

Technical University of Denmark



## How Can FM Create Value to Organisations? – A critical review of papers from EuroFM Research Symposia 2013-2015

Jensen, Per Anker; van der Voordt, Theo

*Link to article, DOI:*

[10.13140/RG.2.1.2361.8089](https://doi.org/10.13140/RG.2.1.2361.8089)

*Publication date:*

2015

*Document Version*

Publisher's PDF, also known as Version of record

[Link back to DTU Orbit](#)

*Citation (APA):*

Jensen, P. A., & van der Voordt, T. (2015). How Can FM Create Value to Organisations? – A critical review of papers from EuroFM Research Symposia 2013-2015. EuroFM. DOI: 10.13140/RG.2.1.2361.8089

## DTU Library

Technical Information Center of Denmark

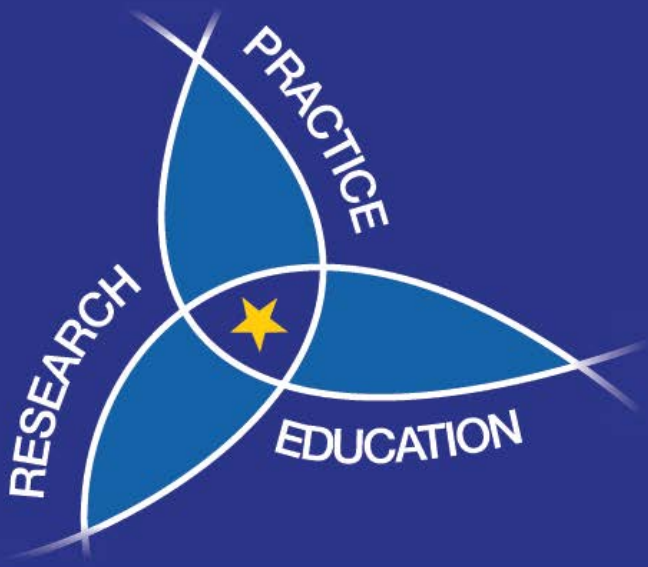
---

### General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.



**EuroFM**  
EUROPEAN FACILITY  
MANAGEMENT  
NETWORK

**The added value of FM**

# **HOW CAN FM CREATE VALUE TO ORGANISATIONS?**

**A critical review of papers from  
EuroFM Research Symposia 2013-2015**

**Per Anker Jensen and Theo van der Voordt**

**Research Report**

**A EuroFM Publication**

**April 2015**

# HOW CAN FM CREATE VALUE TO ORGANISATIONS?

A critical review of papers from EuroFM Research Symposia 2013-2015

Authors: Per Anker Jensen and Theo van der Voordt

Copyright © The authors and EuroFM

April 2015

Published by the European Facilities Management Network (EuroFM)

ISBN: 9789490694081

DOI: 10.13140/RG.2.1.2361.8089

Electronic version available at [www.eurofm.org](http://www.eurofm.org)

EuroFM Publications  
Gooimeer 4  
1411 DC Naarden  
The Netherlands  
Telephone: +31 35 694 27 85  
Email: [eurofm@eurofm.org](mailto:eurofm@eurofm.org)  
[www.eurofm.org](http://www.eurofm.org)

All reasonable care and attention has been taken in compiling this publication. The author and the publishers regret that they cannot assume responsibility for any error or omission contained herein.

All rights reserved. This publication may not be reproduced, re-used, re-purposed, stored in a retrieval system or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise without the prior permission of the publishers.

**The added value of FM**

**HOW CAN FM CREATE VALUE TO  
ORGANISATIONS?**

**A critical review of papers from  
EuroFM Research Symposia 2013-2015**

**Per Anker Jensen and Theo van der Voordt**

**Research Report**

**A EuroFM Publication**

**April 2015**

<b>CONTENT</b>	<b>Page</b>
Preface	1
Foreword	2
<b>1. INTRODUCTION</b>	<b>3</b>
<b>2. ADDED VALUE OF FM – A CRITICAL REVIEW</b>	<b>6</b>
2.1 Corporate Facilities	8
2.2 Learning Facilities	13
2.3 Healthcare Facilities	19
2.4 Temporary Housing Facilities	23
2.5 In-house FM on National Level	25
2.6 Performance Measurement	29
2.7 General Papers	35
2.8 General evaluation of all papers	37
<b>3. VALUE ADDING MANAGEMENT</b>	<b>43</b>
3.1 The Concept of VAM	43
3.2 The LEGO Case	45
3.3 The practice of VAM in Denmark and the Netherlands	48
3.4 Other aspect related to VAM	50
<b>4. LEARNING AND PROFESSIONAL DEVELOPMENT</b>	<b>51</b>
<b>5. CONCLUSION</b>	<b>53</b>
<b>6. FURTHER READING</b>	<b>54</b>
REFERENCES	55

## **PREFACE**

EuroFM's mission is the advancement of knowledge in Facility Management (FM) in Europe and its application in Practice, Education and Research. An understanding of how FM can add value to the organisations is crucial for the professional development. The topic has for some years obtained increasing attention in research. With this review of recent research in this field EuroFM provides an improved basis for such an understanding.

The former chairman of EuroFM's Research Network Group, professor Per Anker Jensen, Technical University of Denmark, proposed the formation of a research group on "The Added Value in FM". He has chaired the group from its establishment in 2009. The group has organised a number of workshops and has been an active part of the annual European FM Conferences (EFMC) with many dedicated sessions, papers and presentations as part of the research symposia as well as workshops and panel debates with practitioners and researchers.

One of the major results of the group until now was the publication of the book "The Added Value of Facilities Management – Concepts, Findings and Perspectives", which was launched at EFMC 2012 in Copenhagen at a plenary session with a presentation, reviews and discussion. The editors of the book were Per Anker Jensen, Theo van der Voordt, Delft University of Technology and Christian Coenen, ZHAW - Zürich University of Applied Science. It included contributions by 18 authors. All participants in the conference were offered a free copy of the book.

Since 2013 the group has been chaired evenly by Per Anker Jensen and Theo van der Voordt. A new result of their work is presented in this research report. The core of the report is a review of selected research papers from recent EuroFM Research Symposia: EFMC 2013 in Prague, EFMC 2014 in Berlin, and EFMC 2015 in Glasgow. In addition some papers have been reviewed that were presented at the international CIB FM Conference 2014 in Copenhagen, which focused on Using facilities in an Open World – Creating Value for all Stakeholders. The reviews provide overview and critical reflections on this new research and evaluate it in relation to knowledge building, management practice and professional development.

The review was originally written as a section for a planned book on "Evidence-Based FM" with a broader presentation of the research activities in EuroFM. However, as the plans for this book did not develop as intended, it was decided to publish the review as a separate research report dedicated to "The Added Value of FM".

EuroFM is pleased to publish this research report and we hope that it will be an important element in the advancement of knowledge in FM and be of inspiration for practitioners, students and other researchers for the activities in their organisations and a basis for further collaborative work in EuroFM. We would like to thank the authors for their contributions.

Ron van der Weerd  
Chairman of EuroFM

Keith Alexander  
Chairman of RNG 2013-2014

Susanne Balslev Nielsen  
Current chairman of RNG

## FOREWORD

When we presented our book on “The Added Value of FM” at EFMC 2012 in Copenhagen the reviewers from practice as well as academia were very positive. However, they also told us, that the book should not be seen as the end, but more like the beginning of investigating this important topic. We agreed with that and it gave us a strong incentive to continue our collaborative research across European borders. We continued by arranging paper sessions and workshops at the following EFMC’s and we were pleased to see that the interest in the topic both among researchers and practitioners continued to increase.

One of the learnings from our book from 2012 was that developing conceptual frameworks for mapping, analysing and visualising added value was useful but also had its limitations by being rather static and not very action oriented. Therefore, we put more focus on investigating how to manage and measure added value in practice and developing a practical management tool which we call Value Adding Management. We for instance investigated how practitioners in FM and Corporate Real Estate Management (CREM) deal with value adding by interviewing professionals from companies in Denmark and the Netherlands.

The main purpose of this report is to provide a state of the art of research and practice in relation to the Added Value of FM. This is done by making a critical review of research papers from FM conferences (chapter 2) and by presenting the concept of Value Adding Management (chapter 3) with results from our own research, including the investigation of management practice in Denmark and the Netherlands. This is supplemented by implications for learning and professional development in chapter 4, conclusion in chapter 5 and recommendations for further reading in chapter 6.

The report is for us a step on the way in creating an overview of the current development of knowledge concerning the Added Value of FM. One of our main concerns has been to evaluate, whether there is a cumulative knowledge building in this field. We must conclude that this is only to a limited degree the case. Therefore, there still is a strong need to develop more knowledge on the topic and in particular to develop a simple standardised model as well as methods and tools to measure and manage the added value of FM that can more easily be applied in practice.

In our aim to achieve this we are working on producing a second book with a more practical aim. We have invited a number of authors to contribute to this new book and organised an authors’ workshop in connection to the EuroFM meeting in The Hague, February 2015. We will soon start editing the contributions. The working title is “Facilities Management and Corporate Real Estate Management as Value Drivers – How to manage and measure added value? We expect this new book to be published in 2016.

Per Anker Jensen  
Technical University of Denmark

Theo van der Voordt  
Delft University of Technology

# 1. INTRODUCTION

The research group on “The Added Value of FM” was established in 2009 on the initiative of Per Anker Jensen, Technical University of Denmark, who was chairman of EuroFM’s Research Network Group in 2007-2008. He also became chairman of the new group, which included researchers from Denmark, Finland, The Netherlands, Switzerland and UK. The general background for establishing this collaborative research group was that the perception and application of FM during the last decades gradually has shifted from primarily steering on cost reduction towards managing facilities as a strategic resource to add value to the organisation and its stakeholders and to contribute to its overall performance.

More specifically, the background also was ongoing work in a NordicFM work group on the topic “Highlight the Added Values for Core Business Provided by FM”. The work group consisted of practitioners from Denmark, Norway and Sweden and was chaired by Ole Emil Malmstrøm, who was board member of EuroFM and former chairman of the Danish Facilities Management Association and the NordicFM network. Per Anker Jensen participated as the only researcher in the group and worked alongside on a research project called “Facilities Management Best Practice in the Nordic Countries”. Based on the combination of these two activities he developed the conceptual framework FM Value Map (Jensen et al. 2008 and Jensen, 2010), which was a basis for the new EuroFM research group. Ole Emil Malmstrøm participated as a practitioner in the research group, and the close interaction between research and practice has been an essential aspect of the development of knowledge on the added value of FM.

The research group started with a workshop in Copenhagen May 2009 and it has over the years met in a number of other workshops in different European countries. The first joint work in the group was to conduct a literature review on the added value of FM and related issues. This was done by combining research from three disciplines: FM, Corporate Real Estate Management (CREM) and Business to Business (B2B) Marketing. This resulted in the conference paper: “The Added Value of FM: Different Research Perspectives” (Jensen et al., 2010) for EFMC 2010, where the group presented the work at a plenary session followed by a panel debate with practitioners. The literature review was later developed into the journal paper: “In Search for the Added Value of FM: What we know and what we need to learn” (Jensen et al., 2012a) published in *Facilities*, where it achieved a Highly Commended Paper Award.

## **Joint book**

At a workshop with 18 participants during EFMC 2010 in Madrid the research group decided to write a book together. This was accomplished within two years, and the book: “The Added Value of Facilities Management – Concepts, Findings and Perspectives” (Jensen et al., 2012b) was launched at EFMC 2012 in Copenhagen. The editors were Per Anker Jensen, Theo van der Voordt, Delft University of Technology and Christian Coenen, ZHAW - Zürich University of Applied Science. The book includes contributions by 18 authors and is divided in four parts. The first part is introduction, including presentation of the three disciplines, FM, CREM and B2B marketing, as well as the making of the FM Value Map. The second part concerns theory and methodology. The third part includes empirical studies and the fourth part concludes with learning and perspectives. At EFMC 2012 the book was presented by the authors at a plenary session and reviewed by a panel of two practitioners and a researcher. All participants in the conference were offered a free copy of the book.



The research group also established a sub-group in 2010 chaired by Christian Coenen, ZHAW with a particular focus on the value chain in FM. They created a framework called FM Value Network focusing on stakeholder management and relationship value in FM. The framework was developed into a case study protocol, which was used in a study of the Learning Café in the Library at the University of Glasgow (Alexander, 2011). The sub-group wrote a joint chapter in the added value book called “FM as a Value Network: Exploring Relationships amongst Key FM Stakeholders” (Coenen et al., 2012) and later on the journal article “Facility Management Value Dimensions from a Demand Perspective” (Coenen et al., 2013), published in *Journal of Facilities Management*.

### **Contributions to EFMC 2013-2015**

During EFMC 2013 in Prague there were both a paper session at the research symposium and a workshop on the added value of FM. Besides, a number of other papers had relation to this topic and will also be reviewed in chapter 2. The topic of the workshop was: “How to manage and measure different value dimensions?” It was chaired by the three editors of the book from 2012 and 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. Prioritization of different types of added value showed to be highly subjective and depends on the participant’s position, experience and personal beliefs. Most prioritized values included the contribution of FM and CREM to the quality of life, the productivity of the core business, user satisfaction and sustainability. The participants found it difficult to mention concrete measures how to add value, partly due to different interpretations of the term “measures” as “interventions” and “ways to measure”. The answers ranged from concrete measures such as evaluate happiness, satisfaction and work support, create energy savings in building retrofitting, and take care of shuttle busses and parking facilities for bikes, to abstract measures such as steering on economics, efficiency and effectiveness, or ‘good price & value for the client’.

This inspired us to investigate the perception and application of the added value of FM among practitioners further. Therefore, we conducted a survey with 10 interviews of experienced practitioners - 5 from Denmark and 5 from the Netherlands - based on a common interview guide. The results were included in a conference paper for EFMC 2014 in Berlin (Van der Voordt and Jensen, 2014). This paper was presented during a paper session on the added value of FM at the research symposium. Like at EFMC 2013 there were a number of other papers with relation to this topic, which will be reviewed in chapter 2. Some of the results from our conference paper will be presented in chapter 3 on Value Adding Management. In the beginning of 2014 we decided to work towards publishing a second book on the added value of FM with a more practical focus than the first book mentioned above. The plans for this new publication were presented at the session during EFMC 2014 and a meeting with interested conference participants and potential contributors were arranged after the session. At the time of writing this report, the work on the new publication is in progress.

At EFMC 2015 the concept of the added value of FM came to the fore as well. In a pre-conference meeting we organized a second authors’ workshop to discuss the progress of our second book, as a follow-up of a first authors’ workshop at the bi-annual EuroFM meeting in the Hague, February 2015. In a paper session on Creating Value in Organisations three papers have been presented about the added value of facilities, one on educational facilities, another one focusing on multiplier effects through FM services, and the third one on performance measurement of public facilities.

### **Added value at CIB 2014**

With Per Anker Jensen being the chair of the organising and scientific committee of the CIB Facilities Management Conference in Copenhagen, May 2014, it is not surprising that the added value topic was included here as well. In line with the conference theme “Using Facilities in an Open World: Creating Value for all Stakeholders”, various papers were devoted to the added value of FM and related topics. We selected three papers to reflect on it, one paper about value adding space management and two papers about performance measurement.

### **Outline of this EuroFM report**

Chapter 2 of this report provides a state of the art of research and knowledge on the added value of FM based mainly on 21 selected research papers from EFMC 2013-2015 and CIB 2014, listed in Table 1. All EFMC papers have been published in Alexander (2013), Alexander (2014), and Alexander and Price (2015). The CIB 2014 papers have been published in Jensen (2014). Chapter 3 focuses on the process of Value Adding Management. This chapter is based on a chapter about this topic in our first book and a EFMC 2014 paper by ourselves about management practice in Denmark and the Netherlands. Chapter 4 discusses implications for learning and professional development, whereas in chapter 5 overall conclusions of this report will be presented. This report ends with suggestions for further reading and a list of references. References used in the reviewed papers are only mentioned, if they are not commonly used in research on the added value of FM and seen as being of special interest for the development of this research area.

## 2. ADDED VALUE OF FM – A CRITICAL REVIEW

The selected papers for this review have been divided in the following seven themes, supplemented with and a general evaluation:

1. Corporate Facilities (paper 1, 2 and 3)
2. Learning Facilities (paper 4, 5, 6 and 7)
3. Healthcare Facilities (paper 8, 9 and 10)
4. Temporary Housing Facilities (paper 11 and 12)
5. In-house FM on national level (paper 13, 14 and 15)
6. Performance Measurement (paper 16, 17, 18 19)
7. General papers (paper 20 and 21)

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 2013-2015 and CIB 2014. Both papers that explicitly referred to “Added value” and papers which in other ways seemed relevant to the topic were selected. We then made a critical review of each paper by reading the full paper and evaluating it according to a common list of criteria resulting in a written review of 1-2 pages per paper. The evaluation criteria were 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.

