type: none"> - understanding the content of adaptability and flexibility - to attain incentive value - Inadequate competences to control the quality and accept the deliveries - selection of contractual models to keep the value for user and owner <u>Advantages and disadvantages of the current contract models / contract forms</u> - Shared enterprise; General contract; General Enterprise; Total enterprise; Early partnership; Late partnership; Interaction Enterprise; PPP <u>Contractual model for the best understanding of user's and owner's values</u> - good and constructive dialogue during the construction phase - cost-effective building process - risk disclosure / distribution - balanced contractual model - interdisciplinary integrations and responsibilities clarifications - keeping incentives through the construction phase for goal achievement - good MOME addressed in a contractual model

Four special workshops with planners and designers with focus on EPP and contractual content on PPP have been held till spring 2015. The findings so far are highlighted in Table 5.

Table 5 – Characteristics and means of value creation from Special workshops

Project group focus	Sub-focus	Characteristics or Means
WG 1 – Characteristics which contribute to value creation	Contribution to Early Plan Phase	<ul style="list-style-type: none"> - to decide crucial factors and secure them through the processes - decisions in early phase should not be easy to change later in the implementation process
WG2 – Means which motivate value creation solutions		<ul style="list-style-type: none"> - if changes is to be taken the reason behind should be clarified, including consequences for core business purpose - better understanding/knowledge of core business as an important input - design team which can or should ask the right questions - integrated architecture and technology from the first day - documentation for MOME as a part of the total process
	Private Public Partnership (PPP) role in the context of Value	<ul style="list-style-type: none"> - introduce new roles and earlier decisions - has a need for SLA's in operation, maintenance and service deliveries including condition at end of contract period

	Creation	- ensure MOME and quality level in user phase - ensure a better commissioning period
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3. Discussion and conclusion

Value creation orientation exceeds the cost orientation of RE and FM, but still the owner' and user' benefits are measured from the perceived value of theoretical exchange value. The total solutions should bring benefit to the society.

To create value from early planning phase means that the solutions should be based on increased knowledge of core business activities, physical environment and open for future changes (technical or social). In the dialogue with the client the design team should be able to ask the right questions which are important for the value creation.

A lot of good characteristics of value creation and instruments for motivating value creation were found during this short time, which is presented in tables 1-5. The very intensive discussions within working groups, students and planners show the need to sharpen the definition of value creation in the project and to achieve common understanding between all stakeholder groups.

Results and observations from discussions are put forward for further development in the project: to include operational solutions, to increase professional competences on value creation, to use multidisciplinary work models, to change the owner's behavior, to prepare a new model as constructive dialogue model in which good MOME orientation is included and keep incentives through construction phase. The interactive guideline, which has to include the model of interaction between investment, MOME cost and core business cost, is an important part of making decisions. It has to show the consequences for the core business purpose, when changes has to be taken.

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