Facilities management research in the Nordic countries
Past, present and future

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In this book about research on Facilities Management (FM) leading researchers from the Nordic countries present their ideas and findings concerning:

- **Past**: The historical development and current trends in FM research in Denmark, Norway, Sweden and Finland.
- **Present**: Ongoing FM research within the following six themes: Working Environments, Sustainability, Innovation and Usability, Partnerships, Knowledge Implementation, and Added Value.
- **Future**: Identification of future trends, challenges and research agendas for Nordic FM.

The book is a result of a Nordic FM Conference arranged by the Centre for Facilities Management – Realdania Research (CFM) on 22-23 August 2011 at the Technical University of Denmark. The title of the conference was: "Research for Practice – Vision of Futures". The conference was arranged in collaboration with NordicFM and DFM – the Danish Facilities Management Association. There were 82 participants from Denmark, Norway, Sweden, Finland and Iceland.

The book is targeted towards researchers, reflective practitioners, teachers and students at advanced levels, including PhD-students, in the field of FM. It is mostly based on papers from the conference with revisions and in a graphical attractive layout. It also includes results of CFM's FM Futures project. The main purpose of this project was to create input to a joint Nordic FM research agenda. Thus, the overriding purpose of the conference, the FM Futures project and this book is to support increased Nordic collaboration on FM research among researchers and with practitioners.
FACILITIES MANAGEMENT RESEARCH IN THE NORDIC COUNTRIES

PAST, PRESENT AND FUTURE

PER ANKER JENSEN AND SUSANNE BALSLEV NIELSEN (EDITORS)
Centre for Facilities Management – Realdania Research (CFM) is a virtual, national Danish research centre with management placed at the Department of Management Engineering, Technical University of Denmark (DTU). CFM arranged a Nordic Facilities Management (FM) conference at DTU’s main campus in Lyngby by Copenhagen on 22-23 August 2011. The title of the conference was: “Research for Practice – Vision of Futures”. This book is a result of the conference.

The title of the conference indicates firstly, that the objective was to present FM research aimed at practitioners and to facilitate discussions and collaboration between researchers and practitioners. Secondly, the title indicates, that the objective also was to present visions of the future of FM and FM research. According to the conference announcement the purpose was to create an exciting meeting place for people working with FM around CFM’s research. The conference program aimed to give insights into research projects, to discuss the results and to explore mutual interests of practitioners and researchers in the next generation of FM research. The ambition was to create a Nordic meeting place, which the participants would remember for the intellectual challenges, its practical relevance and as a milestone in the increased alliance around FM research for practice in the Nordic countries. The conference was arranged in collaboration with NordicFM and DFM – the Danish Facilities Management Association. There were 82 participants in the conference from Denmark, Norway, Sweden, Finland and Iceland.

The book is mostly based on the papers from the conference with necessary corrections and in a graphical elaborated layout. It also includes introductions to each theme, summaries of discussions from paper sessions and workshops during the conference, and results of CFM’s FM Futures project. The main purpose of this project was to create input to a joint Nordic FM research agenda. Thus, the overriding purpose of the conference, the FM Futures project and this book is to support increased Nordic collaboration on FM research among researchers and with practitioners. We are excited to see in the coming years how well we will succeed with this.

We would like to thank all of you who participated in and contributed to the conference, to the FM Futures project and the production of this book.

You can find more information about CFM’s research at www.cfm.dtu.dk. Do not hesitate to contact us for any comments and enquiries about this publication or CFM’s activities.

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Centre for Facilities Management – Realdania Research
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1 INTRODUCTION

Per Anker Jensen and Susanne Balslev Nielsen

The title of this book is: “Facilities Management Research in the Nordic Countries – Past, Present and Future”. This title reflects the overall structure of the book with a division in three parts. Part A gives research overviews of the short development of FM research in the Nordic countries. Part B is the main part and presents current FM research divided according to the themes of the paper sessions at the conference. Part C concerns the future of FM with focus on FM research agenda. Together the three parts give a coherent overview and an in depth insight in the recent developments, the state of the art, and the upcoming trends in FM research in the Nordic countries.

Even though the book includes contributions from Denmark, Norway, Sweden and Finland, it should be stressed that the conference was planned by CFM with our research profile as a starting point. CFM was established in 2008 with financial support from the private foundation Realdania for a period of 5-6 years. The overall research profile for CFM is defined as: “Research in space for humans, buildings with use value, and property and infrastructure, that facilitates”. This indicates that the main focus of the centre is the interrelationships between physical environments and social activities and how professionally managed and serviced physical surroundings can support and improve the conditions and activities of humans and organizations. The research themes have developed during the first years and they are now defined as the following five themes: Working environments, Sustainable FM, Innovation and partnerships, Knowledge implementation and Market and Added value, see also Figure 1 in section 2.2.

The papers for the conference were selected by invitation. The national FM research overviews in part A were keynote papers presented at a plenary session. From Norway and Sweden the papers are written by members of CFM’s scientific committee – Geir K. Hansen, NTNU together with Siri Hunnes Blakstad and Jan Bröchner, Chalmers. From Finland the paper is written by Suvi Nenonen, Aalto University, which CFM also have close collaboration with, and from Denmark the paper is written by Per Anker Jensen, head of CFM.

The papers for parallel sessions in part B were for Denmark based on invitations to all participants in CFM’s national research forum, and all CFM’s current projects at the time are represented. For Norway, Sweden and Finland invitations were sent to FM researchers suggested by Geir K. Hansen, Jan Bröchner and Suvi Nenonen, respectively. Invitations were sent out in August 2010 asking for indication of interest and abstracts. The abstracts were reviewed by us as organizers and editors in December 2010. The full papers were written, reviewed and revised in the first half of 2011. To secure the scientific quality the papers were reviewed by 2-3 reviewers with at least one reviewer from another country than the author(s). The reviewers were – besides us as organizers and editors – Geir K. Hansen, Jan Bröchner, Suvi Nenonen and Keith Alexander.
In relation to part C there was an invited presentation by Antje Junghans, NTNU, who is the present chairman of EuroFM’s research network group, and she presented a recent survey about European FM research and ongoing work on a European FM research agenda. Part C is otherwise based on three workshops during the conference and the FM Futures project as further explained below.

**PART A: NORDIC FM RESEARCH OVERVIEW**

Part A consists of chapter 2 with an introduction in section 2.1 and national FM research overviews for Denmark, Norway, Sweden and Finland in section 2.2-2.5, respectively. Per Anker Jensen explains in section 2.2, that specific FM research in Denmark is very recent compared to the other Nordic countries and did not start before 2005, but there has since the 1980s been some related research and development projects of importance for creation of FM knowledge. The establishment of CFM in 2008 has caused a major boost to Danish FM research. In section 2.3 Geir K. Hansen shows that FM research in Norway started in the early 1990s at NTNU and the Metamorphose 2005 project was of major importance to establish research based education and the Centre for Real Estate and Facilities Management, which from 2008 has had a 5 years research program in public real estate and FM. Other issues like knowledge workplaces, building adaptability and usability are important Norwegian research areas as well. Jan Bröchner in section 2.4 identifies eight different research topics in Sweden based on a review of all published FM research in Sweden – the oldest being a PhD thesis form 1985 – without any clear time trend that indicates a long-term shift in research emphasis. The two heavy topics are ‘space management and briefing’ and ‘contract strategies’. In section 2.5 Suvi Nenonen explains that research on FM in Finland like in Norway started in the early 1990s and she identifies three waves. The first in the 1990s focused on FM services, service development and on production and management of services, while the second focused more on research about the connection between FM and client organizations. The third wave is now focusing on more integrated models, both in the mixed use concepts in different space segments and in enlarging the service business models to e.g. an area context.

**PART B: CURRENT FM RESEARCH IN THE NORDIC COUNTRIES**

Part B consists of chapter 3-8 and each chapter includes papers from one of the parallel sessions with paper presentations at the conference. Each chapter starts with an introduction written by the chairman of the session introducing the topic, presenting the papers, and summarising the discussion from the session. The topics follow the five themes of CFM’s research mentioned above except that ‘Innovation and partnerships’ has been divided in ‘Innovation and Usability in FM’ and ‘Partnerships in FM’. The reason was that there were three papers on Usability, which most suitable could be combined with a paper on ‘Innovation’, particularly because one of the papers on ‘Usability’ concerns ‘User driven innovation’.
CHAPTER 3: WORKING ENVIRONMENTS

This topic focuses on workplace management and how workplaces can be utilised as an organisational tool. In her introduction in section 3.1 Karen Mosbech writes it is very gratifying that we now again are getting focused on the interaction between the physical environment and the activities taking place in them, because it has been a bit quiet on the subject for some years. Juriaan van Meel in section 3.2 presents six contrasting Dutch office cases and concludes that it’s more a question of attitude, almost religion, than a matter of objective facts that determine how to arrange yourselves in your company. It is seldom based on a conscious vision of how to support the organizational goals with the physical environment. Heidi Rasila, Ursula Hyrkkänen and Suvi Nenonen in section 3.3 focus on the restorativeness of knowledge workplaces, i.e. how to arrange workplaces in order to ensure that employees thrive and take stimulating (restorative) breaks. The paper tests 3 sets of methodologies for measuring employees’ well-being and need for inspiration in the work environment and concludes that a combination of methods is needed. Birgitte Hoffmann, Morten Elle and Peter Munthe-Kaas in section 3.4 present a paper of facilitating creative environments with four cases at different organizational scales from urban level to office environments. One of the conclusions is that there is a need to abandon the focus on special rooms and office design as keys to facilitate creative environments. Instead, broader perspectives on the organisation need to be considered, including the concrete correlation between facilities, facilitation and culture. From the discussion of the three papers it was concluded that it is impossible to separate space, work and business. It is not the spaces but the way you use them, which is crucial for success. In many organizations, especially larger, management and employees do not have the same goals and visions. There are no general solutions; it will always be a matter of corporate culture, which frames will best support the work. That is highlighted from all the contributors from different angles.

CHAPTER 4: FM AND SUSTAINABILITY

Sustainable FM (SFm) is a relatively new FM research topic, but it has however – as pointed out in section 4.1 by Jacob Steen Møller in his introduction – for a longer period of time been an important issue for FM practitioners. In section 4.2 Susanne Balslev Nielsen explores current practices of FM and develops a conceptual framework with three strategic positions in SFM – incremental, radical and transformative – to explain how the potential and barriers of SFM activities relate to the organisational context. This should help facilities managers to identify the mindset behind different services and technologies that are promoted as SFM and provide concepts to help clarifying and improving their own emerging strategy of SFM. In section 4.3 Kirsten Ramskov Galamba presents a critical review of the environmental management system as a tool for sustainability based on her PhD project with action research in Albertslund Municipality. The main conclusion is that the environmental management system does not support an understanding of sustainability beyond a highly instrumental focus on specific environmental issues, nor does it support the everyday practice for sustainability in a local authority FM context. Jesper Ole Jensen, Jesper Rohr Hansen and Susanne Balslev Nielsen in section 4.4 present a study of ESCO in Danish municipalities, where they identify three approaches – basic, integrative and strategic. The three approaches include different ambitions, technolo-
gies, economies and innovation potentials, but an in-house approach is also considered as an alternative by many municipalities. However, ESCO is not necessarily a contrast to improving the internal FM capacity. Instead, the partnership included in ESCO projects might include great innovation opportunities for the municipal FM organisation, giving it a more active role in developing urban sustainability. The general discussion showed that SFM is a topic of great interest but also that the broad nature of SFM makes it difficult to identify immediate research topics. SFM is strongly relevant but it needs some time to mature both as a practical concept and as a research topic in its own right.

CHAPTER 5: INNOVATION AND USABILITY IN FM
What innovation and usability have in common might not be immediately evident to either FM researchers or FM practitioners as mentioned by Jan Bröchner in his introduction in section 5.1. Ada Scupola in section 5.2 presents an interview study of innovation in the Danish FM sector. The results show that for big service providers, innovation is a strategic activity and is conducted as a planned and systematic process. For FM service customers with their own FM department, the results are mixed: some of the FM departments have innovation as a strategic priority and clear innovation strategies while other FM departments do innovate without being aware that innovation is taking place. ICT Supplier and Consultants are found to be innovative and their innovations are both driven by the user needs and by the desire to improve their competitiveness. In section 5.3 Geir K. Hansen, Siri Hunnes Blakstad and Nils Olsson provides an overview of ten years of Norwegian usability studies at NTNU. During this period, researcher interest has gradually shifted from a focus on the buildings to the users and their activities. Exploring concepts such as “the effectiveness of a building” has led to new insights. Outcomes of the research include a typology with six types of users and the USEtool with its five process stages. Göran Lindahl, Suvi Nenonen, Geir K. Hansen and Siri Hunnes Blakstad in section 5.4 describe Nordic usability studies within the framework of the REBUS project: national case studies have been performed and then discussed in joint workshops. The project confirmed that previous research on briefs and methods to capture user needs is relevant, but these methods need to include management of action and be supported by information technology. The role of the users as well as effective feedback systems crossing project barriers also needs to be developed and this affects the role of the project manager. In addition, the focus on methods and processes needs to be complemented by a theoretically based discourse. In the final debate at the conference session it was pointed out, that mainstream services research talks about user driven innovation, and this is worth taking seriously and not least the issue of communicating user driven innovations. However, there is probably also a tension between usability and innovation, although this depends on how we choose to define FM innovation and how we divide innovation into phases.

The paper in section 5.5 by Aneta Fronzcek-Munter on facilitation user driven innovation was not presented at the conference, because the author was not able to be present. This was unfortunate as the paper concerns both usability and user driven innovation. The paper presents different methods used in planning of new hospital facilities in workshops with users and the
experiences with using them in practice to improve usability of the built environment. Depending on the methods and the boundary objects used at the workshops the participants had different focus, changed the priorities and developed different solutions.

CHAPTER 6: PARTNERSHIPS IN FM
The most known and discussed partnership concept in relation to FM, at least here in Scandinavia, has been Public-Private Partnerships (PPP) according to the introduction in section 6.1 by Geir K. Hansen. Of course this is one of several other possible types of partnerships. The first paper in section 6.2 by Kristian Kristiansen exactly focuses on PPP. The paper questions the assumption that PPP’s is an advantage for the integration of FM considerations in the planning, design and construction of facilities. The results indicate that the effect of PPP’s on the integration of FM is exaggerated, and that FM practitioners should pay more attention to issues related to the sociology of the construction process rather than legal arrangements like PPP. In section 6.3 Nils Ólsson focuses on flexibility in the building process and in the actual building and the implications for project management and FM. The paper presents a framework with four approaches to flexibility management and possible implications on FM. It concludes that is in the interest of facilities managers that projects have an approach for flexibility management to be able to adjust for future changes. Kresten Storgaard and Jacob Norvig Larsen in section 6.4 elaborate on the anticipation that productivity might rise through long-term collaboration and that the quality of solutions will be better. Four types of collaboration are analyzed based on experience and expectations of the firms and customers from empirical findings of a questionnaire survey and case studies of the Danish FM sector. One of the conclusions is that thrust-enhancing mechanisms and a focus on joint problem solving were decisive factors in creating mutually benefiting long-term relationships within FM. Among the general conclusion from the session was that there are rather few experiences from different concepts regarding partnerships in FM and this reflects that this sector is still immature and under development.

CHAPTER 7: KNOWLEDGE IMPLEMENTATION IN FM
Knowledge implementation is as explained in the introduction in section 7.1 by Per Langaa Jensen an aspect of knowledge management, which focuses on how knowledge can be transferred and shared. In a FM context this often regards knowledge transfer from FM to building projects. The paper in section 7.2 by Sofia Pemsel and Gunner Blomé concerns a slightly different context as it presents a study based on questionnaires in Sweden on knowledge sharing activities in real estate organizations. They found that knowledge sharing were insufficient between different subunits in the organizations, that the main motivation for employees were assuring good jobs for colleagues, incentives for knowledge sharing was not in use, and all could report on additional costs due to missing knowledge sharing. Anders Peder Hansen and Torben Damgaard in section 7.3 based on a combination of a case study and literature review address how FM knowledge can be integrated in the design phase in light of the dominating principles of managing construction work emphasizing standards in contracts, role and skills in combination with informal exchange of experience in communities of practice. They recommend that priority should be given to integrating facility managers into the design phase
and that boundary objects (i.e. objects facilitating a dialogue between different communities of practice) should be given more attention. The paper in section 7.4 by Poul Henrik Due and Peder Stephensen is a best practice project made in parallel to the research project presented in section 7.3. The paper presents a methodology for integrating FM knowledge in construction processes, which has been developed based on workshops with a panel of 18 experienced facility managers. The methodology comprises four elements to take into account when following a predefined screening process. The first experiences from using the methodology in two projects are promising. In the discussion following the presentations of the three papers it was agreed that knowledge feedback from practice to design is weak concerning FM. It was pointed out that such difficulties in feedback from operation to design are also important problems in many areas within production management. Lessons might be learned by analyzing other work in this field.

CHAPTER 8: FM AND ADDED VALUE
The added value of FM is a topic which focuses on the impact FM might have on the core business it supports and possible the surroundings and other stakeholders as explained in the introduction in section 8.1 by Suvi Nenonen. The conference session on this topic had presentations of four papers, but only one of these is included in this book. The reason is that it has been decided to include two of the papers in a new EuroFM publication with specific focus on the added value of FM, which also has Per Anker Jensen as the main editor, and the last paper has been withdrawn from this publication by the author after the conference. The paper included in this chapter is by Akarapong Katchamart, who in section 8.2 presents a product-process matrix to be used for classifying the value positioning of FM organizations. The hypothesis is that FM value positioning located along the matrix diagonal will deliver greater customer value than FM value positioning in the off-diagonal positions of the matrix. The paper also demonstrates the applications of the matrix by examining the FM value positions in the FM organizations within the two multinational Danish based corporations LEGO group and A.P. Moller – Maersk Group.

PART C: VISION OF FUTURES
Part C consists of chapter 9 about FM Futures and Research Agenda starting with an introduction in section 9. In section 9.2 Per Dannemand Andersen, Birgitte Rasmussen and Per Anker Jensen presents future trends and challenges for FM in the Nordic countries based on CFM’s FM Futures project. This project was carried out in parallel with the planning of the conference in 2010 and 2011 with national workshops in Denmark, Norway, Sweden and Finland, a joint Nordic workshop during the conference and a questionnaire just after the conference. The results were quite different in the four countries with sustainability as the main general overall trend and challenge in all countries. Susanne Balslev Nielsen and Keith Alexander is section 9.3 summarises the results from two workshops during the conference about collaboration between researchers and practitioners. It is clearly a great challenge to disseminate research results to practice and mediators between researchers and practitioners can play a very important role, but direct collaboration in research and development projects can also be very beneficial. Antje Junghans in section 9.4 presents a recent survey about European FM research
and the ongoing work on a European FM research agenda. The survey covered 16 institutions and 10 research fields were identified. The objective of the research agenda is to contribute to the further establishment of the FM discipline. Finally, in section 9.5 Per Anker Jensen, Per Dannemand Jensen and Birgitte Rasmussen presents a proposals for a common Nordic FM research agenda, which like section 9.2 is based on CFM’s FM Futures project.

**THE EDITORS FINAL REMARKS – ENJOY!**
We realize that this book is very voluminous and might appear overwhelming and perhaps frightening to start reading. It is not intended to be read from start to end in one go. We have in this introduction attempted to create an overview of the book, which should make it easier to find the chapters and sections of particular interest for you. The book also has at the end an index of keywords to the papers.

We are certain that the book is a treasure box with a wealth of ideas and information of interest for everybody with an interest in FM at an advanced level – not only in the Nordic countries but in all Europe and around the world. One of the fascinating things about research is that it is truly international. We in the Nordic countries can learn a lot about FM from other parts of the world, but we also have a lot to offer to the world. We hope this publication will be a reference book, which you will keep on coming back to for new information and inspiration. Enjoy reading in it!
PART A

NORDIC FM RESEARCH DEVELOPMENTS
2 NATIONAL FM RESEARCH OVERVIEWS

2.1 CHAPTER INTRODUCTION

Per Anker Jensen

Introduction to the topic
The Nordic countries are together with USA, UK and the Netherlands among the internationally leading countries in the development of FM – in relation to business, market and research. It has developed as a field in practice since around 1990 in all four countries. During the 1990s there were research and education activities established in Norway, Sweden and Finland such as at the NTNU in Trondheim, Chalmers Technical University i Göteborg and Helsinki University of Technology (HUT – today part of Aalto University). In Denmark, the establishing of research and education at university level did not start before 2003, when the Department of Civil Engineering at DTU included FM in its strategy.

The next four sections in this chapter present national overviews of FM research in Denmark, Norway, Sweden and Finland based on invited keynote presentation at the conference.

Per Anker Jensen, CFM: FM Research for Practice in Denmark
Research related to FM in Denmark before 2003 was mostly technical oriented with a focus on indoor climate in the 1980s and on energy and environmental impacts in the 1990s. Around year there also were some research activities on Whole Life Costing, including a joint Nordic project. The first research project at DTU with specific FM focus was called “Facilities Management Best Practice in The Nordic Countries”, which included 36 cases from Denmark, Norway, Sweden, Finland and Iceland. One of the general results was the FM Value Map, which was based on cases as well as a parallel work in a NordicFM group on “Highlighting the added value for core business provided by FM”. The FM Value Map was a starting point for a EuroFM research group on Added Value and FM, which plans to publish a book on this topic for EFMC2012 in Copenhagen. The establishing of CFM in January 2008 represented a major boost to FM research in Denmark.

Geir K. Hansen: Overview and Status of FM Research for Practice in Norway
NTNU has since the early 1990s undertaken research related to FM. From 2002 to 2006 the ambitious Metamorfose 2005 project was carried out with the main objectives to develop a research based education and competence environment in relation to Property and FM. In recent years a major project on knowledge work, KUNNE has been carried through in Norway and one aspect of the research has been the knowledge workplaces. Adaptability of buildings has been another focus area in Norwegian research. NTNU has also been central in developing a proposal for a research program for Norwegian municipal facilities management, and the centre has from 2008 had a 5 years research program in public real estate and facilities management. Usability has for the last eight years been an important area of research at NTNU as part of the CIB W111 international research group. A number of case studies have been carried out
and many combinations of research and evaluation methods have been tested in collaboration with public and private organizations. NTNU has also been strongly involved in the joint Nordic REBUS project. One of the results of this was the USEtool evaluation methodology developed by researchers from NTNU together with Statsbygg, Statoil and the county of Sør-Trøndelag.

Jan Bröchner, Chalmers: FM Research for Practice – Swedish developments
Chalmers is the main centre for FM research in Sweden. Chalmers had done research since the 1980s on reuse of industrial areas, which was relevant to a broader development of FM. In 1996 FM Chalmers was established as a strategic action in collaboration between three schools at Chalmers: Architecture, Civil Engineering, and Technology Management and Economics. The university provided basic funding to build up research for a number of years. According to the historical development of Swedish research in the field, the research topics have changed from an initial focus on studies of costs and financial issues, followed by information technology and innovation, space management and briefing, service qualities and satisfaction, contract strategies, company strategies, and finally FM and environmental sustainability. From a review of published research, it is clear that two heavy topics in Sweden are ‘space management and briefing’ and ‘contract strategies’, although there is a wide range of other FM fields that are covered. However, there is no clear time trend that indicates a long-term shift in research emphasis between the eight FM themes.

Suvi Nenonen, Aalto: Facilities Management Research for Practice – An Overview on Finland
In Finland research on FM was started in the early 1990s at the Institute of Real Estate Studies, HUT. Later research initiatives have spread also to other research organizations within the university, for example the Built Environment Services research group, and at other universities and research institutions. FM research in Finland has in the last decades mainly developed in three waves. Each wave has had a different driver and can be identified both as a development of research interest and the changes in the business sector. The first wave of FM research in the 1990s focused on FM services, service development and on production and management of services. The second wave focused more on research about the connection between FM and client organizations. Issues like sustainability, workplace transformations and added value aspects are examples of the themes in a variety of research projects. The third wave is now focusing on more integrated models, both in the mixed use concepts in different space segments and in enlarging the service business models to e.g. an area context. Each perspective of research is still valid, but one can identify the different weights in research interests, mainly required by developments in the FM industry.

FINAL REMARKS
The research in the different Nordic countries has developed based on local conditions and opportunities, but there is also a strong connection between the research environments. Each research environment is very small and vulnerable, so international collaboration is necessary to make sustainable FM research communities.
2.2 FM RESEARCH FOR PRACTICE IN DENMARK

Per Anker Jensen

ABSTRACT

Purpose: The purpose of this paper is to present an overview of research and development in the area of Facilities Management (FM) in Denmark.

Background: Research in FM is a fairly new activity in Denmark, but there have during the 1980’s and 1990’s been a number of development activities on national level, which have had importance to constitute and form a professional basis for FM.

Approach: The paper provides a chronological overview of research and development activities related to FM over the last 30 years in Denmark, including CFM’s ongoing research projects.

Results: In the 1980’s the research activities related to FM mostly concerned indoor climate and there was also some research on briefing and development projects concerning building operation. In the 1990’s the research related to FM was broadened to a wider environmental focus including energy and the external environment. FM started to be developed in practice with a strong focus on benchmarking and IT systems like CAFM. Around year 2000 a number of research and development project on Whole Life Costing was carried out and around 2005 there were some development projects and publications on new offices. Digital handover of data from building projects to FM and Building Information Modelling also became an important field of development. Research in FM started at DTU in 2003 and got a major boost by the establishing of CFM in 2008. In recent years sustainability has emerged as a new important research area in FM both in Denmark and internationally.

Practical Implications: The paper provides an overview of research and development related to FM, which is an important background to understand the trends and the state of the art and gives a basis for discussions and decisions on future research themes and activities.

Keywords: Facilities Management, Research, Development, CFM, Denmark.

INTRODUCTION

While Facilities Management (FM) has been developed in practice from the start of the 1990’s in all Nordic countries, it has been later to be introduced at university level in Denmark compared to Norway, Sweden and Finland. Therefore, research in FM has been very limited in Denmark until 5 years ago. The establishment of the Centre for Facilities Management – Realdania Research in 2008 has been a very important factor to stimulate FM research in Denmark and to create a research environment of a comparable volume to the other Nordic countries. However, we have still not yet any finished PhD candidate in FM in Denmark and the research output it still fairly limited.
There have been some earlier research activities related to FM in Denmark as mentioned in the paper. Research is an important activity to create new knowledge and develop new methods and concepts, but there are other ways than formalized research to make knowledge development. We have over the last 30 years experienced an increased interest in building operation in Denmark and there have been a number of organized development projects, which has supported the constitution of FM and formed a basis for a professional development.

This paper presents a mostly chronological overview of research and development related to FM during each of the last three decades as well as the more specific recent and ongoing FM research activities. To avoid unnecessary repetitions, the topics are mostly dealt with in the decade when they were most important. A list of abbreviations is included at the end of the paper before the list of references.

Because of the author’s central position in this development, part of the paper will focus on his own contributions. This makes the paper less objective than might be desirable, but it also makes it possible to provide an overview based on long term experience.

THE 1980’S: INDOOR CLIMATE, BRIEFING AND BUILDING OPERATION

The research activities related to FM was mostly technical oriented research concerned with indoor climate. The world health organization WHO had in 1983 defined the Sick Building Syndrome – SBS (Jensen, 2008) and research on indoor climate received high priority in Denmark both at universities, the Building Research Institute and the new Health and Safety Institute (Arbejdsmiljøinstituttet). The indoor climate research centre at DTU became an internationally leading research environment under the leadership of the late professor Oluf Fanger, who for instance introduced the unit ‘olf’ as a measure of the strength of a pollution source (Fanger, 1988). A very influential survey of indoor climate in offices in town halls was also undertaken (Skov et al., 1989) and provided a benchmark for evaluation of office.

Research on indoor climate has continued to be a focus area in the following decades, including investigations on impact of indoor climate on office productivity and learning in schools. The importance of cleaning for the indoor climate was investigated by the Danish multinational facility service provider ISS, who published a handbook on this topic in 1991 (ISS, 1991). The Danish Building Research Institute has published a technical recommendation for professional practitioners on indoor climate (SBI, 2000).

Another area of research, which had particular focus in the 1970’s and the early 1980’s in Denmark, was briefing. The Danish Building Research Institute carried out some research projects in this area (for instance SBI, 1981) headed by the Finnish researcher Tarje Cronberg (later member of the Finnish parliament and Minister of Labour in Finland). Since then briefing has not been a research topic in Denmark until recently, when it has again come more in focus for instance at CFM.
During the 1980’s a few development projects related to building operation were carried out. The first of these concerned planning of operation friendly building and resulted in a recommendation from the Building Research Council (BUR, 1985). This was followed up by two publications from the Building Planning System centre (BPS) about common system and principles for maintenance of property divided in a guideline for decision makers and a handbook for professional practitioners (BPS, 1988a and b).

Following a quality assurance reform of the building industry in the mid 1980’s, the Danish Ministry of Housing introduced requirements to prepare operational plans for buildings as part of the handover of new building projects. This resulted in publication of a general guideline about building operation by the Ministry (Bygge- og Boligstyrelsen, 1990), a guideline for managers of building operation from the Danish Building Research Institute (SBI, 1990) and the Danish Association of Consulting Engineers issued a guideline for preparation of handbook for building operation and operational plans (F.R.I., 1990).

THE 1990’S: ENVIRONMENT, BENCHMARKING AND CAFM

The internal environmental focus of research on indoor climate was in the 1990’s very much supplemented by an increasing focus of research on the external environment and energy issues. This resulted for instance in development of methods for life cycle assessment (LCA), establishing of a database for LCA evaluations of building components (SBI, 1998) and simulation programs for energy performance of buildings. This research took place alongside a practical development in the Danish building industry of a comprehensive methodology for environmentally friendly design of buildings coordinated by BPS and published in 1997 as two spring binders for subscription and updating followed by a guideline for building clients and an inspirational guide (BPS, 1997, 1999 and 2000). Research aiming at developing a system for environmental declaration and classification was also started (Dinesen and Hansen, 1999), but not implemented. Only recently has the new Danish Green Building Council started to initiate the implementation of such a system.

An interest in whole life costing (WLC) or life cycle costing appeared in the 1980 and the Danish Ministry of Building published guidelines on this topic in 1989 and 1994 (Boligministeriet, 1989 and 1994). The Danish Association of Consulting Engineers issued a report about WLC as a a management tool (F.R.I., 1995). The Ministry of Housing also issued a report with a new computer program for WLC calculations in 1998 with particular focus on new social housing building projects after it had been mandatory to make such calculations as part of the public approval process (Boligministeriet, 1998).

The Danish Facilities Management Association (DFM) was established in 1991 and one of the first major initiatives was to start a project on key indicators for benchmarking based on participation of and financed by a number of public and private member companies. The work was partly based on and a continuation of the former work in BPS from the 1980’s about common system and principles for maintenance of property, but it also involved major work on defini-
tions of space and other related aspects. A first data collection for the year 1992 was carried out and the results of the project were published in a report, which also included the first coherent introduction to FM in a Scandinavian language (DFM, 1995). In January 1996 a separate association connected to DFM under the name DFM-key figures (today DFM-Benchmarking) was established to continue the activities with key figures and benchmarking as an annual recurring process. One of the major tasks for the new association was to develop a computer based system for data collection, analysis and reporting. The questionnaires were distributed via floppy disks, which were sent to the members and after returning to the secretariat, the data could be automatically transferred to a database. Reports were generated by use of Excel spreadsheets and reports with the generalized results were printed in an annual publication for members only. Today the system is all on-line and web-based.

The implementation of IT had been a hot issue in the building industry in the 1980’s when personal computers and Computer Aided Design systems (CAD) had started to be used more commonly. This development also had a strong influence of the early profession of FM in the 1990’s, when the first Computer Aided FM systems (CAFM) with intelligent integration of digital CAD drawings and alpha-numerical data base systems were introduced in some of the larger FM organization like TDC, SAS and Danish Broadcasting Corporation (DR). However, more simple O&M systems without CAD became much more widespread in smaller companies and in municipalities.

The development of CAD led to the possibility to transfer digital graphical data from building design to building operation, and the Ministry of Housing was early to support this possibility and also saw perspectives in transfer of data to public registers and systems in utility companies. They started a development project under the name CIS-CAD, where CIS was an abbreviation of Coordinated Information Systems. The purpose was to create a public standard for data structure and data transfer between different computer systems and user organizations. A first report was published (Boligministeriet, 1995), but it was not mandatory to use, so it was a guideline rather than a standard. After some test projects and further development revised guidelines were published (Boligministeriet, 1997 and By- og Boligministeriet, 2000). However, the practical effects of CIS-CAD appeared to be rather limited.

THE 2000’S: WHOLE LIFE COSTING, NEW OFFICE, BIM AND CFM

The interest in WLC was very strong around the change of millennium both in research and development. The Danish Building Research Institute carried out a research project with evaluation of 10 experimental building projects (SBI, 2002), which resulted in a small publication by the Danish Enterprise and Housing Authority with 13 tips about WLC (Erhvervs- og Boligstyrelsen, 2002). Furthermore, together with other Nordic research partners the Danish Building Research Institute carried out a joint Nordic project from 2002 to 2004 with the purpose to develop and implement a common Nordic model with cost specifications for WLC and environmental key indicators (SBI, 2005).
The Building Research Council in 2000 published both a report about the use of whole life costing in new buildings and building renovation and a report with a translation of a Norwegian calculation tool for whole life costing of buildings, including a floppy disk with the software (BUR, 2000a and b). In 2000 it became mandatory for all state supported building clients to prepare whole life cycle costing calculations as part of the planning of building projects as part of quality assurance. This was followed up by an investigation among state building clients by a consulting company (Mancon, 2003), which showed that mainly the Danish Defence’s building department used WLC calculations systematically and they had developed their own IT based calculation tool for this purpose. In recent years there has not been so much attention on WLC in Denmark, but the Danish Enterprise and Construction Authority has in 2009 published a Best Practice manual about WLC in public organisations prepared by Ramboll (Erhvervs- og Byggestyrelsen, 2009).