The detailed evaluations were divided between us. One of us reviewed all selected papers from 2013 and the other all selected papers from 2014. The 3 EFMC 2015 and 3 CIB 2014 papers were equally divided between us. We exchanged and commented on each other’s reviews and during this process a few papers were left out and a few others added. All these activities resulted in a list of 21 papers, which are reviewed in this chapter. We sorted them into themes, wrote the thematic reviews and commented on each other’s reviews in several rounds. Based on the thematic reviews we made the general evaluation. Table 1 shows an overview of the 21 papers that were selected for our review.

*Table 1: Selected papers for being reviewed*

No	Authors	Title	Country	Focus	Sector
1	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
2	Appel-Meulenbroek, De Vries and Weggeman (2014)	Layout mechanisms that stimulate behaviour of employees	Netherlands	Innovation by Knowledge Sharing	Offices
3	Gerritse, Bergsma and Groen (2014)	Exploration of added value concepts in FM practice: learning from financial institutes	Netherlands	Conceptual framework	Banks

4	Beckers and Van der Voordt (2013)	Facilitating new ways of learning in Dutch Higher Education	Netherlands	New Ways of Working and Learning	Learning facilities
5	Kok, Mobach and Omta (2013)	Can FM contribute to study success?	Netherlands	Study success	Learning facilities
6	Tinsfeldt and Jensen (2014)	Value adding space management in higher education.	Denmark	Space management	Learning facilities
7	Matzdorf and Greenwood (2015)	Student choice, league tables and university facilities	UK	Student choice	Learning facilities
8	Daatselaar, Schaap and Mobach (2013)	Added value of FM in Institutes for intellectually disabled residents	Netherlands	Disorderly behaviour	Health care facilities
9	Groen (2014)	Contribution of FM to hospital(ity) issues	Netherlands	Experience of hospitality	Health care facilities
10	Van Sprang, Pijls and Tonnaer (2014)	Capturing meal experiences in nursing homes: an exploratory study	Netherlands	Meal experience	Health care facilities
11	Kuijlenburg and Mobach (2013)	The influence of FM on detainees	Netherlands	User satisfaction	Prisons
12	Waroonkun and Prugsignant (2014)	Post Occupancy Evaluation for improving of main dormitories	Thailand	User satisfaction	Dormitories
13	Redlein and Zobl (2013)	Facilities Management in Austria 2012 – Value Add?	Austria	Economic effective implementation of FM	In-House FM
14	Redlein and Zobl (2014)	Facility Management in West- and Eastern Europe	Austria and Romania	Cost savings	In-House FM
15	Von Felten, Bohm and Coenen (2015)	Multiplier effects through FM services	Switzerland	Productivity	Not specified
16	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
17	Lavy, Garcia and Dixit (2014)	A framework for Key Performance Indicators for a holistic facility performance assessment	USA	Performance measurement	Not specified
18	Riratanaphong and Van der Voordt (2014)	Measuring the added value of workplace change: comparison between theory and practice	Thailand	Workplace change	Offices
19	Riratanaphong and Van der Voordt (2015)	Performance measurement of public facilities in Thailand: A case study	Thailand	Performance measurement	Offices
20	Ashworth (2013)	Added value of FM Know-how in the Building Whole Life Process	Switzerland + other countries	FM value creation	Not specified
21	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

## **2.1 Corporate Facilities**

There are three papers that deal with corporate facilities – all from the Netherlands.

### **Paper 1: The effects of interventions in an innovative office on satisfaction, perceived productivity and health complaints**

The paper by De Been and Beijer (2013, pp. 129-141) investigates staff satisfaction and perceived productivity in an almost new office building with desk sharing before and after a number of interventions to improve the office environment. The case organisation is an Environmental Protection Agency in the Netherlands.

#### *Theoretical foundation*

The paper does not include a separate section on theory and it is based on a limited number of references to literature on offices and new ways of working from FM, environmental psychology and ergonomics. There are no references to research on the added value of FM.

#### *Methodology and evidence*

The study applies Post Occupancy Evaluation (POE) methodology based on two rounds of questionnaire survey. The first survey was conducted nine months after occupation and the second exactly 2 years later. The number of responses was around 380 in both surveys with a very high response rate - around 74%. The interventions were made based on the results of the first survey and included changes in relation to indoor climate, acoustics and IT.

The results showed improved performance in most satisfaction scores as well as in perceived productivity. However, the satisfaction with indoor climate was lower in the second survey. Comparison with benchmark data from other Dutch office buildings shows that the satisfaction with the case building was quite high even based on the first survey and based on the second survey the office environment performs very well.

#### *Practical relevance*

The study is relevant for facilities managers in office based organisations and designers of office buildings. The results contribute with new evidence on innovative office with desk sharing in general. The investigation of the effects of interventions is particularly relevant and interesting.

#### *Conclusion*

The paper provides an interesting empirical study, which contributes to evidence based on POE methodology. It is a rare study with POE conducted both before and after interventions. The paper does not contribute to theory on added value, but it provides empirical evidence in relation to benefits in terms of satisfaction and productivity. It does not deal with sacrifices. The results are of interest also in other countries.

### **Paper 2: Layout mechanisms that stimulate behaviour of employees**

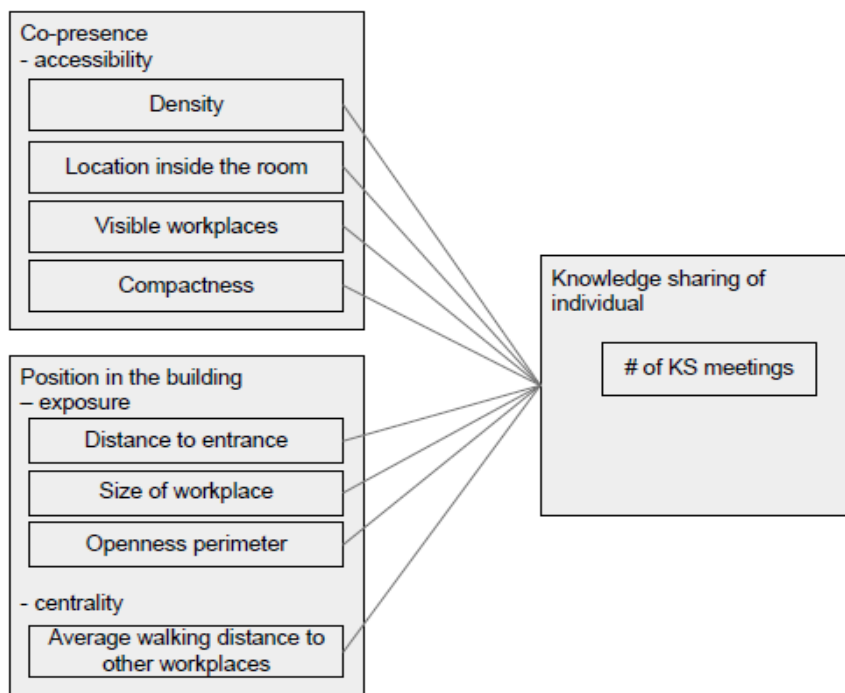
The paper by Appel-Meulenbroek et al. (2014, pp. 5-17) concerns a research and development (R&D) office environment in an industrial company (Océ Technologies). The paper explores how FM can contribute to stimulate innovative behaviour like knowledge sharing (KS) as a means to improve the effectiveness of a R&D organisation. To be able to show the added value of the work environment, quantitative metrics have been used to discover the underlying mechanisms for evaluating office design.

### *Theoretical foundation*

The paper includes some references to research on the added value of FM and CREM, but the theoretical foundation is mostly literature on KS and layout mechanisms, which are common sources in FM-related research on workplace and space management. The general used distinction in knowledge management between tacit and explicit knowledge is applied and layout mechanisms such as accessibility, centrality and exposure are presented. Former layout studies point out that people are more inclined to cooperate when they see each other, for a long(er) time or when passing by. A distinction is being made between co-presence (number of people visible), and movement (number of people moving along a path). It was expected that 1) working in visually open layouts enhances face-to-face interaction through seeing and overhearing; 2) spaces that are centrally located and have connections to many other places enhance unplanned interactions; and 3) because of exposure, employees sitting close to the flows of movement interact more.

### *Methodology and evidence*

Paper 2 applies a research design based on Realistic Evaluation theory (Pawson and Tilley, 1997), which tries to identify mechanisms behind the working of programs. To do this the study identifies quantitative metrics of CRE to investigate correlation with organizational outcome metrics. The conceptual model shown in Figure 1 is developed and applied. The CRE metrics are related to office layout and collected by computer based analyses of floor plans by so-called isovist and visibility graph analyses, using Space Syntax software. The study is based on statistical analysis of correlations between eight quantitative layout metrics that were linked to co-presence/accessibility, exposure and centrality (see Figure 1), and several knowledge sharing behaviour metrics, obtained from office staff with logbooks over one week, to record who meets who, where, how often, and in what kind of interaction. The logbook survey had a response of N = 138 (response rate 51%), resulting in 1907 KS meetings. These are categorised in five KS activities: Descriptions, questions, actions, proposals and evaluations.



**Figure 1:** Conceptual model for layout metrics and KS meetings

The findings show that from the three mechanisms identified from literature only accessibility and centrality had a significant association with the amount of KS meetings. Visibility of colleagues appeared to have a positive correlation of .355, whereas the average walking distance to roommates lowered the amount of KS meetings (correlation .181). The centrality metric showed a decrease in KS meetings with an increase in walking distance to other places (correlation .183) and a decrease in density (.181). Participants in denser environment used meeting areas more often, possibly not to disturb others. Apparently, the exposure mechanism was not really triggered in this case.

#### *Practical relevance*

The paper shows that FM can support and improve the primary process of their clients significantly. The case company could identify with the findings and they felt that the layout metrics represented their building correctly. It also helped FM to discuss the plans for a renovation program with the general management. It will be necessary to have a relevant list of (layout) metrics for each different added value to prove how FM/CREM interventions trigger the desired mechanisms. Realistic Evaluation emphasizes the influence of the context on outcomes. FM departments have to look within their own “black box” and see how layout mechanisms are best implemented to support the specific goals of their client or customers.

#### *Conclusion*

Paper 2 concludes that a focus on unit costs and building condition rather than overall costs and effectiveness will keep FM from capturing full strategic attention. The findings proved that different layout mechanisms exist and that Realistic Evaluation and the quantitative layout metrics that were used are a valid way to study the influence of the work environment on knowledge sharing. However, the study also showed that the influence of the work environment remains hard to be proven empirically. The strong influence of the context on the working of the mechanisms makes it also hard to generalize the results to other organisations.

### **Paper 3: Exploration of added value concepts in FM practice: learning from financial institutes**

The paper by Gerritse et al. (2014, pp. 52-63) concerns overall FM performance in 6 Dutch financial companies with an in-depth case study on office buildings belonging to one bank (ING Netherlands). The paper aims to show the practicality of added value concepts for FM in financial institutes. It tries to respond to the call for further development of FM performance beyond costs to capture and to manage the total value of FM for core business and corporate performance.

#### *Theoretical foundation*

This paper has a particular strong foundation on earlier added value research. The study builds directly on the FM Value Map, but on a number of other references from recent literature on added value as well. The paper also refers to a more general study on business innovation by Low (2000) resulting in nine non-financial value drivers and a value creation index, and showing that innovation, management quality and employee relations have the greatest impact on market value for the involved top 500 companies. The empirical study in the paper applies a list of ten added values derived from earlier FM/CREM research.

#### *Methodology and evidence*

Paper 2 includes a literature review to explore added value in business practice. The field research included an exploratory multiple case study at 6 financial institutes and one in-depth case study. Core topics were explored in a focus group with five experts. The interviews with facility managers

and estate managers were based on methods used in earlier FM/CREM research and focussed on definitions of added value(s) and priorities. The in-depth case study included a survey with the end users (N= 2163; response rate 33%).

According to the respondents the added value of FM can be defined as “the provision of an effective, inspiring and comfortable working environment in a cost efficient manner in which quality levels and costs are balanced, and the facilities optimally support the core business and contribute to the image of the organisation”. Beside cost control FM can contribute to support of productivity, risk control, increase satisfaction, support image, and increase sustainability. There is clear preference and need for cost reductions and cost control by FM. Increasing productivity and customer satisfaction are highly prioritised as well. Pursuing cost reductions is going to have a negative effect in other areas if not in balance with effectiveness and may result in decreased productivity, decreased customer satisfaction and reputational damage. The results also show the influence of time: all respondents indicated the influence of the current financial crisis on their current FM policy.

Successful interventions to reduce costs are reduction of m<sup>2</sup>, smart contract management, improvement of the workplace ratio, and economies of scale. Interventions to improve productivity were flexibility of workplace and workplace layout, activity based working, inspiring environment (ambiance and appearance), and accessibility and availability of workplaces. For the image value, interviewees identified appearance of the built environment, maintenance, interior design, sustainable design, hostmanship (hospitality), and risk management as FM success factors. All critical success factors have been mapped in a conceptual model for the management of added value, see Figure 2.

The in-depth case study illustrates how management of added value can be integrated in FM-operations. It also showed that the end users of FM products and services ranked risk control as highest important value, followed by support of productivity and satisfaction, and support culture as lowest important.

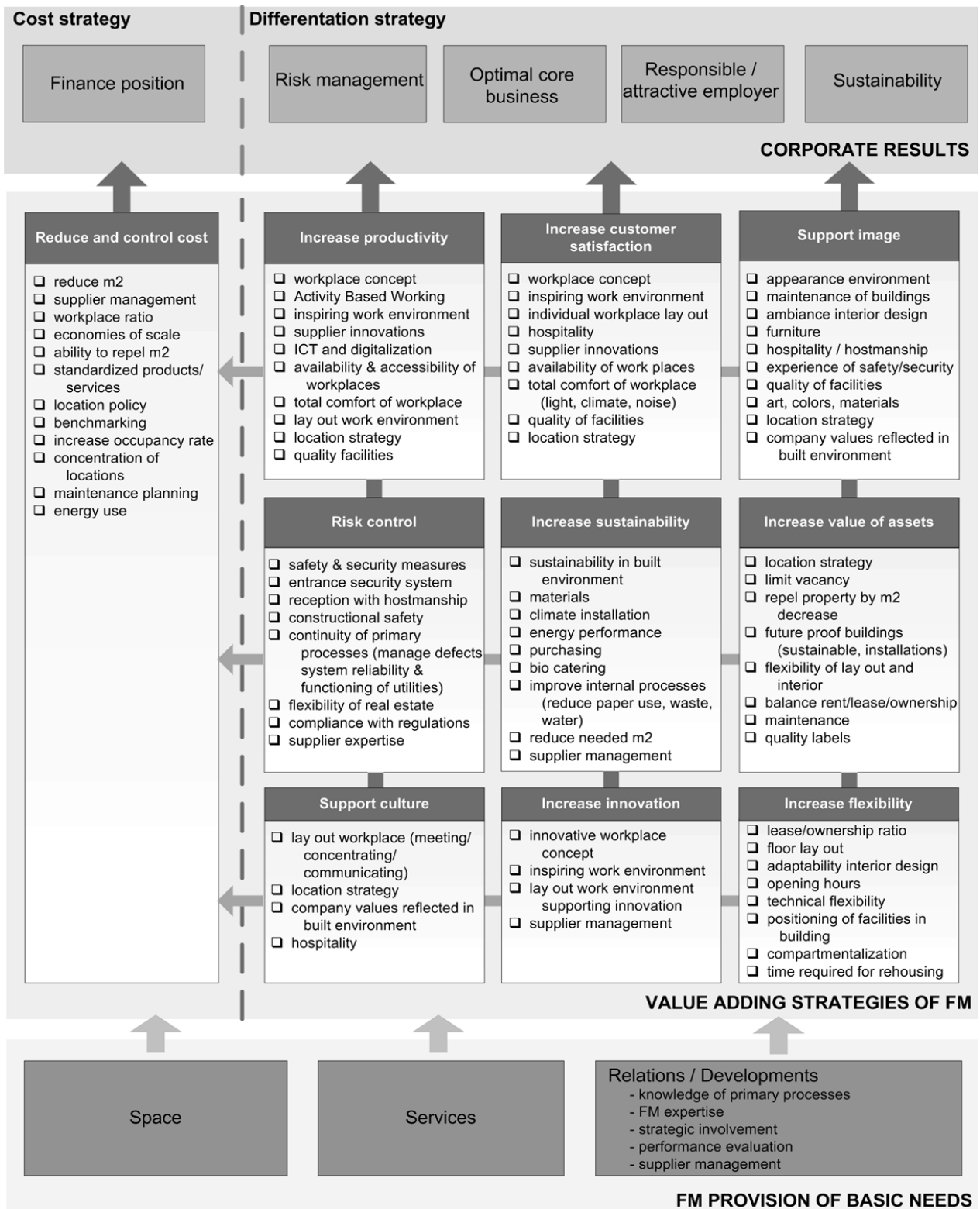
#### *Practical relevance*

Paper 3 confirms the growing awareness of the added value of FM and CREM and the relevance of the distinction between effectiveness and efficiency and between use value and exchange value. It clearly links possible input factors i.e. interventions in the accommodation, facilities, services and FM process to possible outcomes i.e. better performance of the organisation. The findings on prioritised values and the visualisation of relationships between inputs and outcomes can be used to support decision-making. By using the same language of adding value strategies in an operational tool like a customer satisfaction survey, organisations can combine end-user information with strategic management information.

