

## Added value of FM – a critical review

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### ABSTRACT

The purpose of this paper is to provide a state of the art of how the topic “Added value of FM” has been treated recently in research and practice. The paper is based on research papers from EFMC 2013 and 2014. The paper provides an overview and a critical review of this research. A main focus is to examine to which degree there is a cumulative knowledge building in this field. The paper also summarises findings about value adding management in practice and reflects on implications for research and practice.

The critical review shows that some of the papers have a strong foundation in former research on the added value of FM, while many other papers only to a limited degree reflect and build upon this earlier research. This together with a broad scope of themes means that the cumulative knowledge building is rather weak. Besides, only few of the papers contribute directly to knowledge on value adding management. A study about how practitioners cope with the added value of FM and CREM clearly demonstrates a strong interest in the topic among leading professionals but also a lack of common understanding and practical management tools.

**Keywords:** Added value, state of the art, critical review, value adding management

### 1. INTRODUCTION

The purpose of this paper is to show how the topic “Added value of FM” has been treated in recent European research as well as in practice. The paper is part of the ongoing work in the EuroFM research group on “The Added Value of FM”, which was established in 2009. The group has produced a number of publications, including the book: “The Added Value of Facilities Management – Concepts, Findings and Perspectives” (Jensen et al., 2012b), which was launched at EFMC 2012 in Copenhagen.

In this paper we will investigate the research, which has been conducted on the topic since 2012. Both during the research symposium at EFMC 2013 in Prague and EFMC 2014 in Berlin there were a number of papers focusing on various aspects of added value of FM. The paper provides an overview and a critical review of this research. We will also summarise findings about value adding management in practice and reflect on implications for research and practice. The reviews and reflections on the selected papers have been elaborated in greater detail in a EuroFM report, which will be available in pdf form at EFMC 2015 in Glasgow.

## 2. OVERVIEW AND METHODOLOGY

The critical review covers 15 research papers from EFMC 2013 and 2014 listed in Table 1.

Table 1. Selected papers for critical review

No	Authors	Title	Country	Focus	Sector
1	Appel-Meulenbroek, De Vries and Weggeman (2014)	Layout mechanisms that stimulate behaviour of employees	Netherlands	Innovation by Knowledge Sharing	Offices
2	Gerritse, Bergsma and Groen (2014)	Exploration of added value concepts in FM practice: learning from financial institutes	Netherlands	Conceptual framework	Banks
3	De Been and Beijer (2013)	Effects of interventions in an innovative office on satisfaction, perceived productivity and health complaints	Netherlands	User satisfaction and perceived productivity	Offices
4	Beckers and Van der Voordt (2013)	Facilitating new ways of learning in Dutch Higher Education	Netherlands	New Ways of Working and Learning	Educational facilities
5	Kok, Mobach and Omta (2013)	Can FM contribute to study success?	Netherlands	Study success	Educational facilities
6	Daatselaar, Schaap and Mobach (2013)	Added value of FM in Institutes for intellectually disabled residents	Netherlands	Disorderly behaviour	Health care facilities
7	Groen (2014)	Contribution of FM to hospital(ity) issues	Netherlands	Experience of hospitality	Health care facilities
8	Van Sprang, Pijls and Tonnaer (2014)	Capturing meal experiences in nursing homes: an exploratory study	Netherlands	Meal experience	Health care facilities
9	Kuijlenburg and Mobach (2013)	The influence of FM on detainees	Netherlands	User satisfaction	Prisons
10	Waroonkun and Prugsignant (2014)	Post Occupancy Evaluation for improving of main dormitories	Thailand	User satisfaction	Dormitories
11	Redlein and Zobl (2013)	Facilities Management in Austria 2012 – Value Add?	Austria	Economic effective implementation of FM	In-House FM
12	Redlein and Zobl (2014)	Facility Management in West- and Eastern Europe	Austria and Romania	Cost savings	In-House FM
13	Ashworth (2013)	Added value of FM Know-how in the Building Whole Life Process	Switzerland + other countries	FM value creation	Not specified
14	Meerman, Lellek and Serbin (2014)	The path to excellence: integrating customer satisfaction in productivity measurement in FM.	Germany	Connection between productivity and satisfaction	Not specified
15	Katchamart and Then (2014)	Strategic FM-procurement: an issue of aligning services to business needs	Denmark, Hong Kong, Thailand, Netherlands	FM alignment to business	Not specified