At DFM’s 10 years anniversary a Danish handbook in FM written by the author of this paper was published as the first comprehensive introduction to the subject in a Scandinavian language (Jensen, 2001). DFM was publisher and the production of the book was financed by sponsor adverts on the back cover. A second edition was published in 2006 with limited changes except for a new preface and a summary of the development since 2001. A translated and updated version in English was later published by CFM (Jensen, 2008). An updated and extended third edition in Danish including two new chapters has been published earlier this year (Jensen, 2011). The first version of the book was very much based on the author’s practical experience with FM in his job at DR and as part of the professional development in DFM, participation in a number of Danish and EuroFM conferences, active involvement in the development of DFM-key figures and a EuroFM benchmarking project as well as literature studies. The third version is to a much higher degree a research based publication with a stronger focus on strategic aspects. The book is used for teaching at several levels in Denmark, Norway, Sweden and Iceland, and it is still the only comprehensive introduction to FM in a Scandinavian language. All members of DFM receive a copy of the book.

As appreciation of writing the FM handbook the author was later in 2001 awarded the travel grant “The Yellow Brick” by the private Danish foundation BoligfondenKuben. Therefore, he arranged a study tour in august 2001 to England to visit academics at different universities and the Building Research Establishment. My focus was based on my involvement in the early phases of the development of DR Byen on briefing and the relation between FM and building planning. Based on the study tour, literature studies and the experiences from DR Byen he wrote a new book about how huge building projects can be planned to support corporate change and development (Jensen, 2002). The publication was financially supported by BoligfondenKuben and Realdania.

During his work on DR Byen, he followed a MBA course at the Copenhagen Business School and he finished with a dissertation about organization of strategic support functions in DR, which later has been the basis for a conference paper and a research article (Jensen, 2004 and 2011a).
The 1990’s experienced a lot of hype about new office solutions, but there was not much systematic research or development besides specific case projects. One of the organizations with a strong focus on new offices solutions was the Danish Palaces and Property Agency, who used their own office as a test bed and worked as consultants for other state organizations. One of the leading persons was Karen Mosbech, who collected her knowledge and experiences in the book “Workspace” published both in Danish and English (Mosbech, 2004). The Danish Palaces and Property Agency in 2005 published a report about the office of the future based on inputs from two consulting companies working in parallel on the same assignment (Slots- og Ejendomss- tyrelsen, 2005). The Alexandra Institute in Århus also carried out a number of development projects about new office and they participated in the joint Nordic project DEKAR from 2003 to 2005 resulting in a Nordic guide to workplace design (Nordic Innovation Centre, 2007).

The public initiatives concerning CIS-CAD in the 1990’s did as mentioned earlier not have great practical effects. However, a new much more ambitious development program called ‘Digital Construction’ was launched by the Danish Enterprise and Construction Authority in 2003 with the aim to increase the use of IT on the construction industry by making it mandatory for state building clients to set requirements for the companies involved in design and construction of public buildings. The program included four areas, which were project web, digital tendering, 3D design and digital handover from building projects to building operation. The last area was of particular importance to FM. The requirements were put into force in 2007 for new building projects over a certain size and have later been extended to renovation projects, social housing and regional hospital buildings. However, the implementation has suffered from several problems, including an unfinished building classification system, lack of standard measuring methods and insufficient standards for interoperability. Even so, the program has forced the state building clients to be much more aware of the need for IT support of building operation and supported the development of Building Information Modelling – BIM (Jensen, 2011).

The beginning of research at DTU
In 2003 it was decided to prioritise FM as a new subject of research and teaching in a new strategy for the Civil Engineering department (DTU-BYG). This was based on demand from industry rather than based on internal desires and there were at the time no staff with a background from FM. A first initiative from a group of researchers was to develop a profile and start creating a research agenda for “Managing Facilities in a Scandinavian Manner”, which resulted in a paper for the Research Symposium of EFMC2004 in Copenhagen and later an article in Facilities (Elle, et al., 2004). This included an illustration of “FM the Scandinavian way” compared to “FM the mainstream way” as shown in Table 1. The strong building focus and lack of service orientation is striking, but the emphasis on sustainability and holistic principles is much in line with recent development.

The authors first research at DTU
The author of this paper started at DTU in April 2005 with the assignment to develop FM as a field of research and teaching. His initial research focus was to collect basic empirical knowl-
edge about FM, which could form the basis of teaching and further development of a research agenda.

Table 1: Illustration of “FM the Scandinavian way” compared to “FM the mainstream way”

<table>
<thead>
<tr>
<th>Phases in the building process</th>
<th>Basic FM</th>
<th>The Scandinavian way</th>
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<tr>
<td>Values</td>
<td>Operation phase</td>
<td>Integrated, life cycle</td>
</tr>
<tr>
<td>Key competences of facilities managers</td>
<td>Effectiveness, economy, stakeholder perspective</td>
<td>Sustainability, participation and holistic principles</td>
</tr>
<tr>
<td>Qualities in the final building</td>
<td>Understanding and practicing cost effective maintenance and management</td>
<td>Understanding and practicing sustainability and participation</td>
</tr>
<tr>
<td></td>
<td>What you pay is what you get</td>
<td>Long lasting products with lowest environmental burden</td>
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</table>

He started a first research project on his own with a study of how DR had functioned as building client and building over time. In that way he could utilize his own knowledge about and contacts to DR’s organization. The study included an interview survey, a small questionnaire among selected managers in DR and archive studies. The results were published in a research report in Danish (Jensen, 2006) and by coincidence it was made public at the time when a severe budget overrun of DR Byen was announced, so the author was interviewed in television, radio and news papers about my results and views on the situation. Several conference papers, journal articles and a book chapter have been based on the research results, and he has collected a research report in English with some of the results (Jensen, 2008).

The DR case provided an exceptional single longitudinal case study over time. The author wanted to supplement that with a variety of current case studies. In that way he could achieve both a diachronic and synchronic perspective on FM. Together with a research group he managed to get financial support from BoligfondenKuben to the project “Facilities Management Best Practice in The Nordic Countries”, which included all together 36 cases from Denmark, Norway, Sweden, Finland and Iceland divided in 5 main themes. The project started towards the end of 2005 and it was finished by CFM’s publication of a book in both English and Danish in September 2008 (Jensen et al., 2008a). One of the general results in the books was the FM Value Map which was based on the case studies as well as a parallel work in a NordicFM group on “Highlighting the added value for core business provided by FM”. The FM Value Map has been presented in conference papers and journal articles. The FM Value Map is also a starting point for a EuroFM research group on the Added Value and FM, which the author is leading, and the group are planning a book for EFMC2012 in Copenhagen.
A third project started at DTU in 2006 concerning “Environmental management of housing estates under different forms of ownership”, so it was related to sustainable FM. BoligfondenKuben also supported this project and a research group was managed by Jesper Ole Jensen. When he changed job to the Danish Building Research Institute, the project continued in collaboration with him as manager and participants from DTU. The project included an initial workshop with practitioners, a large questionnaire survey and a number of case studies. The project resulted in a report (Jensen et al., 2008b) and in conference papers and journal articles.

Research at CFM

The start of CFM was a meeting that the author arranged together with DFM in February 2006 to test the interest both among practitioners, associations, other research institutions and research foundations to support research and development in FM. The interest turned out to be overwhelming with around 70 participants. The conclusion was to work together to create a basis and develop ideas for relevant project. Over the summer 2006 three focus groups worked on developing ideas, which I compiled together in a proposal for a common program for research and development and submitted it to the private foundation Realdania, who also had shown positive interest at the first meeting. Realdania expressed interest in supporting the establishment of a research centre and it was agreed that the author made a specific centre plan for further approval. The planning process took place during 2007 including two workshops with participants from Chalmers in Sweden and NTNU in Norway. The plan for CFM was approved by the board of Realdania in October 2007 including financial support of DKK 25 million (approx. Euro 3.3 million) over a period of about 5 years. CFM started January 2008 as a national Danish research centre with management placed at DTU’s new Department of Management Engineering. The author became head of centre with Susanne Balslev Nielsen as deputy.

The research profile for CFM was defined as:

Research in Space for humans
Buildings with use value, and Property and infrastructure, that facilitates.

This indicates that the main focus of the centre is the interrelationships between physical environments and social activities and how professionally managed and serviced physical surroundings can support and improve the conditions and activities of humans and organizations.

The research themes have developed during the first years and they are now defined as the five themes shown in Figure 1.
A list of CFM’s ongoing and finished projects is shown in Table 2.

At CFM’s office at DTU there are seven people, including 3 PhD-students. Other colleagues at DTU are engaged in CFM’s projects including a PhD-student at the Department of Civil Engineering and CFM also has projects placed at the Roskilde University, including two PhD-students, University of Southern Denmark in collaboration with consulting company COWI, and The Danish Building Research Institute, Aalborg University. We arrange regular workshops and meeting in our research forum and group tours to EFMC conferences. In 2010 Susanne Balslev Nielsen received the EuroFM Researcher of the Year award during EFMC in Madrid. We also have close collaboration with professor Keith Alexander, CFM, Manchester and with universities in the other Nordic countries and around Europe. We have close links to DFM and NordicFM and we publish regularly in DFM’s magazine FM Update. Our research output increases rapidly from year to year and a large number of journal articles are under publication.

CONCLUSION

In the 1980’s the research activities related to FM mostly concerned indoor climate and DTU became an internationally leading research environment in this field. There was also some research on briefing. Building operation got much stronger attention and some development projects were carried out. In the 1990’s the research related to FM was broadened to a wider environmental focus including energy and the external environment. FM started to be developed in practice with a strong focus on benchmarking and IT systems like CAFM. The earlier political interest in implementing WLC resulted in a number of research and development projects around year 2000. The hype about new office solutions in the 1990’s resulted in some development projects and publications around 2005. Digital handover of data from building projects to FM and Building Information Modelling also became an important field of develop-
Research in FM started at DTU following a strategic decision in 2003 and got a major boost by the establishing of CFM in 2008. In recent years sustainability has emerged as a new important research area in FM both in Denmark and internationally.

Research in FM is a quite new activity in Denmark and it has received a jump start by establishing the Realdania research centre. It has given us a unique opportunity to develop a research environment, build up research capacity and research based knowledge for use in education, in

Table 2: CFM’s ongoing and finished research projects

<table>
<thead>
<tr>
<th>1. Working environments</th>
<th>Period</th>
<th>Status</th>
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<tbody>
<tr>
<td>Knowledge workplaces</td>
<td>2009-2012</td>
<td>Main project started</td>
</tr>
<tr>
<td>Facilities for creative environment</td>
<td>2009-2011</td>
<td>Near finishing</td>
</tr>
<tr>
<td>Usability of the built environment (incl. PhD-study on Usability Briefing)</td>
<td>2009-2013</td>
<td>PhD-study started</td>
</tr>
<tr>
<td>Healthcare Innovation Lab.</td>
<td>2010-2011</td>
<td>Finish 2011</td>
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<tr>
<th>2. Sustainability</th>
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<tr>
<td>Sustainable FM (incl. PhD-study)</td>
<td>2008-2012</td>
<td>PhD finishes 2011</td>
</tr>
<tr>
<td>Energiservicekoncepter (ESCO m.v.)</td>
<td>2009-2011</td>
<td>Near finishing</td>
</tr>
<tr>
<td>ACES – A Concept for Promotion of Sustainable Retrofitting and Renovation</td>
<td>2011-2013</td>
<td>Staring up 2011</td>
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<tr>
<th>3. Innovation and partnerships</th>
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<tbody>
<tr>
<td>Innovation in FM supply chain (new PhD decided)</td>
<td>2008-2012</td>
<td>Ongoing</td>
</tr>
<tr>
<td>Industrial Service Strategies (incl. PhD-study)</td>
<td>2008-2011</td>
<td>PhD finishes 2011</td>
</tr>
<tr>
<td>Operational partnerships and strategic collaborations</td>
<td>2008-2011</td>
<td>Near finishing</td>
</tr>
<tr>
<td>PPP and procurement of FM services</td>
<td>2008-2011</td>
<td>Near finishing</td>
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<th>4. Knowledge implementation</th>
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<th></th>
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<tr>
<td>Implementation of FM knowledge in building projects</td>
<td>2008-2011</td>
<td>Near finishing</td>
</tr>
<tr>
<td>Decision Support System about buildings and well-being</td>
<td>2008-2011</td>
<td>Near finishing</td>
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<td></td>
<td>2009</td>
<td>Finished</td>
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<th>5. Market and added value</th>
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<td>FM processes and added value (incl. PhD-study)</td>
<td>2009-2013</td>
<td>Ongoing</td>
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<td>The Market for FM in Denmark</td>
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<td>FM Market Data (EuroFM)</td>
<td>2008-2013</td>
<td>Ongoing</td>
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<td>FM Futures</td>
<td>2010-2011</td>
<td>Finishes 2011</td>
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and together with practice and as a basis for further research and development. The challenge is to keep a momentum of activities and researchers at a sustainable level when the financing from Realdania dries out. We are very conscious of this challenge, which we are developing strategies to meet. A central part of this strategy is to increase our collaboration with universities and other relevant partners in other countries and particularly in the other Nordic countries. We are not likely to see very large research environments in any of our countries in the near future, but if we work closer together we think that we all can benefit and be in stronger positions than we are on our own.

This paper provides an overview of research and development related to FM, which is an important background to understand the trends and the state of the art and gives a basis for discussions and decisions on future research themes and activities.

**ABBREVIATIONS**

<table>
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<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tr>
<td>BPS</td>
<td>Centre for Building Planning System</td>
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<tr>
<td>BUR</td>
<td>Building Development Council</td>
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<tr>
<td>CAD</td>
<td>Computer Aided Design</td>
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<tr>
<td>CAFM</td>
<td>Computer Aided Facilities Management</td>
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<tr>
<td>DFM</td>
<td>Danish Facilities Management Association</td>
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<tr>
<td>DR</td>
<td>Danish Broadcasting Corporation</td>
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<tr>
<td>F.R.I.</td>
<td>Danish Association of Consulting Engineers</td>
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<tr>
<td>LCA</td>
<td>Life Cycle Analysis</td>
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<tr>
<td>O&amp;M</td>
<td>Operation and Maintenance</td>
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<td>SBS</td>
<td>Sick Building Syndrome</td>
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<tr>
<td>SBI/SBi</td>
<td>The Danish Building Research Institute (today part of Aalborg University)</td>
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<td>WLC</td>
<td>Whole Life Costing</td>
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**REFERENCES**


### 2.3 OVERVIEW AND STATUS OF FM RESEARCH FOR PRACTICE IN NORWAY

**Geir K. Hansen**

**ABSTRACT**

**Purpose:** The purpose of the paper is to present an overview of the status of research and development in the area of facilities management in Norway.

**Background:** Facilities management is a relatively new research field in Norway, and has developed from a formerly more technical and operational approach focusing on maintenance, costs, and financial issues to a more strategic perspective focusing on service quality, added
value for core businesses, and, more recently, environmental issues such as energy, resources, and sustainability.

**Approach:** The paper presents an overview of the main trends and milestones within the field of what is described today as facilities management. It discusses the wide spectrum of topics under the concept Facilities management and how FM as a field of knowledge has developed, and hence also includes examples of development and research which the author considers relevant in this respect.

**Results:** FM research in Norway has developed from a very limited and technical approach, traditionally focusing on necessary maintenance to the present-day more strategic and holistic view of FM. Research activities have followed developments in FM practice and the need for new knowledge, models, concepts, solutions, and products. The standardizing work has been an important part of that, also related to development of models to handle the life cycle costs issue. Adaptability and flexibility have become important issues also from a FM perspective, where buildings and real estate now are seen as strategic means contributing to the added value for users and owners. Public buildings represent a significant part of the total amount of square meters in Norway. The last years there has been a growing recognition of need for research related to schools, kindergartens and hospitals to meet present and tomorrow’s demands. The Centre for Real Estate and Facilities Management plays an active and important role regarding education, dissemination and research agenda for FM in Norway.

**Practical Implications:** The question of what should be counted as FM research is problematic. This paper illustrates the wide spectrum of topics under the concept facilities management and how FM as a field of knowledge has developed and gives an important background to understand trends and state of the art as a basis for reflections on future research.

**Keywords:** Facilities Management, Research, Development, Norway

**INTRODUCTION**

Facilities Management (FM) research in Norway has developed from a very limited and technical approach, traditionally focusing on necessary maintenance to keep buildings in a reasonable condition, to the present-day more strategic and holistic view of FM’s ability to create added value for core businesses. Research activities have followed developments in FM practice and the need for new knowledge, models, concepts, solutions, and products, and now recognize the field of facilities management as a relevant and important contributor to core businesses. In this sense, FM has moved from the basement to the boardroom. In simplified terms, two main directions in FM can be identified: one relates to technical conditions, buildings, and real estate; the other relates to function, people, and activities. Parallel to the development of standards, there has been a change in focus in various organizations and in society in general. During the last twenty to thirty years, several organizations have been established to promote industry’s interests and needs related to the development of standards, indicators, and general development of practice and research within FM.
Until 1990 the focus was on operation and maintenance as integrated activities to the rest of the organization, with costs as a main concern. Developments in technology and new ways of working (ICT) led to new opportunities, but also to new demands for professionalism in coordination and management. Help desks, logistics, cleaning, catering, reception, and transportation became some of the new key issues regarding services and support, but still with costs related to square meters as the most common indicator. Later, the focus shifted towards seeing costs in relation to work space. With the increased focus on space efficiency, flexibility, and adaptability, and also usability and workplace solutions, the economic perspective has simultaneously developed from focusing on costs to looking at total returns on investments.

The question of what should be counted as FM research is problematic. This paper illustrates the wide spectrum of topics under the concept facilities management and how FM as a field of knowledge has developed. Not all researchers who have published findings of practical relevance for FM practitioners see themselves as FM researchers. For this reason, a reasonably generous interpretation of the FM field is adopted here. This paper presents Norwegian research projects and programs on FM issues mainly from the last twenty to thirty years, and the author therefore acknowledges that there may be several research projects and publications that have not been included in this overview.

FROM OPERATION AND MAINTENANCE TO FACILITIES MANAGEMENT

In the 1980s research on buildings and the impact of buildings on organizations focused on specific issues and limited aspects. Norwegian research was heavily influenced by the Danish Byggeriets Utviklingsråd (BUR). During a period of six to seven years BUR published a number of works on the operation and maintenance of buildings. The energy crisis and the green wave that emerged in the mid-1970s highlighted the rapid growth in production and consumption. Environment and energy became important agendas, also in property management. There are several Norwegian publications on energy consumption dating from the 1980s (Haugen 1984; Granum, 1985, Bryn, 1987). There was also increasing interest in more systematic planning of operation and maintenance in this period (Stang et al., 1983, Bjørberg, 1988), that was followed by the development of methods and standards for evaluating technical conditions in buildings. Although operation and maintenance documentation had been used in Norway since the 1950s, a more systematic approach emerged in the 1980s following the engagement of the Association of Consulting Engineers (RIF), an approach that was strongly related to the development of life cycle costs analyses. In 1988 the Norwegian standard NS 3451 Bygningsdelstabell (Table of Building Elements) was published (Standard Norge, 1988). The standardization work continued through a research project in the period 1989–1995, where building management was a subtopic. This led to the publication of NS 3424 in 1995: Tilstandsanalyse for bygverk - Innhold og gjennomføring (Condition survey of construction works - Contents and execution), which included including guidance (Standard Norge, 1995).

One of the important contributions in this context was the development of a conceptual model for organization, roles, responsibilities, and activities related to FM, where the three levels strategy, tactical, and operational dimensions were introduced. An important message was that effective FM means integration and coordination between the three levels. In following up this work, Haugen (1998) argued for a broader perspective on operation, maintenance, and management when discussing how core businesses can be supported from a more strategic point of view.

In the period 2001–2005 a research project titled “Byggeren i fokus” (The client in focus) was conducted with the aim of developing new knowledge for clients and increased awareness of the role of the client and the tasks, responsibilities, and interests in construction projects. In the same period, Blakstad (2002) reviewed existing research on FM and concluded that there were several publications on operation and maintenance, a number of evaluation reports regarding annual costs and some material that dealt with key performance indicators and benchmarking. Other than the above-mentioned sources, there are few sources that can be described as falling within the “core” of facility management. Several studies have focused on factors that contribute to good real estate management, where technical conditions have been used as a measure of success (Bergseng and Håkonsen, 2001; ECON 2001, 2002; Valen and Olsson, 2009). Gissinger discuss this in an article from 2007 where he point out that there has been a great focus on the survey of technical condition and other methods to map the needs for maintenance and repair, but far less focus on how the FM organization actually can handle the internal processes and the work that need to be done (Gissinger, 2007).

During some decades, NTNU and SINTEF Research Institute have done significant research on energy and sustainability, though this is not within the scope for this article. However there have been some studies on building operators and energy management in non-residential buildings (Aune et al, 2009), and the doctoral thesis by Bye (2008) where user participation and energy management is seen in relation to building design, operation and management. In the Nordic Journal of Surveying and Real Estate Research, Haugen (2003a) discusses the question of contracting out property and facilities services in Norwegian municipalities. The organization of FM and outsourcing services has been a hot topic in Norway for some years; for example, service-level agreements have been discussed by Andresen and Sæbøe (2006) as a tool for defining FM services.

Developments in FM, both in Norway and internationally, have shifted from a focus on buildings, operation, and management to seeing building as one of several factors supporting core businesses. In 2007 two new standards for FM were introduced in Norway: NS-EN 15221-1:2006 Fasilitetsstyring - Del 1: Termer og definisjoner (Facility management - Part 1: Terms and definitions) (Standard Norge, 2007a), and NS-EN 15221-2:2006 Fasilitetsstyring - Del 2: Veiledning for utarbeidelse av avtaler om fasilitetsstyring (Facility management - Part 2: Guidance on how to prepare Facility Management agreements) (Standard Norge, 2007b). This work related to the two standards was based on work carried by the European Committee on Standardization (CEN).
FROM BUILDING COSTS TO LIFE CYCLE COSTS

Prior to the 1980s, the focus on costs had mainly been on costs related to building investment and to operation and maintenance, which had been seen as two different and separate economic logics. In a Norwegian public study conducted in 1983 on perspectives for the building sector for 1980–2000 (NOU 1983: 28) the main objective for the sector was defined as to “provide society with buildings and infrastructure with sufficient quality to lowest possible costs.” Within a few years this understanding was widened in the Norwegian Parliament’s St.meld. nr. 34 (1988–1989) (White Paper no. 34) on housing policy for the 1990s, to see costs in a longer time perspective. Several analyses from Sweden and Norway (Strand 1989) showed the importance of focus on the initial phases of design processes and the consequences for building projects later in the processes. The topic is also covered in several master’s theses from the Norwegian Institute of Technology. In addition, Granum (1985) discusses the importance of analyzing costs related to benefits in a project and argues that costs mostly relate to the value of the use of a building, and hence is quite close to methods used in value engineering and value analyses at that time (Miles, 1972).

In Norway, the use of the term “annual costs” was launched approximately twenty-five years ago, under the motto “to make good houses for the right total economy.” From the end of the 1970s, the Association of Consulting Engineers (RIF) played an important role in developing competence in the costs consequences of investments, leading to the first ”standard”, presented in an RIF publication on annual costs (Borring, 1981) and later included as an important perspective in a book by Holm (1983) on economics in building applications. In 1983 the Norwegian Government, through the Research Council of Norway, launched the 3B research program for innovation and development within the construction industry, running from 1983–1989. A total 187 projects were financed under the program, one of them aiming to increase knowledge about annual costs in the construction industry. In 1988 the first Norwegian standard in annual costs for buildings became a reality: NS 3454:2000. Livssykluskostnader for byggverk - Prinsipper og struktur (Life cycle costs for building and civil engineering work - Principles and classification) (Standard Norge, 2000a). This work furthered by the Norwegian Building Research Institute (NBI), which developed a more theoretical basis for the standard, whereby also proposals and guidelines for practical application were added. The first book was published in 1993, with the title Årskostnader. Bok 1: Beregningsanvisning for bygninger (Annual costs. Book 1: Calculation instructions for buildings) (Bjørberg et al., 1993), followed by Årskostnader. Bok 2: Bygninger i bruk (Annual costs. Book 2: Buildings in use) (Henriksen and Thorsnes, 1994), and Årskostnader. Bok 3: Beregningseksempler (Annual costs. Book 3: Calculation examples) (Thorsnes and Bjørberg, 1994).

In Norway the Directorate of Public Construction and Property, Statsbygg, has been an important driving force in the implementation of standard NS 3454:2000 in several pilots related to public buildings, and in the early 1990s developed an internal rent model based on annual costs calculations. An interesting project conducted in the period 1993–1996, Architecture and Economy, discusses costs from a slightly different perspective (Blakstad and Haugen, 1995). The consequences of architectural decisions on projects’ costs were analyzed on the basis of
several case studies of office buildings. Costs were not only related to square meters but also to workplace or functional unit. The study also looked at how contracting and enterprise models affect project results in economic, technical, and architectural terms.

In 2000 a revised version of the standard on life cycle costs (NS 3454:2000) was launched (Standard Norge, 2000b), and finally, in 2007 the first Norwegian standard using the term facilities management was published: NS-EN 15221-1, on terms and definitions (2007a), and NS-EN 15221-2 (2007b). Multiconsult, one of Norway’s leading consultancies, has played an important part in this work, especially through the role of Svein Bjørberg, who also holds the post of Adjunct Professor at the Norwegian University of Science and Technology (NTNU). In the period 2000–2002 Multiconsult was responsible for the project Value Creation Through the Development of Building Management (Verdiskapning gjennom utvikling av bygningsforvaltning), which resulted in several publications on life cycle costs, calculations and principles, life cycle planning, and adaptability, among other subjects (Bjørberg et al., 2007). There have also been several initiatives on a Nordic and international level regarding life cycle costs and relevant standards and models. In 2001 the Nordic Innovation Centre funded a project called “LCC for byggverk” that aimed to establish a joint Nordic model and cost classification for life cycle profit (LCC) calculations and also to identify relevant indicators (Bjørberg et al., 2005).

Another important research program conducted recently is the Byggekostnadsprogrammet (Construction Costs Program). The program was carried out in the period 2005–2010, as a close collaboration between industrial enterprises, and governmental, research, and educational institutions. The program had three main focus areas: improved customer competence, increased productivity, and better management and responsibility at all levels in a project’s value chain. Approximately forty different projects were conducted within the program. Also worthy of mention is the BedreByggBilligere (Better buildings cheaper) project (Norccnsult et al., 2008), which had the objective of facilitating the construction industry in Norway in an efficient way, in order to enable the industry to include life cycle costs as a part of the decision basis for investments. An important aspect of life cycle costs analyses is the need for relevant input regarding empirical data from comparable buildings and/or businesses. During the last decade there has been increasing interest in collecting data through pilot projects (Holtet and Larsen, 2001) and different interest organizations, such as the Norwegian Association of Municipal Engineers (NKF, 2000), the Directorate of Public Construction and Property (Statsbygg), the Nordic Facilities Management Network (Nordic FM), Norsk Forum for Næringsutvikling (NFN, Norwegian Forum for Economic Development), and the Association of Consulting Engineers (RIF, 2000). Bjørberg (2008) gives examples of use of NS 3454:2000 and registration tools for performance of key numbers and empirical data. In 2007, Bjørberg presented a summary of the experiences and state of the art related to life cycle costs in Norway at the Third International Conference on Maintenance and Facility Management, held in Rome (Bjørberg, 2007).

ADAPTABILITY AND FLEXIBILITY IN A FM PERSPECTIVE

Studies and research on flexibility and adaptability are not new phenomena internationally. Traditionally, the focus has been on the technical aspects related to flexibility and not on adapt-
ability as a process of managing changes in supply and demand. In Norway, some early studies dating from the 1960s mainly focused on standardization and modulation related to construction and prefabrication (Standard Norge, 1960; Hofset and Granum, 1969). The research was developed further into theories on open system construction (Apeland et al., 1975). The work was summarized by Bjørn Larsen, at the Oslo College of Architecture, in his book *Open System Building – on theory and practice* (1977). Larsen’s book also reflects on changes related to users’ needs and demands, although not primarily from a management perspective. Flexibility, adaptability, and elasticity were introduced as concepts in Scandinavia between thirty and forty years ago, when they were related to office buildings and flexible wall systems. More recently, there has been a growing understanding of buildings as a strategic means for organizations. An interesting area regarding changes and challenges related to organization is hospitals. The late 1990s and start of the new millennium were characterized by major hospital development projects in Norway. An important issue in this respect was adaptability to meet future needs in patient treatment. The report on a preproject conducted in the year 2000 describes several strategies, concepts, and principles of adaptability in hospitals, with examples from different planned and newly built hospitals (Bergsland et al. 2000). This topic has been studied more recently by Valen and Larsen (2006), who analyzed the physical changes in six Norwegian hospitals and what kind of actions were performed in order to give high physical capability and flexibility in terms of the buildings’ structure.

One of the early articles on adaptability of office buildings is found in International Journal of Facilities Management in 1997 (Blakstad, 1997). Some years later two reports from the project “Generality and flexibility in buildings – costs and benefits 2000 – 2002” draw up theory and principles primarily related to office buildings but also relevant for other types of buildings (Arge and Landstad, 2002; Arge, 2003). Arge (2003) further analyzes which kind of adaptability an owner should choose. The aforementioned reports describe a model that helps owners and users to make qualified decisions regarding adaptability in office buildings. Larsen and Bjørberg (2007) discuss life cycle planning related to adaptability, and describe principles to enhance the functionality of buildings in a long-term perspective.

A more strategic approach can be found in the project report *Kontorutforming som strategisk virkemiddel* (Office building design as a strategic means) by Kirsten Arge and Donatella de Paoli (2000). The project focused on the relationships between physical solutions and organizations, i.e., the users of buildings. The objective was to contribute greater insight into how new office designs could be a means to support a given organization’s business strategy and value creation, and also contribute greater insight into how managers can plan, implement, and manage change processes related to the new office design and organization. One of the findings was that organizations who build for their own core business invest more in adaptability than commercial actors do (Arge, 2002). In line with this perspective, a further important publication is Siri Hunnes Blakstad’s doctoral thesis, *A Strategic Approach to Adaptability in Office Buildings* (Blakstad, 2002) which was financed by the Norwegian Building Research Institute project “Building in a life cycle perspective”. Blakstad advocates a strategic approach to the problem of adaptability, and emphasizes strategic decision-making processes, taking into account various
user requirements, the relationship between buildings and users, and how these relationships change over time. Most of the research on adaptability was summed up in an article by Arge (Arge, 2005) where theory and practice regarding adaptability in office buildings is discussed.

Adaptability has also been discussed in relation to a process perspective in several publications. In his doctoral thesis, Nils Olsson (2006) looked on project flexibility in large engineering projects. Hansen and Olsson (2010) have analyzed flexibility in hospital buildings and construction projects, and their study addresses flexibility relating to planning and construction processes, and also flexibility as a characteristic of hospital buildings. Arge and Blakstad (2010) discuss briefing for adaptability, and argue for a strategic approach to adaptability and a more operational way of briefing related to layered processes. This approach is also elaborated by Hansen and Olsson (2011), who discuss lean thinking in early design phases.

BUILDINGS AND REAL ESTATE AS STRATEGIC MEANS

Workplace

Parallel to the research on the adaptability and flexibility of buildings and an increasing recognition of the strategic dimensions of adaptability, research on the workplace became an important issue for several organizations during the 1990s, especially in relation to office design.

Arge et al (1997) discuss work space use and management from a regional perspective, recognizing the differences in workplace design and culture between Scandinavia and other countries like US and UK. One project to be mentioned in this respect was the KUNNE Knowledge Workplace project financed by the Research Council of Norway and industrial partners in the period 2003–2006. The project focused on new office solutions and new ways of working in knowledge-intensive organizations. The purpose of the research was to design and develop offices and technology to support these ways of working (Gjersvik and Blakstad, 2004a and b; Kjølle et al., 2005; Kvålshaugen et al., 2005). Knowledge production has also been an important topic in this research. Experiences from research indicate that previous methods used are far from sufficient to grasp the essential aspects of knowledge-production processes or to give any guidance on how and where improvements could be achieved. Skaret et al. (2002) analyze the implementation of a new corporate management control system in a company and argue that practical endeavors towards mobilizing and recreating knowledge is an integral part of value-increasing activities. The Knowledge Workplace project has resulted in more than fifty new methods, models, and prototypes, and fifteen doctoral students have been involved throughout the projects (for more information and further reading see www.kunne.no). Some of the experiences and lessons learned from different case studies are summarized by Bygdås et al. (2004) and Carlsen et al. (2004).

New workplace concepts have been strongly debated in Norway and open-space office layouts have been introduced. Arge (2009) raises the question of whether this concept is suitable and relevant for psychiatric clinics. One of the important findings here was the acknowledgement of the critical process factors and the recognition that every solution should be based on work methods, processes, and the culture within an organization. Regarding more recent research it
is worth mentioning a case study following the construction of a new HQ for one of the major Norwegian banks (Blakstad and Andersen, 2011). The results show that the strategic focus and objectives were important for guiding and focusing the process. It would be possible to measure the added value by a systematic quarterly review of the KPIs (key performance indicators) related to the different objectives. This approach has proven to be important in order to achieve change and development within user organizations.

Usability
The concept of usability was first developed in the 1950s, and while its origin relates to applications within product design the concept was later applied in information technology, software development, and web design. In Norway, we have had a strong focus on functionality and a tradition for user involvement in the planning and design of buildings since the 1960s. The main focus and motivation for usability research has been the improvement of facilities for organizations in order to add value to their core business. This work has been done within the framework of the CIB Task Group 51 right from the start in 2001. The Norwegian contribution to the development of usability as a “body of knowledge” has mainly been on developing methods and tools to assess the usability of workplaces, with a specific focus on the effects of buildings for the users and core businesses (Jensø et al., 2004; Blakstad et al., 2008). Parallel to the development of the theoretical field, several case studies have been carried out by Norwegians to explore usability and to test and develop the applicability of methods (Hansen et al., 2005).

An important objective for Norwegian research has been to make the concept of usability operational. As a result, a common usability framework or methodology named USEtool has been developed (Blakstad et al., 2010b; Hansen et al., 2010). It should be emphasized that USEtool was designed to be used by organizations themselves for the purpose of evaluation. The methods and tools should not only be easy to use, but also help to generate an overview and more in-depth knowledge. In the case of USEtool, the development of theory and methods related to usability has been conducted in close cooperation with business partners. Partners had an impact on critical choices to ensure that the methods incorporated in USEtool are possible to perform in “real life.” The long-term relationship with the partners was continued in the Nordic project REBUS: User-oriented Benchmarking for Usability and Sustainable Performance in Real Estate (2007–2009). During the REBUS project, researchers in Sweden, Finland, and Norway continued to develop usability as an emerging field of knowledge in an action research setting. Usability evaluations were seen as phases in continuous developments loops within the “context of use” (Blakstad et al., 2010c). Further, the USEframe framework was developed in order to map and understand the different research approaches used within REBUS (Lindahl et al., 2011).