#### *Conclusion*

This paper is an important contribution to the conceptualisation and visualisation of the added value of FM. However, the evidence for cause-effect relationships between input-throughput-output variables is mainly based on a literature review. The interviews show opinions and practical experiences but no hard evidence based on measuring the outcomes. Further research is needed to clarify how different FM customers (clients, customers, end users) consider the importance of different FM added values, and to explore sector specific and generic performance indicators that correlate between corporate performance and FM performance.





**Figure 2:** Conceptual model for demonstrating added (exchange and use) value

## **Evaluation of paper 1, 2 and 3 on corporate facilities**

*Theoretical foundation:* Paper 1 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. Paper 2 and 3 both have a foundation in earlier research on the added value of FM and CREM and both papers refer to the general distinction between use value and exchange value.

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

*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 2 and 3 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.

## **2.2 Learning Facilities**

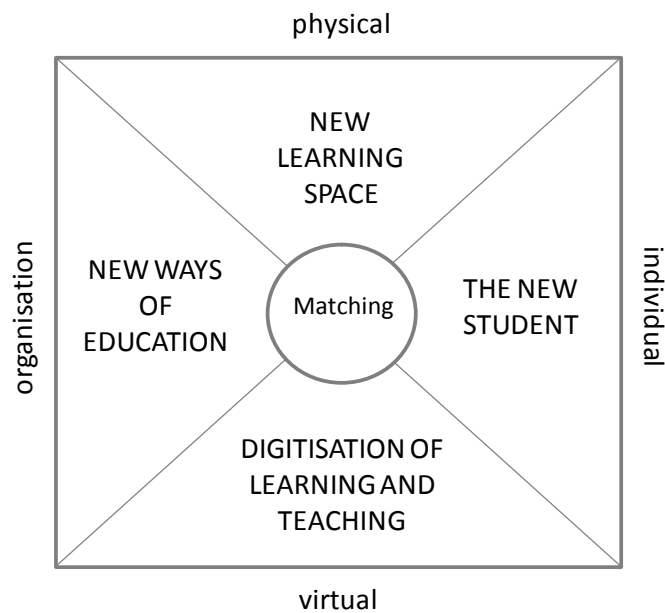
There are four papers about learning facilities, two from the Netherlands, one from the UK and one from Denmark.

### **Paper 4: Facilitating new ways of learning in Dutch Higher Education**

The paper by Beckers and Van der Voordt (2013, pp. 25-35) investigates how facility managers in higher education institutions can align the learning facilities to the changing demand of modern education. The starting point is an analogy between new ways of working in relation to office environments and new ways of learning. Based on a framework from new ways of working a comparison is made between basic drivers and assumptions of new ways of working and new ways of learning, which shows many similarities. The framework consisting of four focus areas - Organisation, Individual, Physical and Virtual – is adapted to new ways of learning, see Figure 3.

#### *Theoretical foundation*

The paper has a foundation partly in theory on new ways of working and partly in theory about recent developments in learning and educational facilities. New ways of working has been one of the most important areas from the early days of FM research with seminal work by for instance Franklin Becker and Francis Duffy, which the paper refer to together with more recent research on knowledge work. The paper does not build directly on research on the added value of FM, but it is concluded, that conceptual frameworks regarding adding value by facilities can be helpful to balance different needs and objectives from a core business point of view and requirements from other stakeholders such as the end users and technical managers.



**Figure 3:** Four focus areas of new ways of learning

#### *Methodology and evidence*

The study applies a qualitative research methodology based on multiple data collection with interviews with 14 facility managers at Dutch Higher Education Institutes, document analyses of organisational strategies and housing plans, and walk-throughs. The study involved 14 of the largest Dutch Higher Education Institutes representing a total market share of 84% of all students in such institutes. In that respect the evidence base is very broad. The study is limited to the perception of the supply side, but the authors mention that the results show a remarkable similarity with another recent Dutch study concerning the perception of new ways of learning among educational professionals.

The paper is concluded with a list of 10 points of attention to cope with new ways of learning. This is supplemented with recommendations for how to incorporate these 10 attention points in space management and to take care of an integral approach of new ways of learning. The recommendations are formulated in 4 matching criteria:

- Try to develop a common language between education people and people that are responsible for real estate and other facilities;
- Organize user contact at all levels;
- Deal with differences between planning horizons of education and accommodation;
- Consider the effects of fixed scheduling of lessons in classrooms.

#### *Practical relevance*

The research has been carried out with comprehensive inputs from practice via interviews. The research topic also has a clear relevance for many FM practitioners responsible for learning environments. The framework and the list of 10 points of attention to cope with new ways of learning provides a good reference for practitioners and the 4 mentioned criteria provides concrete management advice on how to incorporate the 10 point into practice.

### *Conclusion*

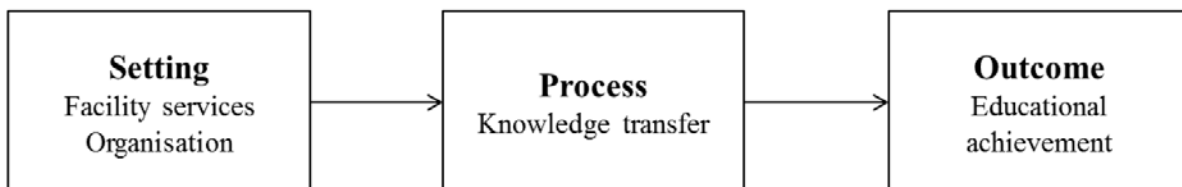
The paper provides an original contribution to research on how to manage modern learning facilities in higher education by incorporating theory from the comprehensive research on new ways of working to the developing practice and research field of new ways of learning. The 4 mentioned criteria is a good example of value adding management in a specific context. The evidence base is quite comprehensive on a national level, even though the study is limited to the perception on the supply side. The trend towards new ways of learning is international and the results of the paper are also relevant for learning environments in other countries.

### **Paper 5: Can FM contribute to study success?**

This paper by Kok et al. (2013, pp. 36-43) investigates the relationship between FM provision and the learning outcome of Dutch Universities of Applied Science. The learning outcome was measured as the percentage of students who successfully leave the university within five years after attending. The FM provisions were based on a preliminary analysis of a national online questionnaire survey among lecturers. It included 40 items of FM provisions that were evaluated by the respondents.

### *Theoretical foundation*

The paper only includes limited theoretical explanation but refers to an extensive literature review presented earlier in a journal paper by the same authors (Kok et al., 2011). The journal paper includes a comprehensive review of FM literature, literature on the added value of FM, and some references to educational research. The understanding of value perception is based on marketing literature. The conference paper presents a conceptual model of added value of FM in the educational environment that is based on the common triple of input – throughput – output, see Figure 4.



**Figure 4:** *Conceptualisation of the added value of facility services in educational environments*

### *Methodology and evidence*

The study applies a quantitative research methodology based on a national online questionnaire survey supplemented with additional data gathered by desk research. The sample included 1,752 responses from 18 Universities of Applied Sciences (UAS). The questionnaire was developed from the extensive literature review presented in the earlier journal paper. The data were analysed statistically based on a regression model to measure the effect of size, religious identity (Christian/non-Christian) and perceived quality of facility services on study success. With data from 18 out of 39 Dutch Universities of Applied Sciences the evidence base is quite comprehensive in a national context. The main limitation is that the study is based on responses from teachers only and not from students, which the authors also recognise.

The results show that the size of universities measured by number of students strongly negatively relates to study success. After controlling for size, universities with a Christian identity showed significantly better educational achievements than institutions without a religious identity. Only seven of the facility components showed a statistically significant relationship with study success. Items with regards to classrooms, classroom conditions, ICT facilities, cleanliness, front office and local printing were positively related to study success, while traditional workplaces showed a negative relation with study success. Items like layout, fitting out, and general facility services did not show a statistically significant relationship with study success. The authors conclude that these findings document that facility services can assist the quality of higher education and that a prime consideration in learning space design is the facilitation of social interaction.

#### *Practical relevance*

The research has been carried out with comprehensive responses from teachers. The results are probably mostly of practical interest for university managers, designers and facility managers. The study provides statistical evidence for the added value of FM in to learning environments and impact on study success and shows which facility components are of particular importance. However, it will require more detailed studies to identify which qualitative aspects make a difference for each of these components. In the present form the results are difficult to apply in practice. The other findings in relation to size of institutions and impact of some facility components on study success are of interest for other countries, although it is unlikely that they can be directly generalised.

#### *Conclusion*

The paper provides important empirical evidence of the added value of FM in relation to study success in higher education. It provides novel statistical documentation showing that some facility components have significant impact on learning outcome. The evidence base is quite comprehensive on a national level, but it is an important limitation that only the views of teachers and not of students are included. Most of the results are of interest for learning environments in other countries.

### **Paper 6: Value adding space management in higher education**

The paper by Tinsfeldt and Jensen (2014, pp. 369-380) presents a methodology for space optimisation in educational facilities, that can add value to organisations. Its focus is on gymnasiums in Denmark. All Danish gymnasiums changed from being state-owned to being self-governing and function nowadays to a high degree as independent companies. New governmental regulations regarding the maximum number of students in each class, reduction of public payment, and modern teaching methods challenge real estate and facility managers to rethinking the accommodation strategy to optimally fit both with the organisational objectives and the organisational culture, new teaching methods, and new financial and political conditions.

#### *Theoretical foundation*

Based on a review of literature on space management, the index for space utilisation developed by Che Ani et al. (2012), and a distinction between effective and efficient use of space and perceived versus actual space utilisation, a number of space optimisation initiatives have been identified that could lead to improvement in space utilisation as well as in learning environments. The empirical findings are used as input for a critical assessment of the theory and methods of Post-Occupancy Evaluations (POE) – with a focus on the version published by the Higher Education Funding Council for England (Blyth et al., 2006) and a new data-collection tool, the USEtool.

### *Methodology and evidence*

The research is based on two case studies of two Danish gymnasiums using methods from Post-Occupancy Evaluation (POE) - document analysis, interviews with the heads of the schools, the facility managers, seven teachers and the chairman of the student council, walk-throughs, observations and questionnaire surveys - and the USEtool. The USEtool has been developed in Norway (Hansen et al., 2011). It focuses on the usability of the building. An essential part of the USEtool is a facilitated walk-through in the building followed by a workshop together with users. The paper mentions a response rate of 100% to the questionnaire survey with students representing three classes at three different levels at each gymnasium. However, no numbers of respondents are included.

### *Practical relevance*

The paper provides examples of how value adding space optimisation processes can be undertaken with extensive user involvement and recommends a new space optimisation procedure including 11 proposals for space optimisation for case 1 and 7 proposals for case 2. However, the research is only based on two case studies in Denmark, which limits the possibility to generalise. The new recommended procedure has not been empirically tested in new cases. Financial costs and benefits are not included at all. Remarkably, none of the two gymnasiums have managed to integrate their use of space with their overall strategic goals such as creating spaces that better can support the teaching, motivate students and teachers, attract more students, and increase the utilisation of existing space to accommodate an increasing number of students.

### *Conclusion*

Paper 6 shows promising ways to optimise space utilisation using POE and the USEtool. It sheds light on which aspects should be included in POE, with as most important aspects Strategic Value, Aesthetics and Image, Space, and Comfort. Additional case studies are needed to test the proposed procedure, both in educational environments and other sectors.

## **Paper 7: Student choice, league tables and university facilities**

The paper by Matzdorf and Greenwood (2015) discusses the impact of a universities ranking and expectations about high quality facilities on student's choice where to study. As a form of benchmarking customer satisfaction, quality, levels of service provision, or popularity, league tables have become a widely applied feature to indicate the performance of comparable organisations in the UK. The current study relates university rankings to (perceived) quality of facilities.

### *Theoretical foundation*

The paper compares the findings of various studies into influencing factors on student choice where to study. It discusses variables such as the reputation and status of the university, type of university, its ranking, location, price, quality of campus, recreational facilities and learning resources, but it does not include a clear theory or a conceptual framework of input-through-output factors.

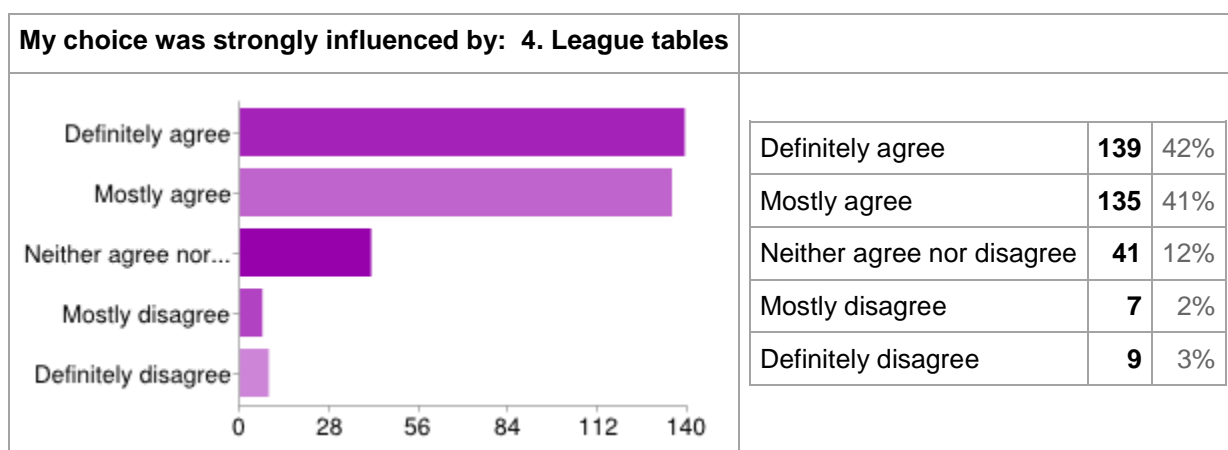
### *Methodology and evidence*

The study aims to establish whether the facilities provided at the University of York had any influence on either the league tables or on students' choice of university. The paper builds on a literature review of former studies into influencing factors on students' choices where to study (for instance Price *et al.*, 2003, who surveyed 8,742 students across 9 English universities). The empirical data are derived from the annual York University Student Union survey with 2,382

responses and 3,500 focus group comments, a survey carried out by one of the authors with 331 responses and 144 comments from focus groups, and results from the Unite Student Experience Report 2012 based on 1,236 responses. The numbers of respondents are quite huge. However, the study is limited to one university and it was not possible to randomise or select samples.

*Practical relevance*

Whereas former studies showed an unclear picture, the current paper confirmed a strong influence of league tables on students’ choice, see Figure 5. Top league universities tend to be selected with a focus on reputation, although there are also students that avoid a top university because they think not to be suitable for the top 5. Personal preferences regarding the location and the cost play an important role as well. Whilst university facilities do not feature high on students’ selection criteria, there are expectations that high ranked institutions come with top class facilities. If not, facilities may act as a dis-satisfier. Students, whose expectations of their institution’s facilities are not met, may vent their disappointment via national satisfaction surveys.



**Figure 5:** Influence of league tables on students’ choice of university

*Conclusion*

The data clearly show the impact of league tables on student choice where to study. Although the impact of high quality facilities seems to be limited, a lack of quality may result in dissatisfaction once the university is selected as a study place. Due to the limitation to one case, the findings cannot be generalised yet. According to the researchers the questionnaire needs redesigning for wider applicability.

**Evaluation of paper 4, 5, 6 and 7 on learning facilities**

*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 focusses on relationships between inputs i.e. facility services and outcomes i.e. study success. Paper 6 builds on a review of literature on space management and a critical assessment of the theory and methods of Post-Occupancy Evaluations (POE) and a new data-collection tool, the USEtool, whereas paper 7 builds on former findings on the impact of facilities on student’s choice where to study.

*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. Paper 6 is based on 2 case studies using mixed methods, and paper 7 is based on 3,950 user responses and over 3,600 focus group comments,

*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.

Paper 6 included interviews with practitioners, whereas paper 7 was initiated by decision makers due to a drop in the ranking of the involved university.

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

### **2.3 Healthcare Facilities**

There are three papers about healthcare facilities, also all from the Netherlands.

#### **Paper 8: Added value of FM in Institutes for intellectually disabled residents**

The paper by Daatselaar et al. (2013, pp. 190-198) 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. The paper was presented at a workshop as research in progress.

#### *Theoretical foundation*

The paper is mostly based on literature on environmental psychology and evidence based design of healing environments. Besides, there are some references to the general literature on FM including research on the added value of FM.

#### *Methodology and evidence*

The study applies a qualitative research methodology with multiple methods including 10 interviews, document analysis and observations. Reported incidents of disorderly behaviour for two residents in one institution are measured and compared in 4 periods with differences in organisational and spatial conditions. The evidence base is quite limited. However, the study is explorative and longitudinal, and it concerns a type of facility that it rarely studied from a FM perspective.



The study shows that a reduction in stimuli can improve the quality of life of residents. Stimuli can occur both in organisation and in space. In periods where there were an individual and stable team, a standardised approach and individual accommodations less incidents were reported than in periods with a group team, team changes, no standardised approach and accommodation of residents in group accommodations.

