How do Real Estate (RE) and Facilities Management (FM) create value for owners and users of commercial and public sector buildings?

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The research project Oscar "Value for owners and users of buildings" funded by the Norwegian Research Council, was established in 2014. Oscar will continue until December 2017. 22 project partners from academia, private enterprises and public sector organizations in Norway, Slovenia, and Germany conduct the research. The basis for Oscar is an assumption about clear connections between the design and operation of buildings and values for owners and users. The life cycle aspect is essential both as an input in early phase planning, and during the following phases, including the user phase. The data presented in this paper were collected in Norway in 2015 through a national online survey answered by 837 respondents. The sample gives a good picture of Norwegian owners' and even users on tactical level (customer) perspectives on RE and FM in private enterprises, hybrid organisations and public administrations. The data has been analysed among others through descriptive statistics, exploratory factor analysis and OLS regression. Findings and results are the following. Based on the factor analysis 7 composite variables (constructs) were established: Obstacles, Environment and LCC, Usability, Image, Financials, Adaptability, and FM. Based on the seven constructs, six hypotheses were derived and tested. Based on testing of the hypotheses we can conclude that obstacles and financials have little or no effect on buildings' perceived usability. The most important factors for buildings' perceived usability are measures promoting environment and LCC, FM, the building's adaptability and measures that improve the organisation's image.

Keywords: Oscar project, facilities management, real estate, statistical analysis

1 Introduction

This paper presents some findings from the research project Oscar. Oscar's starting point is an assumption about clear connections between the design and operation of the buildings and values for owners and users. To get good, adaptable and usable buildings over time, there is a need for competent players with good decision and communication tools for projects and processes. The Life Cycle Aspect is essential as an input in early phase planning. The processes through the following phases have to assure inclusion of the life cycle aspect in a way that creates value for user phase. In accordance with the objectives of Oscar, the most relevant stakeholder groups are owners, users, planners/designers, consultants and contractors, FM service providers and society. The aim of Oscar is to develop knowledge, methods and tools that enable the optimization of the building design given the owners and users' needs. In this way, buildings can contribute to good value creation during its lifetime – both for owners and users.

The left hand side of Figure 1 shows the research model, Oscar's Value Contribution Map, which is designed on the basis of the European FM standard EN15221, and contains two headings, namely 'space and infrastructure' and 'people and organization'. The value creation is understood as a result of the interaction between 'space and infrastructure' and 'people and organization' as well as value contributions from among others planners, architects, consultants, contractors, deliveries, Facility Managers and service providers.

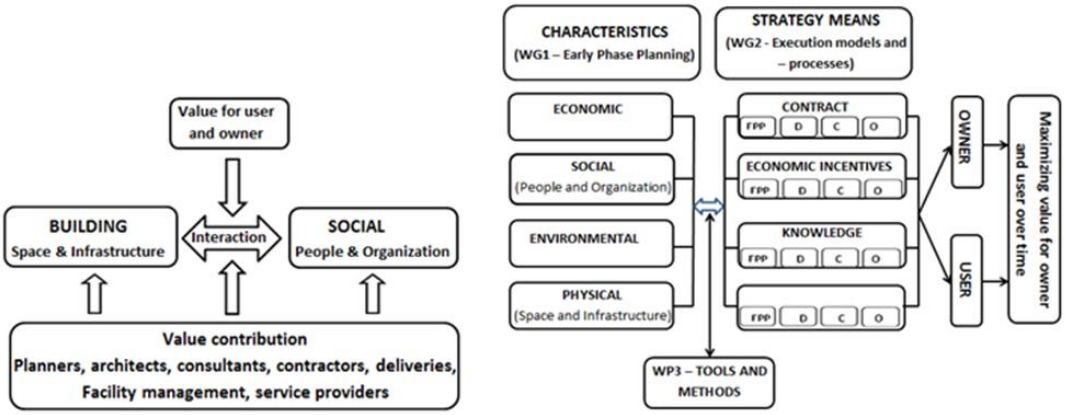

Figure 1: Oscar's Value contribution map and value contribution model

The right hand side in Figure 1 shows Oscar's value contribution model, which in the early phase (WP 1) includes characteristics that can be divided into four dimensions, namely the economic, social, environmental dimension. WP 2 includes the strategy means, which consist of contract, economic incentives, and knowledge, which interact with the early phase characteristics. EPP indicates Early Plan Phase, D indicates Detail Design Phase, C indicates Construction phase and O indicates Operational use of the system. WP 3 is about development of tools and methods to improve the interaction between the early phase and the construction phase.

This paper present results from Oscar's WP 1, which is based on a literature review during the fall 2014, case studies and workshops during 2015 and a national online survey from May to October 2015.

2 Value creation

Value creation is not yet a clearly defined concept, but it includes value contribution orientation in every project or process. From a psychological perspective, the basic value system is defined by Rokeach (1960) as relatively robust organization and structures 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. From socio-psychological view Temeljotov (2005) states that 'every environment surrounding 'humanity' has certain features, characteristics that need special attention, simply because they are very important for humans, their life, survival, living, leisure and work'. The interaction models between individual and environment are gathering on analyses of social variables (individual and group, personality, culture, part, organization, social-economic environmental processing, sphere and frequencies characteristics) considering the influence of physical facts and variable's analyses of nature and shaped environment (characteristics of architecture and landscape, characteristics of the processes). In the RE and FM fields value creation goes in line with added value ability of real estate decisions, processes and inputs to create shareholder's wealth (Jensen et al., 2012, Finch, 2011, Lindholm, 2008, Manning et al., 1999). Especially when it leads to benefits on customer value than core benefits (Menon et al., 2005). Coenen et al (2012) propose FM as a 'Value network' - network of relationships, which creates perceived value amongst key stakeholders (clients, customers and end users). 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. Coenen et al (2012) prepare a list of different multiple dimensions of FM value: exchange value, use value, environmental value, relationship value and financial value, and emphasized that key stakeholders are seen as an integrated economic system to co-create value in FM.

Through the literature review study (table 1) 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 are found.

Table 1: Literature review, sorted into three subjective batches

Author	**Value creation characteristics, processes, models**	**Year**
Thomson Tom	Theoretical /conceptual article	1990
Paul Carder	Theoretical /conceptual article	1995
Dilanthi Amaratunga, David Baldry	Theoretical /conceptual article	2000
Ilfrin Price	Theoretical /conceptual article	2004
Per Anker Jensen	Theoretical /conceptual article	2010
Herman B. Kok, Mark P. Mobach, Onno S.W.F. Omta	Theoretical /conceptual article	2011
Hallgrim Hjelembrekke, Olle Jony Klakegg	Theoretical /conceptual article	2013
Lavy Sarel, John A. Garcia, Dixit K. Manish	Theoretical /conceptual article	2014
Lavy Sarel, John A. Garcia, Dixit K. Manish	Theoretical /conceptual article	2014
Kaisa Airo, Heidi Rasila, Suvi Nenonen	Theoretical /conceptual article	2015
Ozur Gocer, Ying Hua, Kenan Gocer	Theoretical /conceptual article	2015
Per Anker Jensen, Theo van der Voordt, Christian Coenen, Daniel von Felten, Anna-Liisa Lindholm, Susanne Balslev Nielsen, Chaiwat Riratanaphong, Mirjam Pfenninger	Theoretical /conceptual article with a combination of FM and CREM	2012
Coenen, C., Alexander, K., Kok, H.	Theoretical /conceptual article with a combination of FM and CREM	2014
Haddadi Amin, Alenka Temeljotov Salaj, Margrethe Foss, Ole Jonny Klakegg	Theoretical /conceptual article with a combination of FM and Value Management	2015
Per Anker Jensen, Akarapong Katchmarat	Conceptual / case article	2012
Stan Kaczmarczyk, Judi Murtough	Empirical article	2002
Seppo Junnila	Empirical article	2004
Barry P. Haynes	Empirical article	2008
Maartje Maarleveld, Leentje Volker, Theo J.M. van der Voordt	Empirical article	2009
Marjan J. Gorgievski, Theo J.M. vand der Voordt, Sanne G.A. van Herpen, Sophie van Akkeren	Empirical article	2010
Alexandra den Heijer and Hans de Jonge	Empirical article	2012
Agnieszka Zalejska Jonsson	Empirical article	2014
David Arditi, Giulio Mangano, Alberto De Marco	Empirical article	2014

From the user perspective, the value elements are connected with better living condition, like sustainability, adaptability, reliability, flexibility, perceived value for benefits (Sarasoja and Aaltonen, 2012, Valen et al, 2014, Haynes, 2008, Menon et al, 2005, Thompson, 1990, Zeithaml, 1988). For the business, the focus is in the harmonization of the resources and provisions (Coenen et al, 2012, Jensen et al, 2012, Boge, 2012, Huovila and Hyarinen, 2012). In the findings, they state a number of different definitions and focus points on added value of FM, dependent on the academic field and the area of application. Different research perspectives provide, in combination, a holistic view by integration of an external market based view (aimed output) and the internal resource based view (input from FM and RE). The emphasis for added value of FM include the focus on strategic aspect of FM towards the business impacts and effects (Jensen et al, 2015). The concept of added value or value creation changes the perspectives cost reduction orientation of FM (Jensen et al, 2015, Coenen et al, 2012, Sarasoja and Aaltonen, 2012, Boge, 2012). A change from FM as a mean for cost reductions to FM as mean for value creation may necessitate increased outsourcing of FM, because outsourcing of FM may facility innovation and increased value creation. However, organizations that outsource FM may also face serious obstacles to value creation, such as adverse selection and moral hazard problems (Boge 2012).