Blakstad and Torsvoll (2010) explore the possible uses and benefits of implementing usability evaluations in different phases of the workplace management processes in the Norwegian energy company Statoil. Their conclusion is that the knowledge development process is especially relevant to the workplace management process prior to large-scale construction or renovation projects. In the latest contributions from Norwegian usability research, a model for user categorization is proposed (Olsson et al., 2010) where a supply chain approach is chosen.
This model can contribute to a nuanced understanding of users and user needs in different parts of the supply chain.

**Buildings and real estate as a strategic means for efficient health services**

Parallel to the work on adaptability and usability, there has been growing interest and attention regarding buildings and real estate related to hospitals and health care services. In the years to come, Norwegian hospitals will face great challenges that will have influences and consequences for dealing with hospital management and facilities management. Larsen and Bjørberg (2004) describe a methodology for evaluating technical conditions, functionality, and adaptability, based on the principles of how conditions surveys are described in the Norwegian Standard NS 3424 (Standard Norge, 1995). This, combined with a demand profile for a hospital or a hospital department, shows matches or mismatches between demand and supply. Valen and Larssen (2006) describe how the methodology has been used in a case study of several hospitals to see how changes due to new demands, new medical technology, and organizational changes have been handled. Some studies of hospital projects show that one of the major challenges is to adjust to new needs and requirements (Bergsland et al., 2000, Valen et al., 2006). Further, it has been recognized that FM in hospitals has had more of a firefighting character than a strategic approach to how to meet the realities of tomorrow. One relevant recent project is “Buildings and real estate as a strategic means for efficient health services”, conducted by Multiconsult and NTNU in the period 2007–2010. One of the project’s publications discusses the role of a strategic facilities manager and underlines the importance of understanding the clinical activities as an important premise provider for developing buildings and services in the health sector (Larssen and Kvinge, 2008). This discussion is developed further by Bjørberg and Kampsøætter (2009), who underline the need for a more holistic strategy for real estate in order to see this as closer to the development of the core business objectives of effective health services. Two important objectives in the above-mentioned project was further development of methods for mapping existing buildings in special health services, as described by Larssen and Kvinge (2008) and Larsen et al. (2010), and a common classification system (Multiconsult, 2009). Anne Kathrine Larssen’s doctoral thesis, *Bygg og eiendoms betydning for effektiv sykehusdrift* (Buildings’ impact on hospital effectiveness) (Larssen, 2011), summarizes most of the work done within this area in recent years.

**INFORMATION TECHNOLOGY IN FACILITIES MANAGEMENT**

As the complexity and extent of buildings, technology, laws and regulations, and user requirements have increased significantly during the last sixty years, there has been a growing need for systems and structures to handle all information in an effective and operational way. Computerized facility planning and management systems (CAFM) was offered in the USA already in the early 1870s, but at that time had no particular impact on the Norwegian market due to the costs. In Scandinavia the first system for maintenance planning was introduced in Sweden in 1973. It was not before the widespread use of computers was established that such systems became more common. According to Howard and Björk (2007), the first research dealing with product modeling took place as early as the 1970s. However, the development of this technology gained momentum with the start of the ISO STEP (Standard for the Exchange of Product
Data) standardization project in 1985. Several studies from that period examined different solutions and evaluated systems regarding costs and benefits (Asmervik, 1989; Haugen, 1989). One of the early works on computer-aided real estate management is by Hasvik and Haugen (1993), who discuss examples from the operation, maintenance, and management of university facilities. Bejrum and Haugen (1990) discuss a decision and support system and argue for an object-based product model as the keeper of information, rather than traditional classification systems. Haugen (1990) underlines the need for standards for registration and classification as important premises for establishing automated FM systems and a common maintenance management model, and not least the possibilities for coordination, data exchange, and knowledge transfer between projects and within different steps and stages in a project. In his doctoral thesis on building management, Haugen (1990) gives an overview of the status of the use of information technology within facilities and property management, and discusses different possibilities for developing systems and functions.

An important step forward came with the BuildingSMART initiative, and the work of the International Alliance of Interoperability (IAI) is an effort to standardize object classifications and establish libraries with predefined objects (IFC and IFD), and “standardizing” the flow of information (IDM). In Norway, the Norwegian Directorate of Public Construction and Property (Statsbygg) has played an important role in developing and implementing a building information model (BIM) as standard procedure in their projects (Statsbygg, 2006). In her doctoral thesis Exploring Relations between the Architectural Design Process and ICT: Learning from Practitioners’ Stories, Anita Moum (2008) investigates relations between the architectural design process and information and communication technologies (ICT) in real-life projects. The managers of one of the projects in the case studies, AHUS, were particularly interested in the role of IFC-compliant 3D object models in the interface between design and production, and also in the coordination with buildings’ users. The project became a “front runner” in Norway in the use of IFC-based BIM, where four different R&D projects became a part of the process. Two of them are relevant in the context of this paper: one focused on the connection between a requirement/room database and the 3D object models; the other focused on FM documentation generated from the 3D object models.

Regarding FM, there is still little research published on experiences of using BIMs in construction projects. However, several master’s theses on the subject have been conducted in recent years, looking at the possibilities and consequences of BIM technology. According to Rist (2011), life cycle thinking represents the convergence of life cycle costing (LCC), life cycle assessment (LCA), and building information models (BIMs). LCC provides a long-term perspective in terms of cost, LCA reveals where environmental impacts arise throughout a building lifecycle, and a BIM provides a platform capable of holding and organizing this information in a comprehensible way.

MUNICIPAL PROPERTY MANAGEMENT
Property management has gone through major changes in Norway the last ten to twenty years, both in the private and the public sector. A study conducted in 2002 (ECON, 2002) revealed that
the most common problem concerning the facilities management of public buildings and council housing was the inability within municipalities to manage efficiently the budgets allocated for FMs management, especially with regard to maintenance. ECON and Multiconsult uncovered that approximately 40 percent of municipal real estate were in an unsatisfactory condition due to lack of maintenance (ECON, 2001). Several other studies were conducted in the same period, covering topics such as the management, operation, and maintenance of properties in the public and private sector (Bergseng and Håkonsen, 2001), the organization of municipal property (Haugen and Blakstad, 1996; ECON, 2002; Haugen, 2003), and benchmarking (Hoel and Horjen, 1997). A more “exotic” work is the doctoral thesis of Mørk (2003) where operation, maintenance, management and development of churches where the focus for the study. In 2008 a report was published giving an overview of the status of municipal properties in Norway (Bjørberg, 2008). The study covered one-third of the country’s municipalities and counties and shows some major challenges regarding investment strategies in existing buildings and new projects.

Several White Papers and Norwegian Public Reports (NOU publications) discuss problems and challenges related to municipal and public property management. As a consequence of the publication of NOU 2004: 22, Velholdte bygninger gir mer til alle (Well-maintained buildings provide more value for everyone), a five-year research program on the development and management of public buildings in a life cycle perspective has been established at NTNU. The program lasts from 2008–2021 and covers five different research perspectives: research from an owner’s perspective, from a management perspective, from a user perspective, from a building perspective, and from organizational perspectives.

One project within this program looks at different concepts related to how to organize municipal property management in general and especially the possible use of the inter-municipal company, IKS (Interkommunale selskap) (Brattås et al., 2009). The report discusses the obstacles and disadvantages of the use of IKS in property management, and the benefits and opportunities of the same. It also outlines a process for the establishment of an inter-municipal company. Ownership and management of municipality property has also been discussed by Rohn (2011), who argues that principles for private property strategies models also could be relevant and adopted by municipalities and county authorities. Another study done under the NTNU research program has looked at municipal office buildings (Kjølle 2009; Blakstad et al., 2010a). The case study shows that there is a lack of data on space, buildings, and occupancy. It also shows that there is a lack of systems for managing space efficiently in the municipalities.

In recent years there has been major investment in school buildings in Norway, both refurbishing old buildings and building new schools. This has been followed by a discussion of pedagogic principles and how the buildings function regarding learning outcomes, user satisfaction, and space use to mention some of the topics discussed. Arge (not published, 2010) conducted a case study in joint collaboration with the OECD and the Centre for Effective Learning Environments (CELE), parallel to case studies in Copenhagen and Manchester. One of the conclusions was that the survey had focused primarily on physical issues and not on learning outcomes,
which should be the most important issue regarding the usability of school buildings. A smaller study on the usability of school buildings has been conducted Kjølle et al. (2011), and revealed some interesting findings regarding building layout, ways of teaching and perceived learning outcomes.

As mentioned earlier, Norwegian municipalities own a huge number of buildings and square meters, and most of them have experienced problems with maintaining the buildings and their management has become a matter of day-to-day survival. An important issue is how the municipalities can take a more strategic approach to their property management. The SINTEF Byggforsk project “Strategisk porteføljeforvaltning av kommunal eiendom” (Strategic portfolio management of municipal property)” gives an overview of state of the art within this field and discusses how this concept can be understood and used within a municipal context (Arge, 2008). This will be further developed into a guide showing what strategic portfolio management entails and how municipalities can handle this in practice.

Another debated issue regarding the use and management of space in public buildings has been the use of internal rent as a strategic means. Lædre and Haugen (2008) discuss several alternatives regarding the use of internal rent to improve space efficiency and ensure better utilization of real estate in total and how this can be applied in the case of a university.

The municipally research program finances two PhD students, both of whom started their research in 2009: Nora J. Klungseth whose thesis is titled “Usability of buildings and effects on cleaning”, and Arnt Ove Hopland, whose thesis is titled “Municipal property management in a financial perspective”. The program is working to secure financing for a doctoral scholarship for research in sustainable property management with a focus on operation and maintenance, and linked to the Research Centre for Zero Emission Buildings (ZEB) at NTNU, one of eight national centers for environment-friendly energy.

CENTRE FOR REAL ESTATE AND FACILITIES MANAGEMENT

Since the early 1990s, the Norwegian University of Science and Technology (NTNU) in Trondheim has undertaken research related to FM. From 2002 to 2006 the Faculty of Architecture and Fine Art carried out the ambitious Metamorphosis 2005 project (www.metamorfose.ntnu.no), funded by the Research Council of Norway, with additional support from Norwegian associations and companies. The main objectives were to develop a research-based education and competence environment in relation to real estate and FM. Since 2005, NTNU has offered a postgraduate master’s education program, a two-year ordinary master’s program, and a doctoral candidate program in this field, and approximately 120 master’s students have completed courses during the last six years. An important step was to establish the Centre for Real Estate and Facilities Management at NTNU. Professor Tore Haugen, now dean at the Faculty of Architecture and Fine Art, NTNU, was the driving force behind the establishment of the Metamorphosis project and the centre. The centre has founded a network between education, research, and practice in the area of real estate and FM in Norway and with universities and FM network in other countries.
The Centre for Real Estate and Facilities Management is active in several research projects and networks, and the dissemination of publications, reports, projects, and master’s theses, and plays an active and important role regarding the research agenda for FM in Norway (Valen et al., 2007). In 2011 the European Facilities Management Research Network made a survey of twenty-two research institutions and universities throughout Europe (Junghans, 2011). The institutions were evaluated according their number of research fields, number of contributions, and number of researchers. The scope of the survey was an overview of the future research objectives, existing research competencies, planned projects, and concrete proposals. Ten European FM research fields were identified: added value, knowledge, built environment, demand and supply, future, health care, sustainability, usability, workplace and work organization. In this respect, NTNU emerged as the best institution regarding the evaluated parameters covering seven of the research fields in which the institution is active.

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2.4 FM RESEARCH FOR PRACTICE – SWEDISH DEVELOPMENTS

Jan Bröchner

ABSTRACT

Purpose: The purpose is to give an overview of internationally published FM research carried out in Sweden.

Background: Since the early 1990s, many Swedish university researchers have dealt with topics that are relevant for facilities management (FM) practitioners. To understand the relation between researchers and practitioners, the field itself is defined by practice: FM is basically whatever facilities managers do.

Approach: Thirty-three international scientific FM articles written by Swedish university researchers over the last twenty years have been identified. Authors’ abstracts have been used as sources. Additionally, findings published in PhD dissertations not appearing in article form have been included.
Results: Seven themes were found: costs and financial issues, followed by information technology and innovation, space management and briefing, service qualities and satisfaction, contract strategies, company strategies, and finally FM and environmental sustainability.

Practical Implications: For the future, an ambition could be to influence mainstream research into business services research, and this would correspond to practitioners wishing to raise the profile of FM in firms, demonstrating its importance for crucial management decisions.

Keywords: Facilities Management, Research, Scientific publication, Sweden.

INTRODUCTION
Since the early 1990s, many Swedish university researchers have dealt with topics that are relevant for facilities management (FM) practitioners. To understand the relation between researchers and practitioners, the field itself is defined by practice: FM is basically whatever facilities managers do, just as Quality Management is a field that arises from the function of quality managers. The purpose here is to give an overview of internationally published FM research carried out in Sweden. Obviously, there is a boundary problem – what should be counted as FM research? Not all researchers who have published findings of practical relevance for FM practitioners see themselves as FM researchers. A reasonably generous interpretation of the FM field is made here. However, research directed only towards energy management issues has been left outside the overview.

EARLY HISTORY AND FUNDING POLICIES
In 1966, the National Board of Public Building (Byggnadsstyrelsen) approached the National Council for Building Research (Byggforskningsrådet) and raised the question of research and development in the property management field. Maintenance and modernization were key concepts at the time. A 1976 ‘Property management in focus’ seminar organized by the Council discussed mostly issues such as tenant influence on housing management, and it led to three 1978/79 policy documents that outlined further research needs: (1) housing estate management, (2) property management economics, and (3) feedback to construction.

The FM concept with its emphasis on supporting core activities emerged only in the early 1990s on the Swedish scene. Among the background factors, the banking and property crisis at the time, US business influences—notably the introduction of IT outsourcing—and Sweden becoming an EU member state are difficult to disentangle. As a commercial phenomenon, 1996 was the breakthrough year for FM. For university research, government funding was still run along sectoral principles, which meant that when Chalmers University of Technology declared FM to be one of its strategic initiatives in 1996 and also launched a FM master’s programme, the Council for Building Research would contribute with R&D project grants and a flexible attitude to industry collaboration. However, the structure of Swedish research finance was radically
changed in 2001, and the new goals of research policy were that Sweden should be a leading research nation, where research with a high scientific quality is conducted. In the process, the Council for Building Research was abolished and replaced by Formas, which supports research in the areas of Environment, Agricultural Sciences and Spatial Planning. A few years later, special calls for research grant proposals were organized by Formas jointly with BIC, the Building Innovation Centre (now merged into the ‘IQ Samhällsbyggnad’ association), where participation and contributions by firms were part of the scheme. Similar arrangements for international projects have been created by Formas under European ERANET initiatives, although there have been few projects that are obviously of an FM nature.

LINKS BETWEEN RESEARCH AND FM PRACTICE

Seen from an academic standpoint, it is the MScs and the PhDs as skilled persons who are the important and relevant products of the university efforts in fields such as FM. Nobody expects the academic publications to change the FM world on their own; they can be considered as spin-off products, derived from the educational need to systematize what FM practitioners do and think. The ongoing digital revolution among publishers of scientific journals is changing the rules of the research game. Serious research published in article form is now globally accessible and the object of true international exchange of knowledge. Web access to articles means also that they are increasingly used in MSc level FM courses, provided that these are taught in English. Today, any teacher anywhere in established universities can assemble a global reading list for an FM course, spending little effort. Practitioners with the appropriate educational background can also benefit from the wider possibilities of access to articles. However, for practitioners who lack sufficient skills in reading English texts, these developments may raise barriers.

An important link between the technical universities and FM practitioners is the tradition of sponsored MSc theses in the field. Typically, the university appoints one thesis supervisor and the firm a corresponding one, who acts as a contact person. The topic of the thesis is decided on in collaboration. Some of the internationally published articles, presented in the next section, originated in MSc theses. However, mostly due to the strong demand for new construction since the early years of the 2000s, competition from traditional construction contractors and consultants who are eager to recruit graduates, the proportion of FM MSc theses appears to have declined.

From the early 1990s, there has been a situation where Swedish FM consultants have provided much of the private and public sector FM knowledge. In combination with the research policies pursued by central government, it explains why e.g. the successful Aff Committee package of standard contracts and related documents has evolved without university participation. However, there are Swedish consultants with a researcher background who fill a role in transmitting research-based knowledge, as in the useful handbook produced by Högberg and Högberg (2000).
RESULTS – A REVIEW OF PUBLISHED RESEARCH
Despite the real risk that highly concentrated texts fail to do justice to published research, an attempt is made here to extract findings from all international scientific FM articles written by Swedish university researchers over the last twenty years. There are 33 articles that have been identified. Authors’ abstracts have been used as sources, and from these mostly what is listed as results or findings, their stated practical implications, and sometimes an indication of the nature of the empirical base. In a few cases, findings published in PhD dissertations that have not appeared in article form have been included here.

There are seven FM research themes presented here in chronological order, and for each theme, published research is also ordered chronologically.

FM costs and financial issues
When the Council for Building Research began supporting property management research in the 1970s, it was before international publication became the main rule. One example of results from a Stockholm University research group which had its focus on costs and finance was the PhD thesis by Senning (1985), dealing with cost relations and cost control.

After the Swedish central government implemented a radical market-oriented reform of its real estate management, authorities were free to rent premises from private firms, and state-owned properties were allocated to entities that lease their properties to authorities on conditions similar to the open market (Lind and Lindqvist, 2005). Unexpected problems included difficulties in writing good contracts for special purpose buildings, conflicts about rent setting and differences in bargaining power between the property-owning units and the tenants/authorities. The view was that the reform created incentives for public authorities to economise on premises, but that details were important and also to adjust the system to changing circumstances. An example is that introducing school vouchers created problems for systems of internal asset rents.

In an overview of studies of owning versus leasing in the Swedish public sector, Lind and Lundström (2010) relate this issue to general determinants of the choice between owning and leasing. Case studies show that there have been various ‘rational’ reasons for moving from owning to leasing: primarily, better risk allocation and more efficient management of complex properties with both public and private tenants. In other cases, excess supply of capital and a need to strengthen the balance sheet seem to have been more important. The results also indicate that moving from owning to leasing can reduce flexibility.

Information technology and FM innovation
Organizational patterns in facilities management are affected by information and communications technology (Bröchner, 1991). Many profit centres are created, but when it comes to integration across stages of the process, of technical specialties and of technical design with IT system design, tendencies are less obvious.
Three prototype systems demonstrated in Svensson’s (1998) PhD thesis that the product model (the KBS Model) fulfils the requirements of flexibility, stability, adaptability, comprehensibility and cost-effectiveness, which are discussed in this thesis. The generic process model should provide better conditions for integration by capturing aspects of the essence of FM and by providing an overall structure for information handling within FM.

Leading manufacturers are shifting towards innovation strategies where goods and associated services are developed jointly, and this approach to construction would imply stronger input from facilities management into design (Bröchner, 2003a). Paths for integrating the development of facilities design and services were investigated while assuming that the determining force is economic efficiency from the viewpoint of facility owners. Design was seen to reconcile supportive and protective features of facilities. Transaction cost reduction, as caused by the progress in technologies that allow remote monitoring of systems and components, was highlighted as an integrating force for manufacturers and service providers. From a FM viewpoint, integration often has to handle portfolios of old and new buildings in multiple locations.

Sandström et al. (2003) describe a pre- and post-occupancy evaluation of ICT functions in a building with 126 flats in Stockholm. Eleven households were interviewed to clarify whether there is a user value in built-in ICT technology in dwellings. ICT functions that increase the residents’ safety and security, saves time and increase comfort are the ones most appreciated. Hardware and software must be designed as user-friendly if the residents are going to use it.

Lundberg (2007) reported a case study of a project where new assistive technology was used to improve the security for elderly in home care service. Here, 142 elderly people living in their own homes were included in a test of a new safety alarm system. The infrastructure of a multi-story building is of vital importance for the delivery chain of home care. The care provider depends on the functionality of the communication network in the home to sustain care during “care absence” from the tenant or the patient. It is important for facilities managers to be aware of the fact that more and more advanced medical care will be given in people’s own homes.

Later, Sandström and Keijer (2010) explored residents’ attitudes to and acceptance of Smart Homes. Their results are based on surveys of two residential units fitted with advanced smart home systems. The original systems were in operation until end of 2005, when they were replaced by simpler ones, based on the web, an unforeseen change. The extended period of time made it possible to study the residents’ long term attitudes, expectations and demands on smart homes. Albeit functionality related to current demand is a basic requirement, accessibility and trust have emerged as fundamental for a positive attitude and acceptance of functions that constitute a smart home.

Since FM is far from being a recent phenomenon, it is worth taking a very long term perspective on innovation in the field (Bröchner, 2010). Already among the ancient Romans, there were buildings such as baths with complex technologies. There was a striking lack of differentiation
between offices and homes, and the meanings of work and leisure were understood differently. Primitive information technology is a possible explanation, although this did not impede the development of contracts with detailed service-level agreements. Availability and use of energy in facilities, rather than ICT effects, emerge as the most important change during the centuries.

**Space management and briefing**

For Granath (1999), making a workplace entails two essential factors: the physical action of designing, and the design of the work space itself. Building stock can be used as a vehicle to create new, small and medium-sized enterprises in which a participatory and learning process gives users control of their costs and stimulates creative channels between tenants. Workplace making can be the source of new understanding and communication between disciplines that do not usually cooperate in innovative situations – demonstrated by a Volvo case study, which resulted in a new production system for the final assembly plants. It is paramount that the company itself leads the design process. To outsource workplace making is to outsource the knowledge and ability to use space as a long-term production resource. To ensure the best use of future production space it is vital that a company listens not only to the architects but to its own employees. The origin of the Chalmers engagement in FM was a combination of workplace dialogues and reuse of industrial buildings, pioneered as a research field by Joen Sachs (see also Öhrström, 2000).

Gustafsson (2002) explored how a standard for workspace design had developed over time in the research and development department of a large industrial corporation. This standard was intended to be an organizational tool for handling office design. Results indicated that the standard was developed at a high level of complexity in the organization, and was recognized as a solution to a ‘wicked problem’. However, as the change developed into a more administrative phase, the ownership of the problem was moved to lower organizational levels, with reduced complexity as a result. This meant that the standard no longer worked as intended.

Dettwiler and Bröchner (2003) found that growth firms tend to relocate when passing from an entrepreneurial to a managerial phase. Once having relocated within the region, these firms tend to plan for multisite operations with new small offices. Spatial expansion seems to be triggered when no more than 20sq.m are left per full-time employee. When density rises, these firms avoid raising the proportion of remote work. This may reflect that security is a crucial issue, and a concern with protection would also explain an emphasis on creating office boundaries for visitors.

Lindahl (2004) considered in what way spatial issues matter in organisations. By relating the various aspects of his analytical model it is possible to illustrate how focus and perspectives change during organisational and workspace changes. A need for new professional roles and processes for workplace design was noted, and he argued that the relationship between the organisation and the workspace should be a continuous process of design. This contributes to the process of workspace planning by giving a new insight into the traditional aspects of work environmental issues and metaphoric/symbolic qualities.
How will the relationship between patients, the service level and the geographic conditions in healthcare develop in the future (Melin and Granath, 2004)? This will be of great impact for location of new properties and the use of existing healthcare buildings. In order to improve healthcare space requirements, it is important to understand the expression “horizontal integrated care”, and the authors also looked into the phenomenon of “local hospital”. These terms were analysed, and a definition was given that could be shared by most parties in healthcare today and which would enhance communication in healthcare issues.

In her PhD thesis, Strid (2006) studied business incubators. This involved both how the built environment interacts with the birth of new companies and how research about space and business activity in general can be connected to the specific activity at the incubator. The constructed space is one component of the process of taking one’s place that is required in order to establish business praxis. The constructed space also anchors the innovation system as a support system rather than a business-oriented system. The built environment can contribute to establishing a broader view on entrepreneurship and innovation systems.

Workshops revealed trends that urge a re-evaluation of the briefing process (Lindahl and Ryd, 2007). The need for better briefing with the focus on end-users is increasing. The findings also pointed to difficulties for construction projects to deliver what the user-clients need. There was considered to be a lack of systems and methods to keep proper track of user client demands. Goals need to be iterated and validated on a regular and coherent basis throughout projects. Growing interest in process-oriented and strategic briefing appeared.

Bodin Danielsson and Bodin (2008) studied office types, and the lowest health status was found in medium-sized and small open plan offices. Best health was among employees in cell offices and flex offices. Workers in these types of offices and in shared room offices also rated the highest job satisfaction. Lowest job satisfaction was in combi offices, followed by medium-sized open plan offices.

Three aspects of interaction influence the result of a premise-providing project, according to Hinnerson’s (2008) PhD thesis. These are the process, the actors and the structure of the organisation. The process is the facility providers’ tool; shared process descriptions can coordinate and transfer experience and knowledge between projects. On an organisational level, coordination and structure also support the knowledge transfer. A case study indicated that actor behaviour was central in order to establish effective interaction between the organisation providing facilities and their clients.

Initial briefs (programs) have been examined by Elf and Malmqvist (2009) to obtain an overview of current practice in documenting the briefing process for new health care buildings in Sweden. Few strategic briefs make use of evidence to support their statements. Moreover, few briefs had an explicitly patient-focused goal for the project or measurable outcomes.
**FM service qualities and satisfaction**

To assess the scope for tenant satisfaction in the housing refurbishment industry, an empirical study was undertaken by Holm (2000) to identify principles which have implications for housing refurbishment. The relationship between service quality, product quality, tenant satisfaction and employee satisfaction was emphasised in the study, which concerned two multi-family housing estates owned by a semi-public housing association. Analysis of tenant questionnaires indicated a strong link between meeting the customers’ expectations and contractor reputation. Workers strongly believed that quality of work was essential.

When office staff are present in a building during refurbishment or office completion, craftsmen and users will interact. To analyse how this interaction leads to satisfied or dissatisfied users and ultimately to reputations in the market, a survey of office staff and craftsmen in two refurbishment and one office completion project was carried out by Holm and Bröchner (2000). While critical incidents were less important than expected, the service provided by the contractor appears to be the key to improved reputation. Minimizing noise and dust produced would reduce the number of negative views from building users. Findings from the craftsmen survey identify information and work satisfaction as fundamental ingredients for a contractor striving for a good relation with users.

Westlund et al. (2005) have provided empirical results on potential impacts from customer perceived quality and customer satisfaction on various financial indicators for the real estate market. Quality data were taken from the Swedish Real Estate Barometer, and financial data from the SFI/IPD Swedish Property Index. It seems that investments to improve customer satisfaction were at first cost driving, but would, towards the latter part of the time period examined (1997-2002), significantly and positively impact profitability. The main driver for this seemed to be reputation and positive word-of-mouth due to improved customer satisfaction.

**FM contract strategies**

Why process industries tend to rely less on FM outsourcing than other manufacturers can be explained partly by the consequences of process interruption (Bröchner et al., 2002). The UK tendency to outsource is stronger than in Swedish cases, probably owing to stronger ties employers and employees in the Swedish process industry. The management of skills and tacit knowledge also emerged as explanations. Lower population density in Sweden may contribute to a higher degree of integration in companies.

Swedish municipalities experimented with internal contracting arrangements for property and facilities management services during the early 1990s, and the use of external FM contractors has increased (Bröchner, 2003b). When external contractors are used, the tendency is for contract scope to expand. Typically, there are several contracts with duration of three or five years. Output specifications related to performance are seldom found. The Swedish Aff standard form of contract for property management and its related documents are important tools. Over a longer period, the Swedish development from the 19th century dependence on external contractors, followed by a long period of services delivered by municipal employees
and ultimately returning to a greater proportion of services that are bought in the market, can be explained as a reflection of changes in knowledge management.

Kadefors and Bröchner (2004) have noted that companies have increasingly sold their facilities to external independent investors or placed their real estate in semi-independent subsidiaries. Both manufacturing companies and real estate companies increasingly prefer to buy FM services from external contractors. This implies that new relations between users, owners and service providers emerge, where roles are separated in different legal entities without ownership links and are related to each other by explicit and formal contracts. They described the Swedish development and discussed consequences for roles, relations and decision processes. Three key research areas were identified: how space supply and service management may be related to strategic levels of the core business; management of formal and informal aspects of interfirm relations over time; and decision making in the area of flexibility, generality and user adaptation of workspace.

Owners of multi-tenant office buildings pursue various strategies for providing bundles of services to building users (Bröchner et al., 2004). In order to study what determines patterns of bundling, twelve Swedish owners were interviewed. Strategies were found to depend on the size of their property holdings, where those who held less than 100,000sq.m differed from large property owners. There was also a difference between owners that had a tradition of providing construction and property-related services and owners with their main activities in the financial sector. These patterns can be explained by considering transaction costs arising from services coordination and by referring to the dynamics of learning and competence in owner organizations.

The property and FM evolution of offices of growth firms have been analysed in four perspectives (clusters, industrial sectors, age and size) by Dettwiler (2006). Clusters of “low”, “high” and “moderate” FM firms in all major industry sectors were identified. Industry sector is more important for FM patterns than age and size of firms. However, the youngest cluster of firms has the most intense FM activities, which argues for a link between rapid growth and FM.

The effect of changes in GDP on the property management of growth firms has been studied by Dettwiler et al. (2006a), who compared data from 387 growth firms during 1998-2000 (high growth of GDP) and 2001-2003 (low growth of GDP). Correlations were found between ‘down turn period’ and variables that reflect hiring of temporary staff; propensity to rent office spaces; significance of flexible contracts; office location in rural area, and relocation frequency.

Dettwiler et al. (2006b) also highlighted the role of FM for new technology-based firms, comparing firms inside Science Parks with firms located outside. FM was seen as a contributory element that enhances the entrepreneurial environment, which is one explanatory factor of the superior performance and growth of firms inside parks. Proximity to university was especially significant among the firms being inside parks. Infrastructure shows high significance in both groups, whereas the effect of facilities cost differs in range of significance. The authors argued
that FM indirectly contributes to interaction, interfirm relations and networks that can be found particularly in Science Parks.

Ryd and Fristedt (2007) describe the process of the client’s operationally determined requirements as they are translated into a strategic brief, and how this is transformed into general briefs (four outline briefs in total) for various project categories, to be implemented through project briefs in about 500 projects. The procurement procedure was directly based on briefs and the collaboration between the construction project’s various players during design, with the aim of clarifying how the requirements were tested, developed and gradually implemented as physical solutions. Their case study supports the picture of briefing as part of a dynamic process during which all players are responsible for adopting, developing and realising the overall goals of the development operation.

Contract-related formalization serves purposes of learning and coordination as well as of performance control (Kadefors, 2008). Thus, services need different contract design and different management depending on the interaction patterns they entail. Detailed specifications and monitoring may be needed in order to increase mutual understanding, build trust and foster a sustainable industry-level contracting culture. Typically, low-level interaction relations such as technical property services need a focus on fostering trust, while high-contact soft services call for transparency and distance. Furthermore, detailed specification and formalized monitoring are more important for non-strategic support services that may otherwise be left unmanaged and receive low attention from client management.

Bröchner and Badenfelt (2011) compare reasons for change as well as change practices in interorganizational relationships in construction and information technology. Sixteen contractual relationships have been studied through a questionnaire and interview survey conducted among both clients and providers. Project-type relations are contrasted with more continuous service support contracts, such as contracts for FM services. More than their providers, clients tend to ascribe high change frequencies to increase in technical understanding during projects. Early provider participation is associated with lower change frequencies, while the strength of incentives is less influential. Ease of transforming changes into new projects varies between technologies. Irreversibility is important, as well as relations between pre-investigations and the successive revealing of initial conditions, together with the life-cycle of formal and informal communication.

**Company strategies**

Five cultural factors were found by Steiner (2003) to affect corporate identity in early stages of new companies. These factors were vision, aesthetics, play, charisma and trust, of which entrepreneurial vision and aesthetics were especially important. Interviews with founders and managers of small real estate business companies revealed seven corporate identities:— the Gambler and the Investor identities, both of which consider real estate a capital investment activity— the Service Management identity, where real estate business is seen as FM, an activity that needs the same attitude as other service industries such as hotel or restaurant business—
the Family identity, which means managing the real estate heritage— the Serial Entrepreneur identity, who realizes entrepreneurial ideas in the real estate business— the Fast Grower and the Edge City identities, which create short-term success in projects that are later bought up.

Among the 50 largest construction contractors in Sweden, eight out of 44 respondents were engaged in FM, and these differed by being more diversified both into a broader range of services and also upstream from traditional construction (Bröchner, 2008). Those engaged in FM were more innovative in general, and they tended to have employees with a high level of formal education.

**FM and environmental sustainability**

Two housing management practices and their buildings’ energy and water performances were compared by Brunklaus (2009). It is possible to trace energy and water consumption levels to characteristic management styles (e.g., metaphors of ‘caring’ and ‘emergency-driven’). The analysis showed that organising concepts, and more specifically, characteristic management styles, matter for the environment.

Many organizations present their environmental work in the form of annual reports and use the indicators in them for follow-up (Brunklaus et al., 2009). However, internal communication and management is needed for environmental improvements. The indicators found in reports may be suitable for external communication, but are they also suitable internally and operationally. Formulating indicators for internal management is not an easy task; available guidelines are of little help. The environment can be managed internally by relating indicators. Therefore, an additional set of indicators for internal management and a wider responsibility for the life cycle are recommended by the authors.

**TRENDS AND THE FUTURE**

From the review of published research, it is easy to see that two heavy topics in Sweden are ‘space management and briefing’ and ‘contract strategies’, although there is a wide range of other FM fields that are covered. There is no clear time trend that indicates a long-term shift in research emphasis between the seven FM themes identified in the preceding section. Throughout the years, it is possible to see a stable relation between FM research and FM practice, but this relation is more of the nature of “FM research from practice”, implying that researchers have analysed practice, than “FM research for practice” as in the title of this paper. When discussing the relation between research and practice, it is necessary to question the simple linear model shown in Fig. 1, nowadays discredited by innovation researchers who point to the complex and iterative realities. Nevertheless, the linear model still survives as a way of thinking among many policy makers and practitioners.
In the case of scientific FM publications, Fig. 2 appears to be closer to the truth. It is through teaching at various levels, including PhD programmes, that FM research leads to better practice. The transfer mechanism is often that of FM teachers and researchers moving as persons into practice, full-time or part-time.