#### *Practical relevance*

The research has been carried out with involvement of practitioners. The research was approved by the Medical Ethics Review board and was conducted with permission from the parents of the residents and the management of the institutions. The results are of practical interest for designers, facility managers, general managers and designers of institutions for intellectual disabled residents.

#### *Conclusion*

The paper provides novel and interesting insights concerning the influence of FM on behaviour in an unusual type of facility. The evidence base is limited but the paper creates a basis for further research in this specific context and contributes to the general understanding of the added value of FM.

### **Paper 9: Contribution of FM to hospital(ity) issues**

This paper by Groen (2014, pp. 129-138) explores what aspects of a hospital stay are related most to hospitality according to patients. It is based on a study involving patients at three hospitals in the Netherlands.

#### *Theoretical foundation*

The study adopts a definition of hospitality that refers to a host that provides security, psychological and physical comfort for a guest who is away from home, the coming together of a provider and receiver, and a blend of tangible and intangible factors. Hospitality serves as a means for the host and the guest to protect both from hostility. The study secondly builds on a definition of hospitality as a contemporaneous human exchange, which is voluntarily entered into, and designed to enhance the mutual wellbeing of the parties concerned through the provision of accommodation and food or drink. And third, it adopts the four dimensions of hospitality: spatial, temporal, behavioural, and physical. Many of the tangible factors (accommodation, food and drink, cleanliness) are taken care of by FM, whereas the dimensions attitude and behaviour refer to both FM and medical staff. The paper includes references to research on the added value of FM.

#### *Methodology and evidence*

In addition to a review of literature three surveys were conducted in which hospital patients were asked: 1. To rate hospital staff on behavioural aspects regarding hospitality; 2. To select characteristic aspects of hospitality; and 3. Which aspects patients value most. The surveys were disseminated in 5 departments of three different hospitals, with a total N = 960 and response rates ranging from 30% to 76%. The survey method was developed based on the Experience Indicator from Sentea Multisensory Concepting and a pilot in a regional hospital. Questions could be answered on 5 or 7 point Likert scales. At one of the hospitals the quantitative survey was supplemented with a qualitative survey including 8 in-depth interviews with patients from one department.

Taking adequate time, listening, involvement and quality of care were associated most frequently with hospitality. The sample showed significant differences between four generations and between

outpatients and clinical patients. Within the behavioural dimension patients valued 'being taken care of' highest. They want to be set at rest, reassured, and set at ease. Other often mentioned aspects were friendliness, reception, respect, adequate information, and empathy. Aspects of space and facilities were also mentioned, but less often, mainly referring to the availability of coffee in waiting areas, and adequate spaces, also for people in wheelchairs or walkers. The results show some particularity of hospitality in a hospital environment compared with similar research from hospitality industry (hotels etc.). Hospital patients belong to a special type of guest called 'those in need'.

#### *Practical relevance*

The results are mostly of interest for facilities managers and general managers in hospitals and FM providers of services related to hospitality. The different aspects that patients associate most with hospitality and its connection to the four dimensions of hospitality can be used to develop or test a hospitality strategy and to define priorities in FM processes, facilities and services. Although the behavioural dimension was mentioned most often, the physical dimension showed to be an essential element for the perception of hospitality as well.

#### *Conclusion*

This paper provides an important contribution to a topic, which has had little attention earlier in FM research. It contributes to a better understanding of one value parameter: hospitality experience, from the perspective of hospital patients. It is less clear which interventions will contribute to which particular aspects of hospitality.

### **Paper 10: Capturing meal experiences in nursing homes: an exploratory study**

The paper by Van Sprang et al. (2014, pp. 107-116) explores the experience construct and shows data from measuring the meal experiences of elderly clients living in nursing homes. The study involves residents in 8 different institutions in the Netherlands.

#### *Theoretical foundation*

The study is based on the definition that experience is the interaction between the individual and his or her environment, containing functional, mechanical and humane clues, and the inner responses to this interaction. It builds on a holistic conceptual model of the experience construct. It also builds on former studies showing that external triggers in the social and physical environment can partly compensate for a reduction in the elderly's perceptiveness, and that a multi-sensory experience activates the physical processes of people, triggers a person's memory and stimulates eating.

#### *Methodology and evidence*

The study combines qualitative and quantitative research in an innovative way by using a specially developed measurement box based on research on service clues. By including gaming elements residents were triggered to express their thought and feelings with meal experience. The measurement box provided quantitative data that were analysed statistically. This was supplemented by qualitative data based on open questions to the same respondents. The survey was conducted in the post experience phase (after the meals were finished). It was completed by N = 217 elderly people with a mean age of 84.5 years.

Statistical analysis of the responses confirmed that three types of clues can be distinguished as separate factors in meal experience: functional clues (e.g. menu choice, time of having dinner, temperature of the food, presentation on the plate), mechanical clues (sensory perception of the

physical environment e.g. the ambiance of the restaurant) and humane service clues (behaviour and appearance of service providers i.e. general staff and staff of the restaurant). Based on satisfaction scores a number of items for improvement of all service clues came to the fore. The study did not succeed in differentiating between cognitive and affective responses to meal experience.

#### *Practical relevance*

The results are of particular interest for facilities managers and general managers in institutions for elderly people and providers of catering. The questionnaire and measurement box showed to be practically applicable and result in clear responses from the elderly. Probably the same method can be used in other settings as well. The qualitative data can be used as input for improvements.

#### *Conclusion*

This paper – like paper 9 - provides an important contribution to a topic, which has had little attention earlier in FM research. The study shows the importance of being clear about the different aspects of a complex construct such as experience. It also shows the value of a mixed methods approach and building on existing and validated measurement tools.

The use of smileys to measure satisfaction and weather symbols to measure a respondent's affective assessment seems promising but has to be tested on its validity.

### **Evaluation of paper 8, 9 and 10 on healthcare facilities**

*Theoretical foundation:* Paper 8 is mostly based on literature on environmental psychology and evidence based design of healing environments. Papers 9 and 10 have some references to earlier research on the added value of FM. The paper both mostly 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 8 is a fairly limited explorative study based on a mix of qualitative methods. Paper 9 and 10 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 importance of the specific context even within one sector like healthcare. Paper 8 concerns intellectual disabled residents, paper 9 concerns hospital patients and paper 10 concerns elderly people in nursing homes. These differences in contexts give different methodological challenges and different results. In paper 8 data had to be collected from staff and incident reports, while paper 9 and 10 are based on data from the end users. Research among elderly people in paper 10 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.

## **2.4 Temporary Housing Facilities**

There are two papers on temporary housing facilities, one from the Netherlands and one from Thailand.

### **Paper 11: The influence of FM on detainees**

The paper by Kuijlenburg and Mobach (2013, pp. 98-107) investigates the influence of FM on the behaviour of detainees in prison facilities. The paper is based on the assumption that FM can contribute to re-socialization by actively using facility design and detainee activities to positively influence their social behaviour.

#### *Theoretical foundation*

The paper is mostly based on literature on environmental psychology and evidence based design of healing environments. Besides, there are a number of references related to the specific topics of natural views and cooking. There are hardly any references to the more general literature on FM.

#### *Methodology and evidence*

The study applies a qualitative research methodology based on literature review, desk research, walk-through and four interviews with prison managers and facility staff in two Dutch prisons – one placed in the countryside and one placed in an urban environment. The literature review mostly focuses on two aspects of FM – natural views and cooking (self-cooking or not). With only 4 interviews in 2 institutions the evidence base is quite limited. However, the study is explorative and concerns a type of facility that is rarely studied from a FM perspective.

The paper concludes in general that FM influences the behaviour of people. Concerning both natural views and cooking the interviews indicated positive effects but also a risk of more kitchen incidents. These conclusions are considered as indecisive and need further research.

#### *Practical relevance*

The research has been carried out with involvement of practitioners. The results are of practical interest for designers, prison managers and facility managers even though the specific conclusions are indecisive. The results could be of interest in other countries.

#### *Conclusion*

The paper provides novel and interesting insights concerning the influence of FM on behaviour in an unusual type of facility. The evidence base is limited but the paper creates a basis for further research in this specific context and contributes to the general understanding of the added value of FM.

### **Paper 12: Post Occupancy Evaluation for improving of main dormitories**

The paper by Waroonkun and Prugsignant (2014, pp. 329-338) presents the findings of a Post Occupancy Evaluation (POE) of the Choeng Doi dormitories of the Chanmai University in Thailand. These dormitories were built in 1965 and consist of 3 to 4 storey buildings, comprising 6 male dormitories and 9 female dormitories. After over 40 years the dormitories required renovation and modernization. The university wanted the dormitories to be not only a regular accommodation but also an environment for education and the development of social skills. In 2007 the existing buildings were upgraded by integrating the social welfare and student halls to create a Living and Learning Center. The paper aims to evaluate the success of its refurbishment and the viability of POE theory in producing building guidelines that result in a better living and learning environment.

### *Theoretical foundation*

The study builds on eight criteria of building evaluation that were found in the literature and on POE theory that has been developed since the 1980's. It also refers to studies into student housing and student development showing a significant decrease in the number of first year students vacating dormitories that had adopted the Living and Learning Concept (LLC). Major elements of the LLC are: 1) the need for creative activities in various fields, such as academic group discussions; 2) the presence of active staff and students to provide consultation and guidance; 3) an arrangement of the physical environment that encourages student collaboration, such as a living room and recreation room; 4) an inclusion of interesting activities and courses such as cooking and dancing; 5) the creation of feedback mechanisms.

### *Methodology and evidence*

152 randomly selected students who resided in the dormitory in 2009 filled out a questionnaire. The selection utilized purposive sampling at reliability of 0.8. All students were asked to rate their satisfaction on a 5-point scale (from 1 = unacceptable to 5 = very satisfied) on eight criteria: accessibility, building efficiency, sufficient area, flexibility, area allocation, security, privacy and physical appropriateness. After the data-analysis, the data-collection was repeated by interviewing 30 other students.

The findings from the first phase (survey) and second phase (interviews) were rather similar. Both findings showed that the overall levels of building efficiency and student satisfaction (in particular regarding the security system, area allocation and overall satisfaction) were below the standards for student accommodation, so considerable improvement was required. The study also showed that POE theory is appropriate as a building assessment gauge for student dormitories. Building efficiency and physical appropriateness (cleaning, sufficient lighting, no noise disturbance) showed to be most influential on student satisfaction. However, to produce more comprehensive restoration guidelines that would create an appropriate living and learning environment, a behavioural study and additional research is required.

### *Practical relevance*

Based on the findings a huge number of practical suggestions are presented for improvement of the built environment and required activities. Although the research method was developed to evaluate dormitories it can also be used for other environments, in an adapted form.

### *Conclusion*

This study defines criteria for success of a Living and Learning Centre that could also be applied in other sectors. Clear correlations were found between the mean satisfaction scores on particular characteristics of the environment and overall student satisfaction. As such clear connections could be made between input factors and outcomes i.e. student satisfaction. These findings can be used for an improvement program. The study is less clear about the impact of input variables on student development.

## **Evaluation of paper 11 and 12 on temporary housing facilities**

*Theoretical foundation:* Paper 11 is based on a literature review on the impact of the built environment on human behaviour and evidence about healing environments. Paper 12 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 11 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 12 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 11 is limited in empirical evidence, whereas paper 12 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.

## **2.5 In-house FM on National Level**

There are three papers on in-house FM on national level, two from Austria by the same authors and one from Switzerland.

### **Paper 13: Facilities Management in Austria 2012 – Value Add?**

This paper by Redlein and Zobl (2013, pp. 208-212) investigates the implementation of FM in in-house organisations in Austria. It is based on a national survey, which has been undertaken annually since 2005. The main goal was to define and identify parameters that guarantee an economic effective implementation of FM. The paper was presented at a workshop as research in progress and shows the first results of the survey concerning 2012 and a few comparisons with results from 2010 and 2011.

#### *Theoretical Foundation*

The paper 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*

The study applies a mixed method research methodology with qualitative expert interviews and quantitative questionnaire survey. The questionnaire from earlier years was revised based on expert interviews. The respondents were randomly selected among Austria's Top 500 companies. The survey data were collected via phone and/or e-mail. The number of respondents of the survey was N = 82. There is no mentioning of the number of expert interviews or the response rate of the questionnaire. The paper mostly presents results from the survey. It is mentioned that a next step in the research will be statistical tests of correlations among the survey data.

The biggest cost driver in 2012 was energy. The most relevant areas of cost savings were energy, cleaning and personnel. Savings reasons were: new type of contract, rates, technical upgrade, reorganization and utilization of synergies. Administration was the most named area in which an increase in productivity could be observed followed by maintenance/repair and personnel. Reasons for an increase in productivity were: process optimization, utilization of synergies and personnel/employee workload.

#### *Practical Relevance*

The research has been carried out with involvement of practitioners. However, the results are quite general and seem difficult to transform into practical application. They are mostly of interest for facility managers nationally, but to some degree also in other countries.

#### *Conclusion*

The paper provides new insights on the importance of different areas of FM in relation to changes in cost and productivity on national level.

### **Paper 14: Facility Management in West- and Eastern Europe**

This paper by Redlein and Zobl (2014, pp. 339-347) explores the added value of having an in-house FM department, in particular its impact on the number of facility services with cost savings and total annual savings. It is based on the same annual survey as paper 11, but this paper involves both data from Austria and data from Romania.

#### *Theoretical foundation*

The paper refers to a large number of FM-related studies into the added value of FM. It also refers that various publications show cost savings of 10-30% through the efficient use of FM, but most are based on the study of a single company, and data are often not specified in detail. The theoretical foundation is quite similar to paper 11 by the same authors.

#### *Methodology and evidence*

TU Vienna has since 2006 conducted an annual survey among Top 500 Companies in different European Countries such as Austria, Germany, Bulgaria, Romania, Turkey, and the Netherlands. The survey includes both open and closed questions. In addition, qualitative methods such as brainstorming, expert interviews, and group discussions are used. Each year the results of the previous study are used to optimize the new questionnaire. The number of respondents of the survey was N = 71 in Austria and N = 11 in Romania. There is no mentioning of the number of expert interviews or the response rate of the questionnaire. For this paper data were analysed from Austria 2012 and Romania 2013. The data were analysed with statistical tests of two hypotheses.

Important cost drivers showed to be energy, maintenance/repair, safety, cleaning and launching new software. The most relevant areas of cost savings were energy, cleaning, maintenance/repair, and personnel. Savings were mainly possible through new types of contracts, rates, technical upgrade, reorganisation, and utilisation of synergies. The most named areas with an increased productivity were administration, personnel, safety, maintenance/repair and data. Reasons for an increase in productivity were process optimisation, work utilisation, utilisation of synergies, and personnel/employee workload optimisation. The statistical test confirmed two hypotheses: Companies with an own FM department tend to have a significant higher number of facility services with savings than those without an own FM department, and they also have significant higher annual savings.

### *Practical relevance*

The findings from the literature review can be used as a reference for possible cost savings and measures to attain this objective. The positive impact of having an own FM department is interesting input for a strategic discussion, but should be reflected upon in connection to contextual variables such as the capacity of the company or the economic context.

### *Conclusion*

This paper contributes to evidence that a number of FM interventions may result insignificant cost savings. However, the evidence base is very limited particularly for Romania.

### **Paper 15: Multiplier effects through FM services: A survey-based analysis of added value in FM.**

The paper by Von Felten, Böhm and Coenen (2015) aims to answer the question whether FM has the potential to be a value driver in the core business. It explores the potential of enhanced working productivity as perceived by the employees. When investing less than one Euro into FM services increases its productivity by more than one Euro this is called a multiplier effect.

### *Theoretical foundation*

In connection to the definition of FM (CEN, 2006, p. 5), FM is called a service management discipline in addition to its built environment and engineering focus. The study points to the market potential of FM by exploring possible reasons for a FM demand gap due to customers or clients of FM services buying incorrectly, sub-optimally and/or not buying FM services at all, and a supply gap due to providers that have no or too little knowledge of how the FM potential can be tapped. Solving this gap is needed to add value by FM and to make FM strategically relevant.

### *Methodology and evidence*

The paper is based on the findings from a quantitative national online survey with a total of more than 7,500 participants of graduates of universities of applied sciences. First, the paper explores the demand gap, i.e. the perceived potential of enhanced working productivity. Second, the potential of enhanced working productivity is calculated in Euros based on salaries, see Table 2. And third, the use value of enhanced working productivity was compared with the exchange value, i.e. the price of better facilities. Approximately 4,700 participants were willing to answer the additional multiplier questions.

### *Practical relevance*

The study shows that more than 3 out of 4 respondents think that the quality of their work would be slightly better, better or much better when a workplace without disturbance and appropriate ICT services are offered in the best possible way. Appropriate meeting points, technical installations, office services and catering are mentioned by over 50% of all respondents. The estimated annual perceived productivity gains by a workplace without disturbance and optimal ICT services are 50 hours and 31 hours respectively. Calculations show that the benefits of increased productivity due to reduced disturbance by increasing the distance between workers and acoustical measures offset the estimated extra costs and result in a net productivity potential of (per year per person) of € 3,100 per workplace per year. The findings are used to develop a model for measuring the productivity enhancement through FM services and to define the dimensions of a demand gap and a supply gap in FM. The potential demand gap is partly quantified.