The selection and the critical reviews were made in a sequential process starting with a screening of papers that seemed related to the topic of added value of FM based on title, abstract and keywords of all papers in the symposium publications from EFMC 2013 and EFMC 2014. We made a critical review of each paper by reading the full paper and evaluating it according to a common list of five criteria: theoretical foundation, methodology, empirical evidence, practical relevance and contribution to knowledge development. We were particularly interested in

identifying to which degree there is a cumulative knowledge building, so that new research builds on earlier results and contributes with new knowledge of theoretical and practical relevance. Annex A provides an overview of theories and methods applied in the papers, and Annex B shows the level of empirical evidence and the final “product” of each research.

We divided the papers in the following six themes:

1. Corporate Facilities (paper 1, 2 and 3)
2. Learning Facilities (paper 4 and 5)
3. Healthcare Facilities (paper 6, 7 and 8)
4. Temporary Housing Facilities (paper 9 and 10)
5. In-house FM on national level (paper 11 and 12)
6. General papers (paper 13, 14 and 15)

The main results of the critical review are presented in section 3. This is followed by section 4 on value adding management in practice, section 5 with implications for research and practice and section 6 with conclusion.

### **3 CRITICAL REVIEW**

#### **3.1 Corporate Facilities**

Three papers deal with corporate facilities, all from the Netherlands. Paper 1 explores how FM can contribute to knowledge sharing as a means to improve the effectiveness of a R&D organisation. Paper 2 aims to show the practicality of added value concepts for FM in financial institutes. Paper 3 investigates staff satisfaction and perceived productivity in an almost new office building with desk sharing before and after a number of interventions.

*Theoretical foundation:* Paper 1 and 2 both have a foundation in earlier research on the added value of FM and CREM. Both papers refer to the general distinction between use value and exchange value. Paper 3 does not include a separate section on theory and is based on a limited number of references with none to research on the added value of FM.

*Methodology and evidence:* All three papers present very comprehensive studies and in-depth empirical studies. Paper 1 combines different types of quantitative research methods. Paper 2 combines various qualitative methods with a quantitative questionnaire survey, and paper 3 is based on two quantitative POE surveys in the same organisation and office building before and after interventions.

*Practical relevance:* All three studies have been conducted in collaboration with FM-organisations in the case companies and all have clear practical relevance.

*Conclusion:* The three papers provide strong and important contributions with new knowledge of practical relevance. Paper 1 and 2 build strongly on earlier FM research and provide interesting new insights. The evidence bases are quite good in all three papers in terms of amount of data from the case companies, but it is uncertain to which degree the empirical results can be generalized to other companies. The theoretical and methodological insights are of general interests.

### 3.2 Learning Facilities

There are two papers about learning facilities, both also from the Netherlands. Paper 4 investigates how facility managers in higher education institutions can align the learning facilities to the changing demand of modern education and paper 5 investigates the relationship between FM provision and the learning outcome of Dutch Universities of Applied Science.

*Theoretical foundation:* Paper 4 is not really connected to theoretical issues of the added value of FM but it clearly shows that educational performance depends on an appropriate match between new ways of learning, new learning spaces, digitalisation of learning and teaching and coping with the needs and interests of (new) students. Paper 5 has a strong basis in earlier added value research and focusses on relationships between inputs i.e. facility services and outcomes i.e. study success.

*Methodology and evidence:* Paper 4 is partly conceptual based on literature review, but it also includes an empirical study with a mix of qualitative methods, whereas paper 5 is based on an extensive questionnaire that was filled out by 1,752 teachers from 18 out of 39 Universities of Applied Sciences. By use of regression analysis the latter study provided empirical evidence for significant correlations between the perceived qualities of facility services and study success. A limitation of this study is that no students were involved and no objective KPIs of input parameters have been applied.