Raising the academic ambitions further would result in higher citation frequencies from authors who are closer to the mainstream of business services research. A development in this direction could be seen as a parallel with practitioner ambitions to raise the profile of FM in firms, demonstrating its importance for crucial management decisions. While the main channel for research results into FM practice appears to have been education rather than direct application, it is a valid question whether more effort could and should go into initiatives that promise an immediate impact on practice, and where high academic standards would have to make a significant difference from what is on offer from good consultants or is developed in-house among major suppliers of integrated FM services.

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2.5 FACILITIES MANAGEMENT RESEARCH FOR PRACTICE
– AN OVERVIEW ON FINLAND

Suvi Nenonen

ABSTRACT
Purpose: This paper provides an overview of facilities management research and its development in Finland. It summarizes the ongoing research projects and describes the national research practices.

Background: The facilities management research in Finland is supported by different funding organizations, e.g. by Tekes, a Finnish funding agency for technology and innovation. The role of Tekes is to support high-quality research that generates significant commercial potential for businesses while also promoting better competitiveness and welfare for society at large. The research projects are carried out in close collaboration with practice, using the field not only as a source of data but as a reflection and way of steering the research process; the shared interest is in research results that are relevant both for the academic field and practical im-


IMPLEMENTATION. In order to provide possibilities to encourage practice driven research, Strategic centre for Science, Technology and Innovation of the built environment has been created by the Ministry of Employment and Economy.

Approach: The approach is explorative and is based on document analysis and the evaluation of the effectiveness of research projects funded by the Finnish funding agency for technology and innovation, Tekes.

Results: Facilities management research in Finland has developed over the last decades mainly in three waves. The first wave of facilities management research in the 1990’s focused on facility management services, service development and on the production and management of services. The second wave focused more on research about the connection between the facilities management and the client organizations. The third wave is now focusing on more integrated models, both in the mixed use concepts in different space segments and in enlarging the service business models to an areal context, for example. The development of the facilities management industry gives input to the national research agenda.

Practical Implications: The paper is concluded with recommendations on how the multidisciplinary facilities management research and practice can collaborate in order to achieve the best possible benefit from the research processes and results.

Keywords: Facilities Management, Research, Development, Finland

INTRODUCTION
Facilities management (FM) research in Finland has developed in the last decades mainly in three waves. Each wave has had a different driver and the development in different waves can be identified both as development of research interest and as changes in industry and business. The Finnish Facilities Management market was estimated by Cap Gemini in 2004. The potential market of facilities management was 11.7 billion euros. The outsourcing degree was 25 %. The development from 2001 onwards included the following steps, among others: management contracts became more performance-based and service provision grew; global service, management and consultancy companies established FM related businesses in Finland; global interaction became more common with company acquisitions, mergers and professional information exchange; and outsourcing increased rapidly. Along all user centered service and management functions in the private sector, the public sector was expected to have much potential for future outsourcing deals. Both private and public sectors were considered user-owner centric. (Tuomela et al., 2001).

Jensen (2011) investigated Nordic FM market in 2010 and pointed out that during the period of 2004-2008, the total FM market in Nordic countries was influenced by economic growth and development of knowledge and by new emerging providers and services in the service society, and the period of 2008-10 was influenced by the financial crisis with increased competition and
focus on cost reductions, but also with maturing markets in all four countries. In both periods, the total FM market was influenced by increased globalization, professionalism and focus on sustainability. For the actual market, the growth rate during 2008-2009 was very limited in Finland, while the growth rate from 2009 to 2010 was around 5% in Finland.

Additionally, Finland is famous for its high level of technology utilization and for producing environments of high functional quality and building virtual reality. To maintain its competitiveness, the Finnish built physical and virtual working and living environment needs a new dimension of development: the importance of social infrastructure is increasing (Hietanen, 2005). This provides challenges for facilities management industry – new user needs are a key driver in developing a variety of spaces, places and services for living, working and spending free time; customer satisfaction, customer relations management and service implementation models are in focus at the moment. The sustainability and increasing emphasis on environmental issues is a second driver for the industry.

The megatrends and development in the markets are connected to the development of research topics in the field of facilities management research. In Finnish research, the three waves of research can be clearly identified. The first wave of facilities management research in the 1990’s focused on facility management services, service development and on the production and management of services. The second wave focused more on research about the connection between the facilities management and the client organizations. Issues like sustainability, workplace transformations and added value aspects are examples of themes in a variety of research projects. The third wave is now focusing on more integrated models both in the mixed use concepts in different space segments and in enlarging the service business models to an areal context, for example.

This paper describes in more depth the achieved research results during the different waves in Finland. It also summarizes the ongoing research perspectives connected with sustainable communities, spaces and place research, as well as introduces the focus areas and a roadmap for usable built environment research towards 2014. The paper is concluded with an overview of challenges in multidisciplinarity.

RESEARCH IN FACILITIES MANAGEMENT AND SERVICE BUSINESS

The first wave of facilities management research began in the late 1990’s and focused on facilities management services, service development and on the production and management of services. Research in facilities management and its development aimed to identify new service areas and concepts as well as to contribute to procurement processes. As facility services support the core processes of the client, and are thereby a part of the supply chain, the types of relationships between the supply side and the demand side of services were also in the focus of researchers. Tuomela (2005) published a modified grounded theory of interaction and cooperation of workplace networks. The results provide understanding of the workplace network roles and give new insights on workplace network interaction and cooperation. The results suggest
that network members responsible for workplace network management should create more organized forms of formal interaction in order to strengthen the multi-level cooperation within their business relationships. Salonen (2006) studied facilities management partnerships and related risks. According to Salonen (2006) companies are moving towards closer relationships in the FM industry. Companies face new kinds of uncertainties and risks as they move towards collaborative relationships.

Another stream of research focused on the stakeholders of facilities management in client organizations and their influence on service procurement. It is commonly suggested that effective procurement planning and management of FM services can directly affect the relative success of an organization’s business. Therefore, it is surprising that only a few organizations and a few studies have focused on the development of sourcing strategies in FM services or their essential elements, such as outsourcing decisions, service bundling and the selection of the relationship type. The lack of theoretical frameworks is perhaps one reason why strategic planning of sourcing is found to be ignored in the field of FM. Ventovuori’s doctoral thesis (2007) presents the elements of sourcing decisions that are essential for the development of a sourcing strategy in FM services, and integrates five scientifically reviewed research papers. His dissertation points out that the realized sourcing strategies in the FM services context are an integration of the different sourcing decisions that have features of different sourcing strategy approaches presented earlier in the supply chain management and FM literature. As information on a certain market is important for the buyers in making well-grounded sourcing decisions, it is suggested that the buyers of FM services should conduct systematic research on the markets prior to competitive bidding. By using a novel framework for selecting a sourcing strategy in FM services, the buyers can make more rational sourcing decisions.

This relates to one more area of investigation: the selection criteria and processes of service providers as well as performance measurement of facilities services. Lehtonen (2006) focused in his thesis on issues surrounding the selection of the relationship type and the management of partnering relations between a client and FM service providers. The results provide an understanding of the partnering phenomenon in the FM services context and give new insight on when to choose a partnering approach and how to manage partnering relations successfully. The results indicate that companies should adopt a more strategic approach towards sourcing decisions in relation to FM services. Furthermore, in order to ensure successful partnering, precise goal setting with organized forms of cooperation and interaction is required. The specific characteristics of the public sector have also been one research interest. In general, the management of change and its implications has been a topic of interest. Leväinen (2003) conducted a research project called “Contracted Services and Advanced Facilities Management in the Finnish Municipalities”. According to Leväinen (2003) changes in public sector has forced local governments to develop their functions strongly, and especially to operate using market based methods like the private sector. In-house production has increasingly been replaced by client-supplier models, centralization, municipal enterprises, share-hold companies and contracting out.
TOWARDS THE CHANGING NEEDS OF THE USER
The second wave focused more on research about the connection between the facilities management and the client organizations. Issues like sustainability, workplace transformations and added value aspects are examples of the themes in a variety of research projects.

The threefold concept of sustainability is applied in various perspectives in the built environment. It often integrates the whole life cycle of a building, and research on the topic concentrates on developing know-how and methods to assess the different phases from construction to operation and to redevelopment as regards their ecological impact. Within the ecological approach, energy consumption and energy flows are very relevant and often issues that are paid attention to in the design, construction and management of buildings. Beyond the ecological perspective, the social dimension of sustainability, for instance, is concerned with occupational health among other issues. Junnila’s research focuses on life-cycle technologies and management, sustainable buildings, industrial ecology and lean management in real estate and services industries (e.g. Nousiainen & Junnila, 2008).

Knowledge intensive work, or even a transformation into the knowledge society are believed to form the majority of work in the future. This phenomenon has attracted researchers to investigate and create theories and models of how the workplace can best support knowledge work activities. In the research domain of workplace management, the focus lies on the use of the workplace as a strategic resource for organizations on the one hand, and the changes this resource constantly experiences as a result of the ongoing ICT development on the other hand. One of the very first R&D-activities within the field of workplace research developed the concrete example of netWork Oasis – the unique collaborative working, learning and development environment at Joensuu Science Park, Finland. Located in the Finnish province of Northern Karelia, the Joensuu region provides a fruitful “living lab” for studying networks, innovations, and the changing needs of knowledge workers. In the conceptual planning phase the approach was to first reflect the challenges of creating supportive collaborative environments for knowledge workers and to increase the regional attractiveness through the three “I’s” of (1) instruments, (2) interiors and (3) interactions. The third ‘i’, interactions, was emphasized. The focus was to support interactions between different kinds of people in order to harness diversity. To achieve fruitful results from the netWork Oasis activities, the interior and instruments were designed to support and enhance the quality of interactions. Interactions can happen spontaneously or in a facilitated manner. Innovative interior and instrumental solutions in the netWork Oasis increase the quantity and quality of spontaneous interactions. (Inkinen & Kakko, 2007)

While some venture to examine how the physical, social and virtual workplace can be used to encourage learning and knowledge sharing and innovation in the strategy of organizations (Nenonen, 2005), others scrutinize the relationships and interactions between influential factors (Pennaanen, 2004). The implication of new ICT developments to the workplace and its location forms another field of research. New ways of work, e.g. mobile work, distant work, eWork, or disseminated work are related to the theme. The ability of ICT to enable work everywhere, every time, in a multitude of networks and settings, poses new challenges to organizations,
their culture and hierarchy as well as to the individual knowledge worker (Vartiainen et al., 2007). The research project ProWork\(^1\) aimed to understand what the crucial elements of productive knowledge work are and what kind of requirements it sets for the physical and virtual work environment and workplace resource management (Nenonen et al., 2009). The meaning of the office is in transformation: it is important in terms of social connectivity and presence, as well as in providing functional and usable facilities for virtual connectivity. The workplace resource management can have four different agendas: service management, change management, network management and experience management agendas.

The user has been in the focus in other research projects, as well. Rasila (2010) published a thesis about the relationships between a customer and a landlord. Her research emphasized the increasing need of understanding the customers (tenants) and their strategic business goals better than before. Even if the landlords acknowledge this need, they often lack the tools to gain this understanding. Her model provides one solution to this challenge. A project on office occupiers' preferences and needs in a changing business environment, Preferences\(^2\), aimed to understand the physical, social and virtual space attributes the office occupiers prefer in terms of location, buildings, workplaces and services. The study focused both on individual level and organization level needs and preferences.

The Healthy Building research project aims to promote long-term sustainability and quality of the built environment. This basic research in the field of indoor environment began with the large Finnish research project Productive Office 2005 (Seppänen, 2005) and has since been continued. Such research aims to help to create healthy, comfortable and productive settings that are perceived to be satisfactory by their occupants, and at the same time have reasonable energy consumption. Findings indicate a connection between indoor air quality and the productivity of office workers. Researchers are now continuing to broaden the investigations into other types of work and learning (e.g. the Toti project\(^3\)). Information on thermal comfort and how changes in the thermal environment affect human thermal sensation provide new knowledge in designing and developing new indoor environments. This knowledge can help to find out e.g. the most suitable renovation alternatives for old buildings with respect to indoor environment comfort (Airaksinen et al., 2007).

The European research theme, Usability of workplaces (CIB W111), has been one of the second wave research approaches. Usability case studies have been conducted in a variety of space segments, including e.g. shopping centers, (Alho et al., 2008), business parks (Gersberg et al., 2007), industrial places (Lindholm & Nenonen, 2009) and senior housing (Aalto et al., 2010).

The other European research topic of added value has its Finnish roots in the thesis of Lindholm (2008), who investigated the added value of corporate real estate management (CREM) for

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1 www.proworkproject.com
2 www.prefeproject.com
3 www.bes.tkk.fi/en/research/current_projects/toti
the core business. Her model for identifying and measuring the value added by corporate real estate is a novel construct that develops the relationship between corporate strategic management systems and real estate decisions and operations. This provides means to identify and prove the contribution of real estate to the occupier organization and the possibilities that exist for adding value. This research was carried out in the framework of corporate real estate management, but pointed out specific topics for facilities management, as well. The value perspective continues in an ongoing research project that applies the principles of lean management to real estate business. The goal is to improve the productivity of real estate business companies. The focus is on value flows and value creation processes of service companies in the field of real estate business. The main aim of the research is to understand how to create value for the customer and, thus, improve the performance of the companies.4

FACILITIES MANAGEMENT RESEARCH WIDENS THE FOCUS
The third wave is now focusing on more integrated models both in the mixed use concepts in different space segments and in enlarging the service business models towards an areal context, for example. Each earlier mentioned research theme is still valid and will have follow up projects, but one can identify the different emphases in research interests, mainly derived from the development of the facilities management industry.

The increasingly more common theme of sustainability goes beyond the borders of the building and its shell, and also includes the surrounding urban structures. There are themes such as Sustainable Building and Urban Design and Development included in the research projects. These research projects have developed knowledge, methods, and know-how for the promotion of “ecological sustainability”, environmentally sound actions and eco-cycle systems in the design, construction and maintenance of buildings. In effect, the building system and its flows of energy and materials were researched in these projects. Creation of low-carbon communities5 could be an important part of the solution to overcome this challenge of energy consumption. In the ongoing research project by Junnila, Carbon OFF, possibilities to create low-carbon urban communities are studied from two perspectives. The first one focuses on building an environmental management model to create sustainable low-carbon communities. The research is divided into two approaches, a management model based on industrial ecology and modeling of carbon footprints of urban areas to enable the creation of effective carbon management strategies. Based on these approaches, scenarios of carbon mitigation possibilities are built. Second, an international urban development certificate, LEED for Neighborhood Development, is analyzed to examine its applicability to Finland and usability in creating low-carbon urban areas.

The other ongoing project of Junnila is GreenLab. It is about developing a test bed where Finnish real estate market players, such as contractors, developers, building owners, service providers and managers, can test and develop the environmental efficiency of their products.

and processes. The main aim of the study is to identify the processes and products that most influence environmental efficiency and analyze and develop the identified processes and products in order to decrease the carbon footprint caused by the built environment. The tested products and processes are benchmarked against the best international standards to ensure that the achieved level is on high in international comparison. Furthermore, GreenLab assists Finnish companies in concentrating on the right processes and products from the environment perspective and helps them to understand their role in achieving the environmental targets in the future.\(^6\)

In addition to the ecological attributes of sustainable development, the social attributes and well-being factors are starting to receive more attention in the ongoing research. The project about wellness centers (Kunto) will emphasize the social attributes\(^7\). A similar approach has been taken in the KAVERI project on the usable sustainability in shopping centers\(^8\).

A tendency in the research is describing larger and more complex systems. One example is the fairly recent doctoral thesis by Kärnä (2009) on the concepts and attributes of customer satisfaction in construction. The ProPal project continued in this theme and focused on a feedback system for indicating the key points of usability in the feedback flow in different phases of user processes connected to the building (Kärnä et al., 2010). This development was part of the Nordic REBUS project (Lindahl et al., 2011).

Additionally, there is a need to investigate more shared spaces and places: both from the perspective of mixed space segments, e.g. development of home offices, living labs and business ecosystems, and with a particular focus on reconsidering the relationship between real and virtual spaces (e.g. media-spaces, spatial video-conferencing, telepresence applications, and collaborative augmented environments) with a view to understanding the fundamental differences among them and the requirements that this development sets for the facilities management and facilities services. The theme “virtual me” was examined in the earlier mentioned TOTI project. The Technical Research Center of Finland (VTT) has investigated the mobile applications in facilities services (Tolman et al., 2006).

Demographic changes and the increase in the number of elderly people are seen in research on senior housing and areal development. The new perspectives of widening the concepts of facilities services for the housing sector are under investigation, e.g. in the research project ALMA\(^9\). Another driver for the development of the housing sector and procedures related to facilities management are the increasing number of renovations and refurbishment in different space segments. The user orientation in renovation processes seeks applications and implications that are developed into facility service models.


\(^7\) [https://tekes.dicole.net/presentations/attachment_original/482/Teles_KUNTO.pdf](https://tekes.dicole.net/presentations/attachment_original/482/Teles_KUNTO.pdf).

\(^8\) [https://wiki.aalto.fi/KAVERI/Sustainable+shopping+locations+and+concepts+in+a+network+city+(KAVERI)](https://wiki.aalto.fi/KAVERI/Sustainable+shopping+locations+and+concepts+in+a+network+city+(KAVERI)

\(^9\) [https://tekes.dicole.net/presentations/attachment_original/Huuskonen.pdf](https://tekes.dicole.net/presentations/attachment_original/Huuskonen.pdf)
INPUT FROM FUNDING ORGANIZATIONS

Such thematic development in facilities management research is supported by different funding organizations, e.g. by Tekes, a Finnish funding agency for technology and innovation. The role of Tekes is to support high-quality research that generates significant commercial potential for businesses while also promoting better competitiveness and welfare for society at large. This criterion in funding means in practice that research organizations need to collaborate in research processes with industry and companies. The research projects are carried out in close collaboration with practice, using the field not only as a source of data but as a reflection and way steering the research process: the shared interest is in research results that are relevant both for the academic field and practical implementation.

Tekes uses technology programs to allocate its funding, networking and expert services to areas that are important for business and society. Tekes launches programs in areas of application and technology that are in line with the policies outlined in the strategy of Tekes. Tekes allocates approximately half of the funding granted to companies, universities and research institutes through technology programs. Tekes funding is intended for challenging and innovative projects, some of which will hopefully lead to global success stories.

The technology programs provide opportunities for companies to network and develop business expertise and skills in international operations. In the programs they receive Tekes financing for developing products, production, service concepts and business expertise, and also for updating the very latest information about different areas of technology and business. The technology programs consist of research projects by companies, universities and research institutes, plus services that support companies’ business operations, such as developing shared visions and organizing seminars, training programs and international visits.

The ongoing programs that are relevant for the development of facilities management research are:

- The Sustainable community program (2007-2012), which aims to generate renewable business activities in designing, constructing and maintaining sustainable and energy efficient areas and buildings. One core theme of the program is a noticeable improvement in the energy efficiency of buildings and communities, as well as the promotion of adopting renewable energy sources.10

- The Spaces and Places program (2008-2012) seeks answers to questions like: What kinds of premises yield the best results? What kind of environment would best promote learning or working? What would a shop that combined virtual, physical and social spaces and places be like? The target group of the program includes service sector players, information and communication technology companies and the construction and real estate industry. The program encourages the participants to cooperate across sector boundaries. The user of the space is in focus when developing new business models for developing, producing and maintaining the relevant environments.11

10 www.tekes.fi/programmes/community
11 www.tekes.fi/programmes/spaces
• The Built Environment program (2009-2014) focuses on the users’ needs in the built environment and the demands set by them for the practices in the real estate and construction sector. The program increases the usability and serviceability of the built environment by developing the practices of the real estate and construction field. The program focuses especially on renovation and refurbishment, construction for well-being concepts and infrastructure construction.  

The latter program created a roadmap (to be published on the website) to act as the guideline for the Built Environment program. The roadmap points out e.g. the need to understand properties and buildings as services. This statement is a relevant guideline for traditional technically orientated business. The role of change management is emphasized. The vision towards 2020 is to promote the user perspective as the main driver for businesses connected to built environment.

DIFFERENT RESEARCH ORGANIZATIONS AND COLLABORATION

The research partners in Finland consist of university faculties, e.g. in Aalto University, Tampere University of Technology and Oulu University. The Doctoral Programme of the Built Environment (RYM-TO) nowadays provides valuable support also for several PhD candidates carrying out research regarding facilities management. Recently an industry-led new stakeholder, RYM Ltd – Strategic centre for Science, Technology and Innovation of the built environment in Finland, was established. Already at the moment this organization is playing an active role by initiating and organizing industry-led research efforts, which also address certain dimensions of facilities management. Additionally, the Technical Research Center in Finland (VTT) is an active player in the research activities.

KTI, the Institute for Real Estate Economics, combines solid theoretical knowledge with systematic data compilation procedures and professional data processing. KTI also maintains databases on the rents, costs and profitability of properties in Finland. On the basis of this information, KTI publishes market information that is also used to provide information tools for effective real estate management in Finnish organizations both in the private and public sector. KTI carries out several survey and research projects annually. Examples of projects conducted by KTI are: Globalization of the property market, Securitization of the Finnish property market, measuring the customer satisfaction of the occupiers of commercial premises, Real estate strategies in different Finnish organizations, the future demand of premises in the Helsinki region and the environmental key figures of the real estate and construction sector in Finland.

Sitra, the Finnish Innovation Fund, has the duty to promote stable and balanced business development in Finland, the growth of Finland’s economy and its international competitiveness and co-operation. It has been active in research activities concerning sustainable development. Academy of Finland established a new research program for housing in 2010.

12 www.tekes.fi/programmes/builtenvironment
13 http://rym.tkk.fi/en/
14 www.rym.fi/en/
Additionally, Tekes is encouraging research teams to engage in international cooperation. Such network support provides a possibility to link the facilities management research to a wider context and collaboration. Collaboration on a national level also provides opportunities for new research innovations between research organizations. However, the most effective form of collaboration is the close connection with organizations and companies. International networks like EuroFM and NordicFM next to active groups in CIB are major networks besides organizational collaboration abroad.

The different educational institutions in addition to the universities have an important role in applying research results to educational contents. RAKLI represents the interests of property and infrastructure owners, construction clients and user organizations, as well as investors and service providers. The association devises operating models, processes and best practices. They launch development projects themselves or cooperate with other property and construction organizations, public administration agencies or with research institutes and enterprises.

**CONCLUSIONS**

The evaluation of the effectiveness of research projects funded by the Finnish funding agency for technology and innovation was conducted in 2010. The funding programs described in this article have managed to increase the volume of research. The network clusters have also been developed effectively. However, there is a need to pay attention to the ways the research results are implemented in practice. There is an ongoing need to develop the business and management in organizations, including the strategies for R&D-activities. Turbulence in business and discontinuity in the structures is a hindrance for the utilization of the full potential of the research results in the companies. The end-user orientation and a customer-centric approach are still worth developing in industry – the top has not yet been reached. Additionally, the lifecycle knowhow can in the future be the competitive edge for new leads in business. There is a need to widen the spectrum across disciplines. The facilities management is multi-disciplinary research area.

The research has an extensive challenge in investigating the provision and development of a myriad services and capturing the full spectrum, from property strategy, space management and communications infrastructure to building maintenance, administration and contract management in the context of changing trends in general. In today’s knowledge landscape, there are powerful drivers for multidisciplinary research. However, one has to be specific if the research is multidisciplinary and fosters wider knowledge, information, and methods (Frohman et al., 2010). Disciplines remain separate, disciplinary elements retain their original identity, and the existing structure of knowledge is not questioned. Interdisciplinarity is the term that is used when a field of study crosses traditional boundaries between academic disciplines, integrating these different approaches or methods. Interdisciplinarity can be methodological, borrowing a method or concept from another discipline in order to test a hypothesis, to answer a research question, or to help develop a theory or theoretical framework; it is a more com-
prehensive, general view and epistemological form of research. One can also use the term transdisciplinarity, defined as going beyond the academy with case-based or problem-based approaches (Frodeman et al., 2010).

The first wave of facilities management research in Finland can be seen as multidisciplinary by its nature. Through simple collaboration, researchers from different disciplines can accomplish more by teaming. The multidisciplinary teams have to assemble and create a common language and framework for discovery and innovation. This has been fruitful in projects that focus both on the demand and supply side of markets.

The second and third wave need a more interdisciplinary research approach that moves beyond simple collaboration and teaming to integrate data, methodologies, perspectives, and concepts from multiple disciplines in order to advance fundamental understanding or to solve real world problems. The issues are more complex than expected and the system theory provides a framework for understanding the phenomena. The challenge in Finnish facilities management research is not to discover the relevant research problems but in the development of competencies towards interdisciplinary research processes: this means shared understanding, methods and intensive collaboration, not only between industry and research or internationally but in knowledge exchange across disciplines.

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PART B

CURRENT FM RESEARCH IN THE NORDIC COUNTRIES
3 WORKING ENVIRONMENTS

3.1 CHAPTER INTRODUCTION

Karen Mosbech

Introduction to the topic
It is very gratifying that we now again are getting focused on the interaction between the physical environment and the activities taking place in them. It has been a bit quiet on the subject for some years. We have an ongoing need for new knowledge and experience. Many resources are at stake, if companies do not optimize their sites. Not only because of m², but in particular because of the influence from the physical environment on whether skills and resources are used optimally.

This session included 3 presentations

Juriaan van Meel, CFM: Office Contrasts– Six Contrasting Dutch Cases
Juriaan went over 6 cases from the Netherlands. They are very different cases with very different types of businesses: a consulting firm, a law firm, a public organization, a workplace centre, an architectural firm and an "almost-home-office". Juriaans conclusion is that it's more a question of attitude, almost religion, than a matter of objective facts that determine how to arrange yourselves in your company. Not so much a conscious vision of how to support its organizational goals with the physical environment.

Juriaan has written an excellent book about his research project, which I can highly recommend.

Heidi Rasila, Ursula Hyrkkänen and Suvi Nenonen, Aalto University: Empowering Places for Knowledge Work Processes
Suvi focus much on how to arrange workplaces in order to ensure that employees thrive and take stimulating (restorative) breaks. The more efficient the work is organized, the more the need arises for areas to support breaks and wellbeing. Studies conclude that there is a connection between the possibility for employees to find inspiration and the corporate bottom line.

The paper was a presentation of a method for measuring employees' well-being and need for inspiration in the work environment. Suvi stressed that many employees' circumstances change radically when working digitally.

Birgitte Hoffmann, Morten Elle og Peter Munthe-Kaas, DTU: Facilitating Creative environments
The need for creative companies grows in the Western world as a result of competition with Asia. This paper describes 4 Danish case studies: Mind Lab, a government office, Tryg, an insurance company, Musicon, urban planners, and Scion DTU, a science park. The conclusion of
these studies is that there is a great need to focus on special facilities that support creativity, and your success with the facilities that support innovation is depending on the corporate culture. The analysis also concludes that the interaction between organization, people and physical environment has a great influence on the level of creativity in the companies.

**Important statements**
The conclusion of all 3 presentations is that it is impossible to separate space, work and business. There are very few studies dealing with management’s influence on the interaction between the physical environment and its ability to achieve its goals. It’s not the spaces, but the way you use them, which is crucial for success. In many organizations, especially larger, management and employees do not have the same goals and visions.

There are no general solutions; it will always be a matter of corporate culture, which frames will best support the work. That is highlighted from all the contributors from different angles.

The important thing is that it is a competent choice you make, because the physical environment is always either positive or negative – it is never neutral. This session leaves us with more questions than answers.

### 3.2 OFFICE CONTRASTS – SIX CONTRASTING DUTCH CASES

**Juriaan van Meel**

**ABSTRACT**

**Purpose**: The aim of this paper is to get a better understanding of organizations and their work environments. The idea is to find out why some organizations opt for highly flexible or even virtual office concepts, whereas others deliberately choose for more conventional models.

**Background**: In the past decades, mobile and flexible office concepts received a lot of attention. Today, many of these concepts are part of general practice, but, at the same time, we see that these concepts are not yet as mainstream or wide spread as many expected or predicted them to be. This paper takes a closer look at this situation.

**Approach**: The paper starts with an overview of the main trends concerning office concepts. Then, it describes six contrasting cases: the offices of a law firm, a consultancy firm, a government agency, a so-called workhub, an architects firm and a small software firm.

**Results**: The contrasts between the cases show that work environments can take many different shapes and that each shape can be relevant as long as it matches the culture and work processes of the organization.
INTRODUCTION

The office is where you are! That’s what the gurus of the new office used to say in the 1990s to underline their revolutionary ideas concerning the office. Today, this slogan has become a reality. Just look around (or at yourself) and observe that the contemporary work force is able to work anyplace and anytime, using ever smarter gizmos to be on-line and, consequently, ‘on duty’.

Making this observation, it is tempting to state that the conventional office is, at last, on its way out. Yet, we have to acknowledge that the ‘old’ office is still very much among us. City skylines are still dominated by large office blocks, which accommodate large numbers of office workers, who crowd the morning traffic, and then spend a lot of their time sitting in rather bland office interiors.

A good case in point is the Netherlands, which is the focus of this paper. The Netherlands is often seen as one of the forerunners in office innovation (see e.g. Bronner, 2009). And indeed, large numbers of Dutch office workers work from home, or elsewhere, on a regular basis, and many organizations have transformed their offices into club-like meeting spots, with funky design and shared desks. But even so, the majority of Dutch firms still follows the traditional typology of large office blocks, with a mix of cellular spaces and group offices, and personal workstations (NVB, 2009).

This paper will take a closer look at this hybrid, possibly transitional, situation, trying to understand why some organizations opt for highly flexible or even virtual office concepts, whereas others deliberately choose for more conventional models. The paper starts with a quick discussion of the origins of new office concepts and the main trends. Then the paper presents six contrasting office projects which have been selected on the basis of ‘maximum variation’. The idea was to look at a wide range of office types, rather than the usual best practices. The cases concern a law firm (located in a classic cellular office), a consultancy firm (almost ‘officeless’), a government agency that (in a flexible office), a so-called workhub (a members-only office club), an architects firm (located in a studio-like converted chewing gum factory), and a small software firm (that moved from a home office to a ‘real’ office).

Each of the cases provides a different view of the contemporary work environment. Thereby they illustrate that the reality of the office is more diverse and hybrid than the much used dichotomy of ‘new’ versus ‘old’ office concepts suggests. The paper’s main message is that work environments can take many different shapes, and that each shape can be relevant as long as it matches the culture and work processes of its users.
Background

New office concepts are by no means new. As far back as 1969, the Austrian architect Hans Hollein created an art-installation which he called the ‘Mobile Office’, see Figure 1. It was a plastic tube with a telephone that had to demonstrate that new media would soon enable people to work anywhere they wished to. It was the same era in which organizations for the first time started to experiment with concepts like teleworking, non-territorial offices, videoconferencing and paperless offices.

Looking at these trends and experiments, the American management journal BusinessWeek featured an article in 1975, called ‘Office of the future’, and in this article it was predicted that there would be, no doubt, a revolution in the office over the next twenty years. Changes in the office, however, would take an evolutionary rather than a revolutionary pace. It was not until the 1990s that mobile and flexible ways of working became truly feasible. Computers were getting more powerful, reliable and mobile. Organizations were eager to ‘re-engineer’ their business processes. Organizational cultures were becoming less hierarchic and more collaborative and informal. Employees were looking for more individual freedom in time and place to enhance their work-life balance. All in all, fertile ground for a growing interest in new office concepts.

The interest in new office concepts was reflected in a rapid rise of publications, see Figure 2, many of them with enticing titles such as The Obsolete Office, The telecommuter’s handbook: how to earn a living without going to the office or, even better, Undress for Success: The Naked
Truth about Making Money at Home. In general, these books presented a bold and eye-catching vision of how virtual, flexible or creative the future work environment would, or should, be.

An overview of the number of published books per year on the topics of office and workplace design is shown in Figure 2. The overview is based on a key word search in the British Library and an extensive search on Amazon. Used keywords: workplace, offices, office design, workplace design, telework, teleworking and telecommuting.

When trying to summarize the presented visions for the future office, three major themes, or trends, stand out.

(1) Mobile working – Here, the main idea is that office work will increasingly take place outside the office. Few authors believe that office buildings will actually become obsolete, but the general consensus is that offices will lose their dominance and become part of a network of workplaces. Francis Duffy, one of main gurus in the field, writes: “As work spills out into the street, into homes, and into cafes, restaurants, hotel lobbies, and airport lounges, the networked office transcends individual office buildings” (Duffy, 2010).

(2) Open and diverse work settings – The second trend concerns the floor plans of office buildings. The main argument is that office spaces should be open, transparent and diverse to help the flow of ideas within organizations. In this discussion, new office protagonists consider the
conventional cellular office as anathema. Veldhoen (2004), for example, describes it as “a typical exponent of the hierarchical form of organization, whose waste and inefficiency are becoming clear with each passing year”.

(3) Shared use of space -- The third trend concerns the way in which workplaces are being used. Here the trend is from personal to shared workstations, providing fewer desks than people. This trend is triggered by the fact that desks tend to be underutilized, and by the wish to provide staff with a greater freedom of choice in workplace settings.

These trends in office and workplace design are often framed in a dichotomy between ‘new’ and ‘old’ office concepts, see Figure 3.

In this dichotomy, the ‘old’ is about large office buildings with cellular layouts and personal workstations. The ‘new’ is about mobility, diversity, efficiency and freedom of choice. The ascribed advantages new office concepts are cost reduction (because less office space is needed), better communication (due to open layouts and group spaces), more freedom for individual employees (because they can choose when and where to work) and possibly even increased productivity (as an end-result of all other benefits). At least this is the gospel being preached by the protagonists of new office concepts, which in part supported by evidence from evaluation studies (see e.g. Van der Voordt and Been, 2010)

As illustrated, these ideas have been around for several decades now, but currently there is a revival of interest. Just like in the 1990s, there is an explosion of media attention for what is now referred to as ‘new ways of working’ (‘newwow’ for the insiders). This new office revival is no doubt triggered by the many new possibilities of social media which make mobile work more feasible than ever. Other push factors are the wish to create more sustainable workplaces, the need to reduce costs and the entering of new, more tech-savvy generations of workers into the job market.