*Table 2: Annual potential labor productivity gain per service per person – ranked*

FM service	n	Hours	Hours	€	€
		Mean	Median	Mean	Median
Workplace without disturbance	4712	50	34	3300	2100
ICT hardware	4712	31	23	2000	1400
ICT services	4712	29	23	1900	1300
Document management	4712	22	23	1500	900
Mobility services	4712	20	0	1300	0
Office services	4712	19	0	1300	0
Meeting points	4712	19	0	1300	0
Workplace equipment/installation, storage	4712	18	0	1200	0
Workplace air, light, temperature	4712	17	0	1100	0
Catering	4712	16	0	1000	0
Technical installations	4712	13	0	800	0
Childcare	4712	10	0	700	0
Cleaning/disposal	4712	7	0	500	0

### *Conclusion*

The results indicate a huge potential of FM to increase the service productivity, i.e. the ratio between the revenues from a given service and the costs of producing this service. A limitation of the study is that it measures *perceived* productivity gains by graduates of universities of applied sciences. Additional research that also measures *actual* productivity gains and extension to other sectors is needed to validate the current findings.

### **Evaluation of paper 13, 14 and 15 on In-house FM on National Level**

#### *Theoretical Foundation*

Paper 13 and 14 include 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. Paper 15 focusses on a particular value parameter i.e. perceived productivity gains by providing better facilities

#### *Methodology and Evidence*

Both studies from Austria 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 evidence base is very limited for Romania. The paper from 2014 includes statistical tests. Paper 15 is based on a national online survey with more than 7,500 participants of graduates of universities of applied sciences. Approximately 4,700 participants were willing to answer the a questions about perceived productivity gains in case of optimal facilities.

#### *Practical Relevance*

In both papers from Austria the research has 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. Paper 15 is quite convincing about the perceived potential productivity gains – both regarding time savings and lower staff costs - when workplaces without disturbance and appropriate ICT services are offered in the best possible way.

### *Conclusion*

Papers 13 and 14 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, whereas paper 15 clearly shows the (perceived) positive effects on productivity of providing facilities in the best possible way.

## **2.6 Performance Measurement**

Four papers discuss in particular how to measure facility performance and as such how to measure the added value of FM, one from Germany, one from Texas, USA and two by the same co-authors from Thailand and the Netherlands.

### **Paper 16: The path to excellence: integrating customer satisfaction in productivity measurement in FM.**

This paper by Meerman et al. (2014, pp. 201-211) discusses why customer satisfaction should be included in the productivity measurement process in FM and how this could be done. According to the classical economic definition of productivity as the ratio between results and used resources, the costs of solving problems after complaints and the costs of finding a new customer in case of retention of a current customer (or the benefits of the Customer Lifetime Value) should be included in the calculation of resources.

### *Theoretical foundation*

The paper builds on the Service Productivity Measurement Model (SPMM) of Bernhold et al. (2012) that measures productivity in FM mainly through tangible monetary factors such as revenues, labour costs, product costs and costs induced by reclamation and complaints. It also refers to studies that vouched for the inclusion of customer satisfaction in productivity measurement to fulfil its initial purpose: control. A challenge for the development of the service productivity concept and the design of a consistent measurement model is the distinction between different services. Customer Satisfaction is defined as the outcome of a complex information processing process in which customers evaluate their satisfaction by comparing the subjectively perceived performance of a product or service with the expected performance before the product or service was bought. The SERVQUAL model including a 22-item measurement instrument is recommended for measuring customers' perception of service quality. Finally the Net Promoter Score is recommended to measure a customer's feeling towards a company in respect to loyalty, profit and passion.

### *Methodology and evidence*

Two focus groups were set up to discuss productivity measurement and customer satisfaction: one student group of 12 BSc students studying business, and one academic group with 4 academics who are involved in FM research and/or business research. The sessions resulted in an extended Service Productivity Measurement Model and a two-step measurement approach for surveying customer satisfaction.

### *Practical relevance*

No practitioners were involved in this study. The inclusion of customer satisfaction and Customer Life Cycle i.e. the present value of all future cash flows attributed to a customer relationship in the Service Productivity Measurement Model offers the opportunity to a more effective and efficient method for resource allocation, leading to a higher customer retention rate of those customers that are identified as essential.

### *Conclusion*

This study improves our conceptual understanding of service productivity and its connections with customer satisfaction. This gives a more complete picture but makes productivity measurement more complex and labour intensive as well.

### **Paper 17: A framework for Key Performance Indicators for a holistic facility performance assessment.**

The paper by Lavy et al. (2014, pp. 12-23) concerns development of a framework for performance assessment across types of facilities and industries consisting of a selected set of core Key Performance Indicators (KPIs).

### *Theoretical foundation*

The paper is based on theory on performance management; mostly from the field of FM and building research. The paper includes a large number of references and also refers to a former journal article by the same group of authors (Lavy et al., 2010) with a literature review concerning KPIs for facility performance measurement.

### *Methodology and evidence*

The research methodology is based on a rigorous literature review and industry input from a leading professional facility asset management firm serving worldwide. The study derives a list of performance indicators, categorises them, and identify indicators that are quantifiable and can express more than one aspect of a facility's performance. Mathematical formulae are presented for some of the indicators. Although the paper states that major input was gathered from the industrial part, it is not explained what this input consisted of and how it was used and influenced the results.

In the conclusion section the authors propose a list of five KPI's. Four of these are quantitative and based on economical estimations, calculation of ratios, and credit points. They include a Maintenance Efficiency Indicator (MEI), a Replacement Efficiency Indicator (REI), a Functional Space Index (FSI), and an Indoor/Outdoor Environmental Quality (IOEQ) Indicator based on ratings from LEED certification. The fifth indicator is a qualitative one and regards user perceptions based on questionnaire surveys with a reference to POE (Preiser, 1995).

### *Practical relevance*

The paper presents a generic framework of KPI's for facility performance assessment, which is very relevant for practice. The selection of only five indicators might be attractive for companies, but it might also be too simplistic. A framework with a hierarchy of KPIs could be relevant. The paper does not include any empirical validation of the framework except the unclear input from an industrial partner. It is also unclear whether the framework is suitable for all kinds of facilities or more relevant for some than for other.

### *Conclusion*

Paper 17 attempts to develop a framework for performance assessment of facilities with a limited number of KPIs. The paper is based on a comprehensive review of former literature on performance management in FM, but lacks empirical validation of the results. The framework appears to be generic, but it is unclear to which degree the framework is more suitable for some types of facilities.

### **Paper 18: Measuring the added value of workplace change: Comparison between theory and practice**

The paper by Riratanaphong and van der Voordt (2014, pp. 94-105) concerns measuring the added value of workplace change based on case studies from Thailand and the Netherlands.

### *Theoretical foundation*

The paper is based on a combination of theory on the added value of FM and CREM and generic theory on performance management, including various frameworks for performance measurement. The theoretical part is concluded with the table shown in Table 3, which compares 6 performance criteria from Bradley (2002) with 7 different lists of added values based on FM and CREM research.

### *Methodology and evidence*

The research includes 3 case studies of a public and a private organisation in Thailand and a public organisation in the Netherlands. Data on performance measurement was collected from company reports and interviews in each case organisation and compared with the criteria from the six perspectives of Bradley (2002) listed in Table 3. The impact of workplace change on employee's appraisal was examined using the work environment diagnosis instrument (WODI) developed by the Centre for People and Buildings (CfPB) in the Netherlands. The results from the case studies were compared with the average percentages of satisfied employees in 96 cases from the Netherlands. Interestingly, a user satisfaction survey was conducted both before and after the workplace change in the case of the public organisation in Thailand.

The case studies showed that the Balanced Scorecard is the only performance measurement system from literature that is applied in all cases, but not always in its original form. All the 6 perspectives from Bradley (2002) turned out to be included in all three cases; although with different interpretations and in different ways. The results of the surveys showed in general a lower satisfaction in the two cases from Thailand compared with the Dutch case and the average benchmarks from CfPB. An exception is the satisfaction with indoor climate that was much higher in the private case from Thailand compared with the Dutch benchmarks.

### *Practical relevance*

The paper presents interesting cases of performance measurement in connection to workplace change and examples of what areas are included in performance in practice. The concluding section presents a step-by-step plan with six steps for how to select prioritized performance measures. The plan suggests clustering all KPIs in two groups: organisational performance and corporate real estate performance, and classification of all measures e.g. into the six categories of Bradley (2002). The results seem relevant also for public and private organisation in others countries.

**Table 3: Comparison of performance criteria according to Bradley (2002) with various lists of added values**

Bradley (2002)	Nourse and Roulac (1993)	De Jonge (1996)	Lindholm & Gibler (2005); Lindholm (2008)	Van Meel et al. (2010)	Den Heijer (2011)	Van der Zwart and Van der Voordt (2013)	Jensen et al. (2012)
1.Stakeholder perception (employee satisfaction)	Promoting HRM objectives	-	Increasing employee satisfaction	Attracting and retaining talented staff	Supporting user activities	Increasing user satisfaction	Satisfaction
					Increasing user satisfaction		
					Improving quality of place		
2.Financial health	Capturing real estate value creation of business	Increasing of value	Increasing the value of assets	-	Increasing real restate value	Improving finance position	-
3.Organisational development	Flexibility	Increasing of flexibility	Increasing flexibility	Increasing flexibility	Increasing flexibility	Improving flexibility	Adaptation
	Facilitating managerial process and knowledge work	Changing culture	-	Encouraging interaction	Supporting culture	Improving culture	Culture
				Supporting cultural change	Stimulating collaboration		
	Promoting marketing message Promoting sales & selling process	PR and marketing	Promoting marketing and sales	Expressing the brand	Supporting image	Supporting image	-
	Facilitating and controlling production, operation and, service delivery	Risk control	-	-	Controlling risk	Controlling risk	Reliability
-	-	Increasing innovation	Stimulating creativity	Stimulating innovation	Increasing innovation	-	
4.Productivity	-	Increasing productivity	Increasing productivity	Enhancing productivity	Supporting user activities	Improving productivity	Productivity
5.Environmental responsibility	-	-	-	Reducing environmental impact	Reducing the footprint	-	Environmental
6.Cost efficiency	Occupancy cost minimization	Cost reduction	Reducing costs	Reducing costs	Decreasing costs	Reducing costs	Cost

- = not mentioned

### Conclusion

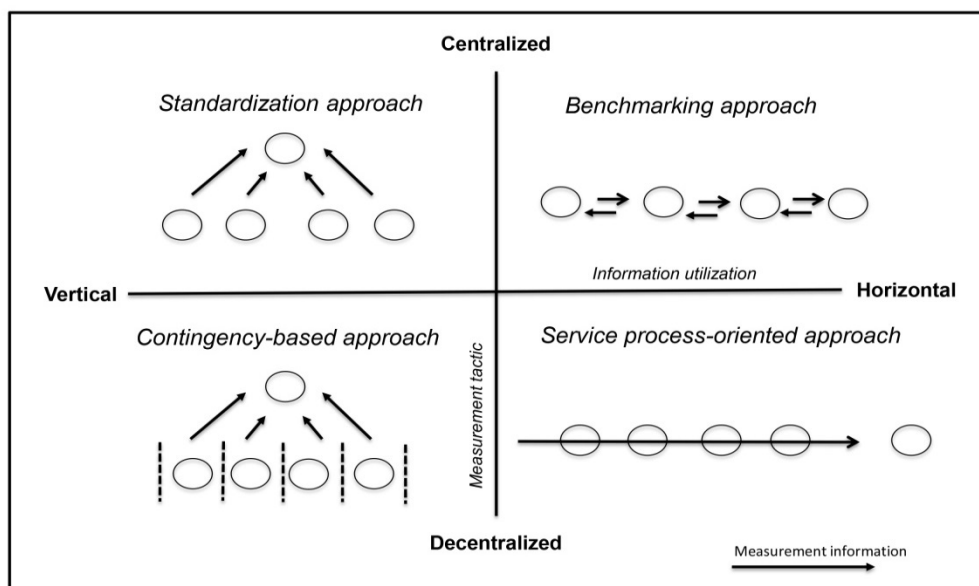
Paper 18 provides a good attempt to theoretically combine a generic performance management framework with many of the proposed list of added values from FM and CREM literature. The paper indicates that there is only a limited uniformity in performance measurement of FM and CREM in practice, and the frameworks presented in literature are rarely applied in practice except for (adaptations of) the Balanced Scorecard. However, with 3 case studies the evidence is too limited to make general conclusions on such aspects.

### Paper 19: Performance measurement of public facilities in Thailand: A case study of Dhanarak Asset Development

The second paper by Riratanaphong and van der Voordt (2015) concerns a state owned multi-user facility for public organisations in Thailand (same case as the public organisation from Thailand in paper 18). The paper explores how performance measurement is undertaken in the case organisation and compares it with relevant theory and performance data from other similar public and private organisation.

### Theoretical foundation

The paper is based on theory on Public Real Estate Management (PREM), New Public Management and Performance Management. A strategy framework for public performance measurement developed by Jääskeläinen and Laihonen (2014) and shown in Figure 6 is presented. There are no specific references to theory on the added value of FM or CREM, but the theories on PREM and Performance Management are closely related to such theory.



**Figure 6:** Strategy framework for public performance measurement (Jääskeläinen and Laihonen, 2014)

### Methodology and evidence

The research methodology is a case study with a combination of quantitative and qualitative methods. The paper presents a number of quantitative data, including comparisons between the case

organisation and 55 other public and private organisations providing similar rented out facilities. The quantitative data are quite comprehensive and are derived from published reports by the case organisation and other public sources. Thus, the primary data are mostly based on 3 interviews in the case organisation, studies of internal documents and walk-throughs in the facilities.

The findings show that the performance measurement process in the case organisation includes a combination of the 4 different approaches in the strategy framework shown in Figure 1. The analysis also shows that the measuring system is lacking some essential aspects compared to theory; particularly concerning user satisfaction. It is concluded that the impact of performance measurement of public facilities could be improved by a shift from operational performance measurement to strategic performance management.

#### *Practical relevance*

The paper presents an interesting case of performance measurement of public facilities, which is of clear relevance for public organisations responsible for managing facilities in other countries. The paper also provides some recommendations on a number of key questions, which need to be answered to be able to select relevant key performance indicators.

#### *Conclusion*

Paper 19 concerns performance measurement of public rented out facilities, which is an area with limited research. The study applies a theoretical framework and demonstrates its relevance. The evidence base is limited to a single case study with comparisons with benchmark data of 55 other similar public and private organisation. The paper does not develop any new theory, but it presents an interesting case and provides a critical evaluation and recommendations for how to select key performance indicators as part of performance management.

### **Evaluation of paper 16, 17, 18 and 19 on performance measurement**

#### *Theoretical Foundation*

All four papers have quite strong theoretical foundations but even though most of the theories are related to performance management and measurement, there is strikingly little overlap among the literature references. Paper 16 is mostly based on literature on service quality and productivity, paper 17 is mostly based on literature on performance measurement related to building and FM, paper 18 has a strong foundation in research on the added value of FM and generic literature on performance management and measurement, while paper 19 is mostly based on literature on performance measurement in relation to public real estate.

#### *Methodology and Evidence*

Paper 16 and 17 are mostly literature based with some input from industry partners (paper 16) and from academic focus groups (paper 17); both aiming at developing KPI's and measuring methods. Paper 18 and 19 both presents empirical research based on case studies and a combination of quantitative and qualitative data.

#### *Practical Relevance*

The research is in all papers of clear practical relevance for measuring performance of FM and CREM. Except for paper 16 they have all been carried out with involvement of practitioners. Only papers 18 and 19 present empirical results of measuring performance in practice.

### *Conclusion*

The four papers together provide important but also quite diverse insights on how to measure performance of FM and CREM. Except for the two papers by the same author there is very little commonality; neither in the theoretical foundation nor in the methods of measuring performance.

## **2.7 General papers**

The last two papers are not linked to a particular type of facility such as offices, health care facilities or educational facilities, but discuss the added value in connection to the whole life cycle (paper 20) and aligning FM services to business needs (paper 21).

### **Paper 20: Added value of FM Know-how in the Building Whole Life Process**

The paper by Ashworth (2013, pp. 250-260) investigates how FM know-how can add value to optimise buildings performance and quality over the whole life process. It combines the creation of two conceptual models regarding people-planet-profit performance with empirical studies including interviews with different stakeholders in the life cycle process and an online survey. The paper was presented at a workshop for postgraduate research and is based on a master thesis.

The conceptual models are based on a division of the building life cycle in six phases with related value aspects. The two models are closely related but one version is circular and the other is linear. The models formed the basis for ten interviews with stakeholders. The results listed as four themes with sub-themes. These were used to develop the on-line questionnaire. There were 62 responses to the survey with the majority from Switzerland, but there were also responses from several other countries. The results are presented as the factors of highest and lowest importance. The conclusions include five key factors for how FM can optimise value creation in the whole life process: 1) capturing user needs in the design and planning process; 2) minimizing the risks of poor quality or higher building maintenance costs; 3) optimum FM organisation to support the core business; 4) achievement of user satisfaction with FM and facilities; 5) optimal space usage planning to best meet the clients' needs.