Huovila and Hyrainen (2012) listed possible drivers which motivate better solutions, such as: trends (including sustainable renovating /refurbishment...), demands from society, market internationalization, international ownership, awareness of the client (social responsibility), international ranking, new

products/ services, ethical goals, demanding client, new actors on the market, strong brand, significant quality problems. Strong brand also include an identification of a corporate image. Bromley (2000) defines that corporate identity is a mode of corporate presentation; corporate image is a mode of its presentation in the public, and; corporate reputation is how the external interested groups perceive it. Part of organizational culture is also the style that marks various processes in the organization and can be divided to explicit (urbanistic-architectural, bio-ergonomic, informational, technological and "micro-electronic" aspect, ecological viewpoint, material symbolic) and implicit culture (manifested mainly in various characteristics of social climate, values, beliefs, the image of organization etc.) (Rus, 1997). On the other side an image of the environment, which is created because of the process between the observer and the environment is subjective: this produces images of various experiences, emotional perceptions of various observers that can be completely different. Intellectual, emotional or pragmatic complex of perception can be dominant, depending on various circumstances and capabilities of the subject (Trstenjak, 1987).

From 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 (I5868, 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 is required. From the perspective to make better decisions, client can calculate different alternatives of investments.

The Nordic 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. In the hospital sector, it was often seen (Department of National Health and Welfare, 1979, Valen et al, 2014) 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 work 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% (Larssen 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.

The VALPRO project (Arge and Hjelmbrekke, 2012) found a lack of understanding the project owner's/users strategic objectives and lack of methodology for translating them into functional buildings. 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. Green and Jack (2004) discuss about values and value mapping, from the creating way to support three main FM branches place, people, and process, and to optimize business support. They stress the value mapping solutions as one of value drivers and value outcomes.

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 safeguarded 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.

According to a 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 government white paper Meld. St. 28 (2011-2012) 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’.

This paper’s research question is how do Real Estate (RE) and Facilities Management (FM) create value for owners and users of commercial and public sector buildings? This research question has been investigated through testing of hypotheses derived from survey data gathered through Oscar’s WP1 concerning early phase planning of buildings.

3 Methods

The data in this paper are a result of a national online survey in Norway from May 2015 until mid-October 2015. The invitation to participate in the survey went to employees in the organizations participating in Oscar’s consortium, and to several others. The vast majority of the respondents are employed by other organisations than those participating in Oscar’s research consortium. The main channels for distributing the invitation to participate in the survey were business sector organizations such as Norwegian Building and Real Estate Association, the Architects’ association, and the Consulting Engineer’s association.

This survey did not address end users of RE and FM, but was specific addressed to respondents working with RE and FM on strategic or tactical level in their organisations. The respondents (N = 837) who answered the web survey are not a result of random sampling. It is thus not possible to generalize the results. However, the sample gives a good picture of Norwegian owners’ and even users on strategic and tactical level (customer) perspectives on RE and FM in private enterprises, hybrid organisations and public administrations.

The online questionnaire was developed based on findings from Oscar’s literature survey during the fall 2014, several workshops and meetings with the research consortium’s partners during the second half of 2014 and early 2015, and even some students’ bachelor and master thesis written during the spring 2015.

The questionnaire begins with questions about the respondent’s demographic data and background (Q1 employer, Q2 gender, Q3 age, Q4 education, Q5 main role in RE projects, Q6 main tasks in RE projects, Q7 what kind of RE projects the respondent has been involved in). In Q8 the respondent is asked about her or his perspective (owner or user) when answering the remaining questions concerning Q9 the economic dimension (11 items + open question), Q10 the social dimension (11 items + open question), Q11 the environmental dimension (9 items + open question) and Q12 the physical dimension (11 items + open question). The questionnaire also includes questions Q13 about owners vs. users perspective on RE, Q14 reporting, and Q15 obstacles against value creation (18 items + open question). Q13 and Q14 are not on the agenda in this paper. This paper emphasizes the four value dimensions Q9, Q10, Q11 and Q12, and Q15 obstacles against value creation.

All questions about the respondents’ background, except the age question, are nominal level variables, and thus inherently qualitative. The questions in the four value dimensions (Q9, Q10, Q11 and Q12) have a four item Likert scale on ordinal level, ranging from ‘No emphasis’ = 1, ‘Some emphasis’ = 2, ‘High emphasis’ = 3, to ‘Very high emphasis’ = 4, and 9 = ‘Don’t know/’Not relevant’, and thus inherently quantitative. Even the questions about obstacles against value creation (Q15) have a four item Likert scale on ordinal level ranging from ‘No obstacle’ = 1, ‘A small obstacle = 2, ‘An obstacle’ = 3, to ‘A major obstacle’ = 4, and 9 = ‘Don’t know/’Not relevant’, and are also inherently quantitative. The ‘Don’t know/Not relevant’ answers in the four value dimensions Q9, Q10, Q11 and Q12, and in the obstacles against value creation Q15 were coded as missing.

The paper’s data concerning the four value dimensions Q9, Q10, Q11, Q12 and the obstacles against value creation in Q15 are thus ordered categorical; i.e. ordinal level data where the ordering is clear, but where the absolute distance between the levels is unknown (Agresti 2010, p. 2). According to Agresti (2010, p. 4) there are two approaches to analyses of ordinal data, which are inherently quantitative. The first is to ignore “the categorical nature of the response variable”, and to use “standard parametric

methods for continuous response variables", and to assign "numerical scores to the ordered categories" and to use ordinary least square (OLS) regression, such as linear regression. The other approach is to use non-parametric methods that "use only the ordering information about the categories", based on "rank and models for cumulative response probabilities". One reason many ignore the categorical or discrete nature of ordinal variables, is that the "underlying scale is thought to be continuous" (Tabachnick and Fidell 2014, p. 38-39). One reason for using non-parametric methods instead of or in addition to for instance linear regression is to detect possible "floor effects", "ceiling effects" and "interaction effects" that might give misleading results with OLS regression (Agresti 2010, p. 5-7). Thus, ordinal analysis can provide more powerful results than nominal analysis, and can detect unobserved continuous latent variables.

The survey data have been analysed with IBM SPSS version 23. The most important analytical methods have been descriptive statistics (frequency, mean, etc.), exploratory factor analysis, and linear regression (OLS).

Factor analysis (FA) and principal component analysis (PCA) are frequently used methods for exploratory analyses of datasets (Field 2013:674 ff.). FA and PCA can define the underlying structure in a data matrix; i.e. summarize or reduce the information in a number of original variables (questions) into fewer (latent) factors (or components with PCA) with the smallest possible loss of information (Hair et al. 1998, p. 90 ff.; Field 2013, p. 667). The mathematical difference between FA and PCA is that FA is based on analysis of the shared variance between the variables, while PCA is based on analysis of all variance in the observed variables (Tabachnick and Fidell 2014, p. 662). The theoretical difference between FA and PCA is thus that factors in FA are assumed to «cause» the variables, while the components derived through PCA are aggregates of correlated variables. In FA, the latent variables are thus assumed to produce the respondents' score on the variables. The main question in exploratory FA according to Tabachnick and Fidell (2014, p. 662) is thus «What are the underlying processes that could have produced correlations among these variables»? FA and PCA are relatively robust methods, because non-normal data can provide degraded, but still useful solutions. However, extreme multicollinearity or singularity is a problem in FA. PCA is more robust in case of multicollinearity. An eigenvalue approaching zero for some of the factors may indicate presence of multicollinearity or singularity in FA (Tabachnick and Fidell 2014, p. 666-667).