In this revival, the new office concepts tend to be presented as universally applicable solutions. There is tendency in the workplace industry to view knowledge workers as a homogenous group that all have the same needs and priorities and should adopt one and the same concept (Greene and Myerson, 2011, Davenport et al, 2002). The general story line is, that office workers should be freed from their office shackles, start working from home or elsewhere, occasionally drop in at the office for an espresso and chat, and work happily ever after. It is a story that is by many considered as attractive and maybe even inevitable to become true.

Below, we will take look at how this story is being picked up in current practice by looking at six different organizations and their work environments. The project descriptions are based on project visits and interviews with architects, facility managers and users.
Figure 3: Dichotomy of the ‘old’ versus the ‘new’ office

The ‘old’ office

Dominant workplace

The office
Large office buildings, on central locations. Staff typically works there 5 days a week, from 9 – 5.

Multiple locations
Distributed set of work locations, both public, private and corporate. Work hours are flexible and extended.

Space layout

Cellular office
Staff is accommodated in private offices or group rooms. Room size depends on organizational hierarchy

Mix of rooms / open offices
Different settings for different activities. Emphasis on openness, social spaces and transparency.

Use of space

Personal workplaces
Workstations are individually ‘owned’ and personalized. Average occupancy typically not higher than 40%.

Shared workplaces
Fewer workspaces than people. Workstations are occupied on an as-needed basis. Occupancy rates near to capacity.

**CASE 1: ALMOST OFFICELESS**

The first case concerns Quintel – a medium sized consultancy firm -, which is a textbook example of a mobile and flexible ways of working. The approximately 35 consultants, who are all co-owners of the firm, are almost fully without office. They are ‘officeless’ because they spend most of their time at their clients, not only providing consultancy, but also coaching and training (they call it ‘co-sultancy’ rather than consultancy). For internal meetings, the Quintel consultants tend to use public venues like restaurants or hotels. Small meetings take place at the consultants’ homes.

So, there seems to be not much of a need for a formal office, which also fits Quintel’s ambition to be ‘lean’, avoiding unnecessary expenses like personal secretaries, extensive support staff or office space. Recently, however, Quintel decided to rent a number of workstations at the ‘Atom club’ in Utrecht – a serviced office where you can rent desks by the month. They did so because they were spending less time at their clients due to the economic downturn. Furthermore, they wanted to spend more time working together on new consultancy products.

The ‘Atom Club’ seemed to be the right type of place for this. It provides office facilities, like coffee, printers and desks, but it lacks the atmosphere of a standard office. It is housed in refitted 1970s office block, where the Quintel consultants have their own group of desks in a large open space together with other users. One of the Quintel consultants says: “I think it is a cool place .... *a sort of club, rather than an office, where you meet colleagues, but also people from other companies, which makes it interesting*”. So, Quintel is not as ‘officeless’ as it seems, but the space they use is highly flexible and shared with others.

**CASE 2: A CLASSIC OFFICE**

The second case concerns DLA Piper, a well-established international law and accounting firm, with an office on the periphery of the financial center in Amsterdam. It is an interesting case because it is an almost stereotypical example of a conventional office, with long corridors, private offices, personal desks, and paper-filled filing cabinets.

A closer look, however, reveals that the term ‘conventional’ does not do fully justice to the project. The fit-out may not be very progressive or radical, but neither is it dull or archaic. When walking around, the office comes across as rather open and lively. Office partitions are fully transparent and most of the doors are open. In the corridors, you see thirty-something workers, with open collared shirts, making small talk. Large corner offices, or other obvious status markers that you may expect from a law firm, are absent.

The refitted DLA Piper office seems fit-for-purpose, matching the staff’s work processes, which require high levels of concentration. Another important explanatory factor seems to be the wish to retain and attract staff. Many of the employees are highly-paid ‘fee earners’, who put in long hours at the office and tend to be quite fond of their private offices. Their satisfaction is likely to be more critical to DLA Piper’s success than savings on space.
It is interesting to note, however, that the refit could have turned out very different. In the early stages of this renovation project, the project team visited several flexible office projects and infused with new ideas they were ready to do away with partitions and personal workstations. But, they also believed that such concepts would clash with the current culture, although that may change in the near future. The facility manager says: “Even some of the partners were in favor of more openness and flexibility. But we didn’t dare too to push the idea [...] The culture is not yet ready. But, it will come. Just like anywhere else, staff is working more and more mobile and digital.”

**CASE 3: ALMOST FLEXIBLE**

In the Netherlands, the central government is well-known for its efforts to implement new office concepts. Good example is Rijkswaterstaat, the public agency that is responsible for much of the Dutch infrastructure (roads, bridges, water ways etc.). Their main office is a large 1970s high-rise in Utrecht, which was renovated and extended in 2007. The building’s work spaces were designed around the idea that employees work from home on a regular basis and have no need for fixed desks or private offices.

What’s interesting about the project is that it shows that implementing such a concept on a large scale can be quite a challenge. Ten years after move-in, the concept’s success is mixed. Some departments still follow the original ‘non-territorial’ concept, but many have fallen back to the use of fixed desks and management offices. As the architect of the project says: “Only the name plates are missing.”

The mixed results are surprising because a lot of time was invested in developing the concept and engaging people in the process. Yet, the new concept has failed to take root in the organization. As the facility manager says: “There have been all sorts of sessions and surveys, but in reality we encounter a lack of commitment ... the mindset of people is still very traditional and there is no central ownership of the concept”. He also notices that desk-based function such as lawyers have trouble with the concept than project managers who spend more time on the road, visiting projects.

At the moment, however, the concept is being put back on track. The building’s population is changing and newcomers seem more open to the concept. Another push comes from the fact that the central Dutch government intends to implement desk sharing across all its departments to reduce accommodation costs.

**CASE 4: COWORKING**

This case concerns a so-called cowork space for independent workers. Cowork spaces resemble serviced offices (like the Atom Club in the Quintel case), but they explicitly aim to create a sense of community and possibilities for ‘cross-pollination’ among their users.

The Hub is an interesting example because it is explicitly targeted at ‘social entrepreneurs’ whom can loosely be defined as people who mix commerce with idealism. To this target group
the Hub wants to provide a ‘habitat for social innovation that borrows from the best of a serv-iced office, an enterprise agency, a friendly café and a political arts space.’

In Amsterdam, this ‘habitat’ has been created on the first floor of a former school. It is a large open space, with several enclosed rooms for meetings, phone calls or workshops. The space is quite densely populated, with casually dressed people in the age range of twenty to forty, who are chatting, making phone calls, or industriously tapping on their i-books.

In terms of design, the Hub is very different from an ordinary office. The place is ‘raw’ and casual. It has exposed concrete ceilings, a bamboo floor, loads of plants, cardboard desks and vintage furniture. This ‘non-office’ atmosphere was a deliberate choice of the initiators. Co-founder Thomas Vaassen says: “Many of the people deliberately decided to break away from ordinary corporate life. So, they are not looking for an ordinary office. They want something that is more casual, social and flexible”.

Even so, the Hub can be considered as some sort of office – a place where people work behind desks and have meetings. The critical difference with a normal office, however, is that the users are fully independent. They go the office because they choose to, not because they have to. This makes The Hub very user oriented and cost aware. Thomas Vaassen: “if we fail to create a community, and do not deliver value for money, people will go somewhere else.”

CASE 5: WORKSHOP
This case concerns NEXT Architects – an innovative and relatively young architecture firm. NEXT’s office is located in a former chewing gum factory in Amsterdam that has been converted into work spaces for creative industries.

In terms of workplace design, the NEXT office is very much in line with a classic idea of an architects studio. It is a large open area, with high ceilings and lots of exposed concrete. The space is furnished with four bright red, long work benches where all the work takes place. In addition, there are two meetings rooms and a small library. When you look around the space, NEXT’s line of business is immediately clear. Models, product samples, drawings and design publications are all over, which gives the space the feeling of a workshop rather than an office.

Unlike you may expect, the large open space is rather quiet. Young casually dressed designers are concentrating on their computers screen, wearing earplugs connected to their their smart phones or i-pods. The quietness, however, can be deceiving. Marijn Schenk, one of the founders, explains: “Several times a day we have ad-hoc chats. These chats may concern a small technical detail or a large master plan, and they easily evolve into full design meetings.” This is also the reason why their office is the dominant workplace. Schenk says: “Most of our work takes place at our office. Occasionally I work on a piece of text from home, but in general everybody is here because we need to discuss and collaborate on projects. That is the nature of our work.”
So, at NEXT, work process are strongly rooted in the physical office. Not because of a conservative attitude towards new office concepts, but because their design work requires collaboration and teamwork.

**CASE 6: NOT FROM HOME**

This case seemed like a good example of a start-up firm operating from home. But it turned out that the firm recently moved from the owner’s home to a ‘real’ office. Semmtech, as the firm is named, is a two-person outfit that is specialized in ‘semantic information modeling’. The firm was set-up by Daan Oostinga and he first worked from his apartment in the inner city of Amsterdam. Working from home was cheap and fairly practical as long as he had no employees. But it was not ideal. As Daan says: “I am not a kitchen table entrepreneur like so many others. I am trying to build up a real firm and a real office helps to underline this idea.”

So, last year, Semmtech moved into an office space in a multitenant office building. The space is spartanically furnished, with two large desks and a meeting table. The furniture is second-hand or from IKEA. There is a large plant that adds some color to the otherwise grayish space. Daan explains “I am pretty down-to-earth, and so is my work space. It has to be functional and affordable. Most critical is a fast computer network and a good chair. Furthermore I am very fond of the fact that the windows can be opened in office.”

For Daan, this is now the main work place. “I have an i-phone, so I do check my e-mail from home, and I spend a lot of time visiting clients, but otherwise I try to do all my work here at the office. Also when I have to work in the evenings or weekends, I prefer to go here. It keeps private and work life separated –which is difficult enough as it is when you have your own firm.”

**COMPARISON**

Comparing the six cases, see Figure 4, it is clear that each of the organization has chosen for a different workplace concept.

Going back to the dichotomy of ‘old’ versus ‘new’ office concepts, see Figure 3, the cases of The Hub and Quintel are good examples of the latter. In both cases, workers are operating with great autonomy and mobility, without a fixed workplace or formal office. It is interesting to observe, however, that these nomadic workers are not completely without office. In both cases, people make use of club-like office spaces which provide classic office facilities like desks and meeting rooms. The attractiveness of these places is that they provide a sense of community and a place where workers can collaborate face-to-face. In that sense, they function as an ordinary office, but in a much more flexible and casual way, being touch points and meeting spots rather than permanent workplaces.

In contrast, the cases of DLA Piper and Semtech are exemplars of the ‘old’, or maybe we should say ‘classic’, office. In both cases, the physical office is the dominant place for work, although working from home is not uncommon. Furthermore, both offices are very much designed as offices.
They are large office blocks, built on office locations, with typical traits like office corridors, office rooms and personal workstations. This type of physical environment seems to be logical outcome of the fact that both organizations are relatively conventional in terms of identity. Furthermore, the owner of Semmtech wanted a ‘real’ office and a similar idea seems to be in the heads of many of DLA Piper’s staff.

The cases of NEXT Architects and Rijkswaterstaat are somewhere in the middle of the old versus new office spectrum. At NEXT Architects, the dominant place for work is the office, just like at DLA Piper, but the place feels more like workshop than an office. It has the kind of collaborative and casual atmosphere that goes well with the non-hierarchic and interactive character of new ways of working.

The office of Rijkswaterstaat is also a mix of ‘old’ and ‘new’ office elements. The Rijkswaterstaat office is a conventional workplace in the sense that it is a large office high-rise, filled with desks and meeting tables. At the same time, however, Rijkswaterstaat can be considered as rather ‘new’ because employees work on a regular basis from home and because the office is supposed to function as a ‘non-territorial’ office – even though the success of the latter is somewhat mixed.

So, what we see is six contrasting cases that have chosen accommodation strategies with very different degrees of ‘officeness’, ranging from almost without office to the classic idea of working in large office building with rooms and personal workstations. When trying to explain the differences between these cases, six important explanatory factors seem to be relevant:

Mobility – The need for office space seems to correlate negatively with the mobility of people. The Quintel consultants have no need for an ordinary office, because they spend a lot of their time at their clients, on the road and working from home. To a lesser extent, the same can be seen at Rijkswaterstaat, where mobile project managers feel more at ease with the flexible concept than more sedentary and desk-based functions such as lawyers.

Collaboration – The use and need for office space also seems to correlate positively with the need for collaboration. Good example is NEXT Architects where people need to be at the office so they can pick up ideas, work together and participate in the many impromptu design discussions. The need for collaboration also explains why all NEXT employees are located in a single open space.

Culture—The observed office concepts are also cultural artifacts, reflecting what is common and expected in a certain industry or organization. In the case of DLA Piper, the cellular layout not only has functional advantages (low levels of disturbance), but it is also a solution that is familiar and part of the ‘mores’ in the industry. The same goes for NEXT, where it is hard to imagine that they would chosen another model than the classic idea of a studio-like open space because this model is so ingrained in industry.
Figure 4: Typological comparison cases

<table>
<thead>
<tr>
<th>Organisation</th>
<th>Case 1: No office</th>
<th>Case 2: Classic office</th>
<th>Case 3: Flexible office</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quintel</td>
<td>Medium-sized strategic consultancy firm</td>
<td>DLA Piper</td>
<td>International law and accountancy firm</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Spatial layout</th>
<th>Case 1: No office</th>
<th>Case 2: Classic office</th>
<th>Case 3: Flexible office</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open office (serviced office)</td>
<td>Quintel rents desks in a serviced office. Those desks are located in an open space.</td>
<td>Cellular offices</td>
<td>Staff works in 1- and 2-person offices, fully glazed. Open group areas for secretaries</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Use of space</th>
<th>Case 1: No office</th>
<th>Case 2: Classic office</th>
<th>Case 3: Flexible office</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shared workstations</td>
<td>There are app. 10 desks available for app. 35 employees</td>
<td>Personal workstations</td>
<td>All employees have their own workstation</td>
</tr>
</tbody>
</table>
Case 4: Workhub

The Hub
Serviced office for independent social entrepreneurs.

Former school
The Hub is located in a former school. Members tend to use the office for a couple of hours or a couple of days per week.

Open space
All (cardboard) desks are in an high-density open space.

Shared workstations
There are app. 65 workstations for app. 250 members.

Case 5: Workshop

NEXT Architects
Medium-sized architecture firm.

Former factory/car-wash
The NEXT office is in a former chewing gum factory. The office is the dominant workplace. Working from home is rare.

Open space
Staff works at long work tables/benches located in an open space, including management.

Personal workstations
All employees have their own workstation.

Case 6: Small office

Semintech
Small software/consultancy firm.

Multitenant office
The firm moved from a home office to a ‘real’ office in a multi-tenant office building. Hardly any working from home.

Office room
Semintech occupies a single office room, with two desks and a meeting table.

Personal workstations
The two employees have their own workstation.
Employment type – Independent and autonomous workers seem more obvious candidates for mobile and flexible office concepts than rank-and-file employees. In the cases of The Hub (independent workers) and Quintel (co-owners of the firm), there is no ‘boss’ or organizational framework that keeps workers at the office. In both cases, people perform self-management and choosing when and where to work is part of that.

Size – In the Rijkswaterstaat case, organizational size seems to be a relevant factor in explaining some of the difficulties the organization has with adopting a flexible office concept. Changing such a large organization requires more effort, communication and commitment from management. Furthermore, the Rijkswaterstaat case shows that it can be quite difficult to use one-and-the-same concept for all the different departments and functions in a large organization.

Vision/philosophy – Office concepts are also a reflection or extension of an organization’s vision and philosophy. The accommodation strategy is used as a means to express certain ideas about the identity of the organization. Quintel, for example, has no formal office because there is no need for it, but also because it fits well into their vision to be ‘lean’. Likewise, but with a different result, Semmtech made a deliberate choice to move into a ‘real’ office because it underlines its vision to build up a ‘real’ company.

PRACTICAL RELEVANCE
The notion that different organizations seek different types of office solutions is hardly a revelation. It is a notion than can be found in much of the existing literature, which stresses that organizations should create and choose work environments that ‘match’ or ‘fit’ their identity and work processes (see e.g. Becker and Steele, 1995, or Duffy, 1994, Greene and Myerson, 2011). In practice, however, this notion is often forgotten. For obvious commercial reasons, the ‘workplace industry’ tends to be rather formula driven in its approach, trying to sell repeatable processes and solutions. Ask an average workplace consultant for advice and he will surely come up with a concept in which people work from home and share desks at the office. Also design solutions are likely to be very similar, with large open spaces, lots of glass, some quiet rooms, and the same type of designer furniture that can be seen anywhere else. In that sense, the new office is almost as much a convention as the conventional office.

This not to say that this is necessarily bad. Many organizations, especially the larger ones, are facing similar issues and can benefit from similar solutions. It is for example no news that many office buildings, across industries, are underutilized, which is hard to justify from an economic or sustainability point of view. Likewise, many organizations have to deal with new generations of employees that ask for more freedom in the place and time of working. To these organizations, new office concepts hold much potential in terms of flexibility and cost savings.

Even so, the message of this paper is that organizations should not blindly follow the new office herd. The cases presented in this paper are rather unique, but they do show that there is no such thing as one best solution. The observed differences indicate that a so-called ‘situational approach’ to workplace design is likely to work best. Such an approach is based on the idea that, in order to be effective, work environments must be tailored to the particular circumstances
and characteristics of an organization. It means that organizations should not rush into a design process, or simply copy best practice solutions, but first formulate their own vision on the work environment. This should not be an excuse to stick to what is known and familiar to them, but to start a critical analysis of their own organization and its accommodation, asking question like: What do people actually do at the office, and how much time do they actually use it? What could we achieve with a new office concept? And what type of workplace qualities are critical to the success of our organization? Now, and in the future?

By finding answers to these questions, organizations can move beyond the dichotomy of ‘new’ versus ‘old’ office concepts, and develop productive office concepts that match their specific situation. As we have seen, the outcome of such a process can be a conventional office, an office in a reconverted chewing gum factory, or no office at all – all these options are relevant as long as they truly work.

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3.3 EMPOWERING PLACES FOR KNOWLEDGE WORK PROCESSES – METHODS FOR ASSESSING THE RESTORATIVENESS OF OFFICE ENVIRONMENTS

Heidi Rasila, Ursula Hyyrkänen and Suvi Nenonen

ABSTRACT

Purpose: The purpose of this paper is to assess potential methods for assessing the restorativeness of workplace environments and knowledge work processes.

Background: The increasing need for intensive knowledge work calls for more attention to the restorative elements of the workplace. Many times this aspect of the workplace environment is
forgotten when workplaces are developed. More attention to the restorativeness should be given because the digital environment sets new kinds of challenges for our working conditions.

**Approach:** This paper takes attention restoration theory (ART) as a starting point and tests methods for assessing and understanding the restorativeness of workplace environments. These methods are surveys, individual and group interviews and heart rate assessments.

**Results:** The results suggest that any of these methods alone does not give a comprehensive account when used alone, but a combination of different methodologies allows for a wide understanding of the restorativeness of workplace environments.

**Practical Implications:** More attention should be paid to the restorativeness of workplace environments, as the well-being of the employees is ever more important in the knowledge era. This article gives a basic understanding of the phenomenon and suggestions to improve the restorativeness of workplace environments.

**Keywords:** Restorativeness, Office design, Employee wellbeing, Heart rate assessment

**INTRODUCTION**

From an end-user perspective, offices have been the subject of research in many studies since the 1970’s. Both laboratory settings (Bharucha-Reid & Kiyak, 1982; Evans, 1979) and real life situations (Sundström et al., 1980; 1982; Wollman et al., 1994; O’Neill 1994) have been studied. One way to approach the issue is to evaluate how office solutions affect the end-users’ environmental or job satisfaction (e.g. Sundström et al., 1982; Hedge 1982). Another way has been to investigate the physiological consequences of the office conditions and the indoor environment to the employees (e.g. Brennan et al. 2002; Loewen & Suedfeld, 1992; Hongisto, 2005).

From an organizational perspective, it has been suggested that workplace solutions affect – among others – organizational performance and productivity, (Ilozer et al. 2002, Haynes, 2007 a; b) organizational agility (Bradley & Hood, 2003), organizational effectiveness and flexibility (Becker, 2002), and the ability to gain and keep employees (Earle, 2003). Thus, the importance of the working environment is acknowledged from both organizational and individual perspectives.

The problem is that most of this literature is limited to studying the working areas as fixed settings and the other areas of the office have been studied significantly less. Still the changing ways of work and new office solutions (Ware 2003; Lindkvist & Elmualin, 2009) put even more pressure on research to focus not only on the workstations and working areas, but also the other types of spaces in the office. The spaces for resting and having breaks are thus gaining ever more importance because they can also be places for sharing knowledge in informal settings, as well as places of rest for both the body and brains of the knowledge worker. In a world of sensory overload, it is increasingly important to provide environments that enable us
to recover and take a respite from the periods of sustained directed attention that characterize modern living and working (eg. Salanova et al. 2010).

The interest of this paper is in the places of relaxation within the office and their resonance on recreation. Enhancing an employee’s job engagement and well-being is a concern of facilities and workplace management. More knowledge is needed for developing the re-creative features of the office: what kind of restorative places could be made and what kind of empowering elements there should be.

However, there are only few, if any, valid tools for assessing the empowering and restorative elements of office. The office environment can be measured from the perspective of ergonomics and indoor climate. On the other hand, research discussing the factors and measurement of the restorative environment emphasizes the context of nature, not the office. Especially the methods for studying the places for relaxation indoors are rare. It is essential to develop the assessment methods for exploring workplace factors which enhance recovery and recreation processes. This paper addresses the research question of how the restorative qualities of recreation areas within the office can be assessed.

Restorativeness is not an easy construct to approach, as it is a psycho-sociological phenomenon by its nature. The aim here is to apply the Attention Restoration Theory (ART) to the circumstances within the office environment. This paper is limited to testing three methods for assessing restoration in the framework of ART. The methods are tested in a case study setting, which sets limitations to the generalizability of the findings.

This article has a multi-disciplinary approach to the theme and it presents one possible set of methods to assess restorative places for relaxation and recovery in the office. The structure of the paper is as follows. In the second section we briefly discuss the ART and how it is applied to assessing work places. Section three describes the methodology, i.e. how assessment methods were applied in two case study settings. Section four presents the main findings of the case experiments and section five discusses these findings.

**STATE OF THE ART**

The notion of restorative environments is based on ART as developed by Kaplan (1995; Kaplan & Kaplan, 1989). The theory states that in an everyday context the individual must direct his/her attention to many sources. This causes mental fatigue that leads to many negative consequences. These consequences include: decreased capability to solve problems, difficulties in concentrating, impulsivity, and increased potential of problems and risk of mistakes (Herzog et al., 1997; Kaplan & Kaplan, 1989).

Restorative environments help in recovering from this kind of mental fatigue. Restorative environments have four distinct features. These are

1. Being away – physical and/or mental distance from the everyday life. (eg. Laumann & al. 2001)
2. **Extent** – an environment that is rich and compatible so that it takes one’s mind away. The sense of extent comes from environments that have a sense of space and time. The sense of time and space are based on, for example, routes, miniatures and historical artefacts.

3. **Fascination** – the fascination of an environment comes from either content (such as people, animals, water, fire) or from the process (storytelling, gaming, problem solving). Fascination may be divided into two types. The soft fascination of an environment leaves space for restorative mental processes. The hard fascination requires using all mental capacities and there is no room for other mental processes. A good example of hard fascination is a football match. (Herzog & Barnes 1999; Pheasant et al. 2008; 2009.)

4. **Compatibility** – an environment that supports individual goals and aspirations. (Kaplan 1995; see also Kaplan & Talbot 1983)

If an environment fulfills these four features, it supposedly decreases the mental fatigue and allows for recovering the mental processes through self-reflection (Herzog et al. 1997; in more detail see Kaplan & Kaplan 1989). The environments may be divided into three types by their ability to decrease mental fatigue and the potential for reflection.

First, the best restorative environments both decrease mental fatigue and have high potential for reflection. In this kind of environments the attention is undirected, and thus the environment does not cause fatigue. In such environments, individuals have mental capacity to reflect their thoughts and feelings. These kinds of environments are perceived as pleasurable to all senses.

Second, there are environments that decrease mental fatigue, but do not allow for reflection. Examples of such environments include shopping malls, concert halls or amusement parks. An individual becomes relaxed by looking or taking part more actively, but as the environment demands a lot, there does not remain any capacity for reflection. The environment has some restorative elements, but it does not allow for reflection.

Third, there are environments that do neither – they do not decrease mental fatigue nor do they allow for reflection. Instead, these environments cause fatigue and stress as they demand directed attention from individuals. The attention restoration theory suggests that urban environments are often these kinds of environments, whereas natural environments are more restorative (Kaplan, 1985). There are several empirical studies to validate ART and its assumptions about restorative environments (eg. Ouellette et al. 2005; Korpela et al. 2001; Laumann et al. 2001; Berto 2005).

In line with ART, the elements of nature have been used a lot in workplace interiors in order to provide soft fascination. Additionally, views from windows have been considered as a source of involuntary engagement. A study by Ulrich (1984) showed that heart surgery patients in intensive care units who viewed landscape scenes reported less anxiety and stress and needed fewer pain medications than a control group that was not exposed to the pictures. The research findings of a number of studies in health care facilities present strong evidence that even 3 to
5 minutes of contact with nature can significantly decrease stress, reduce anger and fear, and increase pleasant feelings (Parson & Hartig, 2000; Ulrich, 1991 and 1999; van den Berg et al., 2003) Meditation suites, nap rooms and on-site yoga facilities can support the being away experience in the workplace context. On one hand the being away experience can also be reinforced by using elements that are not typically the metaphors of work in the office. They provide different meanings and connotations (Paalumäki 2004).

From the perspective of extent, the use of outdoor areas for working has been a consequence of ICT-development: wireless work and mobile equipment are not binding us to work only inside the office. The extension of a yard, garden and nature are refreshing elements in the work environment, as well. The compatibility component is the basic driver in ergonomics. However, in the context of knowledge work the ergonomics has new challenges. The fit factor is challenging for mobile workers (Hyrkkänen 2005).

From the fascination point of view, the knowledge worker can gain a lot of empowerment by looking at scenes of nature: the logic of nature is sometimes refreshing for their own logical thinking. Knowledge work is intangible by its nature and often the visualization is used in order to share common understanding and illustrate the abstract and complicated thinking. The abstract and intangible work should be made tangible (Fructher et al. 2009).

A survey on how the color of interior walls influences the imagination indicates that when people took tests in red conditions – they were surrounded by walls the color of a stop sign – they were much better at skills that required accuracy and attention to detail, such as catching spelling mistakes or keeping random numbers in short-term memory. This is because people automatically associate red with danger, which makes them more alert and aware. The color blue, however, carried a completely different set of psychological benefits. While people in the blue group performed worse on short-term memory tasks, they did far better on those requiring some imagination, such as coming up with creative uses for a brick or designing a children’s toy out of simple geometric shapes (Mehta & Zhu 2009).

In fact, subjects in blue conditions generated twice as many “creative outputs” as subjects in red conditions. The color blue automatically triggers associations with the sky and the ocean. We think about expansive horizons and diffuse light, sandy beaches and lazy summer days. This sort of mental relaxation makes it easier for us to daydream and think in terms of tangential associations; we are less focused on what is right in front of us and more aware of the possibilities simmering in our imagination (Mehta & Zhu 2009).

Another study examined the relationship between ceiling height and thinking style. When people are in a low-ceilinged room, they are much quicker at solving anagrams involving confinement, such as “bound,” “restrained” and “restricted.” In contrast, people in high-ceilinged rooms excel at puzzles in which the answer touches on the theme of freedom, such as “liberated” and “unlimited.” This is because airy spaces prime us to feel free. Furthermore, it was found that rooms with lofty ceilings also lead people to engage in more abstract styles of thinking.
Instead of focusing on the particulars of things, they are better able to zoom out and see what those things have in common (Meyers-Levy & Zhu 2007).

**APPROACH**

The research design in this study aims to test and develop methods to investigate empowering and restorative experiences and workplaces. Three different methods were tested. These methods will be presented in more detail in the following section. The methods used were:

1. Restorativeness surveys (2 surveys) which were carried out once in paper format and once as a web-based survey.
2. Group and individual interviews. The group interviews (2 interviews) were carried out as walkthrough audits and the individual interviews (5 interviews) in a traditional one-to-one interview setting.
3. Heart rate variability testing (HRV) with 11 individuals in one case organization.

The method development procedure was carried out iteratively in two case study organizations. Later these are referred to as organizations A and B. Both organizations were office-based knowledge work organizations. Both were small business units of large Finnish organizations. A was a business unit of a multinational telecommunications company located in a Finnish town called Vaasa. B was an independent unit of Aalto University located in the Helsinki metropolitan area in Finland.

The location of organization A was in an older office building where the company had been for many years. At the moment of the research activities the company has decided to do some refurbishments. The workstations were in an open-plan office with some spaces for concentrated work, negotiations and pauses and eating. The total amount of personnel in the premises was about 100.

The location of organization B was in a newly renovated building in the university campus area. The workers had just moved to this new location from their old and out-dated location. The workstations were in rooms for 2-4 persons and there was an additional open-plan space for part-time workers. In addition to this, there was space for negotiations and a kitchen. In the site there were some 15 full-time employees and about 30 part time volunteer employees.

The information about the research activities in these two case sites are presented in Table 1. The aim of this paper is to assess how these methods work in assessing and creating restorative environments in a workplace context. The next chapter introduces the findings.

**RESULTS**

The three methods tested for this research and the results of this testing are introduced in more detail here.
Surveys: For example Hartig *et al.* (1997a; 1997b) and Laumann *et al.* (2001) have developed surveys to test the restorativeness of natural environments. In the first phase the intention was to find a way to use such survey in a workplace (indoor) context. This process was started by selecting the survey by Hartig *et al.* (1997a; 1997b) as the starting point. This survey was augmented with on-site interviews with the respondents and the survey was then modified according to the findings. The modified survey was then tested on another site.

An original restorativeness survey as suggested by Hartig *et al.* (1998) was carried out in one break room in organization A. The restorativeness statements were augmented with eight indoor environment statements about lightning, sounds, smells, temperature, air quality, furniture, spaciousness and esthetics.

In the case site the statements about the indoor conditions were deemed necessary as there were several serious deficiencies in the indoor conditions that probably affected the restorativeness statements also. For example, it was the hottest day of the summer and the sun was shining through an otherwise enjoyable glass-wall of the breakout area, which made the indoor temperature really high and the indoor air bad. This affects the perceived restorativeness and thus is an important factor to acknowledge in studying the restorativeness of the environment.

The process was carried out in two phases – at first the researcher left the questionnaires to the table of the breakout area. This resulted in one person filling the questionnaire. In the second phase the researcher gave the respondent the surveys personally while they entered the breakout area. This resulted in a response rate of nearly 100% and it was possible to gather the respondent opinions about the surveys at the same time. A total of 43 completely filled paper questionnaires were received for analysis. Additionally, 12 respondents commented on the survey after filling it in.

The interviews revealed that the respondents found some of the statements of the restorativeness survey “absurd” and “irrelevant” to their working environment. Several respondents commented that they responded to the questionnaire just to be polite to the researcher. The

<table>
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<tr>
<th>Phenomenon Organization</th>
<th>Physiological reactions of recreation</th>
<th>Recovery experiences in a recreation room</th>
<th>Recovery experiences</th>
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<tr>
<td>A</td>
<td></td>
<td>Perceived environmental scale (PRS) inquiry in break out areas</td>
<td>Group and individual interviews during the walkthrough audits</td>
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<tr>
<td>B</td>
<td>HRV-measurement</td>
<td>Web-based survey: Perceived environmental scale (PRS) inquiry</td>
<td>Group and individual interviews during the walkthrough audits</td>
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questionnaire consisted of 26 statements and the length of the questionnaire was perceived to be “short enough” and that was probably one reason for the high response rate. Furthermore, many respondents asked if they should fill in the survey about the breakout area or if it is possible to assess some other space where they take pauses and feel restored.

The following conclusions were made about the first survey. First, the restoration may take place in many places, not just in the breakout area. Nearby cafes, restaurants, smoking areas, outdoor facilities and other public places may work well as restorative places. Second, the restorativeness survey statements do not work perfectly in an indoor setting and they need to be altered to study indoor restorative environments. Third, indoor conditions affect the perceptions of the space in question. Thus, it is necessary to tell the respondents whether they should assess the space as it is at the moment, or as it is on a “normal day”,

In the second survey in organization B, the structure of the survey and the number of statements were the same as in the initial survey, but the statements were modified to suit the indoor environment better (Table 2). In this stage the survey was carried out over the internet. The respondents presumably filled in the survey at their workstations, and the momentary indoor conditions of the breakout area did not therefore influence the findings as much as in the

<table>
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<tr>
<th>Table 2: Statements and proposal for improvement?</th>
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<tr>
<td>Being away (BA)</td>
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<tr>
<td>Findings</td>
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<tr>
<td>These statements worked well in the survey.</td>
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<tr>
<td>Extent (EX)</td>
</tr>
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<td>3 out of every four statements were negative while the rest of the statements in the questionnaire were positive. This caused confusion.</td>
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<tr>
<td>Fascination (FA)</td>
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<td>Fascination came more from the action in the breakout area than from the breakout area itself. Magazines, cross-word puzzles, and radio were sources of fascination. Fascination may also work negatively if you have things to do in the breakout area and you can’t spend time there.</td>
</tr>
<tr>
<td>Compatibility (CO)</td>
</tr>
<tr>
<td>Definition of different perspectives: one's own personality, the team personality and the company personality.</td>
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paper version of the survey. Thus, the statements of the indoor conditions were left out from the survey and a possibility to comment on the individual statements was added.