### *Theoretical Foundation*

The paper includes a few references to recent international literature on added value of FM, but most references are to government reports and best practice guides by professional organisations and similar.

### *Methodology and Evidence*

The study applies a mixed method research methodology with conceptual model development, qualitative interviews and quantitative questionnaire survey. With 10 interviews and 62 responses from different countries the evidence base is fairly reasonable, but the conclusions are quite general.

### *Practical Relevance*

The research has been carried out with involvement of practitioners. The “managerial implications” discuss the added value of FM know-how e.g. to increase the value of assets over the long term by reducing maintenance costs and increasing profits from rents of assets.



### *Conclusion*

The paper emphasises the importance of FM know-how in relation to the building life cycle, but the conclusions are quite general and the contribution to the understanding of the added value of FM is limited.

### **Paper 21: Strategic FM-procurement: an issue of aligning services to business needs**

This paper by Katchamart and Then (2014, pp. 318-328) aims to illustrate the interdependencies between business need and strategic decisions on FM procurement.

### *Theoretical foundation*

This study builds on the organisational value chain of Porter (1980), the transaction cost economy theory that goes back the almost eighty years ago, and FM-related literature. A distinction is made between three critical transaction attributes: asset specificity (with seven dimensions e.g. human asset specificity such as skills, knowledge and experience of a firm's personnel, or brand asset specificity), uncertainty, and frequency.

### *Methodology and evidence*

Three issues of interdependency have been investigated: 1) characteristics of the core business that have an impact on FM service and provision; 2) interconnections between business support and FM procurement decisions; and 3) available FM service procurement options. The insights were further explored through semi-structured interviews in 7 case studies from Denmark, Hong Kong, Thailand and The Netherlands. Numbers of respondents are not mentioned. The study focuses on asset specificity. The two other transaction attributes - uncertainty and frequency - are not investigated.

It is concluded that there are four types of business characteristics that impacts on FM services and provision, based on the degree of criticality to business continuity. The interconnections of the asset specificity dimensions indicate that focusing on one dimension of the construct may be inadequate. The study shows why the seven types of asset specificity can add value to the core business and its surroundings.

### *Practical relevance*

The respondents included stakeholders from both the demand and supply side spanning strategic, tactical and operational levels. The specificity construct can be used to assess the extent to which a given FM product or service is tailored to a client's specific needs and requirements based on their specialised abilities in terms of the nature of the core business, customer type, primary activities, and business needs. Managers can use this approach as a decision-making framework to assess FM services procurement decisions and to justify the needs of FM provision and services. An FM organisation can use the framework as a self-evaluation tool to evaluate its procurement and degree of alignment of its current offering with core business needs. However, the paper is not easy accessible to practitioners and as such its applicability might be limited.

### *Conclusion*

The four value adding positions i.e. support of the operation of the organisational primary activities, enabling the organisational capacity and capability, ensuring the operation and performance continuity of primary activities, and enhancing operational performance and business outcomes, can be used to create a dialogue between demand and supply side to align FM offerings with core business's expectations. However, the labelling of the seven dimensions of asset specificity need further testing on its easy-to-understand and applicability by practitioners.

## Evaluation of general papers 20 and 21

### *Theoretical foundation*

Both papers build on former theories by linking added value to the whole building life cycle (paper 20) and by aligning FM to business needs (paper 21). However, paper 21 does not really elaborate the concept of Added Value.

### *Methodology and evidence*

The methods are a mixed method approach including qualitative and quantitative research in paper 20 and multiple case studies in paper 21.

### *Practical relevance*

In both papers practitioners were included among the respondents. The papers did not include a section on “practical implications” but the 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*

Both papers contribute to a conceptual understanding of the role of FM in business success on a generic level. Their contribution to ways to measure the added value of FM is limited.

## 2.8 General evaluation of papers 1-21

Table 4 provides an overview of theories and methods applied in the papers, and Table 5 shows the level of empirical evidence and the final “product” of each research.

**Table 4:** Characteristics of 21 papers: subjects, theories ad methods

No	Authors	Subject	Theory	Methods and evidence <sup>1</sup>
1	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)
2	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
3	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
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	Tinsfeldt and Jensen (2014)	Value adding space management in higher education.	Theory on space management and value adding space management	POE of two cases, with interviews, questionnaire survey and USEtool including observations and walk-through
7	Matzdorf and Greenwood	Student choice, league tables and university facilities	No theory. Builds on former research on impact of league tables and facilities on student choice behaviour	1) Secondary analysis of existing data; 2) Survey; 3) Survey + focus groups
8	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
9	Groen (2014)	Contribution of FM to hospitality	Theory on hospitality and added value of FM in healthcare	Three surveys; interviews with patients
10	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
11	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
12	Waroonkun et al. (2014)	POE of main dormitories	POE-theory + theory D2on living and learning in an educational setting	Survey; interviews
13	Redlein et al. (2013)	FM in Austria	No theory; few references to literature on FM contribution to profitability and efficiency	Expert interviews; annual survey
14	Redlein et al. (2014)	Facility Management in West- and Eastern Europe	Theory on the added value of FM	Expert interviews; annual survey
15	Von Felten, Bohm and Coenen (2015)	Multiplier effects through FM services	Theory on FM as a value driver in the core business, service productivity, use value and exchange value	National survey among alumni of universities of applied sciences
16	Meerman et al. (2014)	Integrating customer satisfaction in productivity measurement	Theory on service productivity measurement and customer satisfaction	Two focus groups
17	Lavy, Garcia and Dixit (2014)	A framework for Key Performance Indicators	Theory on purpose, methods and applications of performance measurement	Review of literature, input from industry partner
18	Riratanaphong and Van der Voordt (2014)	Measuring the added value of workplace change	Theory on performance measurement, performance management and added value	Review of literature; 3 case studies with interviews + survey

19	Riratanaphong and Van der Voordt (2015)	Performance measurement of public facilities	Theory on public real estate management and performance measurement	Data from one case in-depth + benchmark data from 55 other organisations
20	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	Expert interviews; survey with online questionnaire
21	Katchamart and Then (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

*Table 5: Characteristics of 21 papers: response rates, practice involvement and output*

No	Authors	Response	Practice involvement	Output
1	De Been et al. (2013)	N1 = 377; response rate = 75%; N2 = 389 respondents; response rate = 73%	FM involved in initiation and feedback	Satisfaction scores (2 x ex-post + comparison with benchmark)
2	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
3	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
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	Tinsfeldt and Jensen (2014)	Interviews N = 9; survey N = not specified; response 100%	Apart from the interviewed FM no practice involved	11 proposals for space optimisation
7	Matzdorf and Greenwood	1) N = 1,2356; 2) N = 2,382 responses + 3,500 focus group comments; 3) N = 133 + 144 focus group comments	No practitioners involved	Data on Influence of league tables and facilities on students' choice

8	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
9	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'
10	Van Sprang et al. (2014)	N = 217	Respondents = patients; nursing home staff administered the surveys	Impact factors on meal experience and meal appraisal
11	Kuijlenburet al. (2013)	N interviews = 4; N institutions = 2	Respondents = penitentiary staff	Impact of natural view and self-cooking on detainees' behaviour
12	Waroonkun et al. (2014)	N survey = 152; N interviews = 30	Respondents = students	Satisfaction scores on 5-point scales + correlation values of building efficiency
13	Redlein et al. (2013)	N = 82	Respondents = selected randomly among Top 500 companies	Insight in FM organisation, cost drives and cost savings
14	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
15	Von Felten, Bohm and Coenen (2015)	Overall N = 7,500; response to multiplier effects N = 4,700	Respondents come from different economic sectors	Data on potential demand-gap of FM services and perceived potential of productivity growth
16	Meerman et al. (2014)	N1 = 12 BSc students (business); N2 = 4 academics (FM)	Respondents = business students and academics connected to FM	An extended Service Productivity Measurement Model that integrates customer satisfaction
17	Lavy, Garcia and Dixit (2014)		Industry input from a leading professional asset management firm	Proposal for five Key performance Indicators
18	Riratanaphong and Van der Voordt (2014)	N of interviews and surveys not specified	Interviewees come from practice	Performance measurement methods in theory and practice
19	Riratanaphong and Van der Voordt (2015)		Data come from public organisations from practice	Performance measurement methods in theory and practice + proposal to select KPIs
20	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
21	Katchamart and Then (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

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, performance management, (perceived) productivity, and service quality, or concepts such as experience (of meal services, hospitality), and the impact of facilities and services on human behaviour. Only a few papers end up with well-argued proposals for standardized ways or Key Performance Indicators (KPIs) to measure the added value of FM. Besides, it is remarkable that 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, and 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 by Kok et al. (2013) is an exception here. They measure 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 also here paper 5 by Kok et al. (2013) who discuss 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 by Datselaar et al. (2013) 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 lay-out and a dependent variable such as knowledge sharing. An exception is paper 1 by De Been et al. (2013), 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.

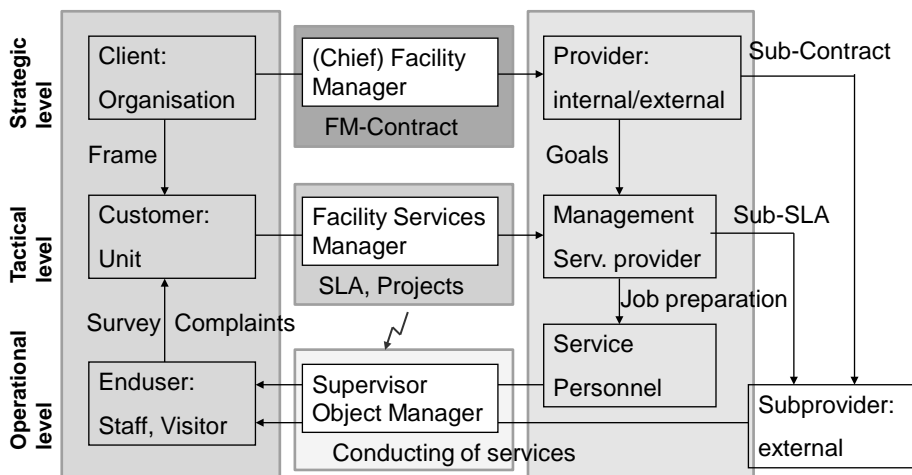
To conclude, all EuroFM Research symposia in 2013, 2014 and 2015 as well as the CIB FM Conference in 2014 delivered fruitful and evidence based contributions to the conceptualisation of the added value of FM and the impact of a number of facilities and services on various value parameters, for instance the impact of improved meal service on user satisfaction, or the impact of natural daylight and daily activities on social behaviour of detainees. Due to the variety of research subjects, research areas, value parameters and research methods, findings from different research projects can hardly be compared. The measurement of the impact of change due to actual interventions and the quantification of cause-effect relationships is still very limited. As such, there is still a strong need for further meta-research such as the current review of recent research and more research in-depth, e.g. by measuring particular value parameters in different settings with different people and different FM interventions.

### 3. VALUE ADDING MANAGEMENT

The research group on The Added Value of FM finished the conclusion section of our first joint article by stating that one of the next steps in our collaborative research would be to develop practice guidelines for value adding management (Jensen et al. 2012a). Our book from 2012 included a chapter with the title “Value Adding Management: A concept and a case” (Jensen and Katchamart, 2012). We will start this chapter by presenting the concept of Value Adding Management (VAM) followed by a case about LEGO; both based on that chapter. After that we will present the main results of our paper for EFMC 2014: “Adding Value by FM: exploration of management practice in the Netherlands and Denmark (Van der Voordt and Jensen, 2014). The chapter will end with a brief outline of other aspects related to VAM, which recently have obtained increased focus.

#### 3.1 The Concept of VAM

The management model of FM in the first European FM standard (CEN, 2006) is based on a distinction between the demand side with the primary processes and activities of an organisation (on the left side) and a supply side with support processes and facility services from internal and/or external provider (on the right side). The relationship is based on a FM agreement. Specifying the demand is done by SLA’s (Service Level Agreements), while delivering the supply is measured by KPI’s (Key Performance Indicators). The interaction between demand and supply takes place on three levels: strategic, tactical and operational, which are related to client, customer, and end user, respectively. A version of the model with typical roles is shown in Figure 7.



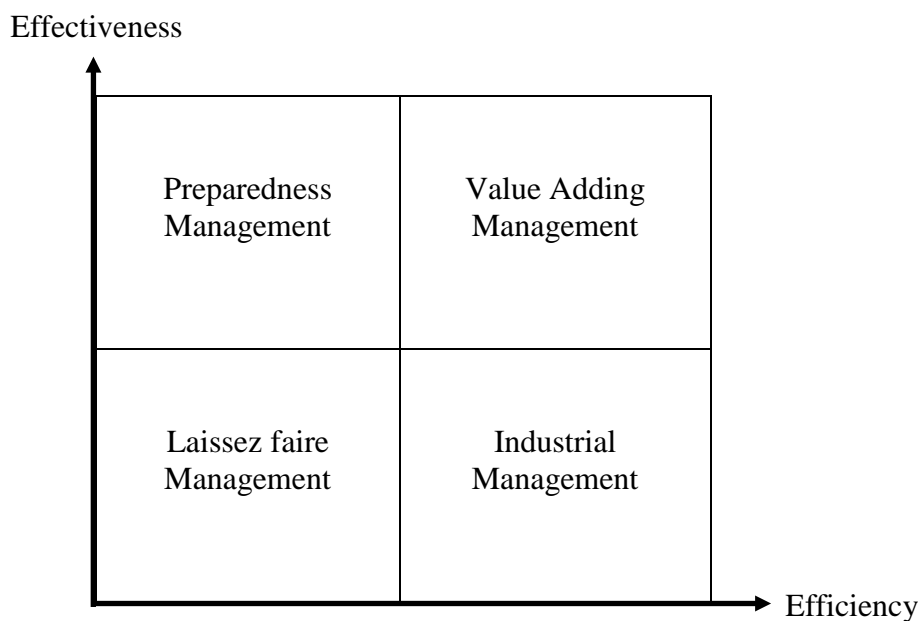
**Figure 7:** FM model with typical roles (CEN, 2011)

VAM is concerned with how a FM organisation can add value to a core business and to relevant stakeholders internally and externally. VAM focuses on the relationships between FM and core business and involves management of all relevant stakeholders.

An illustration of how VAM is distinguished in comparison to other forms of management in relation to effectiveness and efficiency is shown in Figure 8. If there is a lack of management focus, it is likely that both efficiency and effectiveness is low, which is the situation shown in the bottom left corner called Laissez Faire Management. The situation where the management focus is on



optimizing efficiency is shown in the bottom right corner and called Industrial Management. This is equivalent to traditional management methods in manufacturing based on Tayloristic scientific management tools like motion and time methods (MTM), and modern concepts like lean or agile management. The opposite situation where the management focus is on optimizing effectiveness is shown in the top left corner and called Preparedness Management. A fire brigade is an extreme example of this situation, where one has an organisation stand by in case of the occurrence of a certain undesirable event, but any management concept where high effectiveness has priority whatever the cost is in this category. VAM is placed in the top right corner where both effectiveness and efficiency have high priority.



**Figure 8:** VAM compared with other forms of management (Jensen and Katchamart, 2012)

Jensen (2007 and 2011) investigated the organisational relationship between FM and core business on strategic and operational level with inspiration from theory on governance and forms of coordination. The basic forms of coordination of business activities between different actors or units are according to this theory via a market based on price or by hierarchy in an organisation. A number of other forms of coordination like coalition and negotiation have been identified as well (Grandori, 1997).

The conclusions in relation to FM are that for decision-making related to strategic FM concerning common corporate capacity and infrastructure, it is important to create a close collaboration and alignment between the FM organisation and the core business to achieve the necessary business orientation. Such collaboration could take the form of a coalition managed by a forum of representatives from FM and the different parts of the company. As a contrast, for FM provisions with a differentiation in relation to various internal users, de-centralised decision-making seems to be the obvious solution (Jensen, 2011). That is particularly the case where the quality of the provision is easily defined and understood by both parties. In those cases price seems to be the best form of coordination and a service orientation is essential. Examples of this could be cleaning, catering, internal removals, hiring of conference rooms, and procuring of standard products. For

more complex provisions with the need for dialogue about specific customisation, more centralised decision-making may be needed involving negotiation between managers at some level. Space management issues, like rebuilding projects and workplace design, could be typical examples (Jensen and Katchamart, 2012).

Based on this it seems essential that the relationship management in VAM is differentiated on the three levels as shown in Table 6. Business orientation means that considerations for the whole corporation are in focus. This calls for joint decision making involving all main stakeholders at management level, which can take the form of a coalition. Customer orientation means that the specific needs of each business unit or department are in focus. This calls for a bilateral negotiation and decision making. Service orientation means that individual users' needs are in focus. In this case the services are either provided based on price per order, for instance catering and transportation, or based on a service charge such as part of internal rent or similar, for instance cleaning and security.