One important measure in FA and PCA is Bartlett's test of spericity, which tests whether there is sufficient correlation among the variables in the data matrix (Hair et al. 1998:99). The sample is acceptable for FA if the p-value for Bartlett's test is less than 0.05. Another important measure in FA and PCA is Kaiser-Meyer-Olkin's (KMO) measure of sampling adequacy. KMO's measure of sampling adequacy varies between 0 and 1. A KMO measure of sampling adequacy of 0.8 or more is "meritorious". Above 0.7 is "middling", above 0.6 is "mediocre", and below .50 is "unacceptable" (Hair et al. 1998: 98-99).

This paper is based on FA with Maximum Likelihood (ML) factor extraction. ML factor extraction maximise the canonical correlation between the variables and factors (Tabachnick and Fidell 2014, p. 689). Canonical correlation works almost as multiple regressions. In multiple regressions the aim is to identify how a particular combination of metric or dichotomous independent variables (IV) can explain or predict variation in a single dependent metric variable (DV) or response variable (RV). In canonical correlation, the aim is to identify and maximise the common (shared variance) between several metric IVs and several metric DVs or RVs. MANOVA is a special case of canonical correlation (Hair et al. 1998, p. 444; Tabachnick and Fidell 2014, p. 617-618). Rotation often makes it easier to interpret FA and PCA solutions. This paper is based on VARIMAX rotation because orthogonal rotation such as VARIMAX usually provides clear separation of the factors; i.e. high or low factor loadings (Hair et al. 1998, p. 109-110). Such separation between high and low factor loadings simplifies interpretation of the rotated solution.

Oblique rotation methods, such as for instance SPSS' Direct Oblimin permit correlated factors, instead of independent factors such as in orthogonal rotation. Oblique rotation may simplify the interpretation, but the factors derived through oblique rotation have to be validated because they are not orthogonal (Hair et al. 1998, p. 110). One way of validating factor derived through exploratory FA is confirmatory FA (CFA), for instance through use of structural equation models (SEM). SEM and CFA are not the topics in the present research. Both SEM and CFA are logical further steps in analysis of this dataset.

The rule of thumb is that factor loadings +/- .30 meet the minimum level, +/- .40 are usually considered more important, but factor loadings exceeding +/- .50 are "practically significant", according to Hair et al., (1998, p. 111). However, factor loadings +/- .30 can be significant if the sample size exceeds 350 (Hair et al. 1998, p. 112 Table 3.2). This is the case in this study. In this study it is thus possible to utilize factor loadings down towards .30 if there is a clear separation between the factors (usually approximately 0.30) if the questions have factor loadings on more than one factor.

The results from FA and PCA are often used to establish new composite variables (constructs); i.e. summated scales by adding variables loading on the same factors (or components in PCA) and calculating the average score. Such summated scales reduce measurement error and simplify identification of common factors (Hair et al. 1998, p. 116-1117). Based on the factor analysis 7 constructs were established. These constructs are continuous and vary between minimum 1 and maximum 4, and are thereby possible to use as data for linear regressions. The constructs' reliability have been tested through calculation of Cronbach's Alpha for Each construct. Cronbach's Alpha is a measure of internal consistency; i.e. whether the questions or items in a summated scale measure the same latent variable. Cronbach's Alpha ranges from 0 to 1, and .60 is usually considered as the lower limit of acceptability in exploratory analyses. However, the rule of thumb is to require a Cronbach's Alpha of .70 or better (Hair et al. 1998:88, 118).

The constructs have been analysed through simple and multiple linear regression. It is worth to notice that in multiple linear regression, the unstandardized b-values not only tell us the regression line's slope, but also tell us to which degree each IV affects the DV's or RV's outcome (i.e. the "effect"), when the other IVs in the model are held constant (Jaccard and Turrisi 2003, p.8). Thus, the b-values in multiple linear regressions represent the effect of each IV on the DV or RV controlled for the other IVs in the model. It is similarly worth to notice that the IVs' standardised Beta values (Beta or β) in linear multiple regressions tell us the number of standard deviations the DV or RV will change if the IV in question is changed one standard deviation (Jaccard and Turrisi 2003, p. 8-9; Field 2013, p. 340). Betas are measured in standard deviations, and are thus standardised and possible to compare across studies. The Beta is thus a very useful effect measure.

A final topic that is useful to notice when working with multiple linear regressions is the various measures of correlation. The zero-order correlation is the simple correlation (Pearson's Rho) between the IV and the DV or RV. The partial correlation is the correlation between the IV in question and the DV or RV, controlled for the effect of the other IVs in the model. Finally, the part correlation is the correlation between the IV in question and the DV or RV controlled for the effect of the other IVs in the model's effect on the DV. Thus, the part correlation is the unique relationship between each IV and the DV (Field 2013, p. 341).

4 Results

This section provides an overview of the respondents, and the respondents' answers to a battery of questions about which factors they perceive create or do not create value for owners and users of buildings. The respondents' answers to these questions were reduced to seven composite variables or constructs through use of FA. These seven constructs in turn have been used to develop six hypotheses to elucidate the research question about how Real Estate (RE) and Facilities Management (FM) create value for owners and users of commercial and public sector buildings. These six hypotheses have been tested with linear regressions.

4.1 The respondents

The 837 respondents consists of 460 (55.0 per cent) from private enterprises, 111 (13.3 per cent) from hybrid organisations and 266 (31.8 per cent) from public administrations (government, counties and municipalities). The gender distribution is almost 20-80, namely 173 or 20.7 per cent women and 663 or 79.3 per cent men. The 459 respondents from private enterprises who have answered the question about employer and gender consist of 82 women (17.9 per cent) and 377 men (82.1 per cent). The 111 respondents from hybrid organizations consists of 24 women (21.6 per cent) and 87 men (78.4 per cent). The 266 respondents in public administrations consists of 67 women (25.2 per cent) and 199 men /74.8 per cent). Thus, the majority of respondents are men, and most are employed by private enterprises or

public administrations. There are relatively more female respondents among those employed by hybrid organisations and public administrations than among those employed by private enterprises.

What about the respondents' age? RE and FM is often considered as the grey haired persons' businesses. This is also partly the case in this study. The respondents' age ranges from 22 to 83 years. The respondents' mean age is 49.7 years, and the median age is 50 years (N = 832). Thus, half of the respondents are 50 years or older.

What about the respondents' education? 600 respondents (71.9 percent, 96 women and 504 men) have a degree in engineering. 85 of the respondents (10.2 percent, 26 women and 59 men) have a degree in business administration. 54 respondents (6.5 percent, 21 women and 33 men) are architects. 47 respondents (5.6 percent, 12 women and 35 men) have other educations, and many of these are various kinds of artisans. 30 respondents (3.6 percent, 12 women and 18 men) have education in finance, investment and law. Finally, 19 respondents (2.3 percent, 5 women and 14 men) have education in social sciences or humanities.

The respondents' two most common roles are property and landowner (N= 198, 23.7 percent) and consultant engineer (N= 170, 20.4 percent). The third most common role is property manager (N =149, 16.1 percent). The least common roles are property agent (N = 1, and 0.1 percent) and supervisory authority (N = 11, 1.3 percent). Only 27 of the respondents (3.2 percent) represent tenants or users. 19 respondents (2.3 percent) represent FM service providers. 425 (51.0 percent) of the respondents have been involved in early phase development of RE. 264 (31.7 percent) of these are employed by private enterprises. 48 (5.8 percent) are employed by hybrid organizations, and 113 (13.5 percent) of are employed by public administrations. 472 (56.6 percent) of the respondents have been involved in the construction phase. 284 (34.1 percent) are employed in private enterprises, 50 (6.0 percent) in hybrid organizations, and 138 (16.5 percent) in the public sector. 284 of the respondents (34.1 percent) have been involved in the operation and FM-phase. 115 of these (13.8 percent) are employed by private enterprises, 59 (7.1 percent) by hybrid organizations, and 110 (13.2 percent) by public administrations.

What kind of RE projects have the respondents been involved in? 437 (52.5 percent) have been involved in commercial premises and offices. 305 (36.7 percent) have been involved in housing projects. 249 (29.9 percent) have been involved in schools. 217 (26.1 percent) have been involved in facilities for assisted living. 167 (20.1 percent) have been involved in facilities for higher education. 149 (17.9 percent) have been involved in cultural facilities. 129 (15.5 percent) have been involved in hospitals. 115 (13.8 percent) have been involved in sports facilities. 103 (12,.4 percent) have been involved in other projects, such as for instance military installations. Finally, 25 (3.0 percent) have been involved in prisons. The respondents have thus been involved in most kinds of RE projects.

Thus, the respondents do not represent the Norwegian normal population, but the respondents are representative for those working with RE and FM on strategic and tactical level.