The response rate was in this case very low: 15 out of 45 employees on-site answered the entire questionnaire. The comments on some statements were quite negative and some respondents felt that the statements repeat each other. The conclusion was that with a survey alone, it is impossible to gain knowledge about restorativeness in a working environment. It was decided to carry on studying the restorativeness with other methods in this organization: a walkthrough audit and heart rate measurements were carried out.

**Walkthrough audit:** As the second method, individual and group interviews were tested as a method to understand the restorativeness of workplace environments. Five individual interviews were carried out in case organization A, and a walkthrough audit was carried out in both case organizations, A and B. Both of these audits included five participants – i.e. 5 workers – from each case organization. In organization A the interior designer hired to manage the refurbishments joined the audit.

Both the individual and group interviews were carried out as thematic interviews and the themes of the discussion were the components of restorativeness suggested by Kaplan (1995). These were: being away, compatibility, extent, and fascination. Furthermore, the participants were asked to show the places in the workplace and near it where they enjoyed staying while being on a break.

The audits covered places such as different kinds of official and unofficial breakout areas, smoking areas, nearby restaurants and cafes and also the workstations, as the participants spent some of their breaks by sitting by their desks with a cup of coffee and a friend or a moment in social media. This method allowed getting a glimpse of the network of places for restoration. In the first walkthrough audit the aim was to discuss the restorativeness of the environments with the themes laid out as defined by Kaplan and Kaplan (1989), namely being away, extent, fascination, and compatibility. The problem was that these terms were too far away from the normal lives of the participants and they had difficulties in understanding the abstract constructs. No one had previously considered if they felt “being away” or “fascinated” during their breaks. Thus, the latter audit was carried out by just discussing the pros and cons of the restorative environments.

The walkthrough audits increased the understanding of the network of restorative places and provided some insights into the reasons why these places were seen either as restorative or non-restorative. Some insights are presented in Table 3. Methodologically the walkthrough audits do not allow deriving objective and measurable findings, but they provide data about the specific case. Combined with surveys, the material from walkthrough audits provides deeper insight into the issue of restorativeness in the office.
Heart rate variability testing: As the third method, the heart rate variability in assessing the restorativeness of workplaces was tested in organization B. The objective of this test was to evaluate how the heart rate variability measurement functions as a tool for assessing the restorativeness of different workplaces. Heart rate variability (HRV) reflects the functioning of the autonomic nervous system (ANS). Thus, stress and the recovery of the ANS can be evaluated with HRV analyses. There are different variables (RMSSD, LF, HF and the LF/HF ratio) representing HRV.

In addition to carrying the heart rate belt, the respondents were asked to fill in a diary all events during the assessment days from the moment they woke up until bedtime. They were instructed to be exact especially with writing down events at the workplace, i.e. what they do, when and where. The HRV measurement succeeded in showing the stress and recovery periods during the assessment days, but failed in giving precise explanations for the recovery reasons. The bottleneck for assessing recovery in different places was the diary method, and especially human behavior. Even though the respondents were very motivated and interested in this measurement and had strict instructions for keeping the diary, they nevertheless scarcely wrote down comments on the diary.

In Figure 1, there is an example of failure of measuring due to poor diary notes. In the stress and recovery chart, the red figures represent stress reactions, the green figures represent recovery and the blue figures physical activity. The work and sleep periods are marked in the figure with grey lines as well. The consecutive numbering describes the notes in the diary made by the respondents.

### Table 3: Some insights from the group interviews during the walkthrough audits

| Being away (BA) | Comes from a natural element, from a real move from one place to another or to a virtual place, a short walk in fresh air, or looking out from the window. It is important that the noises, visions or smells of the work do not follow to the break – and vice versa. |
| Extent (EX) | The success and history of one’s team / individuals and common memories should be made more visible – the organizational success and history have negative effects on restorativeness. |
| Fascination (FA) | Radio, television, magazines, newspapers, game consoles, cross-word puzzles. Fascination that takes long periods of time does not fit in restorative environments. It is just irritating to know that I could do something nice, but I do not have the time to do it. |
| Compatibility (CO) | Compatibility with whom – me, my team or the organization? The space sends a message about how individuals and teams and their breaks are appreciated in the organization. |
In this example, the respondent had a proper recovery period when he worked at the main work place during the pm hours (marked by the red circle, see figure 1). Because there are no notes in the diary regarding what he was doing and where in the main place he worked, no explanation for that recovery period could be documented.

**Figure 1: Testing HRV – stress reactions and recovery periods during two days**

**PRACTICAL IMPLICATIONS**

This paper aimed to increase methodological and practical understanding of the workplace environments as restorative places. The theoretical background was drawn from attention restoration theory (ART) and the four viewpoints of ART were used as a foundation for the empirical part. The four viewpoints for the restorative environments were being away, extent, compatibility, and fascination.

The article tested three sets of methodologies – surveys, group and individual interviews connected to walkthrough audits, and heart rate variability measurements. None of these alone provided enough understanding of the restorativeness of workplace environments, but a combination of the methodologies may prove successful in yielding results that can help create more restorative workplace environments. Table 4 summarizes the positive and negative issues concerning the methodologies used.

The characteristics of a restorative environment were in a minor role in this research due to the fact that the relevant step is to identify suitable methods for investigations first. However, we may ask whether the workplace environment may and/or should allow for reflection for its users. Reflection may be a source of innovation, free flow of thoughts and relaxation – this can be a vital source for many organizations. The restorative environments cannot be approached without understanding them from the perspective of the work processes, organizational goals
and visions. Traditionally restorativeness is associated with the legal breaks during office hours. However, the new ways of working are connected with the dissemination of place and time of work. Physical and mental well-being is nowadays affected not only by physical workplace conditions but also by digital conditions.

Further, as Staats et al. (2003) suggest, the lack of stressing elements does not alone make a space restorative. The significance of the environment for the individual experiences of stress and other negative symptoms is not a linear function. Thus, the practitioners and academics need to consider for what purposes and why the work environment should be restorative and how it can be supported by spatial solutions, interior design and by a variety of ways of using the workplace.

### Table 4: Evaluation of the methods

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<th>Method</th>
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<td><strong>Survey</strong></td>
<td>Possibility for researcher to be on-site and make sure that all responses deal with the same space by having the survey in the breakout area. High response rate. Possibility for interaction with respondents.</td>
<td>The researcher needs to go on-site to reach the respondents. The responses need to be manually typed into the software.</td>
</tr>
<tr>
<td><strong>Internet</strong></td>
<td>Easy to reach many respondents with little effort. Independent of situational factors, as the response is not made in the same space that is evaluated.</td>
<td>Need for illustration in order to assure that the same places are evaluated. Restricts the scope of the network of the breakout areas, which varies between different individuals.</td>
</tr>
<tr>
<td><strong>Interviews and Walkthrough audits</strong></td>
<td>Possibility to also capture the “unofficial” restorative areas. Specific discussions connected with specific spaces. Deeper understanding of individual experiences. Provides practical information for improving the workplace.</td>
<td>The material is non-quantitative and may not be generalized.</td>
</tr>
<tr>
<td><strong>HRV-measurement</strong></td>
<td>Independent of individual articulations and interpretations, provides objective data about the physical reactions. Provides stimulus material for the interviews.</td>
<td>Cannot be used in linear cause-relation reasoning, complexity in the interpretations of the measurements. Sensitive issues might decrease willingness for voluntary testing.</td>
</tr>
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</table>
The tested methods indicated that the empowerment and the restorative experience start with the individual and can be achieved in many places within the work environment. In order to get a holistic view, a variety of methods has to be used. The context of the work, the organization and background factors of an individual have to be taken into account.

Interesting research themes in the future include the restorativeness of virtual work environments. Additionally, it is important to conduct research in order to find a set of methodology that suits the practical needs better. As the variety of boundary objects have been already investigated, the applications to restorative workplaces would be interesting to identify.

REFERENCES


ABSTRACT

Purpose: The purpose of the paper is to support the field of Facilities Management to take up the challenges and opportunities offered by the discourse of creativity. The key focus of the paper is on the discursive nature of creative environments and on the relation of facilities and facilitation. The paper explores four cases of different scales and organisational contexts of creative environments.

Background: Demands for creative environments have become a central focus in Western public and private businesses. Creativity has in particular been promoted as a means of staying ahead in the competition with the growing economies in Asia, and thus the perception of businesses being able to reinvent themselves and produce innovative ideas are central to the economic thoughts in the western world. The concept of creativity has become a main driver, not only in the creative industries, but it is also constructed as an essential guideline by the managerial level in public administration and business in general, producing a noticeable demand for facilitating creative environments within these organizations.

Approach: The paper is based on the results from a research project on facilitating creative environments, financed by the Danish Centre for Facilities Management – Realdania Research. It presents case studies of four Danish creative environments, analysing the development of the environment, the physical facilities, the facilitation processes, the relationship between facilities and facilitation, and the use of the facilities and the local interpretation of "creativity". Furthermore, it presents theoretical perspectives on creativity from different fields of literature on creativity (like Ericsson 2001) and urban planning (like Landry 2000). While the three cases include more traditional work space, the fourth case includes an urban perspective on creative environments.

Results and practical implications: A central point in the lessons learned is the need to abandon the focus on special rooms and office design as keys to facilitate creative environments. Instead, broader perspectives on the organisation need to be considered, including the concrete correlation between facilities, facilitation and culture.

Keywords: Creativity, Facilities, Facilitation, Culture, Work space
INTRODUCTION
The discourse of creativity has during the last decade influenced cities, businesses and society as a whole. Creativity is seen as the key to a better future by a number of actors, among those the United Nations (United Nations 2008). The global fascination with creativity are related to the context of general reorganizations of western societies as a consequence of economical crises, energy crises, technological development, institutional changes, and globalization in general (Harvey 1989; Ericsson 2001). The concept of creativity has become a main driver, not only in the creative industries, but it is also constructed as an essential guideline by the managerial level in public administration and business in general (Ericsson 2001), producing a noticeable demand for facilitating creative environments within these organizations.

Creative environments in workplaces need facilitation in many ways, some of which exceed the field of Facilities Management (FM), e.g. process facilitation and general management. However, FM has the potential to contribute to this development in dialogue with other fields, and we therefore proceed to explore the area between facilities and facilitation that FM may contribute to.

The paper is based on the results from a research project on facilitating creative environments, financed by the Danish Centre for Facilities Management – Realdania Research. Results from the project are described in Larsen et al. (2011), Hoffmann et al. (2010), and finally in a report in Danish (forthcoming). In this paper we present the main results from different case studies of Danish creative environments, analysing the local interpretation of "creativity", the history of the environment, the physical facilities, the facilitation processes, and the relation between facilities and facilitation. We will demonstrate how a narrow interpretation of “creativity” and a lack of attention paid to facilitation may hamper the creative potentials of the facilities that are supposed to catalyze creative processes.

THE CREATIVE TURNS
The concept of “the creative class” by the American Professor Richard Florida (2002; 2003) must be seen as a very dominant headline for the current focus on creativity. However, in this section, we will point to the changing understandings of creativity that can be identified through history and the different approaches currently in play in order to support reflections and development of strategies in the field of FM to creativity. Secondly, we will present a short review of how FM addresses creativity. This review indicates that the field of FM not yet has addressed the discourse of creativity systematically, and furthermore we point to the potentials for FM to develop reflections and approaches on how to do this.

After God, before Florida
Drawing mainly on Daniel Ericsson’s study on the “creativilisation” of work life from 2001 we give a very short account on the historic development of the idea of creativity. The aim is not to give a detailed analysis as in Ericsson (2001), but to show that creativity should not be addressed as an absolute. The perception of creativity changes over time and is constructed in relation to the existing ideas, societal organisations and material constellations.
"Creativity" is articulated as a core virtue today for individuals as well as for organisations. This was not always the case. While individuals and communities may have acted creative during all times, the idea of "creativity" was originally reserved to the powers of God(s). Until a secularisation took place in the renaissance, the creativity of man was the result of divine inspiration and judgement (Ericson 2001). The "creative" was mainly an artist reproducing God's work and this was the result of special talents of this individual "genius".

During the process of industrialisation and the development of capitalism, creativity became related to the abilities of man to be innovative within science and production. At the same time the psychology of creativity shifted the locus of genius from the faculty of "judgement" to that of "imagination" (Weiner 2000:76, from Ericsson 2001:128). While the origin of the word creation relates to the Latin word "creare"- to create, the specific concept of creativity was phrased in 1875 by Ward writing about Shakespeare (Ericsson 2000:114). However, according to Fenyö (in Ericsson 2000:114), the concept spread only slowly, e.g. it was not included in the Swedish thesaurus until 1986.

Creativity gets connected to democratic and emancipatory ideas and as creativity gets linked to learning and experience, it becomes a potential for everybody. However, the political theorist Karl Marx adds to the theoretical basis of creativity as he relates to the material conditions and underlines the need for work to be liberating in order for man to develop the creative potential (Ericsson 2011: 130).

We will end this subsection by a cite of Jaos (1996) taken from Ericsson (2001:131) that outlines three different and co-existing metaphors for creativity in the late 19th century that together captures "modernity", and underlines the potential for critical thinking:

The idea of expression circumscribes creativity primarily in relation to the subjective world of the actor. The idea of production relates creativity to the objective world, the world of material objects that are the conditions and means of action. And finally, the idea of revolution assumes that there is a potential of human creativity relative to the social world, namely that we can fundamentally reorganize the social institutions that govern human coexistence (Jaos 1996: 71, in Ericsson 2001).

After the crisis: "Creativity"!
In recent decades, following in the wake of the crisis of the post industrialised industrial core in Western countries, creativity has turned into a key focus for growth. A new bond has developed between culture and economy and what is labelled "the creative industries" (communication, research, computer hard- and software, design, advertising etc.) are characterised as the contemporary engine of Western economies (Florida, 2002; 2003). This "creative turn" is concurrent with a marked shift away from traditional hierarchies towards more open kinds of network organisations in the economy also seeping into public administration mowing from "government" to a more networked "government" and business oriented "new public management" (Rhodes 1996).
The urban perspective constitutes one of the dominant narratives in the development of the creativity discourse and it supports the focus on a broader approach to creative environments. While different cities at different times have constituted creative environments facilitating cultural and technological developments (Hall 1998), in the last decade the competition between cities for direct investment has been explicitly influenced by the idea of creativity. This has influenced urban planning changing focus away from producing effective "business climates" often in designated enterprise zones that score high in ICT, HQ facilities, geographical accessibility and a well educated labour market in order to attract corporations. Instead, the current focus is on creating the right "people climate" of tolerance and diversity in order to attract the creative people that either develop or attract the contemporary growth engines of the economy, "the creative industries" (Florida 2002; 2003). Different approaches to creative communities can be identified (Florida 2002; 2003, Landry 2000; Overmeyer 2007), however, the novelty is the direct linking of the physical and cultural aspects with economical development and the deliberate integration of this idea into urban planning and development.

A parallel narrative on creativity and creative environments can be derived from a managerial perspective with a series of theoretical and practical approaches also drawing on theories of learning and psychology. The idea of organizational learning has been a headline in the development of organizations in the "knowledge society" (which is another way of referring to the post industrialised society). E.g. Agryris & Schön (1973) and Senge (1990) draw learning and personal development from formal settings to become an integrated part of the lives of organizations and individuals. Several approaches explicitly dealing with “creativity” can be identified in the fields of design and innovation (Csikszentmihalyi 1996; de Bono 1999; Scharmer 2007). Some of these relate creativity very strongly to the use of specific methods and phases, e.g. de Bono promotes a series of specific methods. This focus supports the ideas of creativity as something performed in special rooms or with special techniques.

While most of this research in creativity had dealt with individuals, lately, more focus is put on how creativity depended on social and collective practises. E.g. even though Csikszentmihalyi is engaged in creative individuals, he argues that creativity relates to rules and procedures among groups (1996). In her book from 2008, Tanggard connects creativity to communities of practise and underlines that what counts as creative is decided by criteria within these.

From the different contexts, the idea of creativity as a main driver of social processes of change has fused, and Florida’s notion of “the creative class” (2002) has become a signpost in the strategic planning of not only many western cities but also of international organizations as well as public and private businesses.

We need to draw attention to the current positive connotation of creativity and point to the more “dark” or difficult sides of creative work. Once again drawing on Weiner (2000), Ericsson points to two different types of creativity that co-existed in the beginning of the 19th century: While the one go against “reason”, the other departs from this. Thus, in the early development of the science of psychology, creativity also gets connected to pathological sides of mind in the
form of “madness” (Ericsson 131f). In newer times more people points to the idea that creativity includes both “convergent” as well as “divergent thinking” (Guilford 1950) as well as “single and double loop learning” (Argyris & Schön 1974). This perspective stresses that creative work may challenge dominating perspectives, structures, and cultures, and that this poses special challenges to the organizations that want to exploit the creativity discourse.

To sum up this section, the creativity discourse has become manifest in concrete strategies and approaches in both public and private organizations to develop “creative environments”. This development is subject to ongoing and local interpretations, drawing on different approaches to creativity, and what is considered a creative environment will differ. Therefore with this section we underline that creativity as well as the current focus on creative environments must be reflected as part of a societal discourse. Creativity and the development of creative environments cannot be regarded as objectively “good”. Consequently, questions that support reflection on what this discourse means for the development of workplaces – as well as the rest of society – must be asked not just by researchers but also by practitioners: E.g. what are the consequences of the strong focus on creativity for work life? Who is creative and who is excluded? Furthermore, creativity cannot be approached as a coherent approach with well researched directions and methods. When working with creativity in practise one must take responsibility to explicitly consider approaches and methods and their strengths and weaknesses.

The field of FM approaching creativity
FM has developed a strong practice around providing a supportive framework for businesses and organizations based on the physical facilities, however, in this section we claim that the field of FM needs to relate systematically to the creativity discourse.

Newer definitions of FM communicate a broader ambition of FM to become:

- a strategically integrated approach to maintaining, improving, and adapting the buildings and supporting services of an organization in order to create an environment that strongly supports the primary objectives of that organization (Barret cited in Alexander et al. 2004:3).

Bearing this in mind, one should expect to find a vivid discussion of how creative processes in public and private businesses could be supported by FM in the current FM literature. We did however not find many traces of such activities in a review conducted in 2010, only a few separate elements that may be used as stepping stones in future moves (Hoffmann et al. 2010). A special issue of Facilities from 2011 can therefore be seen as a first sign of FM directly approaching the creative turn. Interestingly, the volume aims to investigate the relationship between the physical work space and the creative processes and therefore we include some points from this volume in the following analysis.

Approaching the question of the relation between facilities and facilitation we firstly point to icons of the creative age such as Google and the design company IDEO. They are both examples of how corporations have internalised social and physical aspects of the urban milieu on
their own premises in order to harvest the innovative potentials of creative people in informal social interactions (Turner 2009; Radich 2005; Gladwell 2000). From inside the field of FM, Noor and Pitt (2009) along these lines show, in their review on innovation in facilities management service delivery, how the provision of recreational spaces as well as designated team spaces (resembling what Scharmer (2007) labels as “lairs”) supplementing traditional office workspaces, has been integrated in FM strategies in order to make environments conducive of innovation. They state that innovation requires many different creative processes over a sustained period and should involve many people, and argue for the need to consider human and process oriented aspects such as “lateral communications” (ibid 218). They further state that the FM interface is a strategic approach to create a workplace atmosphere that is able to set an innovative culture and ambiance towards an organization’s prosperity (Noor and Pitt 2009: 219).

Thus, these iconic firms and the researchers recognise the importance of the larger scale physical environment and the entire culture of the organisation when approaching creativity. This is, however, not the dominating trend among practitioners and FM researchers. Many, like Steen and Markhede (2008), Parket et al. (2011), Roper (2008) and Martens (2008) are focusing on physical aspects of the micro-level of the facility as they discuss the design of workspaces as the mean to support innovation and creativity. In several organisations the creative space is reduced to a room in a special colour (Radich 2005).

The discussions on physical layout of workspaces and organisational creativity are taken a little further in some articles in the special issue on "Creative facilities" that directly addresses creativity. While only one of the contributions which some of the authors of this paper have contributed to (Larsen et al. 2011) reflects the discursive nature of creative workplaces, they all recognise that creativity somehow relate to complex social processes. The basic question across most contributions deals with how the physical facilities may support interaction that is considered a basic criterion for creative environments. Some relate to different types of work requirements and different groups (Greene and Myerson 2001; Parkin et al. 2011), and others deal with creativity as a staged process (Sailer 2001; Oseland et al. 2011). In this way, they presume what Sailer do explicitly, namely that interaction has a strong link with the physical world (2011:8).

One looking for information on how to design workplaces will find a series of practical implications in these contributions, as well as limitations, such as the challenges relating to privacy and work environment. However, there are not many inputs on the wider understanding of creative environments or the facilitation of the creative environments – neither as direct facilitation nor more basic everyday processes. This paper takes up this challenge, and through a study of different contexts we aim to explore different approaches to creative environments focussing on the relation between facilities and facilitation as it unfolds in these concrete cases.
CREATIVE ENVIRONMENTS – FOUR DANISH CASES

In this section we present four different case studies of "creative environments". Like Ericson who investigates what he labels as "the creativisation of work life" as a socially constructed phenomenon, we are not interested in mapping specific criteria and identifying competences in order to point out especially creative organisations or businesses (2001). Instead, we explore how creativity is conceptualised and performed in different ways in four concrete case studies at very different organisational scales. Thus, the main research questions are firstly to outline the different representations of creativity that are articulated in the concrete cases and how these have developed in the specific cases? And secondly, to explore how creativity is facilitated and how the relationship between facilities and facilitation works?

We have carried out the case studies of "creative environments" by conducting qualitative semi-structured interviews, by observations, and through literature studies. The cases presented are part of a larger study of Danish cases that have been performed as part of the project "Creative environments". The cases have been chosen to picture regular and established public and private businesses that are relevant to the field of FM, and they represent a diversity of scales, formality, and organisational types. It should be noted that none of the organisations are working within the traditional field of "creative businesses" such as architects, designers etc. and further that not all of the cases label themselves as "creative environments". The cases are: 1. Mindlab: Facilitating public innovation; 2. Tryg Insurance: "Future work space"; 3. SCION: Incubator for business entrepreneurs, and finally 4. Music on: Creative urban redevelopment zone. While the first three cases represent more traditional businesses, the forth case is about an urban retrofitting. This case is included to highlight the urban dimension of the creative turn for the field of FM. As described in the section above, not only are the quality of the urban context of growing importance for the localisation and development of businesses, the urban life is a key inspiration for businesses on how to develop their facilities.

The description of each case is structured in the following way: We shortly describe the story of development, the physical space, and the facilitation taking place. We also comment on the use and the culture developed related to creativity.

Mindlab – facilitating public innovation

Mindlab is a public development unit made to facilitate professionals in and across three Ministries to innovate their approaches and methods, especially relating to servicing the citizens and other users. It was established in 2001 to support one Ministry, and during the first years Mindlab engaged in a series of smaller projects and processes, but was then re-organised to support innovation across three different Ministries (the Ministry of Economic and Business Affairs, the Ministry of Taxation and the Ministry of Employment). An assessment of the activities further pointed to the need for Mindlab to engage deeper in the processes to make sure that the projects are in fact realised and implemented. Today 10 employees engage in approx. 6-7 projects per year where they organise long term cross disciplinary and user oriented innovation
processes in close collaboration with the participating professionals. They carefully choose the projects by assessing the potential outcomes such as changes in public services and the development of new competences and procedures in the participating departments. During the recent years of global economic crisis, the management of Mindlab has reshaped its raison d’être towards supporting the efficiency of the public sector – not just better services, but better and cheaper services.

Mindlab have some high profiled facilities in central Copenhagen in a department of the Ministry of Economic and Business Affairs. The rooms have been designed and redesigned several times as the facilitators get experiences and new demands develop (and reduced in competition with other demands in the department). Besides a large room with flexible furniture and walls that can easily be re-organised before and during workshops, they have an out of the ordinary shaped room-installation labelled “The Mind”.

The core of Mindlab is the facilitation competences of the employees to stage and conduct processes that aim at create inter disciplinary collaborations and develop, evaluate and implement ideas. The processes as well as the competences are systematically developed. The facilitators can orchestrate the processes anywhere; however, the facilities serve several purposes. Firstly, the flexibility of Mindlab makes it easy to facilitate workshops and seminars with changing settings along the processes. Secondly, the facilitators of Mindlab emphasise that these facilities act as neutral grounds for the different groups of professionals and other groups to meet. And thirdly, part of the facilities that were designed by a group of artists and architects, including “The Mind”, is an important part of the profiling of Mindlab as a special place. Mindlab is also equipped with a complex light system that so far has not been used very much.

During a recent re-design process of the facilities, they considered removing “The Mind” as it did not work as expected, e.g. it was hard to use the walls inside for writing and posting notes and the indoor climate and the acoustics were not good. However they decided to keep it because of the symbolic powers of this “creative room”. Not only is it signalling that “this space is different”, so that the users develop their expectations of the processes they are supposed to engage in when working together with Mindlab, it also signalises the innovative powers of the Danish governmental organisation.

Tryg – “the future workspace”

Five years ago, the insurance company TRYG started a larger retrofitting of their domiciles in both Denmark and the rest of Scandinavia under the headline “The living house”. The story is that their director experienced that their way of organising the offices in private cubicles had not changed over many years. 1600 persons work in the domicile of TRYG in Ballerup and many resources have been put into the long term process of both renewing facilities, as well as a large organisational and cultural change. The overall goal is to create “the future workplace”, a concept that is related to the recruitment of the future generations of employees. The design is meant to support innovation and creativity by increased communication, knowledge sharing,
collaborations and competence development, as well as work satisfaction, and a corporate identity, as employees and customers should be able to recognise the organisation easily. The corporate focus on order and recognition includes a policy of “clean desk”, so that all work stations look the same, only on your name tag can you add some personal decorations. Projects may be presented on the walls for celebration and knowledge sharing if respecting the “Living house concept”.

The facilities include a series of rooms of different scales and functions: open work zones with flexible work stations, project rooms, meeting facilities of different scales, special rooms for innovation and collaboration, and “ramblas” – large open spaces that includes formal meeting facilities and more informal areas with sofas and coffee. A key issue is openness which is mirrored in the design with large offices and glass walls. Another issue is flexibility, all employees have been provided with laptops, and because of the wireless internet, they may work everywhere in the buildings. As all tables and chairs and personal “caddies” are the same, you can easily move people around. The idea of being a “paper-less” workplace means that everybody have two screens, and to print you have to go to one of the large shared printers and use your personal code. Finally, the facilities include a focus on art. The design of a large red heart shaped sculpture hanging in the main entrance is meant to mirror the key value of the organisation. This heart shape is integrated in the design, e.g. in lamps in the buildings. Additionally, a series of young artists are invited to create decorations of especially the meeting rooms.

In the beginning they thought of the process as mainly an "architectural project", but during the process they realised that this had to include a major cultural change in the organisation. The process has been facilitated by a series of workshops especially targeting the managers at different levels because they have to take ownership of the process and implement the changes among their personnel. In this way all personal are meant to be included in the change process. Rules are attached to new facilities, e.g. you may change the layout of the rooms, but you have to bring it back to the original layout after use. The whole process includes a series of different elements that are supposed to develop the new culture, including storytelling and humoristic movies. Still, they are surprised that the facilities do not make the changes by themselves and that they have to teach people how to use the new facilities – e.g. that the use of the "ramblas" is not as high as expected and they have to work with that, also on the management level. It has to be a legitimate action to go and sit in the “ramblas”.

**SCION DTU – incubator for business entrepreneurs**

SCION DTU is a science park owned by the Technical University of Denmark (DTU) focusing on knowledge intensive businesses, particularly in the fields of clean-tech, life-science and ICT, established at DTU in 2004 as a satellite of an older organisation that focuses on larger businesses (1962). The compound consists of offices, laboratories and common meeting facilities and service functions such as a reception and cafeteria. Around 100 businesses with a total of 600 employees are hosted at SCION DTU.
The purpose of SCION DTU is to create good conditions for growth for small businesses, by supplying physical facilities, service, consultancy and professional networks. SCION plans to have approx 20% of the tenants to be consultancy businesses, working with counselling, business development or other kinds of services, which can be used by the other tenants.

In addition to traditional service facilities, SCION DTU have established more recreational services such as fitness facilities, a “game room”, and the opportunity to get your hair cut or get a massage. “Flower Fridays” is a new initiative for the engineers to remember flowers for their wives, and SCION DTU is also considering take-away meals. All these initiatives are supposed to make it easier for the entrepreneurs to focus on their businesses.

SCION DTU is also facilitating networking and courses in different formal and informal formats. These may include students and researches from DTU. They aim to establish a frame that allows the entrepreneurs to focus on their own business, and all initiatives must contribute directly to the development. The general experience is that informal networking usually follows after more formal events organized centrally. It does not just happen by the coffee machine.

The new facilities and facilitation services are not used as much as one may expect. Many businesses are interested in the recreational facilities but SCION DTU assesses that it is as much because of the symbols of a creative environment directed at current and potential employees.

The general claim of SCION DTU is that you need stable management of the facilities before you are able to facilitate networks and creativity for the hosted businesses. This point is closely related to the main role of SCION DTU as a landlord of rented out facilities. In this way, SCION DTU has their primary focus on the facilities.

**Musicon – Creative urban redevelopment zone**

Musicon is a large former industrial area with a few remaining industrial buildings, located south of the centre of the provincial town Roskilde. Just south of Musicon is the field where the Roskilde Festival takes place every year, a music festival with approx. 100,000 participants.

Shortly after the industry had left the area, skaters took possession of one of the larger buildings and an informal computer-café was established in another building. The area was bought by the municipality in 2003 and, inspired by international references like NDSM in Amsterdam, the municipality developed a vision of a creative, living environment with 2000 jobs and 650 dwellings. A secretariat was established to facilitate the urban development.

In practise, the interpretation of what kind of business is to be considered “creative” is narrowing the potential group of developers, as only businesses related to the cultural sector are considered. A dance company, painters, a writer, a graphic design bureau and an international concert booker are among those who are allowed to occupy Musicon. Along these lines, the municipality plans a rock-museum. This interpretation of creativity excludes large parts of what Richard Florida considers as the creative class. Furthermore, the formal cultural sector is, more or less
inevitably, gradually pushing the more informal urban pioneers out of the area. The secretariat is supporting the informal activities that fit into the scope of the area and the general rules. The question is if it is possible for the informal activities to stay informal in this process.

The facilitation is focused on the physical urban development, not on facilitating the local creative processes among the actors in the area. The secretariat is handling the process of attracting new actors to the area, the renovation of some of the existing buildings, and the dialogue with the municipality concerning the future development. The users of the area do, however, interact. They have begun to create common activities.

**SUMMING UP – FACILITIES, FACILITATION, USE AND CULTURE**

None of these cases are working within the traditional field of creative businesses and yet they all very distinctly relate to the global focus on creativity trying to create growth by attracting and supporting the “creative class”. At the same time, the understandings of creativity and how this should be supported are diverse in the case studies.

Mindlab is a concrete and spectacular case of how the global focus on innovation and creativity is unfolded in a public administration. Here, the focus is on developing the innovative competences of public workplaces including the culture across formal and professional borders with the explicit criterion of developing societal welfare. However, the case illustrates that the vision of creativity in the public administration is developed in the cross-pressure between the need for efficiency improvement and welfare.

SCION DTU is a more traditional example of how entrepreneurialism is supported by creating a frame for individuals and small groups in order to support the framework around developing an idea: concrete facilities, interaction and common learning. In this case, creativity is focused on business development, and the criterion is to better the path of the creative ideas into the market. In this way, they try to shape or discipline creative people into market realisation.

The retrofitting of Tryg is directly related to the discursive “need” to be an innovative and attractive environment. In the redesign of the buildings and the organisation, Tryg supports a rather wide understanding of a creative environment relating communication, collaboration, and work environment. They relate to a series of elements from the “creative city” about informal meetings and diversity of spaces, but in the concrete efforts of developing a “people environment” the case portrays a dilemma between unfolding the informal urban culture of the “Rambla” and the formal business principles of e.g. “clean desks”.

The case of Musicon directly relates to “the creative city” discourse as they try to redevelop this industrial area to support the development of Roskilde as an attractive city to live and work in for the “creative class”. Still, the concept of creativity is linked to traditional fields and perceptions of art as an especially creative domain. By implying this interpretation of creativity, the municipality may miss the opportunity of cross-fertilization between the cultural sector and innovative businesses in the field of computer software, energy savings, industrial robotic development, medicine etc. Creative icons like Google draw heavily on this kind of cross-fertilization.
In Table 1 we have outlined key features of facilities, facilitation, use, and culture in relation to creativity. The cases also mirror a diversity of facilities and approaches to facilities and facilitation.

In the case of Mindlab, the focus is on the one hand on the facilities, not at least because of the very spectacular symbols of creativity that were developed for Mindlab, and the facilities do play roles of flexibility and symbolic values. On the other hand, the facilitation is the core of Mindlab, as the focus during its use has turned away from the spectacular facilities and the creation of ideas to the facilitation of long term processes aiming not only at developing ideas but also at integrating the novelties in practise. The methods used are carefully developed...
to match each project aiming at the whole process from analysis to idea and realisation. At SCION DTU the context is different as the focus is on the basic facilities. Some facilities have mainly symbolic value as in the case of Mindlab. The facilitation is considered as supplementary, but SCION DTU also experienced a need for support of the social processes and therefore they employed a person to support these. In the case of Tryg, the need to modernise the facilities initiated the development, but what started out as a physical endeavour turned out to include a lot of organisational efforts to change the culture according to the ideas behind the design. Also here we have iconic facilities in the form of art, glass walls, and the "ramblas". Finally in the case of Musicon the "raw facilities" are the basic potential, in principle open for re-design and use, as well as the space between the buildings. The facilitation in the form of urban development processes aims at opening the area up for the creative new developers and supporting the life between the buildings. The "creativity" is supposed to come along with the new inhabitants, and thus the facilitation only relates to the urban development that in practise enacts a gate keeper function. This case depicts a dilemma between openness and the need to dive into uncertainty versus the formal planning practises and need for political control. Thus, this facilitation may accidentally hamper the development as it narrows down the "creativity" to be included.