*Practical relevance:* Paper 4 showed clear similarities between new ways of working and new ways of learning and contributes to a better understanding of both fields. Paper 5 used respondents that teach in practice and shows more light on their perceived qualities of facility services in connection to study success. A next step could be to be more precise about actual qualities and further exploration of *why* particular services have a positive impact and others have no or a negative impact.

*Conclusion:* The two papers confirm the relevance of facilities and services in higher education in order to cope with new ways of learning and to contribute to study success. Both papers build on earlier conceptual analyses of input and output parameters. The mechanisms for *how* spaces, facilities and services add value to higher education institutes need further exploration.

### 3.3 Healthcare Facilities

There are three papers about healthcare facilities, all from the Netherlands. Paper 6 investigates to what extent changes in organisation and space can contribute to the quality of life of intellectually disabled residents with a severe behavioural disorder. Paper 7 explores what aspects of a hospital stay are related most to hospitality according to patients. Paper 8 explores the experience construct and shows data from measuring the meal experiences of elderly clients living in nursing homes.

*Theoretical foundation:* Paper 6 is mostly based on literature on environmental psychology and evidence based design of healing environments. Papers 7 and 8 have some references to earlier research on the added value of FM. Both papers build on theory on hospitality experiences, but there is surprisingly little commonality in the literature they refer to and the theories they present.

*Methodology and evidence:* Paper 6 is a fairly limited explorative study based on a mix of qualitative methods. Paper 7 and 8 are quite comprehensive studies applying a mix of qualitative and quantitative methods and covering several institutions. Both show the strength of such an approach.

*Practical relevance:* All three studies have been conducted in collaboration with FM-organisations in the case institutions and all have clear practical relevance.

*Conclusion:* The three papers together show the impact of the specific context even within one sector like healthcare. Paper 6 concerns intellectual disabled residents, paper 7 concerns hospital patients and paper 8 concerns elderly people in nursing homes. These differences in contexts give different methodological challenges and different results. In paper 6 data had to be collected from staff and incident reports, while paper 7 and 8 are based on data from the end users. Research among elderly people in paper 8 also gives special challenges for data collection. The three papers provide important contributions both in relation to research methodology and new theoretical and practical knowledge on the added value of FM in healthcare facilities.

### **3.4 Temporary Housing Facilities**

Two papers deal with temporary housing facilities, one from the Netherlands and one from Thailand. Paper 9 investigates the influence of FM on the behaviour of detainees in prison facilities and paper 10 presents the findings of a Post Occupancy Evaluation (POE) of the Choeng Doi dormitories of the Chanmai University in Thailand.

*Theoretical foundation:* Paper 9 is based on a literature review on the impact of the built environment on human behaviour and evidence about healing environments. Paper 10 refers to POE theory and literature on student housing and student development. Both papers do not explicitly discuss theoretical insights or empirical research about the added value of FM.

*Methodology and evidence:* With only four interviews paper 9 does not add much empirical evidence for the added value of natural view and self-cooking i.e. a positive impact on behaviour of detainees in prison facilities. However, the study is explorative and findings from literature are confirmed by the interviews which is promising. Paper 10 is quite well empirically funded by a survey with N = 152 and 30 additional interviews with students.

*Practical relevance:* Both papers show the potential added value of interventions in the built environment and supportive activities. Benefits are respectively a more positive behaviour of prisoners and improved student satisfaction. To be able to draw more generic conclusions and to develop guidelines that can be applied in other sectors as well, additional research is needed to compare the perceived performance of facilities with the actual performance measured by KPIs.

*Conclusion:* Paper 9 is limited in empirical evidence, whereas paper 10 clearly shows the relevance of POE and the benefits of supplementing a questionnaire survey with interviews. Both papers are pretty clear about the input parameters and the positive outcomes of interventions i.e. better behaviour and higher satisfaction levels, but do not pay any attention to the sacrifices and costs of the interventions.

### 3.5 In-house FM on national level

There are two papers on in-house FM on national level, both from Austria and by the same authors. Paper 11 investigates the implementation of FM in in-house organisations in Austria. Paper 12 explores the added value of having an in-house FM department. It is based on the same annual survey as paper 11, but this paper involves data from both Austria and Romania.