4.2 The answers

Table 2 to 5 shows the respondents answers to the questions in the Economic dimension (Q9, 11 items), the Social dimension (Q10, 11 items), the Environmental dimension (Q11, 9 items), and the Physical dimension (Q12, 11 items). The questions in each dimension about the respondents' perceptions are in the same order as in the questionnaire. The answer alternatives for the questions in these four dimensions was a four item Likert scale on ordinal level, ranging from 'No emphasis' (coded as 1), 'Some emphasis' (coded as 2), 'High emphasis' (coded as 3), to 'Very high emphasis' (coded as 4), and 'Don't know/'Not relevant' (coded as 9). The 'Don't know/Not relevant' answers in the four value dimensions Q9, Q10, Q11 and Q12, and in the obstacles against value creation Q15 were defined as missing, but were kept apart from those who had not answered the question (system missing, coded as 99).

Table 1: The Economic dimension

Question	Valid N	Mean	SD	Don't know/Not relevant (N)	System missing (N)	Rank (Mean)
The building's economic life span (NPV of cash flow)	632	2.90	.828	45	160	4
Effect on core business	652	3.28	.725	24	161	2
Energy costs	658	3.07	.774	18	161	3
Investment costs	653	3.39	.698	23	161	1
Cost efficient services (front desk, catering, security, etc.)	593	2.39	.823	82	162	10
Cost efficient cleaning	623	2.55	.826	52	162	7
Life cycle costs	637	2.77	.886	37	163	5
Market value in case of sale	590	2.30	1.111	84	163	11
Total cost per workspace in the operational phase	584	2.42	.978	90	163	8
Yield	548	2.42	1.083	127	162	8
Economic risk	591	2.61	1.012	84	162	6

The number of valid answers varies from 658 for 'Energy costs' (rank 3), to 548 for 'Yield' (rank 8). The answers' mean value vary between 3.39 for 'Investment costs' (rank 1) and 2.30 for 'Market value in case of sale' (rank 11). The number of 'Don't know/Not relevant' are particularly high for the questions about 'Yield' (127), 'Total costs per workspace in the operational phase' (90), 'Economic risk' (84), 'Market value in case of sale' (84), 'Cost efficient services' (82), 'Cost efficient cleaning' (52) and the 'Building's economic life-span' (45). The high number of 'Don't know/Not relevant' answers for these questions may indicate that future financial and operational issues are less important for the respondents than immediate out-of-pocket expenses.

Table 3: The Social dimension

Question	Valid N	Mean	SD	Don't know/Not relevant (N)	System missing (N)	Rank (Mean)
Workplaces facilitating flexible ways of working	597	2.96	.800	38	202	3
Areas facilitating formal and informal meetings	591	2.78	.780	44	202	7
Promoting pride (organisation's cultural values)	599	2.68	.841	36	202	9
User involvement	613	3.00	.791	22	202	1
Owner governance	591	2.84	.756	44	202	4
Architectonic qualities	617	2.84	.735	18	202	4
Individual mgt. of sunscreens, light, temperature, etc.	608	2.67	.814	27	202	10
Interior qualities facilitating well-being and tidiness	612	2.81	.747	23	202	6
Orientable (intuitive signs, etc.)	604	2.74	.819	30	203	8
Security and safety (protection against unwanted incidents)	619	2.98	.802	15	203	2
Facilities for physical activities (gym, wardrobes, etc.)	564	2.25	.847	70	203	11

The number of valid answers vary from 617 for 'Security and safety' (rank 2) to 564 for 'Facilities for physical activities' (rank 11). The answers' mean value vary between 3.00 for 'User involvement' (rank

1) and 2.25 for ‘Facilities for physical activities’ (rank 11). The number of ‘Don’t know/Not relevant’ answers is far less than in the Social than in the Economic dimension. The number of ‘Don’t know/Not relevant’ are particularly high for the questions about ‘Facilities for physical activities’ (70), and ‘Owner governance’ (44), and ‘Areas facilitating formal and informal meetings’ (44).

Table 4: The Environmental dimension

Question	Valid N	Mean	SD	Don’t know/Not relevant (N)	System missing (N)	Rank (Mean)
Use of renewable energy sources, reduced influence on the external environment	597	2.90	.808	20	220	4
Use of materials and components with long life	602	2.96	.795	14	221	3
Use of environmental friendly/labelled products	595	2.70	.801	21	221	5
Use of recycled/recyclable materials	577	2.06	.796	39	221	9
Energy efficiency	600	3.19	.739	16	221	1
Indoor climate and comfort	598	3.17	.720	18	221	2
Greenhouse gas emissions during the building's life-span (LCA)	575	2.37	.895	41	221	7
Environmental certification (BREEAM, etc.)	572	2.17	.919	44	221	8
Facilities for efficient waste mgt.	591	2.63	.785	25	221	6

The number of valid answers varies from 602 for ‘Use of materials and components with long life’ to 572 for ‘Environmental certification’. The answers’ mean value vary between 3.19 for ‘Energy efficiency’ (rank 1) and 2.06 for ‘Use of recycled/recyclable materials’ (rank 9). The number of ‘Don’t know/Not relevant’ answers is far less than in the Social than in the Economic dimension. The number of ‘Don’t know/Not relevant’ are fewer than in the Economic and Social dimensions, but are particularly high for the questions about ‘Environmental certification’ (44), ‘Greenhouse gas emissions during the building’s life-span’ (41), and ‘Use of recycled/recyclable materials’ (39).

Table 5: The Physical dimension

Question	Valid N	Mean	SD	Don’t know/Not relevant (N)	System missing (N)	Rank (Mean)
Area use (logistics, movements of persons and goods, etc.)	582	3.06	.738	19	236	2
Elasticity (possibility to change the building's volume, use, etc.)	571	2.63	.836	30	236	7
Flexibility (the possibility to change the building's floor plan, etc.)	581	2.81	.835	20	236	5
Generality (the possibility to change the building's function, other uses, etc.)	566	2.34	.937	35	236	11
Innovative solutions	578	2.44	.795	23	236	10
Life cycle planning (integrated architecture and technology, long-term solutions, etc.)	570	2.52	.847	31	236	9
Parking facilities for cars	579	2.54	.773	22	236	8
Parking facilities for bicycles	580	2.75	.807	21	236	6
Suitable materials for intended use and life-span	585	2.86	.794	15	237	4
The existing building's technical condition in case of transformation and upgrading	543	2.87	.777	57	237	3
Accessibility and universal design	587	3.13	.718	13	237	1

The number of valid answers vary from 587 for 'Accessibility and universal design' (rank 1) to 543 for 'The existing building's technical condition in case of transformation and upgrading' (rank 3). The answers' mean value vary between 3.13 for 'Accessibility and universal design' (rank 1) and 2.52 for 'Life cycle planning' (rank 9). The number of 'Don't know/Not relevant' answers is far less than in the Social than in the Economic dimension. The number of 'Don't know/Not relevant' are fewer than in the Economic, Social and Environmental dimensions, but are particularly high for the questions about 'The existing building's technical condition in case of transformation and upgrading' (57), 'Generality' (35), 'Life cycle planning' (31) and 'Elasticity' (30). There is a high number of "Don't know/Not relevant" answers for some of the aspects that determine buildings' long-term value.

Table 6 shows the respondents' answer to the questions concerning perceived Obstacles against value creation (Q15, 18 items). The questions concerning the respondents' perceptions are in the same order as in the questionnaire. Even the questions about obstacles against value creation have a four item Likert scale on ordinal level ranging from 'No obstacle' (coded as 1), 'A small obstacle (coded as 2), 'An obstacle' (coded as 3), to 'A major obstacle' (coded as 4), and 'Don't know/'Not relevant' (coded as 9).