*Table 6: VAM relationship differentiation (Jensen and Katchamart, 2012)*

<b>Level</b>	<b>Demand side</b>	<b>Relationship focus</b>	<b>Coordination form</b>
Strategic	Client	Business orientation	Coalition
Tactical	Customer	Customer orientation	Negotiation
Operational	End user	Service orientation	Price per order/Service charge

### **3.2 The LEGO Case**

LEGO is a Danish family owned company producing construction toy products for the global market. LEGO's headquarters is placed in Billund in the middle of Jutland, but they have production facilities and sales offices around the world. The LEGO group has approx. 9.000 employees (information collected in 2010). FM in LEGO is a part of LEGO Service Centre (LSC) which is an integrated business unit encompassing support services such as information technology (IT), human resources (HR), indirect procurement (not production related) and reception. The FM unit is responsible for all LEGO's facilities around the world.

LEGO uses the Balanced Score Card as a corporate management tool. For FM they have developed a strategic map, where the financial perspective at the top level from the original strategic mapping methodology (Kaplan & Norton, 2000) is replaced by a value add perspective divided in effectiveness and efficiency.

LSC as an operational department strive to be seen as a "valuable asset" which can deliver highly professional services that supports the business in a way that cannot be bought anywhere, rather than only perceived as a "cost centre". LSC not only provides day-to-day services but also drives value add from its services by optimizing efficiency and effectiveness. LSC makes a distinction between value add (VA) activities and non-value add (NVA) activities. NVA activities are day-to-day services to support LEGO's core business, while VA activities are based on business cases or are activities that create extra value to LEGO's core business. VA stems from changing value streams, changing normal services or changing business processes, and as such requires collaborations across the existing organisational borders.

VA can according to LEGO be divided into financial and non-financial value - financial value examined by cost reduction and non-financial value by volume, quality and flexibility as specified below. VA can also include CO<sub>2</sub> emission reduction, environmental portfolio improvement and green account. An added value report is a supplementary part of the financial report, which is delivered to LSC's client and customers. The objective of FM is to deliver minimum 5% value adding every year. This is measured by the so-called value add equation:

$$\text{Value add} = \text{Volume} * \text{Quality} * \text{Flexibility} / \text{Cost}.$$

Volume represent the level of scalability and is calculated as the number of standard services (part of the service catalogue) delivered. Quality is measured in two ways. The user perceived quality is measured by use of surveys which are sent to randomly selected users. The quality can also be documented with quantitative metrics, e.g. the incident rate as a percentage of all services delivered. Flexibility is measured in surveys where the “buyer’s” perception of LSC’s flexibility is evaluated.

Cost is divided into direct and indirect costs. Direct costs are measured in two ways: annual Total cost for LSC divided by annual total net sale for the LEGO group, and total cost for LSC divided by total number of employees in the LEGO group. The indirect costs are measured by customer surveys, in which the respondents are asked to estimate the resources spent on using the most frequently used services. Besides, the user impact on new and adjusted processes and services are estimated.

Only initiatives which are initiated by LSC and recognized as adding value by the customers benefitting from the initiatives are accepted as VA and can be included in the calculation. The value equation is being used as a performance measurement tool and a basis for dialogue with internal stakeholders, and also as a tool for the staff in the FM unit to put focus on why they are there.

An example of a VA business case is the “LEGO look and feel” concept. This involves the interior decoration and layout of both the main foyer and common spaces in administrative areas with a modern design utilizing LEGO products as design objects and thereby putting focus on LEGO’s brand for both visitors and staff. LSC provides projects as part of this concept to a fixed price to LEGO’s client and customers. Other examples of VA are changing office layout with space reduction while sustaining employee satisfaction, and reducing cooling temperature for moulding machines in production facilities with huge reduction in energy consumption and CO<sub>2</sub> emissions while sustaining product quality.

The relationship between LSC and its internal stakeholders is shown in Table 7. LSC posits itself as a middle management moderator between a strategic level and an operational level. To maximize delivered service values, LSC needs to juggle the mutual interest between each stakeholder, for instance LEGO governance, management level, business units and end users, on global and local level.

FM as a part of LSC has to compromise needs of the different stakeholders. Thus it is necessary to understand their needs by creating the communication channels to align its service delivery with their expectations. Balanced Scorecard is used as a strategic management tool at the global level to measure the performance of the global service centre and if it delivers according to the local needs at the local price by compromising between global service with local needs, culture, system, and price.

The management of LSC participates in an annual meeting with LEGO’s top management – the leadership team – to evaluate performance and discuss development plans. In order to align strategic management decisions between top management and FM on a continuous basis, LEGO has established a LSC Facility Committee with the main focus on the three aspects: projects, capacity, and competency. The meetings are held every 6 weeks. An example of the procedure is the situation, when LEGO wants to expand with a new production line. The Facility Committee will ask for collaboration between the directors of Global Supply Chain, CFO and FM to create a dialogue on the strategic level across the LEGO organisation. The FM unit will investigate a number of alternative locations and these will be evaluated by the main stakeholders. Decisions will be made jointly by the members of the Facility Committee. The Facility Committee is a clear example of a coalition between FM and corporate management.

*Table 7: LSC’s relationships with LEGO’s core business (Jensen and Katchamart, 2012)*

Stakeholder	Communication channel	Target Group	Focus area
Client	Leadership team survey and meeting	Top 40 management level included vice president	Where are we?
			Do they see LSC as added value to LEGO business?
			What are we doing with added value?
			Is LSC a good partnership with LEGO?
LSC Facility Committee meetings	Comprising of CFO, head of LEGO Corporate Center, head of Global Supply Chain, head of LSC and by invitation head of Marketing & Products and head of Customer & Education Division	Prioritizing LSC services and makes decision across the board	
		Aligning LSC services with business process	
Customer	Customer meetings	Customers are director level and above	Agreement on key performance indicator (KPI) and service level agreement (SLA)
	Customer survey		Do they understand/ know LSC services?
End users	User survey	Users are everyone below director level	Do they understand/ know LSC services?

LSC’s service levels are negotiated and decided bilaterally with the management of each business unit as customers. LSC also measures their performance based on satisfaction surveys by regular intervals. These surveys are differentiated in relation to the client, customers and end users as shown in Table 4.

### 3.3 Practice of VAM in Denmark and the Netherlands

In the conference paper from EFMC 2014 we explored how people in practice cope with the added value of FM/CREM and if and how they incorporate this concept in their daily practice (Van der Voordt and Jensen, 2014). We conducted 10 interviews with experienced senior facility managers, corporate real estate managers, consultants and service providers, 5 in Denmark and 5 in the Netherlands. Criteria for selection were senior level of practical experience, a mix of FM and CREM professionals and a mix of in-house FM, service providers and consultants. All interviewees were from the private sector. The final sample represents various sectors such as biotechnology, technical services, maintenance management, FM service provider and consultancy. Years of experience range from 12 to 34 years.

Almost all interviewees use the term Added Value (AV) in daily practice, in various settings:

- Internally in in-house FM organisations, between FM organisation and corporate management, and within provider companies;
- Externally between clients and providers (in contract negotiations and on-going collaboration), clients and consultants, and clients and deliverer of IT-systems and equipment

The AV-concept is both used to demonstrate the added value of ones' own function or department and to discuss the added value of FM/CREM-interventions. Related terms are Value Creation, Value Increase, Appreciation, Total Value Add (TVA) and Economic Value Added (EVA). In the nineties AV was mainly linked to Economic Value Add and Shareholder Value, whereas nowadays the concept has a wider scope, depending on the person you talk with e.g. a CEO, operational manager, supplier or end user.

One of the advantages of applying the AV-concept is that the dialogue is moved away from the contractual agreement and the SLA's. According to one respondents: *"It makes the customer feel that you are interested in his business and not just in submitting the next bill. It makes is possible to raise the level of the whole FM provision"*. It helps to speak the language that top managers understand. Downsides of the AV-concept are that AV is perceived differently by different people and difficult to be made concrete and operational and to document. AV concerns things that cannot always be measured in economic terms. It is very important to understand which value is most important for the client or customer and what he or she really needs (often more than simply solve the current problem). In addition to sound data, storytelling can also be used to convince clients of the added value of FM and CREM provisions and proposed interventions.

Most practitioners perceive AV as the trade-off between benefits and costs and steer on value for money and making the Core Business more effective. The term AV is connected to Value, which both has an economical meaning and meanings related to feelings and other subjective and qualitative aspects such as comfort, making complex things simpler and easier to be managed, and high speed delivery. Various interviewees made a distinction between what they called hard economic aspects and more soft aspects related to Health, Safety, Environment and Quality.

Benefits are mainly linked to clients, customers and end users but also to shareholders and – less often – to society as a whole. All respondents include 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. This is also essential in provider companies' sales arguments.

Though the term AV is not always used explicitly, practice is always concerned about balancing between the benefits of e.g. flexibility of short term contracts, speed of delivery or better quality and the costs of extra investments or higher running costs. AV depends very much on the client's perception. One of the service providers makes a distinction between the value they provide as part of their standard package at the start of a new contract, and the value they create during the contract. The latter changes a lot depending on what is important for the customer over time.

The focus on particular types of value depends on the involved stakeholders. According to one of the CREM-interviewees:

- Shareholders focus almost one-sidedly on a high Return on Investment and low risk, costs and reliabilities.
- The Board of Management usually connects added value to their strategic vision and policy and steer on maximum turnover (volume of business), minimum costs, and a high Ebit (earnings before interest and taxation).
- Heads of regional units have to cope with both top-management needs (profit), regional customers and employee requirements. They try to find a balance between cost reduction and benefits such as attraction and retention of talented staff.
- Site managers focus more on operational issues and employee satisfaction.

There is also a difference in VAM on strategic, tactical and operational level. According to one of the CRE-managers adding value on strategic level regards developing site master plans and implementing the real estate strategy. Its focus is on the long term decisions and avoidance of complaints. AV on tactical level regards for instance speed of delivery and to do what is being asked. Issues on operational level include cost reduction, employee satisfaction and customer satisfaction. Although AV is mostly treated on strategic level, it is of relevance on all levels and for everybody in the FM organisation. It should be part of the organisational culture. However, according to one respondent FM is not really a strategic issue in most organisations and CEOs are not really interested in FM. Talking about AV on operational level can even be counterproductive because *“operational managers don't have a clue of what AV actually means”*. Focus points in FM also depend on the context. When the economy is booming, avoiding dissatisfaction and commotion might be key issues, whereas in times of economic recession cost reduction will be in the core. The size of the company is a factor as well. In small firms FM is mainly operational.

One of the interviewees pointed to Maslow's pyramid of needs as a starting point for management of value. In his own words: *“FM does not create value by supporting the lower levels in the pyramid. They are taken for granted and you will get criticism, if they are not fulfilled, but you will not receive any appreciation, if they are fulfilled. That is just doing the work that is necessary. To be appreciated you need to deliver something that is beyond basic expectations.”*

Besides KPI's there are a number of other ways to visualise and document added value. Providers often prepare performance reviews with fixed intervals to their customers. Other examples are business cases for specific initiatives and reports on finished projects. Added value is also included in the communication with stakeholders in less formal ways as part of on-going dialogue and storytelling. Management of expectations is an important aspect of adding value. One of the providers have attempted to make an annual added value report on key accounts, but they have not yet managed to find the right way to meet the customers' expectations.

Their experience with using Balanced Scorecard is that the economic and people perspectives are quite easy to document, while the customer and process perspectives are much more difficult to measure. It also depends a lot on what triggers the specific customer and user.

The interviewees were asked as an open question “What is your top five of main values to be included in management of accommodations, facilities and services?”. Table 8 depicts the frequencies of the main values categorised according to the impact parameters from the FM Value Map. The responses are divided in Danish and Dutch interviewees and in total.

**Table 7: Main values related to impact parameters from to the FM Value Map**

<b>Impact parameter</b>	<b>Denmark 24 (100%)</b>	<b>Netherlands 17 (100%)</b>	<b>Total 41 (100%)</b>
Satisfaction	8 (33%)	2 (12%)	10 (24%)
Cost	5 (21%)	10 (59%)	15 (37%)
Productivity	6 (25%)	1 (6%)	7 (17%)
Reliability			
Adaptation	3 (13%)	1 (6%)	4 (10%)
Culture		2 (12%)	2 (5%)
Economic			
Social			
Spatial			
Environmental	2 (8%)	1 (6%)	3 (7%)

Table 5 shows that values related to Satisfaction and Cost are most frequently prioritized, but with a striking difference between the interviewees from Denmark and the Netherlands. Satisfaction is seen as much more important than Cost in Denmark, while Cost is seen as much more important than Satisfaction in the Netherlands. Productivity is also important, but mostly in Denmark. Values in relation to Adaptation and Environmental are mentioned in both countries, while Culture only is represented in the Netherlands. The remaining four impact factors – Reliability, Economic, Social and Spatial are not represented in the response to the open question, but they were also recognised as important when asked more specifically – by some more than by others.

### **3.4 Other aspects related to VAM**

The concept of VAM as presented above includes stakeholder management as an essential element. A related concept is the FM Value Network, which was presented in another chapter in our book from 2012 and looks at FM as a centre in a network of relationships with multiple stakeholders (Coenen et al., 2012). Relationship management focuses on relationship value and builds on theory on buyer-seller relationships from Business to Business (B2B) marketing literature.

Another concept closely related to VAM is alignment. There has recently been published a number of studies particularly on the alignment between Corporate Real Estate (CRE) and corporate strategy. We present the concept of alignment in-depth and review this research in our coming book.

## 4. LEARNING AND PROFESSIONAL DEVELOPMENT

Based on the EFMC 2013 and 2014 papers, our EFMC meetings with academics and practitioners, the responses to our interviews with practitioners, and the LEGO case, 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 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 attain a growing interest of researchers in the fields of FM and CREM, which is illustrated by the papers we discussed in chapter 2 and also by various papers that were submitted to the joint CIB W070, W111 & W118 FM Conference in Copenhagen, May 2014, with “Creating Value for All Stakeholder” as one of its main themes. In MSc theses and PhD theses the added value concept is reflected upon as well, including exploring prioritized values, inter alia in commercial offices (Lindholm, 2008), the health care sector (Prevosth and Van der Voordt, 2011; Van der Voordt et al., 2012; Van den Bouwhuijsen and Doodkorte, 2013; Wetzels, 2014; Van der Zwart, 2014), municipalities (Ham, 2014), and higher education (De Vries, 2007; Den Heijer, 2011; Beckers, in progress). Related to this, performance measurement is a key issue in current research as well, e.g. regarding KPIs used by public and private organisations (Lindholm, 2008; Riratanaphong, 2014), the industry (Bisschops, 2014), engineering facilities (Man and Lai, 2014) and more generic (Lavy et al., 2014).

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 on “The Added Value of Facilities Management” 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., 2012b). 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 operationalisations are 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 measurement added value” (working title, expected 2016).

In addition to these main themes for further research, a number of research topics can be mentioned that need more attention. In two joint journal papers by Jensen et al. (2012a; 2014) we reflected on the conclusions from various trend reports and on what we know and what we still need to know. The findings can be summarized in a list of prioritized research topics:

### 1. Examining the nature of value and added value and its dimensions.

- What main dimensions and sub-dimensions does added value of FM consist of?
- Which value dimensions lead to synergy and which values are conflicting?
- How can different value dimensions be measured and managed?
- Which KPIs are used or could be used on strategic, tactical and operational level, regarding the real estate portfolio, buildings, units, places, facilities and services?
- How can complex cause-effect relationships be disentangled and measured?



- What can different disciplines such as architecture, engineering, business administration, marketing, psychology, economics, FM and CREM contribute to a better understanding of added value and value adding management?
- 2. Exploration of particular value parameters in depth**
- How can FM add value regarding branding of the organisation, flexibility, sustainability, Corporate Social Responsibility, health and well-being, risk management, and relationship value?
- 3. Identifying value drivers**
- What factors are important drivers of value adding management?
  - Which value dimensions are prioritized by shareholders and other stakeholders such as local authorities and communities, managers, investors, developers, designers, clients, customers, end users and visitors? Why?
  - Who is involved in decision making on adding value by FM and value adding management, strategic, tactical, and operational, and in which phases of FM processes?
- 4. Exploring conditions of value**
- How does the potential of value creation of FM vary by sector (e.g. industry, offices, health care sector, higher education, retail and leisure)?
  - What is the impact on value adding management of the economic context (e.g. economic growth versus economic decline), the political context, national and corporate culture, technological developments, globalisation, type of market (e.g. a suppliers market versus a demand driven market), or type of company (commercial versus not for profit, starter versus renowned company, level of maturity of FM and CREM)?
- 5. Implications for practice**
- In what ways can FM providers signal high value to clients, customers and end users to obtain desired effects?
  - How can value adding management be incorporated in corporate strategies?
  - How can practice cope with the reversal from the supply chain into a more customer oriented one and issues such as experience value of FM, branding and hospitality
  - How can organisations cope with conflicting values?
  - Which governance structures do exist for FM to secure the alignment between FM and core business, on strategic, tactical and operational level.
  - How do or can organisations cope with the dilemma between what can be measured and what really matters?
- 6. Methods to capture value**
- What qualitative and quantitative methodologies need to be developed to capture the holistic view of value of FM?
  - What measures are necessary to examine the value relationship between FM and primary business activities in a consistent, valid, and reliable manner?
  - Which methodologies are available or should be developed for FM becoming a critical strategic management tool linking FM to the organisation's core business strategy and value adding management?