CONCLUSIONS AND PRACTICAL IMPLICATIONS
The analysis in this paper frames some interesting perspectives for the field of FM to discuss in relation to creative environments and the relation between facilities and facilitation. Firstly, that in order to facilitate creative environments it is seldom enough to establish special rooms or work with office design. The entire environment needs to be included, whether this is the whole organisation, the whole area or the ongoing processes. Secondly, it is not enough to consider the facilities, the relation between the facilities and the facilitation of social processes must be included and developed in relation to the objectives and contexts in each case. And finally, the cases point to the need to consider and work with the culture of an organisation to use the potential of creative facilities. Even the best facilities and facilitation will fail if the basic culture does not support the development of creative environments.

"cultures" identified in these cases is on the one hand the informal and open cultures that support new ideas and collaborations, often formulated as the informal meetings that are supposed to be supported by the different meeting places, whether these are physical facilities like the "ramblas" in Tryg or the "formalised informality" processes like the workshops in Mindlab. On the other hand, "efficiency oriented business cultures" or "policy oriented government cultures" cannot be overlooked, as they may dominate and twist the directions on initiatives, relations and cultures. The objectives may be integrated as the management of Mindlab claims to do in the ongoing process to secure the legitimacy of Mindlab in times of crisis. This will have an effect on how creativity is perceived and performed. But whether this is positive or not is not for this paper to decide. We just conclude that if the cross-pressure is neglected this will certainly hamper the facilitation of creative environments.
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4 FM AND SUSTAINABILITY

4.1 CHAPTER INTRODUCTION

Jacob Steen Møller

Introduction to the topic
This subject (Sustainable Facilities Management, SFM) is as FM research topic relatively new, it has however for a longer period of time been an important issue for FM practitioners. This is due to the increased focus on climate impact, CSR and sustainability as important goals for companies and institutions, and certainly sustainability has become a contributor to the branding of companies. Thus it is of major interest for FM practitioners to seek new knowledge and discuss SFM amongst peers. The session contributed to this exchange of ideas and experience.

The session included 3 presentations.

Susanne Balslev Nielsen, CFM: “Claims of Sustainable FM: Exploring current practices”
The presentation aimed to understand the concept of SFM at a general level. Based on case analysis it gave some answers to the question: How does the FM practitioners approach SFM? It identified three levels of SFM: The “incremental”, the “radical”, and the “transformational” level.

The debate following the presentation showed that SFM as a separate topic is of major interest both to practitioners and researchers, but it also showed that the FM community is seeking a common understanding of how to bring the overall and very broad concept of sustainability “down to earth”, and of how to develop practical methods for implementing SFM. Whereas no common consensus on the subject has developed as yet, it was the hope of several session participants that further research would lead to a common platform of knowledge on the subject.

The presentation gave a critical view on a well established tool of “Environmental Management (EM)” in a Danish municipal authority. In the investigated case the practitioners of EM found the tool formalistic and branding oriented and only to a lesser degree a practical tool to bring real environmental value.

The debate following the presentation established many parallels between EM, and the widespread experience with formalistic Quality Assurance (QA) tools. It was even suggested that this type of approach had come to an end and that more focus should be put on empowering the employers and less on control systems and formal procedural tools.
Jesper Ole Jensen, Jesper Rohr Hansen, Danish Building Research Institute, Susanne Balslev Nielsen, CFM: “ESCO in Danish Municipalities – Basic, integrative or strategic approaches”.

The presentation investigated cases of ESCOs in Danish municipalities. In particular the case of the Middelfart municipality which has proclaimed itself as “ESCO Municipality”. The ESCOs in case were all seen as alternative means to finance energy saving investments and only to a lesser degree as means to implement innovative technical solutions.

The debate pinpointed that ESCO projects must be aligned with the actual organisation. Also it was mentioned that ESCOs often will be successful in cases where the baseline is poor: A city with well maintained buildings have already harvested those low hanging fruits that attract ESCO companies.

General discussion
The general discussion showed that SFM is a topic of great interest but also that the broad nature of SFM makes it difficult to identify immediate research topics. It was the feeling of the chairman; that SFM is strongly relevant but also that SFM needs some time to mature both as a practical concept and as a research topic in its own right.

4.2 CLAIMS OF SUSTAINABLE FM: EXPLORING CURRENT PRACTICES

Susanne Balslev Nielsen

ABSTRACT
Purpose: The purpose of the paper is to provide an overview of current practices within the emergent management discipline: Sustainable Facilities Management (SFM).

Background: To develop a sustainable society, facilities managers must become change agents for sustainability in the built environment. Facilities Management (FM) is contributing to the environmental, social and economical problems, but can at the same time also be a part of the solution. However, to integrate sustainability in FM is still an emergent niche within FM, and the examples of SFM so far seems to come out of very different mindsets of aims and means.

Approach: SFM is studied as a phenomenon and a socio-technical construction using qualitative research methods in the period 2008-2011. This paper presents a synthesised understanding of SFM, based on literature studies, participation in research projects, testing of preliminary findings and dialogue with practitioners. Emphasis is on the openings for SFM in order to contribute constructively to the further research and development of the discipline.

Results: The result is a framework which relates the studied examples and openings for SFM with the organisations general FM strategy and with the organisations general integration of
sustainability as a value in core business. The general FM strategy and the role of sustainability in core business seem to be the most dominating factors for the possibilities for even starting to realise an SFM strategy. Three understandings of SFM are identified which have different strategic approaches:

• The incremental: Limit environmental impact from organisation activities
• The radical: Towards a vision of a sustainable future
• The transformative: Going beyond the organisation to establish new partnerships for co-creating of new socio-technical services and technologies

These SFM understandings are concluded to be coexisting claims of SFM definitions.

Practical Implications: Facilities managers will be able to identify the mindset behind different services and technologies that are promoted as SFM. But maybe just as important is that they are provided with concepts that can help them clarify and improve their own emerging strategy of SFM. The limitations of the research call for deeper investigations and a collaborative effort from researchers and practitioners to develop SFM in practice and theory.

Keywords: Innovation, Management, Realized strategies, Sustainable facilities

INTRODUCTION

As the explorer Dr. Livingstone investigated Africa, I have for more than 3 years searched for sustainability in the Facilities Management (FM) profession to learn about Sustainable Facilities Management (SFM): What is it? How can facilities managers integrate sustainability in FM, and what strategies is employed? What are the possibilities and the barriers to promote SFM?

This paper presents the findings in this explorative research. It has not been an easy investigation because the strategy and the results of SFM are often non-physical and seldom the first thing a visitor sees, when visiting an organization. Sometimes the coffee machine is the place where it is most easy to see if there have been considerations of ecology and fair trade influencing the choice of services offered to the users of the building. Other times it is the building design which shows considerations of solar energy, storm water retention and biological diversity, but most times it is only in an organizations policy papers and annual reporting it is possible to see indicators of whether organizations integrate sustainability in its FM strategy.

The research did not stop with the visible signs of SFM. The purpose was to understand the processes leading to the current practice of SFM in specific organizations and to understand openings for further development. This I could do only by talking with the people involved, to hear their learning’s and reflections on realization processes. As Mintzberg et al. (1998) would say: this has been a strategy safari for emergent strategies.

The background of this research is that FM has an impact on the planet as a whole, on the balance of natural resources, the climate and for the future of humanity on earth. Despite how distant it may seem in the day to day operations for a facilities manager, a building user or a
building owner. Ultimately any decision about the unity of People, Places and Processes has a consequence in terms of the impact on the planets environmental, social and economical sustainability. One could argue that there are aspects of FM which have more sustainability potential than others, why the focus should be only on FM which e.g. has an impact on energy use. However this would be too narrow a perspective, and too reductive towards the potential role FM could play in a transformation towards a sustainable society. SFM is therefore explored as an open concept, and in general all examples are accepted as SFM as long as it is an innovation within FM and a step in direction of sustainability. Leaning on Mulgan and Albury (2003), this includes different types of innovation:

- Incremental, i.e. minor changed and “add-ons” to existing practices
- Radical, i.e. new services or new ways of “doing things” in relation to the process or service delivery.
- Transformative/systemic, i.e. new work force structure, organizational types and organizational relationships, leading to major changes at society level.

Still a critical attitude is appropriate, everything that are claimed to be SFM is not SFM, and when is FM becoming SFM? The challenge of separating sustainable solutions from non sustainable solutions are well known from the consumers world, where consumer products or services are allowed to be labeled as green or sustainable only if they are documented as being significantly more green or more sustainable that the conventional products (Danish Consumers Ombudsman 2011).

This paper can be seen as one answer to the call for support in implementing SFM, which comes from FM organizations (e.g. Alexander 2009 and Jensen 2010) and from an increasing number of facilities managers. The hope is that the article will provide input for reflections on how anyone with a professional interest in facilities management can qualify strategic SFM approaches. In the following is a brief state of the art regarding SFM, followed by an insight into the research method, and an analysis of the relations between SFM and the general FM approach, the organizational context and dominating strategies. Finally conclusions and perspectives for practice are given.

**SFM AS NEW DISCIPLINE WITHIN FM**

A precondition for SFM to emerge in practice is that decision makers are aware of their role as change agents for current practices around the construction, operation and use of facilities. A survey made with CONCITO, Denmark’s green think tank, show that investors, building administrators and construction companies in Denmark have a surprisingly poor knowledge about evaluation methods, energy concepts and other tools for climate friendly buildings (CONCITO 2010). To the question: “Have you asked for or used environmental assessment tools, energy concepts or other tools for climate friendly buildings, that goes beyond the requirements by law?”, only 26% out of 176 respondents answered yes, that they had gone beyond current legislation, 65% said no, and 9% did not know. The survey included a question specific addressing the knowledge about SFM, and here the respondents could answer 1-5, where 1 = not at all and 5
The first handbook on Sustainable Practice for Facilities Managers was written by Shah (2007) who provided first of all the general challenges for a facilities manager in relation to sustainability policy and secondly a rich selection of check lists and tools in order to support practitioners in working with SFM. More recent research literature at conferences and FM journals are reporting on case studies of SFM, and with the increasing number of articles it is not possible to refer to all in this paper. But two articles are highlighted in this paper on strategic SFM. Elmualim et al. (2010) describes the barriers and commitment of the FM profession to the sustainability agenda. Based on a United Kingdom survey they point to 3 major barriers for SFM which is lack of time, knowledge and support from senior management. And they point to the need of practical tools as well as more engagement and commitment from facilities managers to overcome resistance towards change. The authors stress that the FM industry is complex, and their research was in a position to create an overview of the industry and less on the context specific variation. According to Durmus-Pedini and Baabak (2010) SFM is also a matter of strategic risk management. Beyond the benefits of going green in terms of: environmental, health and community, financial and market benefits, there are risks in terms of financial, market, industry, performance and legislative risks. Based on their research facilities managers are encouraged to choose which risks to take and to realize initiatives that are reducing the risks.

For the present research a theoretical frame is needed to structure the analysis of the current SFM practices. Because the challenge of integrating sustainability in FM to some extent is generic, it is more relevant to use the four generations of knowledge management within FM as suggested by Pathirage et al. (2008) than applying a structure based on size and the type of organization e.g. separating for-profit organizations or not-for-profit organizations as public authorities. The four generations are:

1. **FM merely considered as an overhead to be managed for minimum cost rather than optimum value.**
2. **FM as an integrated continuous process in relation to the organisation’s individual business.**
3. **FM as resource management concentrating on managing supply chain issues associated with the FM functions.**
4. **FM as strategic management to ensure alignment between organisational structure, work processes and the enabling physical environment according to the organisation’s strategic intent.**

As illustrated in the following section, these different FM approaches provide different openings for SFM to evolve. But just as important is the support of the senior management for the pur-
pose of structuring the analysis of the empirical findings. The pioneer in learning organizations, Peter Senge presents in Senge et al. (2010) and on basis of Hart (2005) four complementary strategic perspectives for how organizations integrate sustainability as a value in the organization framework including core business and support functions as shown in Figure 1. These will later be used to explain why some facilities managers has to struggle to get support from top management for SFM, while others are in more favorable positions.

**Figure 1: The Sustainable Value Framework (Hart 2005), as illustration of strategic positions in integration of sustainability in organizations core business.**

The four strategic positions arise from two main perspectives: one dimension is if the focus is held on the internal business of the organisation or if external stakeholders’ interests are met as well. The second dimension has to do with the extend of dealing with open-ended problems and solutions, is the organisation acting on basis of what we know today or is it acting upon visions and expectations about the future. The Strategy *Pollution Prevention* is according to Senge et al. (2010) the most seen, second is *Product Stewardship* and *Clean Technology*, whereas the strategy *Sustainability Vision* is seen only in niches, and often in organizations with a long time perspective or not-for profit organizations.

**APPROACH**

I have spoken with more than forty facilities managers about sustainability and how they saw the challenge from their work position. In presentations and post graduate courses I have pre-
sented my preliminary observations and reflections for more than fifty persons and have been confirmed in my identification of the context dependency of SFM strategies. My informants are facilities managers in a broad sense: estate managers, directors, caretakers, service providers, procurement manager etc. This is relevant since realizing SFM strategies is a challenge at all levels, strategic, tactical and operational, and since there, as Minzberg’s work (e.g. Minzberg et al 1998) is concluding, is most likely a gap between the intended strategy and the realized strategy. The gap and the explanations of the gap is where the barriers for certain SFM activities can be found. Most of the informants work in Danish companies; some works in international corporations and others operates in non-Danish European countries. Some are mainly occupied with design of new buildings for housing or office purposes, some in charge of FM, some purely service providers of single services, integrated services or technology providers. The practical experiences of integrating FM and sustainability varied. Few said they had a strategy or plan for SFM, most said this was important and something they wanted to do more of, some had practical experiences with different means/initiatives and rather many were uncertain about what to do to realize SFM.

Through literature studies, participation in research projects, testing of preliminary findings and dialogue with practitioners I have collected a pool of information and narratives about organizations (public and private), their FM approach, their motivations for integrating sustainability at strategic, tactical and operational level, as well as the learning they extracted about overcoming barriers. With this research approach I provide, not the answer of how sustainability can effectively be integrated in FM, but a synthesized narrative about how sustainability sometimes is integrated in FM, and a generalization into strategic patterns.

The strength is that it addresses the general strategic challenge of FM, but there are also weaknesses of this approach:

• Personal stories and maybe bragging mostly without further reality check
• Risk of overexposing small success histories without consideration of total problems and limitations of solutions
• Risk of over exposure of negative critique due to unhappiness with other issues of work life.
• The findings are real but might be marginal and not representative for the FM industry as a whole.

However taking these risks and limitations in consideration, and omitting the responses where sustainability had no interest and where the informant had no personal experience, this paper aim at being a syntheses narrative of different and co-existing strategic SFM approaches.

EMERGING PATTERNS OF SFM

The empirical research show that facilities managers and their organizations have different understandings of which kind of sustainable initiatives that is viable for them in their organiza-
tion, and which is not, at least at the time of the interview. The following is a presentation of the examples of services/processes/technologies that gets the possibility to emerge within different FM approaches, and different strategic perspectives of integrating sustainability in core business and support functions. Finally is a brief description of three different strategic perspectives that are guiding organizations SFM activities.

**SFM embedded in existing FM-approaches**
If SFM is seen as a new target within FM then it becomes relevant to see if and how different FM approaches allow different sustainability activities to emerge. In the following the four different generations of knowledge management in FM (Pathirage et al 2008) is used as a frame to illustrate different FM approaches and the related openings for SFM. The differences are illustrated in table 1.

**Table 1: SFM embedded in four FM approaches: examples and openings**

<table>
<thead>
<tr>
<th>FM as cost reduction</th>
<th>SFM openings: when economical feasible</th>
<th>Example: At hotels, where guests are encouraged to reuse towels to reduce washing and protect the environment. Or energy saving initiatives which are economically feasible under the ordinary financial return period.</th>
</tr>
</thead>
<tbody>
<tr>
<td>FM as a continuous process integrated in business own development</td>
<td>SFM openings: interest in long term operational costs and the quality of the building</td>
<td>Example: a municipality monitoring energy use and including energy projects in their operation and maintenance programs</td>
</tr>
<tr>
<td>FM as resource management concentrating on managing supply chain issues associated with the FM Functions</td>
<td>SFM opening: sustainability is considered when buying new facilities or services</td>
<td>Example: green purchasing politics that can include buildings, lamps, cars, energy installations that are chosen with consideration of lifecycle considerations and different sustainability labels</td>
</tr>
<tr>
<td>FM as strategic management to ensure alignment between organizational structure, work processes and the enabling physical environment according to the organization’s strategic intent.</td>
<td>SFM opening: sustainability initiatives are beneficial for society as well as for attracting and keeping employees and customers. Sustainability has the potential to open for new markets and develop core business. Interest in demonstrating Corporate Social Responsibility (CSR)</td>
<td>Example: Branding initiatives, “we are green”, of many different kinds, eg use of management tools like “triple bottom line: economical, social, and environmental”. The transparency and documentation vary. Virtual meeting facilities are used to reduce the need for travelling. CSR is a group of examples.</td>
</tr>
</tbody>
</table>
The legitimacy of SFM depends on the integration of sustainability in core business

The previous section described how the FM approach has an impact on the openings and barriers for SFM, whereas the following section describes how the role of sustainability in relation to organizations’ core business is another dominating factor for the development of SFM strategies.

Among the organizations that have activities within SFM, there are as mentioned earlier strategic differences in how sustainability is integrated in core business. In the following is a description of four different strategic positions (Hart 2005) and what openings they give for SFM. The openings are illustrated with examples.

Table 2: Examples and openings of SFM in different organizational contexts, with various positions in integrating sustainability as a value in core business

<table>
<thead>
<tr>
<th>Product Stewardship: The organizations want to become leaders within their product and in a time where sustainability is high on the society agenda, this includes consideration of sustainability.</th>
</tr>
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<tbody>
<tr>
<td><strong>SFM opening:</strong> SFM is perceived as something a professional FM organization can master, and especially the larger companies with high ambitions of professional FM are in the process of implementing SFM. The driver for SFM is to be competitive in FM as well. In this situation the facilities manager will play an important role in ensuring that the company vision is fulfilled and documented in practice.</td>
</tr>
<tr>
<td><strong>Example:</strong> A hotel is branding itself as CO2-neutral hotel in order to attract customers and to be outstanding when others are not yet ready. Another example are the private building administrators that develop business models for green leasing and green building administration services, to gain a better market position in relation to customers who are willing to pay for a green profile, also within the use of buildings and real estate management.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pollution Prevention: The organization want to prevent pollution and are there for working with documentation, analyses and actions plans in order to know the status of pollution and to realize reduction plans.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SFM opening:</strong> The FM departments are expected to present green accounts and environmental reports are made to ensure knowledge about energy use, CO2 levels, waste production etc. It can be a very bad case for any organization if it is exposed as a heavy polluter; therefore efforts are made to be aware and preferable in control of the environmental impact. Sometimes this environmental burden originates mostly from the core business, but in knowledge companies it is often the operation of space that is resource demanding. In this situation the facilities manager is expected to know the environmental impact, to act on the most harming problem areas. Here an environmental management system seems like a must, but also knowledge about your suppliers and their production matters. In order to deal with the complexity some kind of risk management is likely.</td>
</tr>
</tbody>
</table>
• **Example:** The FM departments analyses resource used in the relevant facilities (water, electricity and water. Sometimes also waste, emissions and more) and suggest technical or behavioral changes to receive a lower pollution level. Variations show in the definitions of the system in consideration. Some defined the system boarders by the geographical space, others goes beyond the geographical space and apply supply chain thinking and includes e.g. energy production and productions at suppliers. The inclusion or exclusion of pollution from employees/facility users is debated in some situations, because it is a considerable environmental problem.

**Clean Technology:** *The organization wants to appear as a front runner in applying new and innovative solutions*

• **SFM openings:** The FM department is expected to use innovative and clean technology and services. An example is the use of smart metering and monitoring of energy use. There is an increasing number of suppliers and consultants that offer solutions for controlling energy costs and for reducing pollution. The starting point is the technology and then this can be developed also to include installation and maintenance, building project management, financing etc., like in the situation with eg. ESCO’es. The facilities manager is expected to know the companies, and to choose the best technologies.

• **Example:** A supplier of solar panels is offering their companies to install and operate solar panels at building roofs, which some companies find very attractive as a way to reduce CO2 emissions. Sometimes the solar panels are installed to be visible to signal actions behind sustainability continuousness. Electrical cars is another example.

**Sustainability Vision:** *The organization is acting from a vision of a future society and sustainability is fully integrated in core business. The perspective is corporate and there for the stakeholders outside the organization is considered too.*

• **SFM openings:** The FM department is expected to support the core business in acting sustainable, why there is a full support in developing SFM. A corporate approach is leading to considerations of how to contribute to local communities, as described by (Alexander 2006) and other ways of practicing CSR, and develop shared values (Porter 2011). The understanding of sustainability is generally: holistic thinking behind specific actions; an open process, because sustainability is not a condition we can reach, it is a utopia which we can only work towards; context dependency; and a wholeness of the social, the environmental and the economical.

• **Example:** The association ”The Natural step” or the Danish “Gate 21” are examples for organizations that have committed themselves to form partnerships about developing technologies and solutions from a vision of sustainability. The companies that are committing to the development of an infrastructure for storing wind mill energy in electrical cars, by replacing their company cars with electrical cars, is another example.
The different strategic positions presented above illustrate how the organizational context calls for different SFM approaches. Therefore it is important to clarify the organizations strategy and even challenge the way sustainability is integrated as value in the mission of an organization. In the light of radical change Senge et al. (2010) concludes that the strategies of Product Stewardship and Pollution Prevention primary leads to incremental innovations, whereas the Clean Technology strategy and the Sustainability Vision strategy that have the perspective of radical innovations at system level. Mulgan and Albury (2003) operate as mentioned earlier with a third type of innovation: the transformative. Deeper studies of specific cases of new SFM services and new socio-technical systems and their longitudinal development is needed to evaluate the type of innovation at stake. The time aspect is also important to evaluate the type of innovation, as some innovations later become common practice.

**Strategic positions in SFM**

Talking to those who have an intended or realized strategy for SFM, there seems to be a pattern of three dominating strategic perspectives employed by the Facilities Managers. The strategies are FM strategies and outline different positions in integrating sustainability as value in FM. In relation to the strategies mentioned in 4.1 and 4.2., they are a synthesized mix of openings, examples and positions. The three strategies are briefly described in Table 3.

<table>
<thead>
<tr>
<th>Table 3: Three strategic positions in SFM</th>
</tr>
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</table>

**The incremental strategy**

The strategy is to document a **limited environmental impact from the organization activities.** The goal is to meet relative or absolute reduction, or ultimately Zero Emissions or CO2 neutrality. In this perspective the most important is to measure the reduction and the environmental impact. The variation in approaches has to do with the choice of indicators which mostly includes CO2 and energy use, but broader sets of sustainability indicators can also be in use. The ethical dilemmas concern the system borders and what to include or not, as well as the willingness to include indicators where performance is not good already and maybe also difficult to improve. In this strategy it is less important if the environmental burden is reduced at the facilities or by others eg by the utilities, or if it is visible for the users or not.

**The radical strategy**

The second strategy is to comply with the **vision of a sustainable building.** The strategy is still to reduce the environmental burden, but the social aspects can be just as important. There for attention is payee to the users, their experience and needs, and who to involvement the users in the sustainability of the building. The facilities, which most often are buildings, are analyzed and incompliance with concepts about sustainable buildings (including natural ventilation etc.) is used to design new buildings and retrofitting projects. The users are regarded as both a part of the problem and a part of the solutions why campaigning for environmentally sound behavior is encouraged. In this strategy certificates like LEED and BREAM becomes more and more used, even though they sometimes are easy to achieve and do not always lead to noticeable reduction in the environment impact. In this strategy it is important to find solutions related to the local community, this goes for eg. energy provision, collection of storm water, biodiversity etc.
The economical dimension of ecology is not mentioned in any of the strategies above, because economy is always a restriction to initiatives and actions, and there for not addresses explicitly. The interesting question it is what the facilities managers choose to do with the budget in the given context. There for emphasis is here on the positions in balancing the environmental and social aspects of sustainability as well as the positions in separating sustainability challenges into what “our responsibility” and “others responsibility”, and how to priorities initiatives.

Due to the limitations of the research there is a need to further explore the lessons that can be learned from organizations which employ the different strategies, either as deliberate strategies or as an emergent strategic pattern of activities.

CONCLUSION

The explorative research of SFM and openings for integrating sustainability in FM has revealed not only a collection of examples of SFM activities, but also a conceptual framework has been developed to explain how the potential and barriers of SFM activities relate to the organizational context.

The general FM strategy and the role of sustainability in core business seem to be the most dominating factors for the possibilities for even starting to realise a SFM strategy. Three understandings of SFM are identified which have different strategic approaches:

The incremental: Limit environmental impact from organisation activities
The radical: Towards a vision of a sustainable future
The transformative: Going beyond the organisation to establish new partnerships for co-creating of new socio-technical services and technologies

Despite their differences these three SFM strategies are coexisting claims of SFM, and call for further research in order to evaluate and improve SFM strategies and practices. This was not possible within the frames of this research project alone, and is therefore an invitation to further research.
PRACTICAL IMPLICATIONS
The paper is meant to be a support for those practitioners who want to develop a stronger SFM strategy and this is done providing a set of analytical steps which can be used to reflect upon an organization’s current strategy, intended, deliberate or realized (Minzberg et al 1998). The article also supports the personal reflections about a facilities manager’s role as change agent and partner in innovating FM practices.

The practical implications for researchers are to examine and develop the suggested framework. The limitations of the research call for deeper investigations and a collaborative effort from researchers and practitioners to develop SFM in practice and theory.

ACKNOWLEDGMENTS
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4.3 A CRITICAL REVIEW OF THE ENVIRONMENTAL MANAGEMENT SYSTEM AS A TOOL FOR SUSTAINABILITY

Kirsten Ramskov Galamba

ABSTRACT
Purpose: The aim of the article is to make a critical review of the environmental management system as a tool for sustainability in local authorities.

Background: As a point of departure sustainability is outlined as an ambivalent term that has been interpreted in a number of ways, which is important as the understanding informs the choice of societal response to the ecological crisis.

Approach: Action research has been used as the primary methodological approach for the empirical work and the empirical material has been analysed with respect to reflections on environmental management and the notion of sustainability.

Results: The main conclusion is that the environmental management system does not support an understanding of sustainability beyond a highly instrumental focus on specific environmental issues, nor does it support the everyday practice for sustainability in a local authority FM-context. As a branding tool it might have some potential but there is a risk that the tool legitimizes non-sustainable practices as sustainable, which can lead to frustrations and resignation among employees willing to actually make a difference.

Practical Implications: Facilities managers in local authorities must be aware that when using management technologies as e.g. the environmental management system other means than the system are needed if they aim for sustainability in a broader sense. The instrumental rationality on which the systems are based can lead to alienation and restrict innovative thinking in relation to solutions that could potentially contribute to a sustainable society, as it is very difficult for employees to think beyond the system in their everyday work life. One possible alternative arena for innovation towards sustainability is workshops designed and facilitated in a way that allows for a life world perspective to emerge.

Keywords: Environmental management, Sustainability, Local authority, Action research.

INTRODUCTION
Sustainability has become an important issue for business and public institutions which has resulted in a huge variety of ‘sustainability tools’ used to manage efforts for sustainability in organisations. Tools are often implemented with a branding perspective without further reflections on the notion of sustainability, which result in highly instrumental approaches to sustainability.
In Facilities Management (FM) focus is very often on environmental sustainability or social aspects related to the users of buildings and little focus is put on the perspective of the facilities manager and the potential tension between tools and management systems and the possibility for employees to address issues beyond what systems dictate.

This article gives an insight to the clash between a specific tool for sustainability – the environmental management system – and the broader work life-based perspective on sustainability held by employees in a Danish local authority FM-department. First an introduction to the concept of sustainability is given to inform and perhaps challenge the view on sustainability. After the theoretical introduction to sustainability and research related to the environmental management system in local authorities the methodology is presented, followed by a presentation as to what can been learned from the action research process about the use of environmental management systems.

**SUSTAINABILITY AND THE INSTRUMENTAL RATIONALITY**

Sustainability is a term widely used and thus colonized by a number of interpretations representing culture and context. The mainstream use of the term is often seen as ‘sustainable development’ indicating that sustainability is believed to happen in the process of development. As development has become synonymous with (material) growth regulated by the capitalistic market, sustainable development is understood as growth balancing resource consumption with nature protection. This approach to sustainability is based on an instrumental rationality that dominates what Habermas calls the ‘system world’: the economic aspects and the political-administrative system in society that functions through money and power with efficiency, effectiveness and target orientation as central aspects; actions thus get legitimacy by being target oriented and efficient (Hvid, 2006). The response to the ecological crisis in the western world is seen as implementation of cleaner technologies and environmental management systems, regulated by environmental laws and market mechanisms by quotas and trade of ‘sustainable products’.

History has shown, however, that in spite of the firm belief in human’s ability to master nature by regulation of output/input systems, the ecological crisis is not declining. Nature has long been regarded a ‘stock of materials for human economic activity’, which is undermining understandings others than the ‘market rationalities’ towards production and exploitation of natural resources in the name of growth.

Nature is, however, first of all a basis for life – or ‘the basis for life’ (Wuppertal Institut für Klima, Umwelt und Energie, 2007b). This is sharpened by the Indian thinker and environmentalist Vandana Shiva (2005) who claims that the total dominance of the market economy is creating a highly unstable situation. The economy of nature and the sustenance economy

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**16 Sustenance economy: where life is nourished, maintained and renewed (e.g. giving birth).**
that were once seen as the foundation for human progress are not regarded a value today, which allows increasing efficiencies and growth in GNPs to happen on the basis on losses of economy of nature and the sustenance economy. This provides us with an illusion of efficiency produced by externalizing the ecological costs (e.g. mining, overfishing waters) leading to economic growth and simultaneous degradation of natural ecosystems that used to support life in local societies.

In Shiva’s conceptualisation economy of nature is the foundation for sustenance economy on which the capitalistic market economy builds. Using nature in a way that allows for regeneration people can sustain lives and contribute to the market with surplus from production. In the modern world, however, the balance is turned upside down as shown in Figure 1 (Shiva, 2005).

![Figure 1: Sustainability must be based on a stable constellation of the three economies: the nature’s economy, sustainance economy and market economy. At present the situation is unstable as nature has been over-exploited and therefore not a good basis for the sustenance – and market economy (Shiva, 2005).](image)

As the response to the ecological crisis based on an one-dimensional instrumental rationality seems to have led to a less sustainable world in terms of nature protection, equality and coherence of local societies (Wuppertal Institut für Klima, Umwelt und Energie., 2007a), additional means of dealing with the challenges must be looked for.

I will here turn to the Habermas-inspired work of Elling (2008) focusing on sustainability in the light of modernisation. He has characterized the modernization as a process of differentiation by the emergence of expert cultures based on different rationalities of which the instrumental rationality is by far dominating society. He claims that it becomes increasingly difficult to find arenas where target orientation and efficiency are not guiding and legitimizing actions, and this is the key to understand the un-sustainable state of the world. A society based on one-
dimensional instrumental rationality becomes irrational due to the uncoupling of the systemic mechanisms from the social structures (Elling, 2010; 2008)(Elling, 2010). That means that the values of right and truth integrated in the ‘life world’ by communicative action (Nørager, 1998; 1985) becomes marginalised in decision making. The irrationality is seen when systems steered by targets and indicators leads to practices where humans and nature – perceived as resources for production – become exploited beyond regeneration without any ethical reflections and corresponding corrective actions. There is a risk that even though actions directed by the system are perceived as irrelevant or even destructive by employees, they would not be able to oppose the system due to the dominance of instrumental rationality; one must argue from values of efficiency towards targets to be heard by management (Hvid, 2006).

ENVIRONMENTAL MANAGEMENT

The environmental management system (EMS) is based on the instrumental rationality and a belief that good and documented management can lead us out of the ecological crisis. The system was developed as an answer to an increasing demand on business to handle the environmental aspects in a systematic and proactive way, as a result of a focus on the global character of the environmental problems since the 80’s. EMS was transferred from the private to the public sector in the period where trends from New Public Management (Hood, 1991) were influencing public sector governance strategies (Norén & Malmborg, 2004)(Jensen & Due, 2008).

An EMS can be described as ‘part of an organization’s management system used to develop and implement its environmental policy and manage its environmental aspect’ (Jørgensen & Remmen, 2007) and is built on the principles of a management circle: Plan – Do – Check and

Figure 2: Principles of the Environmental Management System
Act (see Figure 2). EMS thus secures a circular collection of data related to selected goals, which according to Hvid (2006) holds potential for an active involvement – but also the risk of increased control and disempowerment of employees (Hvid, 2006).

Environmental management has been discussed in relation to FM (Wan Yim, 2007; Conry & Goldberg, 1994) but not explicitly in a local authorities context. In a local authorities context it has, however, been elaborated on in various articles discussing the implementation and functionality of the EMS in the local public administration (Bekkering & McCallum, 1999; Emilsson & Hjelm, 2002; Emilsson & Hjelm, 2004; Emilsson & Hjelm, 2005; Norén & Malmborg, 2004) and the way targets can be set in eco-auditing to ensure environmental sustainability (Aall, 1999).

Norén and Malmborg (2004) states that as local authorities are increasingly becoming efficiency-seeking service providers and less public administrations striving to implement political goals and fulfilling requirements for equality and justice, there cannot be found any institutional obstacles for the use of EMSs in local authorities. An interview survey does, however, show that the functionality of the standardized EMS in local authorities depends on which administration is using it: EMS seems to be functioning well in the producing, technical service administrations and in the local government owned companies and less well in the caring and social service administrations. This finding is supported by Emilsson and Hjelm (2002) who conducted a postal survey in all Swedish local authorities in 2000: ‘Only 10% of the EMS implementing local authorities answered that EMSs are being implemented in softer sectors, schools being the most frequent sector’. This is explained with the fact that ISO 14001 and EMAS are developed to and thus suited to the part of the organisation that resembles industry the most (Emilsson & Hjelm, 2002). FM as developed in the private sector could be an example of that.

Carlo Aall (1999) identify three scientific approached to eco-auditing: ‘An ecological approach describing the state of and human impact on the environment; a technological approach describing resource streams and analysing opportunities of reducing the consumption of resources, emissions and wastes within defined systems and a management approach evaluating to what extent the organisation complies with internal and/or external standards and goals’. Aall conclude that the best effect of local authority EMSs in terms of improving the environment is when data from five steps of a cause-and-effect chain are included in the audit report: 1) action; 2) result; 3) organisational matters (the ‘system’); 4) environmental impacts and 5) environmental effects (Aall, 1999). When discussing the FM role in local authority EMS this is interesting as FM is directly influencing on more than one of the parameters.