Table 6: Obstacles against value creation

Question	**Valid N**	**Mean**	**SD**	**Don't know/Not relevant (N)**	**System missing (N)**	**Rank (Mean)**
Too much emphasis on technical and economic aspects	546	2.14	.721	33	258	16
Absence of incentives for users	502	2.41	.757	77	258	13
Lack of appropriate and unambiguous commissioning of the project (mandate)	548	2.76	.805	31	258	1
Insufficient use of digital tools for decision support	531	2.11	.789	48	258	17
Insufficient understanding of the users' real needs	559	2.62	.855	20	258	8
Insufficient organizing of the project - necessary roles and competencies not represented	556	2.67	.856	23	258	4
Lack of ambitions concerning innovations	547	2.41	.848	32	258	13
Lack of vigour and ability to make decisions	555	2.64	.926	24	258	6
Lack of multidisciplinary understanding in the project organization	560	2.73	.860	19	258	3
Lack of emphasis and competencies concerning life-cycle planning and economy	547	2.60	.832	32	258	10
Lack of emphasis on and competencies concerning the operational phase	559	2.76	.826	20	258	1
The end-users lack understand of the scope of the delivery	558	2.61	.786	21	258	9
Lack of transfer of information from the early phase actors to those involved in the subsequent phases	552	2.64	.833	27	258	6
Lack of involvement of the end-users	557	2.47	.847	22	258	11
Lack of knowledge concerning how to describe functional and technical requirements	558	2.66	.846	21	258	5
Lack of strategic foundation	528	2.47	.913	51	258	11
The architectural profession has a too dominant role	543	2.35	.927	36	258	15
The technical professions have a too dominant role	543	1.98	.775	36	258	18

The number of valid answers varied from 560 for 'Lack of multidisciplinary understanding in the project organisation' (rank 3) to 543 for 'The technical professions have a too dominant role' (rank 18). The answers' mean value vary between 2.76 for 'Lack of appropriate and unambiguous commissioning of

the project (mandate)' and 'Lack of emphasis on and competencies concerning the operational phase' (both with rank 1), and 1.98 for 'The technical professions have a too dominant role' (rank 18). The number of 'Don't know/Not relevant' answers is approximately as in the four value dimensions, but are particularly high for the questions about 'Absence of incentives for users' (77), 'Lack of strategic foundation' (51), 'Insufficient use of digital tools for decision support' (48), and 'The architectural' (36) and the "Technical professions have a too dominant role' (36).

The relatively high number of system missing, which increased during the questionnaire may indicate that some of the respondents became tired during or considered the survey too time consuming. Getting answers on all questions in comprehensive questionnaires is a challenge in Norway, most likely because many persons receive several invitations to surveys. The high number of system missing may affect the

4.3 Factor analysis

The data from the Economic dimension (Q9), the Social dimension (Q10), the Environmental dimension (Q11) and the Physical dimension (Q12), and Obstacles against value creation (Q15) were subject to exploratory FA with ML extraction and Varimax rotation. Table 7 shows the results of the FA for those questions where the factor loadings were .2 or higher.

Table 7: Rotated factor solution (ML extraction, Varimax rotation, factor loadings > .2) (factors marked by underscored bold text)

	Factor												
Question	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
Lack of emphasis on and competencies concerning the operational phase	**.762**												-.315
Lack of multidisciplinary understanding in the project organization	**.752**												
Insufficient organizing of the project - necessary roles and competencies not represented	**.751**												.240
Lack of vigour and ability to make decisions	**.702**												.356
Lack of knowledge concerning how to describe functional and technical requirements	**.700**												
Insufficient understanding of the users' real needs	**.697**												.215
Lack of involvement of the end-users	**.691**												
Lack of transfer of information from the early phase actors to those involved in the subsequent phases	**.691**												
Lack of strategic foundation	**.685**												
Lack of emphasis and competencies concerning life-cycle planning and economy	**.678**												-.218
The end-users lack understand of the scope of the delivery	**.675**												
Lack of appropriate and unambiguous commissioning of the project (mandate)	**.669**												.205
Lack of ambitions concerning innovations	**.548**			.204					.261				

Insufficient use of digital tools for decision support	**.538**												
The technical professions have a too dominant role	**.428**												
The architectural profession has a too dominant role	**.420**												
Absence of incentives for users	**.360**												
Too much emphasis on technical and economic aspects	.276												
Greenhouse gas emissions during the building's life-span (LCA)		**.796**		.254									
Use of environmental friendly /labelled products		**.784**											
Use of recycled/recyclable materials		**.678**											
Use of renewable energy sources, reduced influence on the external environment		**.675**	.250									.291	
Use of materials and components with long life		**.646**	.282					.215					
Energy efficiency		**.646**										.322	
Facilities for efficient waste mgt.		**.589**	.352										
Environmental certification (BREEAM, etc.)		**.563**			.250				.230				
Energy costs		**.541**					.203	.315				.396	
Life cycle costs		**.510**	.224					.463					
Life cycle planning (integrated architecture and technology, long-term solutions, etc.)		**.466**		.248		.247		.315	.403				
Indoor climate and comfort		.435	.367	.237						.402			
Innovative solutions		.416	.233	.239		.303			.402				
Orientable (intuitive signs, etc.)		.391	.343	.321			.241						
Area use (logistics, movements of persons and goods, etc.)			**.632**			.253							
Accessibility and universal design		.251	**.601**	.203									
The existing building's technical condition in case of transformation and upgrading		.396	**.484**			.232							
Suitable materials for intended use and life-span		.435	**.458**			.247		.296					
User involvement		.259	**.447**	.226									
Effect on core business			**.440**	.241									
Owner governance			.320		.308								
Architectonic qualities				**.675**									
Interior qualities facilitating well-being and tidiness		.257	.233	**.649**			.208						
Promoting pride (organisation's cultural values)		.237		**.569**							.218		
Parking facilities for bicycles		.340	.213	**.401**									

Facilities for physical activities (gym, wardrobe, etc.)		.298		**.375**			.260						
Individual mgt. of sunscreens, light, temperature, etc.		.320		.332									
Yield					**.846**								
Economic risk					**.769**								
Market value in case of sale			-.203		**.745**							.216	
Investment costs					**.392**								
Flexibility (the possibility to change the building's floor plan, etc.)		.275	.253			**.750**							
Elasticity (possibility to change the building's volume, use, etc.)			.283			**.718**							
Generality (the possibility to change the building's function, other uses, etc.)						**.668**			.209				
Workplaces facilitating flexible ways of working		.225	.337	.346		.382					.357		
Cost efficient services (front desk, catering, security, etc.)		.237		.220			**.664**						
Cost efficient cleaning		.229					**.624**	.205					
Security and safety (protection against unwanted incidents)		.315	.331				**.396**						
Total cost per workspace in the operational phase					.261	.230	**.357**		.289		.230		
The building's economic life span (NPV of cash flow)		.311			.345			.512					
Parking facilities for cars					.283		.236			.337			
Areas facilitating formal and informal meetings			.223	.453			.240				.489		

Extraction Method: Maximum Likelihood. Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 20 iterations.

The dataset was suitable for FA, because K-M-O's measure of sampling adequacy was .897. Bartlett's test of spericity was also acceptable (Approximately Chi-Square = 9744.914, df = 1170 and sign. = .000). The FA made it possible to derive seven factors (F1-F7). These seven factors in the rotated solution explains approximately 46 per cent of dataset's variance.

The first factor F1 denoted as Obstacles (17 items) includes several obstacles to value creation, and all the items are from this dimension. Most of these items are about poor planning and project management. Factor F1 Obstacles explain approximately 12.2 per cent of the variance.

The second factor F2 denoted as Environment and LCC (11 items) includes mainly questions about environment, energy efficiency, materials, waste management, environmental certification and life cycle costs. Eight of the items are from the questionnaire's Environmental dimension, two are from the Economic dimension and one is from the Physical dimension. Factor F2 explains approximately 6.6 per cent of the variance. Environmental issues are important for the environment as well for the organisation's bottom line and a building's life cycle costs.

The third factor F3 denoted as Usability (6 items) includes questions about area use, accessibility and universal design, the building's condition in case of transformations or upgrades, materials, user involvement and effect on the core business. Four of the items are from the questionnaire's Physical dimension, one question is from the Social dimension and one is from the Economic dimension. Factor F3 explains approximately 3.3 per cent of the variance.

The fourth factor F4 denoted as Image (5 items) includes questions about architectonic qualities, interior, pride and organisational culture, parking facilities for bicycles and facilities for physical exercises. Four of the items are from the Questionnaire's Social dimension, and one is from the Physical

dimension. Image is of high importance for many organisations, and buildings can be used as highly visible landmarks and advertising posts for organisations that emphasises image building.

The fifth factor F5 denoted as Financials (4 items) include questions about yield, economic risk, market value in case of sale and investment costs. All of the items are from the questionnaire's Economic dimension.

The sixth factor F6 denoted as Adaptability (3 items) include questions about the building's flexibility, elasticity and generality. All of these items are from the questionnaire's Physical dimension. Adaptability is of high importance for a building's future value, as well for a building's life cycle costs and environmental impact.

The last factor F7 has been denoted FM (4 items) and these questions are about cost efficient services, cleaning costs, safety and security and the total cost per workspace in the building's operational phase. Three of these items are from the questionnaire's Economic dimension. One of the items is from the questionnaire's Social dimension. FM is of high importance both for the users' experience with a building, as well for the building owners' return on their investment.