*Theoretical Foundation:* Both papers includes several references to recent international literature on added value of FM. Value added is understood as effects in terms of cost savings and increase of productivity on one side and cost drivers on the other side.

*Methodology and Evidence:* Both studies apply a mixed method research methodology with qualitative expert interviews and quantitative questionnaire survey. The questionnaire from earlier years is revised based on expert interviews. The respondents are randomly selected among Top 500 companies. The paper from 2014 includes statistical tests.

*Practical Relevance:* The research has in both papers been carried out with involvement of practitioners. The positive impact of having an own FM department based on statistical test is interesting input for a strategic discussion. However, the results are quite general and seem difficult to transform into practical application.

*Conclusion:* The two papers provide new insights on the importance of different areas of FM in relation to changes in cost and productivity and the effects of having an internal FM department.

### 3.6 General papers

The last three papers are not linked to a particular type of facility, but discuss the added value in connection to the whole life cycle (paper 13), relationships between different value parameters (paper 14) and aligning FM services to business needs (paper 15).

*Theoretical foundation:* All three papers build on former theories by linking added value to the whole building life cycle, searching for interconnections between different values i.e. productivity and customer satisfaction, and aligning FM to business needs. However, paper 15 does not really elaborate the concept of Added Value.

*Methodology and evidence:* The methods range from a mixed method approach including qualitative and quantitative research to interviews with focus groups and individual interviews in a number of cases.

*Practical relevance:* In paper 13 and 15 practitioners were included among the respondents. The papers did not include a section on “practical implications” but all papers deliver input to improve the benefits and to reduce the costs of FM and to strengthen the degree of alignment of FM to core business needs, be it in rather generic and abstract terms.

*Conclusion:* All three papers contribute to a conceptual understanding of the role of FM in business success, partly on a generic level, partly focussing on particular values such as service productivity and customer satisfaction. Their contribution to ways to measure the added value of FM is limited.

### 3.7 General evaluation of papers 1-15

Regarding the theoretical foundation, all papers build on former theories and references. Due to the huge variety in research subjects, the theoretical foundations show a huge variety, too. Only a few papers refer in particular to theoretical frameworks on the added value of FM such as the FM Value Map from Jensen (2010), or the value parameters that were used by Lindholm (2008), Van der Zwart (2011), and Prevosth and Van der Voordt (2012). Other theories regard economic theory on the value chain, conceptual models of user satisfaction, (perceived) productivity, and service quality, or concepts such as experience (of meal services, hospitality), and the impact of facilities and services on human behaviour. None of the papers end up with well-argued proposals for standardized ways or Key Performance Indicators (KPIs) to measure the added value of FM. Most papers only discuss the benefits of particular choices regarding FM services or spatial layouts i.e. its impact on user satisfaction, knowledge sharing, or efficient use of space, whereas no paper discusses the sacrifices in terms of time, money, effort and risk to attain these benefits. Hardly any paper discusses how to implement the FM interventions. In other words: all papers focus mainly on the output and much less or not at all on the input.

Most papers measure perceived performance i.e. the impact of actual FM interventions or perceived qualities of FM services on satisfaction and perceived productivity and not on quantitative data regarding for instance the number of clients, number of complaints, costs or profit. Paper 5 is an exception, which measures the impact of perceived FM qualities on study success, which was measured on an aggregate institutional level as “the percentage of students who successfully leave the University of Applied Sciences within five years after attending”. The evidence for cause-effect relationships between input-throughput-output variables is still limited. The throughput is underexposed as well. An exception is again paper 5, which discusses knowledge transfer as an intermediary mechanism between facility services and educational achievement.

All papers include in varying degree empirical evidence. Data collection methods usually include interviews (individually or with focus groups) and (online) questionnaires with open and closed questions, in combination with literature review, analysis of documents, observations and walk-throughs. Most papers apply common data collection techniques such as 5- or 7-point Likert scales or build on renowned methods such as SERQUAL. In paper 8 a special developed measurement box was used to measure user satisfaction and respondents' affective assessment.