## 5. CONCLUSION

It is very encouraging that so much new research on the added value of FM was presented at EFMC 2013 and 2014. It is even more positive that all the research papers provide 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. Studies concerning municipalities or state agencies are almost lacking. There are papers about unusual types of facilities as well, like institutions for intellectual disabled residents and prison facilities. Many studies concerns 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 21 reviewed in chapter 2), 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 6 papers based on qualitative methods and 4 based on quantitative methods. The majority of papers are based on mixed methods, including both qualitative and quantitative methods. Paper 14, 15 and 20 are mostly quantitative and use the qualitative research mainly to develop or adapt a questionnaire for a quantitative survey. Paper 3 is mostly qualitative and supplement interview based multi case studies with a questionnaire survey in one of the cases. Paper 9, 10 and 12 are more genuine 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. This type of research seems to be particularly suitable for research on added value.

Several papers show the importance of the specific context, which makes it difficult to generalise results across different organisations and facilities. This has important consequences for the choice of research methods. The latter is clearly demonstrated by paper 8, 9 and 10 all focusing on healthcare facilities. Paper 8 concerns intellectual disabled residents, where data about user behaviour has to be collected indirectly by staff interviews and incident reports. Paper 9 concerns ordinary hospital patients, which can be addressed with normal interview methods, while paper 10 concerns elderly people in nursing homes, where reduced communication abilities for some respondents require special methodological considerations. 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 limited degree reflect and build upon the earlier research within the field. 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 and the implementation of change. Our study presented in chapter 3 about how practitioners cope with the added value FM and CREM clearly demonstrates a strong interest in the topic but also a lack of common understanding and practical management tools. Another striking conclusion is that most papers focus on the benefits of interventions for particular stakeholders, and as such neglect the sacrifices in terms of time, money and effort, the risks of interventions regarding conflicting values, and who benefits most and least of different kinds of interventions and change.

## 6. FURTHER READING

This chapter ends with a list of references we refer to in the text above. What is most interesting for further reading depends of the purpose of the reader, e.g. being a FM practitioner in search for practical guidelines or clear KPIs, being a CEO who wants to learn more about the nature of added value, being an academic interested in conducting research into added value of FM and value adding management, or being a teacher looking for input to lectures or text books. Of course we recommend our own book on “The Added Value of Facilities Management” (Jensen et al., 2012b) as a “must read”, because this book presents an overview of key topics regarding the concept of added value, various value dimensions, value adding management, performance measurement systems and KPIs, We also recommend the PhD-theses by De Vries (2007), Lindholm (2008), Den Heijer (2011), Katchamart (2013), Riratanaphong (2014), and Van der Zwart (2014). Although these PhD theses are rather academic, they are practical as well due to presenting clear conceptual models and empirical data about various value dimensions, prioritized values, and value adding management practices. For our next book on “Facilities Management and Corporate Real Estate Management as Value Drivers: How to manage and measurement added value” (working title, expected 2016) we have invited a number of authors from different countries to elaborate different value parameters by presenting a state of the art of current knowledge, definitions, main research findings, KPIs, and knowledge gaps. Suggestions for input are welcome.

## REFERENCES

- Alexander, K. (ed.) (2011), *University of Glasgow Library Learning Café – Added Value of FM Case Study*. EuroFM Research Project. EuroFM. July 2011.
- Alexander, K. (ed.) (2013), FM for a sustainable future. Conference papers EFMC 2013, *International Journal of Facilities Management, EuroFM Journal*. March 2013.
- Alexander, K. (ed.) (2014), Promoting Innovation in FM. Research Papers Advancing knowledge in FM, EFMC 2014. *International Journal of Facilities Management, EuroFM Journal*. March 2014.
- Alexander, K. and Price, I. (2015). People make facilities management, *EuroFM Research Papers 2015*, EuroFM, Schiphol-Rijk, The Netherlands.
- Appel-Meulenbroek, R., De Vries, B. and Matthieu Weggemans, M. (2014), Layout mechanisms that stimulate behaviour of employees. Paper from EFMC 2014 (Alexander, 2014).
- Ashworth, S. (2013), Added Value of FM Know-how in the Building Whole Life Process. Paper from EFMC 2013 (Alexander, 2013).
- Beckers, R. and Van der Voordt, T. (2013), Facilitating new ways of learning in Dutch higher education. Paper from EFMC 2013 (Alexander, 2013).
- Beckers, R., *Aligning higher education accommodations to new ways of learning*. PhD Thesis, forthcoming.
- Bernhold, T., Kaling, N. and Lellek, V. (2012), Productivity Measurement Model – A Holistic Approach for Services. In Junghans, A. and Jensen, P.A. (eds.), Proceedings of the 11th EuroFM Research Symposium, Polyteknisk Forlag, Lyngby, pp. 20-30.
- Bisschops, B. (2014), *Influences on real estate benchmarking practice*. MSc-thesis. Faculty of Architecture, Delft University of Technology,
- Blyth, A., Gilbyand, A. and Barlex, M. (2006), *Guide to Post Occupancy Evaluation*. Higher Education Funding Council for England.
- Bradley, S. (2002), “What’s working? Briefing and evaluating workplace performance improvement”, *Journal of Corporate Real Estate*, 4, 150-159.
- CEN (2006), *Facility Management – Part 1: Terms and definitions*. European Standard EN 15221-1. European Committee for Standardization.
- CEN (2011): *Facility Management – Part 4: Taxonomy of Facility Management – Classification and Structures*. European Standard EN 15221-4. European Committee for Standardization.
- Che Ani, A.I., Tawil, N.M., Musa, A.R., Tahir, M.M. and Abdullah, N.A.G. (2012), Frequency Index for Learning Space in Higher Education Institutions. *Procedia – Social and Behavioral Sciences* 56, 587-593.
- Coenen, C, Alexander, K. and Kok, H. (2012), FM as a Value Network: Exploring Relationships amongst FM Stakeholders. Chapter 5 in: Jensen, P.A., Van der Voordt, T. and Coenen, C. (eds.) (2012), *The Added Value of Facilities Management – Concepts, Findings and Perspectives*. Centre for Facilities Management - Realdania Research, DTU Management Engineering, and Polyteknisk Forlag, May 2012.
- Coenen, C., Alexander, K. and Kok, H. (2013), Facility management value dimensions from a demand perspective. *Journal of Facilities Management*, Vol. 11, No. 4.
- Daatselaar, R., Schaap, M. and Mobach, M. (2013), Added value of FM in Institutes for intellectually disabled residents. Paper from EFMC 2013 (Alexander, 2013).
- De Been, I. and Beijer, M. (2013), The effects of interventions in an innovative office on satisfaction, perceived productivity and health complaints. Paper from EFMC 2013 (Alexander, 2013).
- De Jonge, H. (1996), “De toegevoegde waarde van concernhuisvesting”. *NSC-conference, Amsterdam*. Amsterdam.
- De Vries, J. (2007), *Presteren door vastgoed*. PhD Thesis. Delft: Eburon.

- De Vries, J.C., De Jonge, H. and Van der Voordt, T. (2008), Impact of real estate interventions on organisational performance. *Journal of Corporate Real Estate* Vol. 10 no. 3, 208-223.
- Den Heijer, A. (2011), *Managing the University Campus: Information to support real estate decisions*. Doctoral Dissertation, Delft University of Technology.
- Gerritse, D., Bergsma, F., and Groen, B. (2014), Exploration of added value concepts in facilities management practice: learning from financial institutes. Paper from EFMC 2014 (Alexander, 2014).
- Grandori, A. (1997), Governance Structures, Coordination Mechanisms and Cognitive Models. *The Journal of Management and Governance*. 1: 29-47, 1997.
- Groen, B. (2014), Contribution of FM to hospital(ity) issues. Paper from EFMC 2014 (Alexander, 2014).
- Ham, M. (2014), *Het gebruik van wetenschappelijke kennis bij het managen van vastgoed in de gemeentelijke sector*. Afstudeerscriptie faculteit Bouwkunde TU Delft.
- Jensen, P.A. (2007), The Organisational Relationships between Support Functions and Core Business. In Proceedings of EFMC2007 Conference and Research Symposium: 6th EuroFM Research Symposium, p. 47-54, Zürich. Euroforum.
- Hansen, G.K., Blakstad, S.H. and Knudsen, W. (2011), *USEtool – Evaluating Usability – Methods Handbook*. Trondheim: NTNU.
- Jääskeläinen, A. & Laihonen, H. (2014), A strategy framework for performance measurement in the public sector, *Public money & management*, Vol. 34, No. 5, pp. 355-362.
- Jensen, P.A., Nielsen, K. and Nielsen, S.B. (2008), *Facilities Management Best Practice in the Nordic Countries – 36 cases*. Centre for Facilities Management – Realdania Research, DTU Management Engineering, Technical University of Denmark.
- Jensen, P.A. (2010): The Facilities Management Value Map: a conceptual framework. *Facilities*, Vol. 28, No. 3/4, pp. 175-188.
- Jensen, P.A. (ed.), Using facilities in an open world: creating value for all stakeholders. *Proceedings of CIB FM Facilities Management Conference*, Copenhagen, 21-23 May 2015.
- Jensen, P.A., Van der Voordt, T., Coenen, C, Von Felten, D., Lindholm, A.-L., Nielsen, S.B., Riratanaphong, C and Schmid, M. (2010), *The Added Value of FM: Different Research Perspectives*. EFMC2010 Conference and Research Symposium, Madrid, 1-2 June 2010.
- Jensen, P.A. (2011), Organisation of Facilities Management in relation to Core Business. *Journal of Facilities Management*. Vol. 9, No. 2.
- Jensen, P.A. and Katchamart, A. (2012), *Value Adding Management: A concept and a case*. Chapter 10 in: Jensen, P.A., Van der Voordt, T. and Coenen, C. (eds.) (2012), *The Added Value of Facilities Management – Concepts, Findings and Perspectives*. Centre for Facilities Management - Realdania Research, DTU.
- Jensen, P.A., Van der Voordt, T., Coenen, C, Von Felten, D., Lindholm, A.-L., Nielsen, S.B., Riratanaphong, C. and Pfenninger, M. (2012a), In Search for the Added Value of FM: What we know and what we need to learn. *Facilities* Vol. 30, No. 5/6, pp. 199-217.
- Jensen, P.A., Van der Voordt, T. and Coenen, C. (eds.) (2012b), *The Added Value of Facilities Management – Concepts, Findings and Perspectives*. Centre for Facilities Management - Realdania Research, DTU Management Engineering, and Polyteknisk Forlag, Lyngby.
- Jensen, P.A., Van der Voordt, T., Coenen, C. and Sarasoja, A-L. (2014), Reflecting on future research concerning the added value of FM. *Facilities* Vol. 32 No. 13/14, pp. 856-870.
- Kaplan, R.S. and Norton, D.P. (2000), Having Trouble with Your Strategy? Then Map It. *Harvard Business Review*, September-October 2000.
- Katchamart, A. (2013), *Profiling Value Added Position in FM*. PhD thesis 8.2013, DTU Management Engineering, May 2013.

- Katchamart, A. and Then, D. (2014), Strategic FM Procurement: an issue of aligning services to business needs. Paper from EFMC 2014 (Alexander, 2014).
- Kok, H.B., Mobach, M.P. and Omta, S.W.F. (2011), The added value of Facility management in the educational environment. *Journal of Facilities Management* 9 (4), 249-265.
- Kok, H.B., Mobach, M.P. and Omta, S.W.F. (2013), Can Facility management contribute to study success? Paper from EFMC 2013 (Alexander, 2013).
- Kuijlenberg, R. and Mobach, M.P. (2013), The influence of facility management on detainees. Paper from EFMC 2013 (Alexander, 2013).
- Lavy, S., Garcia, J.A., and Dixit, M. (2010), Establishment of KPIs for facility performance measurement: Review of literature, *Facilities*, 28, 9, 440-464.
- Lavy, S., Garcia, J.A. and Dixit, M.K. (2014), A framework for Key Performance Indicators for a Holistic Facility Performance Assessment. Paper from CIB 2014 (Jensen, 2014).
- Lindholm, A. (2008), *Identifying and measuring the success of corporate real estate*. PhD thesis, Helsinki University of Technology.
- Lindholm, A.L. & Gibler, K. M. (2005), "Measuring the Added Value of Corporate Real Estate Management: beyond cost minimization", *12th Annual European Real Estate Society Conference, Dublin, Ireland*.
- Low, J. (2000), The value creation index. *Journal of Intellectual Capital*. Vol. 1, No. 3, pp. 252-262.
- Man, C.S. and Lai, J.H.K. (2014), *Selection of Key Performance Indicators for Engineering Facilities in Commercial Buildings: A Focus Group Study in Hong Kong*. Paper from EFMC 2014.
- Matzdorf, F. and Greenwood, J. (2015), Student choice, league tables and university facilities. Paper from EFMC 2015 (Alexander and Price, 2015).
- Meerman, A., Lellek, V. and Serbin, D. (2014), The Path to Excellence: integrating customer satisfaction in productivity measurement in Facility Management. Paper from EFMC 2014 (Alexander, 2014).
- Nourse, H. & Roulac, S. (1993), "Linking Real Estate Decisions to Corporate Strategy", *Journal of Real Estate Research*, 8, 475-494.
- Pawson, R. and Tilley, N. (1997), *Realistic Evaluation*. SAGE publications, London. UK.
- Porter, M.E. (1980), *Competitive strategy*. Free Press, New York.
- Preiser, W.F.E. (1995), Post-occupancy evaluation: how to make buildings work better, *Facilities*, 13, 11, 19-28.
- Prevosth, J. and Van der Voordt, T.J.M. (2011), *De toegevoegde waarde van FM. Begrippen, maatregelen en prioriteiten in de zorgsector*. Facility Management Nederland, Naarden.
- Price, I., Matzdorf, F., Smith, I. and Agahi, H. (2005), "The impact of facilities on student choice of university". *Facilities* 21 no. 10, 212-230.
- Redlein, A. and Zobl, M. (2013), Facilities Management in Austria 2012 – Value Add? Paper from EFMC 2013 (Alexander, 2013).
- Redlein, A. and Zobl, M. (2014), Facility Management in West- and Eastern Europe. Paper from EFMC 2014 (Alexander, 2014).
- Riratanaphong, C. (2014), *Performance management of workplace change in two different cultural contexts*. PhD thesis. Faculty of Architecture, Delft University of Technology.
- Riratanaphong, C. and Van der Voordt, T.J.M. (2015), Performance measurement of public facilities in Thailand: A case study of Dhanarak Asset Development. Paper from EFMC 2015 (Alexander and Price, 2015).
- Riratanaphong, C. and Van der Voordt, T.J.M. (2014), Measuring the added value of workplace change: comparison between theory and practice. Paper from CIB 2014 (Jensen, 2014).

- Tinsfeldt, M. and Jensen, P.A. (2014), Value adding space management in higher education. Paper from CIB 2014.
- Van den Bouwhuisen, M. and Doodkorte, E. (2013), *Huisvestingsmanagement in de V&V-zorgsector*. MRE thesis, Tias School for Business and Society, Tilburg.
- Van der Voordt, T., Prevosth, J., and Van der Zwart, J (2012), *Adding Value by FM and CREM in Dutch Hospitals*. In Jensen et al. (eds.), *The Added Value of Facilities Management: Concepts, Findings and Perspectives*. Centre for Facilities Management - Realdania Research, DTU Management Engineering, and Polyteknisk Forlag, Lyngby, Denmark.
- Van der Voordt, T. and Jensen, P.A. (2014), Adding Value by FM: exploration of management practice in the Netherlands and Denmark. Paper from EFMC 2014.
- Van der Zwart, J. (2011), Real Estate Added Value and decision-Making in Hospital Infrastructure. Proceedings of HaCIRIC International Conference on Global Health Infrastructure Challenges for the next decade, 26-28 September, Manchester, UK.
- Van der Zwart, J. (2014), *Building for a better hospital. Value-adding management & design of health care real estate*. PhD Thesis, Faculty of Architecture, Delft University of Technology.
- Van der Zwart, J. & Van der Voordt, T. (2013), "Value adding management of hospital real estate. Balancing different stakeholders' perspectives". *(E)Hospital* Vol. 15, no. 3, 13, 15-17.
- Van Meel, J., Martens, Y. & Van Ree, H. J. (2010), *Planning office spaces: a practical guide for managers and designers*, London, Laurence King Publishing Ltd.
- Van Sprang, H., Pijls, R. and Tonnaer, G. (2014), Capturing meal experiences in nursing homes: an exploratory study. Paper from EFMC 2014 (Alexander, 2014).
- Von Felten, D., Böhm, M. and Coenen, C. (2015), Multiplier effects through FM services: A survey-based analysis of added value in FM. Paper from EFMC 2015 (Alexander and Price, 2015).
- Waroonkun, T. and Prugsignant, DS. (2014), Post-Occupancy Evaluation for improving of main dormitories. Paper from EFMC 2014 (Alexander, 2014).
- Wetzels, M. (2014), *Sturen op toegevoegde waarde van vastgoed in de Geestelijke Gezondheidszorg*. MRE thesis, Tias School for Business and Society, Tilburg.