Table 8: Constructs, factor loadings and reliability

Factor	**N**	**No. of items**	**Factor loadings**	**Inter-item correlation**	**Cronbach's alpha**
F1 Obstacles	440	17	.762 - .360	.583 - .098	.914
F2 Environment and LCC	509	11	.796 - .466	.676 - .297	.907
F3 Usability	514	6	.632 - .440	.463 - .292	.794
F4 Image	514	5	.675 - .375	.488 - .240	.760
F5 Financials	519	4	.846 - .392	.723 - .189	.794
F6 Adaptability	557	3	.750 - .668	.701 - .570	.828
F7 FM	517	4	.664 - .357	.586 - .269	.733

Table 8 shows that all the seven constructs have factor loadings between .796 and .357. The inter-item correlations similarly vary between .723 and .098. The constructs also have acceptable reliability, because all constructs have a Cronbach alpha above .7 (cf. Hair et al. 1998:88, 118). Thus, the seven constructs seem reasonable, given their N, number of items, factor loadings and alphas.

Table 9: The constructs' means, medians, SD and distributions

		F1 Obstacles	**F2 Environment and LCC**	**F3 Usability**	**F4 Image**	**F5 Financials**	**F6 Adaptability**	**F7 FM**
N	Valid	441	509	514	514	519	557	517
	Missing	396	328	323	323	318	280	320
Mean		2.55	2.68	3.04	2.67	2.68	2.60	2.59
Median		2.59	2.73	3.00	2.60	2.75	2.67	2.50
Std. Deviation		.550	.591	.529	.570	.782	.752	.642
Skewness		-.126	-.100	-.511	-.141	.076	.058	.128
Std. Error of Skewness		.116	.108	.108	.108	.107	.104	.107
Kurtosis		-.281	-.387	.225	.030	-.982	-.581	-.509
Std. Error of Kurtosis		.232	.216	.215	.215	.214	.207	.214

Table 9 show the seven constructs with their means, medians, SDs and distributions. The means vary between 2.55 (F1 Obstacles) and 3.04 (F3 Usability). The standard deviations vary between .550 (F1 Obstacles) and .782 (F5 Financials). Construct F1 Obstacles, F2 Environment and LCC, F3 Usability and F4 Image have SDs less than .60. Construct F5 Financials, F6 Adaptability and F7 FM have standard

deviations between .642 and .782. Thus, the respondents agree somewhat more about the four first constructs than the last three.
There are several ways to calculate skewness and kurtosis. SPSS' method for calculation of skewness and kurtosis assumes that perfect normal distributions have zero skewness and zero kurtosis (Field 2013, p. 182). Positive skewness indicates several low scores, and negative skewness indicates several high scores. Construct F1 Obstacles, construct F2 Environment and LCC, construct F3 Usability and construct F4 Image have slightly negative skewness. Construct F5 Financials, construct F6 Adaptability and construct F7 FM have slightly positive skewness. Positive kurtosis indicates peaked distributions with heavy tails. Negative kurtosis similarly indicates flat distributions with light tails. Construct F3 Usability and F4 Image have slightly positive kurtosis. Construct F1 Obstacles, F2 Environment and LCC, F5 Financials, F6 Adaptability and F7 FM have slightly negative kurtosis. Thus, Table 8 show that the seven constructs approximate normal distributions. The slight deviations from the normal distributions can be a result of the questions' four-item Likert scale, and the respondents' answers. A Likert scale with more items than four, for instance eight or ten-items may have given better distributions; i.e. distributions with less skewness and kurtosis.

4.4 Hypotheses

To investigate the research question, namely how RE and FM can create value for owners and users of commercial and public sector buildings, based on the results from the FA there have been established six hypotheses:

H1: There is a negative relation between construct F1 Obstacles and construct F3 Usability.
H2: There is a positive relation between construct F2 Environment and LCC and construct F3 Usability.
H3: There is a positive relation between construct F4 Image and construct F3 Usability.
H4: There is a positive relation between construct F5 Financials and construct F3 Usability.
H5: There is a positive relation between construct F6 Adaptability and construct F3 Usability.
H6: There is a positive relation between construct F7 FM and construct F3 Usability.

These hypotheses have first been tested through examination of the constructs' correlation matrix. The hypotheses have thereafter been tested through use of linear regression models with construct F3 Usability as dependent variable (DV) and measure for a building's value for owners and users. The six other constructs F1 Obstacles, F2 Environment and LCC, F4 Image, F5 Financials, F6 Adaptability and F7 FM were independent variables (IVs) in the regression models.

4.5 Testing of the hypotheses

Table 10 shows the results of the first test of hypotheses H1-H6, based on examination of the constructs' correlation matrix.

Table 10: The constructs' correlation matrix

Constructs		F1	F2	F3	F4	F5	F6	F7
F1 Obstacles	Pearson Correlation	1						
	Sig. (2-tailed)							
	N	441						
F2 Environment and LCC	Pearson Correlation	-.008	1					
	Sig. (2-tailed)	.879						
	N	408	509					
F3 Usability	Pearson Correlation	.014	.622**	1				
	Sig. (2-tailed)	.774	.000					
	N	402	462	514				
F4 Image	Pearson Correlation	.093	.577**	.525**	1			
	Sig. (2-tailed)	.061	.000	.000				
	N	404	459	461	514			
F5 Financials	Pearson Correlation	.196**	.219**	.034	.212**	1		
	Sig. (2-tailed)	.000	.000	.488	.000			
	N	373	440	424	432	519		
F6 Adaptability	Pearson Correlation	.120*	.472**	.512**	.433**	.281**	1	
	Sig. (2-tailed)	.013	.000	.000	.000	.000		
	N	428	495	502	496	455	557	
F7 FM	Pearson Correlation	.063	.571**	.560**	.544**	.172**	.449**	1
	Sig. (2-tailed)	.207	.000	.000	.000	.000	.000	
	N	397	455	453	464	459	476	517

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

Cohen (1988) distinguished between small, medium and large effect sizes, and established .10, .20 and .50 as limits for respectively small, medium and large effect sizes for Pearson's Rho (r). The correlation matrix show that construct F1 obstacles is almost uncorrelated with construct F2 Environment and LCC, F3 Usability, F4 Image and F7 FM ($r < .10$) and slightly correlated with construct F5 Financials ($r = .196$, sign $< .01$) and F6 Adaptability ($r = .120$, sign $< .05$). These findings clearly weaken hypothesis H1 about a negative relation between construct F1 Obstacles and construct F3 Usability.

Construct F2 Environment and LCC is similarly highly correlated (large effect size, $r > .50$, sign $< .01$) with construct F3 Usability, F4 Image, F7 FM and partly also with F6 Adaptability ($r = .472$, sign $< .01$). Construct F2 Environment and LCC is medium strongly correlated (medium strong effect size) with construct F5 Financials ($r > .2$). These findings clearly strengthen hypothesis H2 about a positive relation between construct F2 Environment and LCC and construct F3 Usability.

Construct F3 Usability is strongly correlated ($r > .50$ and sign $< .01$) with construct F4 Image, F6 Adaptability and F7 FM. These findings clearly strengthen hypotheses H3 about a positive relation between construct F4 Image and construct F3 Usability, H5 about a positive relation between construct F6 Adaptability and construct F3 Usability, and H6 about a positive relation between construct F7 FM and construct F3 Usability.

Construct F3 Usability is almost uncorrelated with construct F5 Financials. This finding clearly weakens hypothesis H4 about a positive relation between construct F5 Financials and construct F3 Usability.

Table 10 also shows that construct F4 Image is strongly correlated (r > .50 and sign < .01) with construct F7 FM and medium to strongly correlated with construct F6 Adaptability (r = .433 and sign < .01). Construct F4 Image is also medium strongly correlated (r > .20, sign < .01) with construct F5 Financials. Construct F6 Adaptability is almost strongly correlated with construct F7 FM (r = .449, sign < .01).

The second test of hypothesis H1-H6 is a series of bivariate regressions with construct F3 Usability as DV and the other six constructs as IVs.