The level of evidence shows a huge variety, ranging from only four open interviews to surveys with a high N rising to  $N = 2,163$  and response rates amounting to 75%. However, only a few papers compare the setting before and after change. Most papers only show data that were collected ex post, after a change, compare different settings that were not changed at all, or take a snapshot in time to measure the relationship between an independent variable such as spatial layout and a dependent variable such as knowledge sharing. An exception is paper 3, which includes POE surveys twice in an almost new building, with some interventions between the first and second POE.

In a few papers practitioners were involved in defining the research topics and/or as interviewees – individually or in focus groups - or respondents to a survey. Remarkably often an explicit subsection on practical implications is lacking. Whereas most papers contribute to a better

conceptual understanding of adding value by FM and include empirical data to deliver evidence for the impact of FM on user satisfaction, perceived productivity, cost savings and business performance, not many papers end up with practical guidelines on how to measure and manage the added value of FM.

#### **4. VALUE ADDING MANAGEMENT IN PRACTICE**

As a follow up to the book from 2012 mentioned in the introduction the authors of this paper together with the third editor of the book, Christian Coenen, ZHAW, organised a workshop during EFMC 2013 in Prague on the topic: “How to manage and measure different value dimensions?”. The participants were asked at the beginning of the workshop to fill in a short questionnaire about their perception of the concept of “Added Value of FM”. The results confirmed that the concept of Added Value is interpreted in many ways and linked to a huge variety of different topics. This inspired us to investigate the perception and application of the added value of FM and CREM among practitioners further. Therefore, we conducted 10 interviews with experienced practitioners - 5 from Denmark and 5 from the Netherlands - based on a common interview guide (Van der Voordt and Jensen, 2014).

Regarding the definition of added value all respondents referred to both benefits and costs of FM/CREM interventions. Benefits were mainly linked to clients, customers and end users but also to shareholders and – less often - to society as a whole. All respondents included different types of added values, without a clear classification into for instance user value versus customer value, or economic value versus environmental value. Practitioners mainly steer on the impact of FM and CREM on the core business and organisational performance, and this is also essential in provider companies’ sales arguments.

Prioritized values were costs and satisfaction, followed by productivity. Remarkably, four out of ten outcome parameters that are included in the FM Value Map of Jensen (2010) - reliability and economic, social and spatial impact on the surroundings - were not spontaneously mentioned at all in response to the open question about prioritized values. These issues came only to the fore when we asked for comments on the list of possible added values that was shown after the open questions. Not all values showed up on the list – in particular possible impacts on the surroundings – did immediately ring a bell and raised different interpretations or misunderstanding. Sustainability was mainly perceived as a building characteristic. Most respondents made no clear distinction between impacts on the core business and impacts on the surroundings, and focussed more on a distinction between interventions regarding buildings and building related facilities and services versus choices regarding the location and the surroundings. Because practitioners use different terms, various responses could not be allocated clearly to one particular value.

#### **5 IMPLICATIONS FOR RESEARCH AND PRACTICE**

Based on the EFMC 2013 and 2014 papers, our meetings with academics and practitioners, and the responses to our interviews with practitioners, it can be concluded that added value and adding value by facilities and services are currently well-known and widely applied concepts in daily practice among leading practitioners in interactions between various stakeholders, and

perceived as key issues in FM and CREM. Adding value by real estate, facilities and services and value adding management also attain a growing interest of researchers in the fields of FM and CREM, which is illustrated by the reviewed papers.

At the same time we can conclude that there is still a long way to go to design a clear, well-visualised and widely accepted framework of well-defined value parameters and connected performance indicators, and ways of value adding management on strategic, tactical and operational level. In our first book we traced more than 50 different definitions of added value, various lists of value parameters, and a huge number of performance measurement systems and KPIs (Jensen et al., 2012a). In order to improve value adding management and to be able to share insights, to benchmark and to compare research findings, a common taxonomy should be developed. Furthermore, clear operationalization is needed, not only in order to be able to measure the added value of different interventions in buildings, facilities and services, but in particular also to disentangle complex cause-effect relationships between input (type of change), throughput (implementation) and output (outcomes in terms of benefits, sacrifices and risks). This is exactly the theme of our second book on “Facilities Management and Corporate Real Estate Management as Value Drivers: How to manage and measure added value” (working title, expected 2016).

In addition to these main themes for further research, a number of other topics for research, education and practical development need more attention. We refer to our two joint journal papers (Jensen et al., 2012b; 2014), where we have reflected on the conclusions from various trend reports and on what we know and what we still need to know.

## 6 CONCLUSION

It is very encouraging that so much new research on the added value of FM as reviewed in this paper was presented at EFMC 2013 and 2014. It is even more positive that all the research papers provides new empirical evidence and many of the papers are based on quite comprehensive studies. The research represents a wide scope of different types of facilities and a varied scope of FM services, themes and activities. There is a surprising overweight of studies of different type of institutions like learning and healthcare facilities compared to corporate facilities, and there were no studies concerning municipalities or state agencies. There are papers about unusual types of facilities like institutions for intellectual disabled residents and prison facilities. Many studies concern FM in a broad sense but there are also papers concerned with more specific and not commonly researched aspects like hospitality and meal experiences. There is an overwhelming dominance of studies from the Netherlands (9 out of 15), which hopefully is an inspiration for researchers in other countries.

The papers are based on a sound mixture of different research methodologies. Out of the 15 papers there are 5 based on qualitative methods, 3 based on quantitative methods and the majority are based on mixed methods, including both qualitative and quantitative methods. Mixed research, where the quantitative results provides overview and identify the most important aspects, while the qualitative research identifies specific interventions, that can actual add value, seems to be particularly suitable for research on added value.

Several papers shows the importance of the specific context, which both makes it difficult to generalise results across different organisations and facilities and has important consequences for the choice of research methods. Another aspect of context is the economic situation at a specific time, where the financial crisis starting in 2008 has changed the focus to be more on cost reduction than before the crisis.

Some of the papers have a strong foundation in former research on the added value of FM, while many other papers only to a limited degree reflect and build upon this earlier research. This together with the broad scope of themes means that the cumulative knowledge building is rather weak. Besides, only few of the papers contribute directly to knowledge on value adding management. Our study about how practitioners cope with value adding value management clearly demonstrates a strong interest in the topic among leading professionals, but also a lack of common understanding and practical management tools.

## REFERENCES

The 15 reviewed papers are listed in Table 1 and are not included in the following list. The papers from EFMC 2013 are published in Alexander (2013) and the papers from EFMC 2014 are published in Alexander (2014).

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**Annex A: Characteristics of 15 papers: subjects, theories ad methods**

No	Authors	Subject	Theory	Methods and evidence <sup>1</sup>
1	Appel-Meulenbroek et al. (2014)	Layout mechanisms that stimulate behaviour of employees	Limited AV theory; knowledge sharing; layout mechanisms	Realistic evaluation; Space Syntax analysis; logbooks
2	Gerritse et al. (2014)	Exploration of added value concepts in FM practice of financial institutes	AV theory ; FM Value Map; various AV parameters	Multiple case study; semi-structured interviews; survey
3	De Been et al. (2013)	Effects on satisfaction, perceived productivity and health	No theory; few references to literature on employee satisfaction, productivity and well-being	Two ex-post surveys (9 months + 2 years and 9 months after occupation)
4	Beckers et al. (2013)	New ways of learning in Dutch Higher Education	Theory on new ways of working and recent developments in learning and educational facilities	Literature review; interviews
5	Kok et al. (2013)	Contribution of FM to study success	Theory on added value of facility services in educational environments	Online survey
6	Daatselaar et al. (2013)	Added value of FM in Institutes for intellectually disabled residents	Theory on the impact of organisation and space on (aggressive) behaviour	Interviews; observations; incident reports
7	Groen (2014)	Contribution of FM to hospitality	Theory on hospitality and added value of FM in healthcare	Three surveys; interviews with patients
8	Van Sprang et al. (2014)	Capturing meal experiences in nursing homes	Theory on eating behaviour and meal experience of elderly people.	Survey with a specially developed measurement box
9	Kuijlenburet al. (2013)	The influence of FM on detainees	Maslow hierarchy of human needs + literature on the impact of the physical environment on behaviour etc.	Open interviews; walkthroughs
10	Waroonkun et al. (2014)	POE of main dormitories	POE-theory + theory D2on living and learning in an educational setting	Survey; interviews
11	Redlein et al. (2013)	FM in Austria	No theory; few references to literature on FM contribution to profitability and efficiency	Expert interviews; annual survey
12	Redlein et al. (2014)	Facility Management in West- and Eastern Europe	Theory on the added value of FM	Expert interviews; annual survey
13	Ashworth (2013)	Added value of FM Know-how in the Building Whole Life Process	Theory on the Added Value of FM and Life Cycle value measurement	Expeert interviews; survey with online questionnaire
14	Meerman et al. (2014)	Integrating customer satisfaction in productivity measurement	Theory on service productivity measurement and customer satisfaction	Two focus groups
15	Katchamart et al. (2014)	Strategic FM-procurement; aligning services to business needs	Theory on interconnections between FM procurement and business support, focusing on asset specificity.	7 case studies with semi-structured interviews demand and supply side