Table 11: Bivariate regressions with F3 Usability as DV

IV	**Constant**	**Unstd. B [95% CI]**	**B's Std. Error**	**Beta**	**t**	**Sign.**	**R^2**
F1 Obstacles	3.013	.014 [-.080 - .108]	.048	.014	.287	.774	.000
F2 Environment and LCC	1.547	.556 [.492 - .620]	.033	.622	17.044	.000	.387
F4 Image	1.743	.487 [.415 - .559]	.037	.525	13.224	.000	.276
F5 Financials	2.982	.023 [-.043 - .089]	.033	.034	.694	.488	.001
F6 Adaptability	2.087	.363 [.310 - .417]	.027	.512	13.312	.000	.262
F7 FM	1.841	.460 [.397 - .523]	.032	.560	14.340	.000	.313

Table 11 shows that it is possible to rule out construct F1 Obstacles and construct F5 Financials as explanations of construct F3 Usability. Firstly, construct F1 Obstacles and construct F5 Financials are not statistically significant (sign. > .05). Secondly, Beta is smaller than .1. Finally, R^2 or explained variance in the regressions with construct F1 Obstacles and construct F5 Financials as IVs is zero; i.e. construct F1 Obstacles and construct F5 Financials cannot explain any of the variation in construct F3 Usability. Thus, these linear bivariate regressions exclude construct F1 Obstacles and construct F5 Financials as explanations of construct F3 Usability. These findings seriously weaken H1 about a negative relation between construct F1 Obstacles and construct F3 Usability, and H4 about a positive relation between construct F5 Financials and construct F3 Usability.

Table 11 similarly shows that the constructs F2 Environment and LCC, F4 Image, F6 Adaptability and F7 FM can explain a significant part of the variation in construct F3 usability. Firstly, these four IVs are statistically significant (sign. < .05). Secondly, Beta is larger than .50. Finally, R^2 vary between .387 (construct F2 Environment and LCC) and .262 (construct F6 Adaptability). Thus, construct F2 Environment and LCC can seemingly explain 38.7 per cent of the variation in construct F3 Usability. Construct F7 FM can similarly explain 31.3 per cent, construct F4 Image 27.6 per cent, and construct F6 Adaptability can explain 26.2 per cent of the variation in construct F3 Usability. Thus, even these findings strengthen H2 about a positive relation between construct F2 Environment and LCC and construct F3 Usability, H3 about a positive relation between construct F4 Image and construct F3 Usability, H5 about a positive relation between construct F6 Adaptability and construct F3 Usability, and H6 about a positive relation between construct F7 FM and construct F3 Usability.

However, there is a catch. The results mentioned above are too good to be "true". As we can see from the correlation matrix in Table 10, construct F2 Environment and LCC, F4 Image, F6 Adaptability and F7 FM correlate medium to highly with each other and with construct F3 Usability. Thus, in order to find the "true" effect of construct F2 Environment and LCC, F4 Image, F6 Adaptability and F7 FM on the DV construct F3 Usability, we have to control for the effect of the other IVs on each IV through use of multiple regression. Multiple regression makes it possible to keep the other three constructs constant (control variables). By doing this we can find the "true" effect of the IV in question on the DV construct F3 Usability controlled for the effect of the other three IVs.

The final test of hypotheses H2, H3, H5 and H6 is thus a multiple regression with construct F2 Environment and LCC, F4 Image, F6 Adaptability and F7 FM as IVs and construct F3 Usability as DV. Table 11 show the results of this multiple regression. This multiple regression gives an R^2 of .488, which is very good. Thus, a model with construct F2 Environment and LCC, F4 Image, F6 Adaptability and F7 FM as IVs can explain 48.8 per cent of the variation in construct F3 Usability as DV, but that is not the main issue here. The multiple regression's high R^2 clearly strengthens hypotheses H2, H3, H5 and

H6 about positive relations between construct F2 Environment and LCC, F4 Image, F6 Adaptability and F7 FM, and construct F3 Usability.

Table 12: Multiple regression with F3 Usability as DV

IV	**Unstd. B [95% CI]**	**SE B**	**Beta**	**t**	**Sign.**	**Zero-order corr.**	**Partial corr.**	**Part corr.**	**VIF**	**Tolerance**
Constant	1.079 [.874 - .1.284]	.104								
F2 Environment and LCC	.285 [.199 - .372]	.044	.316	6.501	.000	.614	.310	.233	1.833	.546
F4 Image	.121 [.034 - .208]	.044	.130	2.726	.007	.527	.136	.098	1.759	.568
F6 Adaptability	.145 [.084 - .206]	.031	.200	4.679	.000	.507	.229	.168	1.418	.705
F7 FM	.185 [.107 - .263]	.040	.221	4.668	.000	.563	.228	.168	1.740	.575

The first thing to notice is that all the four constructs F2 Environment and LCC, F4 Image, F6 Adaptability and F7 FM are highly statistically significant ($t > 2.56$ and sign $< .01$). Thus, the four IVs are suitable, and this finding clearly strengthen hypotheses H2, H3, H5 and H6 that the IVs construct F2 Environment and LCC, F4 Image, F6 Adaptability and F7 FM can explain variation in construct F3 Usability.

The other thing to notice is that when controlling for the other three IVs, construct F2 Environment and LCC's unstandardized B is reduced from .556 in the bivariate regression (Table 11) to .285 in the multiple regression; i.e. approximately half the effect, but there is still a positive and statistically significant effect. Construct F2 Environment and LCC's Beta is similarly reduced from .622 to .316, even here half the effect, but it is still there. These findings clearly strengthen H2 about a positive relation between construct F2 Environment and LCC and construct F3 Usability.

The same is the case for construct F4 Image, where there unstandardized B is reduced from .487 in the bivariate regression to .285 in the multivariate regression controlled for the other three IVs, but there is still a positive and statistically significant effect. Construct F4 Image's Beta is similarly reduced from .525 in the bivariate regression to .130 in the multiple regression. Thus, controlling for the other IVs reduce construct F4 Image's Beta with DV F3 Usability to a fourth compared to what was the case in the bivariate regression, but the positive effect is still there. These findings clearly strengthen H3 about positive relation between construct F4 Image and construct F3 Usability.

Construct F6 Adaptability's unstandardized B is similarly reduced from .363 in the bivariate regression to .145 in the multiple regression; i.e. approximately the half, but the positive effect is still there and it is statistically significant. Construct F6 Adaptability's Beta is also reduced from .512 in the bivariate regression to .200 in the multiple regression, i.e. only forty percent of the bivariate regression's Beta, but the positive effect is still present. These findings clearly strengthen H5 about a positive relation between construct F6 Adaptability and construct F3 Usability.

The unstandardized B for construct F7 FM is reduced from .460 in the bivariate regression to .185 when controlled for the other three IVs in the multiple regression; i.e. almost sixty per cent less than in the bivariate regression. Nevertheless, even here, the positive effect is still present, and the effect is statistically significant. Even construct F7 FM's Beta is reduced from .560 in the bivariate regression to .221 in the multiple regression, to approximately forty per cent of the bivariate regression's Beta, but the effect is still present. These findings clearly strengthen H6 about a positive relation between construct F7 FM and construct F3 Usability.

Thus, multiple regression, which controls for the effect of the other three IVs reveals significantly reduced unstandardized B and standardized Betas in all the four IVs when controlling for the effect of the other IVs. Multiple regression with constructs F2 Environment and LCC, F4 Image, F6 Adaptability and F7 FM as IVs indicate smaller unstandardized B and Betas than in the bivariate regressions, but hypotheses H2, H3, H5 and H6 still hold. Thus, the constructs have positive effects on the DV construct

F3 Usability, but the effects are somewhat smaller than indicated by the bivariate regressions, which do not control for the effect of other variables. Based on the results of the multiple regression there is largest effect (unstandardized B) on the DV construct F3 Usability from construct F2 Environment and LCC (.285), second largest effect from construct F7 FM (.185), third largest effect from construct F6 adaptability (.145) and smallest effect from construct F4 Image (.121).

The third thing to notice is the part correlation, which is the correlation between the IV in question and the DV controlled for the effect of the other IVs in the model's effect on the DV. Each IV's part correlation thus tells us the unique relationship between each IV and the DV (Field 2013, p. 341). The part correlation or the net effect of each IV on the DV is usually significantly smaller than the zero order correlation (Pearson's Rho) which is almost similar to the Beta in bivariate regressions.

In Table 12 we can see that the part correlation between construct F2 Environment and LCC and construct F3 Usability is .233, a medium strong effect size according to Cohen (1988). This finding strengthens H2 about a positive relation between construct F2 Environment and LCC and construct F3 Usability.

We can similarly see that the part correlation between construct F6 Adaptability and construct F3 Usability and between construct F7 FM and construct F3 Usability is .168, which is in between a weak and medium strong effect size, according to Cohen (1988). These findings strengthens H5 about a positive relation between construct F6 Adaptability and construct F3 Usability, and H5 about a a positive relation between construct F7 FM and construct F3 Usability.

Finally, Table 12 shows that the part correlation between construct F4 Image and construct F3 Usability is only .098, a small effect size according to Cohen (1988). This finding strengthens H3 about a positive relation between construct F4 Image and construct F3 Usability.