1) Note: because most researchers also included literature study and analysis of documents, this is not mentioned explicitly

**Annex B: Characteristics of 15 papers: response rates, practice involvement and output**

No	Authors	Response	Practice involvement	Output
1	Appel-Meulenbroek et al. (2014)	N = 138; response rate = 51%	Respondents = R&D employees, no FM people	Conceptual model for layout metrics and KS meetings; correlations
2	Gerritse et al. (2014)	N survey = 2,163; response rate = 33%	Survey respondents = end users; interviewees include FM directors	Conceptual model for demonstrating added (exchange and use) value
3	De Been et al. (2013)	N1 = 377; F4 response rate = 75%; N2 = 389 respondents; response rate = 73%	FM involved in initiation and feedback	Satisfaction scores (2 x ex-post + comparison with benchmark)
4	Beckers et al. (2013)	N = 14	Interviewees were facility managers	New ways of learning framework + parallels between NWoW and NWoL
5	Kok et al. (2013)	N = 1,752; response rate = 13% - 2-45% per institute	Respondents = lecturers, no FM people, no students	Multiple regression analysis with beta factors showing levels of correlation
6	Daatselaar et al. (2013)	N interviews = 10; N patients = 2	Respondents = staff members, no FM people, no patients	Impact of organisation and space on mean number of incidents per month, per patient
7	Groen (2014)	N surveys = 960; responses = 30-76%; N = interviews = 8	Respondents = patients, no FM people	Appraisal scores on 7-point Likert scales + associations with 'hospitality'
8	Van Sprang et al. (2014)	N = 217	Respondents = patients; nursing home staff administered the surveys	Impact factors on meal experience and meal appraisal
9	Kuijlenburet al. (2013)	N interviews = 4; N institutions = 2	Respondents = penitentiary staff	Impact of natural view and self-cooking on detainees' behaviour
10	Waroonkun et al. (2014)	N survey = 152; N interviews = 30	Respondents = students	Satisfaction scores on 5-point scales + correlation values of building efficiency
11	Redlein et al. (2013)	N = 82	Respondents = selected randomly among Top 500 companies	Insight in FM organisation, cost drives and cost savings
12	Redlein et al. (2014)	N Austria = 71; N Romania = 11	Respondents = selected randomly among Top 500 companies	Insight in FM organisation, cost drives and cost savings
13	Ashworth (2013)	N interviews = 10; N questionnaire = 62	Respondents = various stakeholders including FM people	Insight in the added value of FM and FM know-how
14	Meerman et al. (2014)	N1 = 12 BSc students (business); N2 = 4 academics (FM)	Respondents = business students and academics connected to FM	An extended Service Producty Measurement Model that integrates customer satisfaction
15	Katchamart et al. (2014)	N = 7 companies or public authorities	Respondents represent companies or public authorities, not specified	Overview of 7 types of asset specificity that add value to the core business