Thus, in this case the part correlations are only between approximately a third (construct F2 Environment and LCC, F6 Adaptability and F7 FM) and a fifth (construct F4 Image) of the zero order correlations. This is most likely because the constructs correlate highly, such as shown in Table 10. However, even the part correlation findings strengthen hypotheses H2, H3, H5 and H6.

Finally, multicollinearity; i.e. perfect linear relationships between the variables can be a problem in multiple regressions. The variance inflation factor (VIF) and the tolerance statistic (1/VIF) are common measures of indications of multicollinearity. The rules of thumb, according to Field (2013, p. 325-326) are that a VIF larger than 10 is "cause for concern", an average VIF "substantially greater than 1" can indicate biased regressions, and tolerance less than .2 indicates "potential" problems, and tolerance less than .10 indicates "serious" problems. Thus, given Field's rules of thumb, Table 12 shows few indications of multicollinearity between the multiple regression model's four IVs. Thus, there are good reasons to trust the findings from the multiple regression model concerning hypotheses H2, H3, H5 and H6, about positive relations between construct F2 Environment and LCC, construct F4 Image, construct F6 Adaptability, construct F7 FM, and construct F3 Usability.

5 Discussion

This paper have presented some findings from the research project Oscar. Oscar's starting point is an assumption about clear connections between the design and operation of the buildings and values for owners and users.

The research question is how RE and FM can create value for owners and users of commercial and public sector buildings. The data presented in this paper come from a national online survey in Norway from May 2015 until mid-October 2015, where the respondents reported about their perceptions concerning which factors that create or do not create value for owners and users of buildings. The survey did not address end users of RE and FM, but targeted respondents working with RE and FM on strategic or tactical level in their organisations. The respondents (N = 837) are not a result of random sampling. Thus, it is not possible to generalize the results from this study. However, the sample gives a good picture of Norwegian owners' and even users on strategic and tactical level (customer) perspectives on RE and FM in private enterprises, hybrid organisations and public administrations.

Exploratory FA (ML extraction, Varimax rotation) uncovered seven latent variables or factors. These latent variables were used to establish seven composite variables or constructs. These constructs were in turn used to establish six hypotheses: H1: There is a negative relation between construct F1 Obstacles and construct F3 Usability. H2: There is a positive relation between construct F2 Environment and LCC

and construct F3 Usability. H3: There is a positive relation between construct F4 Image and construct F3 Usability. H4: There is a positive relation between construct F5 Financials and construct F3 Usability. H5: There is a positive relation between construct F6 Adaptability and construct F3 Usability, and H6: There is a positive relation between construct F7 FM and construct F3 Usability. These six hypotheses were tested through examination of the correlation matrix and bivariate and linear regression analyses, in order to elucidate the research question. Construct F3 Usability was the DV and construct F1 Obstacles, F2 Environment, F4 Image, F5 Financials, F6 Adaptability and F7 FM were IVs in the regression models.

Examination of the correlation matrix and bivariate regression weakened H1 about a negative relation between construct F1 Obstacles and construct F3 Usability, and H4 about a positive relation between construct F5 Financials and construct F3 Usability. The conclusions concerning H1 and H4 are that there are no statistically significant relations between construct F1 Obstacles and construct F3 Usability, and between construct F5 Financials and construct F3 Usability. Thus, obstacles against value creation and financial issues seem to be far less important for the owners and users' perception about a building's usability than formerly assumed. However, these findings do not rule out that investment oriented building owners are highly aware of obstacles and financial issues' relevance for their building projects' success.

Examination of the correlation matrix, bivariate and multiple regression gave strong support to H2 about a positive relation between construct F2 Environment and LCC, and F3 Usability; H3 about a positive relation between construct F4 Image and F3 Usability; H5 about a positive relation between construct F6 Adaptability and F3 Usability; and H6 about a positive relation between construct F7 FM and F3 Usability. Bivariate regressions with constructs F2 Environment and LCC, F4 Image, F6 Adaptability and F7 FM as IV and construct F3 Usability as DV returned high R^2's and strong and highly significant unstandardized Bs' and standardized Betas, such as F2 Environment and LCC (Unstd. B = .556 [.492 - .620], sign. .000, and Beta = .622), F4 Image (Unstd. B = .487 [.415 - .559], sign. .000, Beta = .525), F6 Adaptability (Unstd. B = .363 [.310 - .417], sign. 000, Beta = .512) and F7 FM (Unstd. B = .460 [.397 - .523], sign. .000, Beta = .560). Thus, F2 Environment and LCC seems to have most effect on F3 Usability, F4 Image seems to have second most effect on F3 Usability, F7 FM seems to have third most effect on F3 Usability, and F6 Adaptability seems to have least effect on F3 Usability.

However, multiple regression with the constructs F2 Environment and LCC, F4 Image, F6 Adaptability and F7 FM as IVs and construct F3 Usability as DV very much modified the findings from the bivariate regressions and revealed that the unstandardized Bs, when controlled for the other IVs, were significantly smaller than in the bivariate regressions, but still positive and highly significant. The multiple regression also changed the order of how the IVs construct F2 Environment and LCC, F4 Image, F6 Adaptability and F7 FM seems influence DV construct F3 Usability. In the multiple regression, the IVs direct effect were F2 Environment and LCC (Unstd. B = .285 [.199 - .372], sign. .000, and Beta = .316), F4 Image (Unstd. B = .121 [.034 - .208], sign. .007, Beta = .130), F6 Adaptability (Unstd. B = .145 [.084 - .206] sign. 000, Beta = .200) and F7 FM (Unstd. B = .185 [.107 - .263], sign. .000, Beta = .221). Thus, the multiple regression revealed that controlled for the other IVs F2 Environment and LCC seems to have most effect on F3 Usability, F7 FM seems to have second most effect on F3 Usability, F6 Adaptability seems to have third most effect on F3 Usability, and F4 Image seems to have least effect on F3 Usability. These findings are also supported by the part correlations; i.e. the unique or net effect of each IV on the DV, which were .233 for F2 Environment and LCC vs. F3 Usability, .168 for F7 FM vs. F3 Usability and F6 Adaptability vs. F3 Usability, and .098 for F4 Image vs. F3 Usability.

One of the problems with the current research is the slight deviations from normal distribution in some of the constructs, among others most likely because the questions about factors that create or reduce value for owners and users of buildings had a four-item Likert scale. Likert scales provide data on ordinal level; i.e. it is possible to rank the data, but the distance between each level in the scale is subjective and not known. One remedy for this problem is further analysis of the dataset through use of non-parametric methods, such as for instance discussed by Agresti (2010). Further analysis with non-parametric methods can corroborate or modify the findings in this paper.

This dataset have not yet been thoroughly examined for moderation (interaction) effects. This is a logical next step in the further analysis. One of the preliminary working hypotheses are interaction effects depending on the respondents' gender, education, employer and role in RE projects.

Another problem with the current research is that the data analyses and hypotheses testing have been based on exploratory FA with orthogonal rotation and linear regression with SPSS version 23. One approach for further analysis of this dataset can be FA with oblique rotation and confirmatory factor analysis (CFA) through use of structural equation models (SEM) with for instance AMOS or LISREL. SEM can also be an interesting approach to identify more complex and not so obvious relations in this study's dataset.

Thus, the main message to owners and users of buildings from this study among Norwegian respondents is that to improve buildings' usability, owner and users of buildings should prioritise measures promoting environment and LCC, FM, the buildings' adaptability and measures that improve the organisation's image, and in that order. Image building if the fundamentals are not in place very much like building sand castles. Hakkinen and Nuutinen (2007) also discussed user satisfaction, adaptability, indoor conditions, service life, cost efficiency and environmental impacts from office building perspective. They found that the targets regarding energy-efficiency, eco-efficiency, adaptability, indoor conditions and service life, but they found some problems with reference to pursued modern and innovative workspaces. Hebert and Chaney (2102) gave one interesting perspective of raising of awareness of sustainability by the theory of citizen participation on the particular case study. With active involvement of end users in the design process, sharing decision-making power and accountability, they reached the "partnership", so the recognition and understanding of the importance of sustainability increased. However, measures concerning environment, LCC, safeguarding the building's adaptability and even some of the measures promoting the organisation's image is very important questions in early phase planning of buildings. Some of these decisions are actually irreversible when the construction phase have been completed and the use phase begins. Thus, owners and users of buildings may have to live for decades with inferior solutions if wrong decisions are made during early phase planning of the building. FM is partly an issue during the buildings' use phase. Nevertheless, several questions concerning whether organisations are able to implement successful FM are actually determined during early phase planning of buildings.

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