Emilsson point to the need of a more local authorities adapted standard focusing on environmental impact of a more indirect origin and a more reflective approach to the system (Emilsson & Hjelm, 2005) whereas Norén and Malmborg (2004) point to a lack of research analysing how local authorities can work with EMSs and simultaneously meet requirements of citizens and members of the local community to take part in the local governance for sustainability (Norén & Malmborg, 2004). Hopefully this article will shed light on a corner of this research area.
Seen in the light of the notion of sustainability the research on environmental management in local authorities is inscribed in an understanding of sustainability based an instrumental rationality. Questions asked in the articles have the character as to how the system effectively can be implemented or adjusted to fit the local authorities, and though also the questions of citizen involvement and reflectivity related to use of the system are raised it does neither question the system as such or discuss it in relation to a broader understanding of sustainability.

APPROACH
The methodology for this paper can be divided in two as 1) methodology for empirical work and 2) principles for analyzing the empirical material with the focus on this specific article.

The principal methodology in the PhD project is Action Research which is a research tradition with the double aim of creating action and produce new knowledge in the same process. Action research builds on the normativity that history can be made by human beings in democratic processes in everyday life (Nielsen, 2006). Ontologically it builds on the belief that reality must always be considered unfinished and changeable in many directions, and that democratic processes can lead to active decisions regarding the direction of change (Skjervheim, 1996).

The action research process is methodologically inspired by two main traditions within action research: Systemic action research (Flood, 2010) and Critical Utopian action research (Nielsen, 2006). The inspiration from systemic action research has particularly influenced on the first part of the process while the critical utopian tradition has inspired the overall framing of the design and analysis of the process. The critical utopian action research tradition is based on critical theory with an opening towards the action perspective through the use of future creating workshops developed by Jungk (Jungk & Müllert, 1989).

The overall aim of all workshops has been to provide room – ‘free spaces’ – for employees to reflect on their own practice – within and beyond the systemic restrictions of everyday work life dominated by the instrumental rationality (efficiency and target orientation). Free spaces are understood as arenas where employees can play with ideas and wishes without being restricted by the power of everyday reality characterised by an extremely busy work life dominated by instrumental rationality.

The ‘production’ of the action research process in the form of log books and transcribed interviews has been analyzed with a critical hermeneutic framing searching for aspects related to environmental management and for openings towards horizons beyond the systemic, instrumental understanding of sustainability. Having been part of the action research process, my presumptions and theoretical orientations have been an integrated part of the hermeneutic circle switching between ‘part and the whole’, ‘text and context’ and ‘presumptions and (new) understanding’ (Fredslund, 2005). I have thus tried to understand the content of the process in the light of the actual context as well as the organizational and societal ‘whole’ in which the
ideas and visions are embedded. The mirroring of the first analysis into a theoretical discussion on sustainability and the rationalities of society has given the critical edge to the analysis on which this article is based.

The action research process took place in the period 2009 – 2011 in Albertslund local authority FM-Department. Albertslund is a city situated in the outskirts of Copenhagen with approximately 30,000 inhabitants. Albertslund is known for the extensive citizen involvement in the management of green areas and in environmental questions since the beginning of the 90’s. The administration has worked with environmental management since 1999 and is today fully certified with the EU regulation EMAS (European Commission, 2011), which means that 3,000 employees are working within the frame of the environmental management system (Albertslund Kommune, 2007; Albertslund Kommune, 2008).

**FINDINGS**

I will now turn to the review of the EMS as a tool for sustainability based on the empirical insight gained through the action research process taking place in 2009-2011.

The action research process in the FM department\(^\text{17}\) showed a discrepancy between aim of the EMS and experiences among the employees. At the very first team based workshops employees in all teams made clear that ‘environmental work is something going on at the strategic level – elsewhere in the organisation’. They experienced a distance from the high environmental profile communicated to the public and the actual work done in their department. Employees thus seemed alienated to the concept of environmental management which was stressed by the negative attitude towards the system that was regarded rigid and irrelevant to everyday environmental work. Later in the process it became clear that when environmental issues in everyday work situations were discussed, it had no connection whatsoever with the environmental management system. Even in situations when it would have been natural to discuss how the EMS could strengthen the environmental work or how the system could be changed to better support everyday practice – this did not happen.

In the Future Creating Workshop held 1½ year after the first workshops critique were given on the lacking connections between ambitions and resources (not only concerning environmental management though), and the EMS was described as rigid, heavy and bureaucratic with no connection to the everyday work life and the priorities of values (e.g. environmental, aesthetic, economic, social etc.) the employees must balance from task to task.

Having been mystified with the separation in the understanding of environmental management system as opposed to everyday environmental practice during the entire process, I confronted the employees asking why no one chose to elaborate further on the critique. It turned out that they are fed up with the contradiction in the strong branding of Albertslund on the environmental issues and what they experienced as no focus (and thus not enough allocated resources)

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\(^{17}\) Department of Real Estate, Road and Park (FM Department) is part of the Environmental and Technique Administration that has been certified with the EU regulation EMAS since 1999.
on the issue from the management – ‘as if the environment has become a word of commercial value only’ (quote from Future Creating Workshop 2010).

The EMS is seen as extra paperwork without any gaining and thus a source of frustration in relation to environmental work as such. The obligatory training provided within the frame of EMS is aimed at understanding the system and not the actual professional challenges connected to everyday work life. It is, however, expected that employees in the organisation have the necessary skills to act according to environmental goals, which make especially newcomers feel unsecure and alienated to the environmental aspects of work.

The system cannot, however, provide awareness, knowledge and skills, only a managerial focus on the specific areas chosen as targets (e.g. reduction of CO2). There is a huge difference in knowledge and skills between experienced employees and those with less seniority. Knowledge and knowhow is passed to newcomers by a ‘master – apprentice’ principle, which implies that a huge amount of knowledge related to practice is tacit and embedded in culture. The informal communication in daily work life does, however, enable employees to better balance judgements according to other values than efficiency through a critical world life perspective (according to the theory of Habermas briefly presented in the introduction). This is very much the case in Albertslund local authority FM-department, and the critical distance to the EMS can be seen as a result of this.

When discussing what should remain tacit knowledge and what should be translated into procedures and ‘data’, the employees reflected on the balance between a more transparent – but also more rigid – explicit knowledge and the culturally embedded tacit knowledge that would demand less paperwork and updating of systems. Very early in the process the Green Accounts were pointed to as the primary environmental management tool, which can be seen as one balance between a certain amount of data and at the same time the flexibility to act without the rigid baggage of the EMS.

The strong focus on environmental sustainability measured by green accounts and managed through the EMS was criticized to be far too narrow, without the holistic view that could support a more sustainable thinking. That the employees did indeed hold rich and nuanced visions related to sustainability became clear in the workshops. Interestingly both visions related to the efficiency of the system and utopias reaching beyond the instrumental rationality were developed.

Early in the process visions of a more qualified ‘tool box’ emerged with a focus on data handling and knowledge sharing by more efficient communication patterns. The employees expressed a frustration due to lack of knowledge, common procedures and valid data as a basis for decisions in everyday practice. Later – in the future creating workshop – the idea of a database be-
came embedded in a vision on the organisation as point of departure for designing the GIS\textsuperscript{18}-database from which information on every aspect of the administration should be drawn – by the respective administrative areas and as a support to cooperation across administrative borders. Also visions as to how the FM department and local society should cooperate on developing a sustainable city were developed, as were more internal ideas regarding what was considered sustainable work life.

**DISCUSSION**

The quality of the ideas and vision developed in the ‘free arenas’ provided by the workshops were significantly different from the quantitative goals set by the EMS. The visions were indeed holding democratic potentials for sustainability embracing a public – citizen relationship as opposed to the systemic and highly instrumental EMS.

The action research process has shown that free spaces in everyday work life allow for ideas and discussion transcending the restrictions of a highly instrumental approach to sustainability. The question is, however, whether such free spaces can be created – and survive in a public sector highly influenced by the instrumental rationality and pressed by demands for savings due to ever tighter economic frames. The action research process in Albertslund show that employees had major difficulties to find the time to act on the visions between workshops, though they really wanted to and felt inspired to create space for more ‘thinking and reflection’ in their everyday work life.

When revisiting the concept of sustainability as outlined in the introduction, the EMS is inscribed in the ‘sustainable development’ understanding of sustainability based on instrumental rationality with efficiency as a main criteria for success. The system has no mechanisms actually securing environmental sustainability as it is only framing procedures related to the implementation of targets. Focus can be put on performance or output (e.g. emissions) – but whether the emissions are within the borders of what ecosystems can tolerate is not part of the audit. The EMS is nothing more than an instrumental management tool that provides a management focus on environmental issues. Due to the relativistic construction (no limits to growth) the environmental management system can end up giving legitimacy to unsustainable practices and be used as a sustainability branding tool, while at the same time imposing rigid, undemocratic restrictions on employees work life and thus end up reproducing what in the first place made the world un-sustainable.

**CONCLUSION**

The two approaches to sustainability presented above build on different ontological assumptions and rationalities. The managerial approach represented by the EMS builds on an assumption that if the system is just designed in the right way (environmental) sustainable practice will automatically emerge. Employees will act according to the systemic logic and thus perform in

\textsuperscript{18} Geographical Information System.
a way that supports the fulfilment of the organisational environmental goals. To ensure that this happens circles of evaluation are incorporated, focusing on documentation and measurable performance. Using this approach makes the role of management clear: checking the results according to goals.

The bottom up approach based on workshops (free spaces) builds on the assumption that visions developed from a life world perspective transcend the instrumental rationality in a way that allow employees to identify with the visions and thus integrate the thinking in everyday action. In relation to management the perspectives derived from a bottom up process are not necessarily adaptable in the managerial systems or might even challenge those. If, however, management succeed in supporting a returning focus on the utopian horizons as open, unfinished ideas of a sustainable work life and FMs contribution to a sustainable society, I would claim that more sustainable practices would gradually emerge.

The question is whether the EMS can serve as the principal tool for sustainability. The rich and nuanced visions developed in the workshops and the critique on the EMS seems to speak for itself: The EMS does not support action for sustainability in the FM Department. On the contrary it has led to frustrations and negative stories about discrepancy between the environmental branding of the local authority and the actual work done. The action research process has, however, showed that employees are really engaged in the environmental work, just not connected to the EMS. The high political priority on the environmental issues for a long period seems to be of more importance than the actual system.

REFERENCES


4.4 ESCO IN DANISH MUNICIPALITIES: BASIC, INTEGRATIVE OR STRATEGIC APPROACHES?

Jesper Ole Jensen, Jesper Rohr Hansen and Susanne Balslev Nielsen

ABSTRACT
Purpose: The aim of this paper is to discuss the possible benefits of involving Energy Service Companies (ESCO) in realising energy savings in municipalities, and how ESCO projects can be formulated very differently in the various municipalities, according to building volume, use of technologies, energy savings, type of collaboration etc.

Background: Since 2008, several Danish municipalities have started energy retrofitting of municipal buildings, based on contracts with Energy Service Companies. In spite of the strong growth of ESCOs, there is also widespread scepticism about ESCO, as many municipalities see an in-house approach as a better alternative.

Approach: Our research is based on literature studies and on qualitative interviews with Danish municipalities carrying out ESCO projects, as well as with ESCO providers.

Results: Our studies suggest that different ESCO approaches are being used in Danish municipalities, which we label the basic, the integrated and the strategic ESCO approaches. The three approaches include different ambitions, technologies, economies and innovation potentials. Whereas the basic approach implies a ‘traditional’ guarantee-based model, with relatively few buildings, energy retrofitting and low investments, the integrative and strategic approach include a higher degree of partnership, a more ambitious building renovation approach, and more innovative understandings of facilities management. We also compare ESCO with energy retrofitting as an in-house approach, which many municipalities are considering.

Practical Implications: We suggest the practical implications of our findings, as a short characteristic of the different approaches, intended for municipalities to start up energy retrofitting of municipal buildings.

Keywords: ESCO (Energy Service Companies), Municipal buildings, Energy retrofitting, Innovation, Facilities management

INTRODUCTION
An Energy Service Company (ESCO) is generally defined as a company that is engaged in developing, installing and financing comprehensive, performance-based projects (Vine, 2005). An ESCO company provides a package consisting of technology, financing, project management, education and counselling. In an ESCO contract, the ESCO provider guarantee energy saving and becomes responsible for eventual risks for not achieving defined energy savings, instead of the client (e.g. a building owner). This is making investments in energy savings more calculable
and thereby attractive for clients. ESCOs play an important role for improving energy efficiency in the existing building stock in Europe (Marino et al., 2010). The EU Directive on Energy End-user Efficiency and Energy Services (2006) sent a strong signal to European member states to support the formation of energy services, and in many European countries there is a growing ESCO activity. In Denmark, ESCO plays a central role in the Danish government’s strategy for reducing energy use in buildings from April 2009. ESCO contracting is also being promoted by the Ministry of the Interior and Social Affairs to increase municipalities’ use of Public Private Partnerships (PPP).

So far, the main growth of Danish ESCOs has taken place in the municipal sector. In 2008 a handful of municipalities had started ESCO projects in municipal buildings, whereas in the beginning of 2011, 15 municipalities (of 98 municipalities in Denmark) have signed ESCO contracts or are preparing to do so. The ESCO model used in Danish municipalities does not include private or third-party financing, thus ‘Energy Performance Contracting’ (EPC) would be a more correct term to use. As ‘ESCO’ however is used widely in a Danish context, the paper will also use this term. In the Danish context, ‘ESCO’ is used for the companies as well as for the types of agreements between the client and the provider. In the Danish municipalities, ESCO contracts in general include guaranteed energy savings (on heating and electricity) for a selected part of the municipal building portfolio, based on retrofitting and different energy renovation initiatives on the buildings, training of facilities management (FM) staff, and energy labelling of buildings. Contracts are typically of 8-12 years’ duration.

As the main parts of the contracts are from 2008 and on, the Danish experience of using ESCO is still new, and debates are still going on between municipalities on viewpoints and the pros and cons of ESCO contracting. One of the main reasons for the reluctant attitude amongst some municipalities, as also mentioned by Bertoldi et al. (2007), is the alternatives to ESCO regarding energy retrofitting. Surveys of Danish municipalities on ESCO show that many consider it more profitable to complete the energy-efficient retrofitting themselves as an in-house project, that they are sceptical about the financing mechanisms in the ESCO arrangement, and that they prefer to keep competences in-house (IDA, 2010; NRGi, 2009). Thus, in this paper we focus on the different municipal arguments for using or not using ESCO, and on the considerations on competences of the municipal FM organisation in relation to improving energy efficiency in municipal buildings.

STATE OF THE ART
For a long time ESCO has been known as a concept mainly in USA and Asia, but only in recent years ESCO markets have emerged in EU countries like Germany, Austria, France, Spain, UK, and Sweden. ‘ESCO’ is however differently defined across EU member states, in practice covering concepts like EPC (Energy Performance Contracting), ESPC (Energy Service Provider Companies), DC (Delivery Contracting) and others (Marino et al., 2010). Also the types of buildings included vary, as well as ESCO providers, technologies used etc. (Marino et al., 2010). The international research literature on ESCO is however limited, and mainly restricted to experience from the US and Asian markets, as well as from individual European countries. Much of
the existing European literature on ESCO concerns the development of framework and concepts from selected countries, on how to promote ESCO, identifying barriers etc., whereas the literature assessing the outcomes of ESCOs is limited. So far the Danish research has also been limited, and mainly consisted of consultants’ R&D reports on ESCO, for instance concerning international promotion on ESCO, assessments of market segments for ESCO, reports on test projects on ESCO etc. The only studies of existing ESCO initiatives in Denmark have so far been student reports. The limited research probably reflect that ESCO is a relatively new concept in Denmark, as the earliest ESCO contracts are from 2008, and that the practical experience of ESCO so far mainly concerns the initial phases.

APPROACH
Theoretical approach
Our approach to ESCO was not based on the dissemination of ESCO itself, but on the results and outcomes delivered by ESCO; ESCO should not be seen as a result in itself, but as a way to gain results. Our focus on results and outcomes includes energy reductions and economic savings, but also softer measures, such as innovation potential and development of the municipal FM organisation. Firstly, our research interest focused on the consequences of introducing ESCO contracting in municipalities: What types of changes and innovation does it foster, and will it eventually give the FM organisation another role, especially in relation to promoting energy efficiency also amongst private building owners in the municipality? Secondly, we discuss the ‘in-house’ strategy as an alternative to ESCO, which many municipalities are considering.

To understand and conceptualise possible outcomes of ESCO, we use ‘public innovation’ as a theoretical framework. Public innovation includes different types of innovation including product innovation, service innovation, process innovation, position innovation, strategic innovation, governance innovation and rhetorical innovation (Hartley, 2005). ESCO contracting can be seen mainly as process innovation; the products and services are well known, but the way the services are organised is new. Based on Mulgan and Albury (2003) we can differentiate between different types and degrees of innovation (IDeA Knowledge, 2005):

- Incremental, i.e. minor changes and ‘add-ons’ to existing practices
- Radical, i.e. new services or ways of ‘doing things’ in relation to the process or service delivery
- Transformative / systemic, i.e. new workforce structure, organisational types, and inter-organisational relationships, leading to major changes in the FM organisation on energy efficiency, as well as strategic and governance innovation.

The main hypothesis based on Hartley is the divide between innovation within the governance organisation (‘traditional management’ and ‘new public management’) and beyond the governance organisation (‘networked governance’). According to Hartley (2005), network governance has the biggest potential for creating innovation. Summarising the growing literature on network governance, Sørensen & Torfing defines network governance as “a relatively stable
horizontal interfacing of interdependent, but operationally autonomous actors, 2) that interacts and tries to influence each other through negotiations, 3) that takes place in an institutionalised community, 4) that is self-regulating within a framework defined by the political authorities and 5) in a broad sense contributes to public regulation” (Sørensen & Torfing 2005:15). In other words: network governance forces the public sector to facilitate networks of otherwise un-coupled actors and to design the network as a set-up where these actors can pursue their own interest, while at the same time contributing to the political goal achievement of the public agency. This is both a substantial organisational and strategic challenge. Along the line of Hartley, we assume that these challenges create new opportunities for innovation in FM in municipalities.

Methodology
The paper is based on an ongoing research project aiming at identifying the potential and barriers to the application of ESCO contracting in Danish municipalities. The paper is based on a survey of existing Danish ESCO initiatives, international literature studies of ESCO experiences, as well as qualitative interviews with selected ESCO actors. This includes ten interviews with leading civil servants in ESCO municipalities, one interview with a municipality with an in-house strategy, and two interviews with ESCO providers. The interviews are based on a semi-structured interview-guide, focusing on motivations and experiences with ESCO, especially regarding innovative aspects. The interviews were carried out as a mix of face-to-face interviews and telephone interviews.

RESULTS
Motivations for energy retrofitting
The growth in ESCO projects in Danish municipalities should be seen in relation to different political drivers for Danish municipalities to take up energy retrofitting of their buildings in general, either as ESCO projects or as in-house initiatives. In order to understand the Danish context, it is necessary to mention two important drivers:

Energy labelling and financing: The Danish Government signed a political agreement in 2005, where the main objective was statutory energy labelling of both public and private buildings. To encourage energy savings, the municipalities were allowed to take out loans for the renovation, if they included the suggestions for energy improvements outlined in the energy label for the buildings, as well as other specified energy-reducing initiatives. Normally, municipalities are not allowed to start building projects by taking out loans, as a way for the state to keep municipal taxes under control. This also includes typical initiatives in an ESCO contract. The ability to take out loans is the main ‘carrot’ for the municipalities to engage in energy retrofitting projects, and thus energy labelling of municipal buildings plays an important role. In order to strengthen this, an agreement from 2007 between Local Government Denmark (LGDK)19 and the national government settled that all initiatives for energy efficiency with low payback time (< five years) outlined in the energy label on public buildings should be completed within four years.

19 Local Government Denmark is the interest group of Danish municipalities. All 98 municipalities are members.
Voluntary climate agreements: The climate agenda has been an important motivation for many municipalities, and especially two voluntary agreements are mentioned by most municipalities as motivations for improving energy efficiency in municipal buildings. One is the ‘Climate Municipality’, a voluntary agreement between the municipality and the Danish Society for Nature Conservation, which obliges the municipality to reduce energy consumption by 2% per year in the municipality as a whole, i.e. not just the municipal administration, but the municipality as a defined area, including private building owners. This includes not just energy for heating of buildings but all kinds of energy, including supply, transport, electricity etc. At the moment, about 2/3 of all Danish municipalities have signed such an agreement. Another voluntary agreement is the ‘Curve-cracker agreement’ with the Centre for Energy Savings in which the municipality promises to reduce electricity consumption in public buildings by 2% per year.

Finally, some municipalities initiated ESCO because of a dire need for improving building standards. The poor standard of municipal buildings has worsened during the current recession, thus making it more or less impossible for some municipalities to uphold proper building standards. According to these municipalities, ESCO is a possibility for a radical upgrading of the building stock otherwise not possible.

Different ESCO approaches in Danish municipalities
Looking closer at the municipal ESCO projects in practice, they are different in relation to technologies, economy, ambitions etc., and subsequently in the way the process is organised, the type of challenges, experience, and the innovative perspectives of the FM organisation. On the basis of our research we identify three different approaches to ESCO:

The basic ESCO approach
The basic ESCO-approach includes replacement of installations and regulation of energy systems and services like CTS control, monitoring, light steering, heat regulation etc. These technologies are relatively simple and relatively inexpensive but with high energy-saving potential and therefore has a short payback period. The basic ESCOs have the advantage of being practically and politically easily adaptable concepts. This only occasionally involves improvements of the building envelope, making the ‘ordinary’ FM and building maintenance almost independent of the ESCO project. The limited interaction implies results are primary technical and with limited innovation in relation to the FM organisation and building users. The approach fits well in municipal administrations based on ‘new public management’ with a large degree of outsourcing to private partners. For such municipalities the project design and procurement are regarded as relatively unproblematic. The ESCO projects in the municipalities of Vallensbæk, Kerteminde and Greve can be defined as projects having this approach. Challenges observed in the municipalities using the basic ESCO approach include coordination and organisation of central and departmental FM units, distribution of energy savings between buildings, and the level of information from the ESCO provider. These can be seen as challenges that can largely be met with adjustments to the existing organisational set-up. Thus it requires no innovative approach from the municipality to implement the ESCO concept. Although these municipalities report no or limited innovation in their ESCO projects, it might on a general level act as a
‘stepping stone’ in the development of more integrated concepts, establishing confidence on the concept, the procedures, the operators etc. These projects might spark off political interest in energy savings, building improvements and CO₂ reductions.

The integrative ESCO approach
Several municipalities have started more ambitious ESCO projects that include monitoring and regulation in combination with the building envelope, or intensifying focus on improving indoor climate. Such projects require major investments and give longer pay-back times, but they typically include a wider segment of the municipal buildings, if not all buildings. Here, the ‘worst’ buildings (with the highest savings potential) ‘pays’ for improvements on the ‘best’ buildings, for instance by installing photovoltaic panels or other types of renewable energy sources. In these projects, a main challenge is related to identifying the project and the tender, and to structure it in a way that allows as many buildings to be included as possible. Compared with the standard ESCO approach, it requires more work, more local adaptation in terms of coordination between improvements of installations and buildings, and more innovative thinking about how to design the ESCO contract. The integrated approach might not be a formulated strategy at the outset, but might emerge along the process of defining the tender. The municipalities of Høje Taastrup, Halsnæs and Sorø are examples of the integrated approach. In the municipality of Høje Taastrup, the preparations for ESCO contracting showed that the buildings were in a better shape than expected, which made it difficult to find the 15% energy reductions that were the target. Therefore, they had to ‘climb up the tree for the high-hanging fruits’, by including solar panels on the town hall in the contract. The city council had to accept that the payback period was extended from 15 to 20 years, which according to the civil servant was a great challenge. The municipality of Halsnæs started out with a conservative aim of 15% savings that they were certain that they could find. However other stakeholders raised the question, why the goals were not more ambitious. This led to a new project description, with more ambitious goals, including that 15% of the reductions should come from renewable energy, and 35% from improvements of the building envelope. There are several indications from municipalities using the ‘integrative approach’ that the ESCO project might become an eye-opener for developing new energy-savings initiatives with actors and institutions outside the municipal administration, using ESCO inspired initiatives.

The strategic ESCO approach
Introducing ESCO might lead to new ways of thinking about the role of facilities management in developing local competences on energy retrofitting, and general lessons from ESCO contracting as learning process to develop competences on public-private collaboration. Three of the first municipalities to introduce ESCO have developed a collaboration on ESCO (Middelfart, Kalundborg and Gribskov), and can be seen as the Danish spearheads of ESCO. Attracting external financing to develop a handbook on ESCO and other activities to promote ESCO in municipalities has helped them to develop strategic initiatives on ESCO. All municipalities see ESCO as a step towards wider goals. This includes for instance ambitions to be an international first-mover on energy efficiency (Kalundborg), or on ESCO contracting on other building types: private schools, other public buildings, social housing, and private building owners, where the
municipal FM organisation will act as the ‘network facilitator’ (Middelfart). Also, ESCO can lead to considerations of the future municipal building portfolio and the FM organisation (Gribskov municipality). Furthermore all three municipalities have ambitions to develop local competences amongst Small and Medium Sized Enterprises (SMEs) and local enterprises on energy renovation, which is highly needed. For the three ‘ESCO spearheads’, the energy-retrofitting projects themselves have been rather simple, but they have been implemented in a strategic context that allows the experience from ESCO to be disseminated on an urban scale, as a planned learning process on energy retrofitting and increasing public-private collaboration. Moreover, all three municipalities are considering a new round of ESCOs, based on the lessons learned in the first and basic ESCO project. These cases show us, in line with Hartley (2005), that ‘network governance’ approach holds a strong innovative potential compared with innovation within the governance organisation.

The different ESCO approaches with the different types of challenges and potential for innovation are outlined in Table 1 below.

<p>| Table 1: Three approaches to ESCOs in municipal buildings, adapted from Hartley (2006) |</p>
<table>
<thead>
<tr>
<th>ESCO approach Characteristic</th>
<th>Basic</th>
<th>Integrative</th>
<th>Strategic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Focus on installations and control in building retrofitting</td>
<td>Focus on installations and building envelope energy savings finance building improvements</td>
<td>Focus on using ESCO as a learning process. Disseminating competences on energy retrofitting on an urban scale, based on partnerships</td>
<td></td>
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<tr>
<td>High energy savings, low risk</td>
<td>Energy savings finance building improvements</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Simple contracts. Low level of coordination between ESCO and municipal FM required</td>
<td>Complex contracts Partnership model required</td>
<td></td>
<td></td>
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<tr>
<td>Public management paradigm</td>
<td>New public Management: Increasingly contractual management and strategic FM</td>
<td>Network governance: FM-organisation as broker and negotiator between private owners and ESCOs. FM organisation unit increasingly integrated with other sustainability initiatives</td>
<td></td>
</tr>
<tr>
<td>Type of innovation</td>
<td>Incremental: Constant improvements, but no real innovation</td>
<td>Radical: Ways of delivering service is changed, but within existing FM framework</td>
<td>Transformative: ESCO experience leads to new roles and function of the FM organisation and new types of organisation</td>
</tr>
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</table>
Energy retrofitting of municipal buildings as an in-house project

Our interviews with municipalities and ESCO operators have demonstrated that the main alternative to ESCO is to carry out energy retrofitting of municipal buildings as an in-house project. This concept is non-standardised and eclectic, as outlined by Colburn et al. (2005). It can include mixes of public efforts and outsourcing, different levels of ambitions, as well as the ‘do nothing’ alternative (Colburn et al., 2005). From interviews and studies of municipal practices, we can identify two predominant approaches to in-house energy retrofitting of municipal buildings:

A. Municipalities that for a prolonged time have carried out energy retrofitting and successive upgrading of the municipal building stock, and therefore have limited potential for energy savings. The municipalities of Kolding, Skive and Albertslund are frequently mentioned examples of such an approach. Their saving potential is typically less than 10%, and they are therefore not regarded as potential ESCO municipalities. The ESCO suppliers do not see these municipalities as potential customers as they have proved that they have been able to manage energy retrofitting of the buildings as a part of FM and have the necessary competences in-house.

B. A group of municipalities that have no track record on gradual energy retrofitting, but decides to carry out an extensive energy retrofitting of the municipal buildings as an in-house project, and as an explicit alternative to an ESCO project. An example of this strategy is the municipality of Vejen. This municipality was strongly inspired by the ESCO project in the neighbouring municipality of Middelfart, and had several meetings with them, but “.the more we heard, the more we thought that ‘we can do this ourselves’”(civil servant, Vejen municipality). The main argument of the city council was that the municipality should have influence on the solutions being implemented to save energy; they did not want to buy energy savings only. Additionally, these solutions should be implemented concurrently with the general maintenance of the buildings. The municipality has 120 buildings with 210,000 m². It was decided to lend DKK 52 m (EUR 7 m) for investments in the buildings, which would be paid back after 13 years due to reduced costs for energy services. The municipality has hired two energy specialists to go through the buildings, in order to identify energy-saving potential. This will take approx. 5 years, meaning that in the first years there will be no savings. This is longer time compared with Middelfart, where the analysis period took 1½ years. The types of solution will depend on the perceived problems in relation to the specific buildings.

ESCO versus in-house energy retrofitting

We have asked municipalities as well as ESCO providers and consultants about their perception of the pros and cons of carrying out energy retrofitting of municipal buildings as an ESCO project versus an in-house project. The following issues of discussion seem to be crucial in the choice between the ESCO and the in-house approach:

Financing and guaranteed savings

A main reason for the municipality to enter an ESCO contract is the possibility of financing the improvements of many buildings over a short time; within a two-year period of analysis the
ESCO supplier provides a sufficient basis for a full-scale implementation in the entire building portfolio, where energy savings are guaranteed by contract. ESCO providers argue that the strength of this approach, as opposed to the in-house approach, is that you start saving money from ‘day one’. The ESCO contractor mobilises energy retrofitting in a short time, and start saving energy almost immediately. The in-house approach operates with a smaller in-house staff, which prolongs the period of analysis before building retrofitting is implemented, and energy savings are reached. This result in a stepwise model where results are reached gradually, as a contrast to the ESCO model that includes more instant results (see Figure 1).

If the municipality should finance the renovations traditionally, there would normally only be room for gradual improvements, due to the limitations of municipal budgets and manpower. In an ESCO project the municipality raise loans for the entire project at one time. As an illustration, one municipality stated that it could have had DKK 1 m per year (EUR 130,000) for an in-house retrofitting over the coming years, but the ESCO contract gave them DKK 68 m (EUR 9 m). For some municipalities, financing might be the main reason, as they see themselves as capable of completing the building improvements themselves.

A main argument against ESCO is, however, also financial. A survey from 2010 showed that the main reason for municipalities not to enter ESCO contracting is a better economy by doing it yourself; 82% of the municipal directors claim that in terms of economy it is better to finance the improvements in other ways than as an ESCO contract. Nevertheless, such financing is difficult to find, and it is an open question what the alternative to ESCO financing there is. One possibility is municipal equity, another is funding from the ordinary budget, but this would be possible only for major municipalities. The question of the administrative capacity to carry out the building improvements is usually not mentioned in the discussion of the pros and cons on ESCO, but it is very important for especially the smaller municipalities. As one municipality explains: “It would take a long time to establish an organisation that could manage an assignment like that, and we would have to start to downsize it almost as soon as we had started” (civil servant, municipality of Vallensbæk). In a similar way, other municipalities state, that it would have been completely impossible to carry out such a task with their staff, which is usually very small. Keeping this task in-house therefore requires a major re-organisation, which for many municipalities would be unrealistic.

**Flexibility and transaction costs**

Proponents of ESCO argue that ESCO is a partnering constellation leading to a two-way flexibility that allow the local government to coordinate the energy-renovation implementation conducted by ESCO with regular building maintenance as well as change in political priorities, such as sale of buildings. However, since ESCO is also based on a contract, based on strict legislation on tender, both local governments and an ESCO supplier have pointed out the rigid aspects of the initial licensing. A local government undertaking an ESCO project typically increases its knowledge of ESCO during the process, but is unable to enlarge the amount of buildings involved due to legislation.
Proponents of the in-house approach argue that it allows local government to integrate regular building maintenance with energy retrofitting, thus making more comprehensive, effective and flexible refurbishments. If the ceiling lighting has to be replaced why not use the budget for building maintenance to replace the ceiling and re-insulate? The ESCO projects however demonstrate that it is possible to combine municipal maintenance with the ESCO project. If, for instance, the municipal FM refurbishes the facades, it will affect the energy efficiency of the building. Therefore a re-calculation of the base-line is necessary. As energy efficiency can be assessed relative objectively, the challenge is limited, but such negotiations and recalculations might be seen as ‘transaction costs’.

Another issue is the change of strategies. The proponents of the in-house approach argue that local governments in the future face big challenges concerning care of children and senior citizens as a result of radical changes in economy and demographics. These challenges in the welfare landscape make it a very open question, whether the existing building stock will be the same the next 20 years, and whether some energy refurbishment may have been implemented in vain, since the owner of buildings and users may have been replaced. With the in-house ap-
proach, the politicians have a yearly opportunity for adapting the energy refurbishment to political strategies, such as larger units of public institutions, thereby providing more flexibility.

**Capacity building**
Proponents of both ESCO and the in-house approach argue that the respective approaches could be used for a much needed capacity building in the municipal FM organisation, especially on energy retrofitting and FM management as such. As shown in Vejen’s in-house approach, the politicians found it very important to have a more skilled FM organisation afterwards, which they thought was better achieved if they carried out the energy retrofitting themselves. From a project perspective, they argue that an in-depth knowledge of your building portfolio means that you know exactly where to start implementing renovation-initiatives. This allows you to save the salary of consultants, and at the same time to start saving money from ‘day one’. Moreover, the in-house approach gives them full control over what technical solutions to implement, thereby tailoring the energy-saving solutions to the different type of buildings – whereas from their viewpoint, ESCO suppliers might be prone to standardised solutions like expensive CTS technology.

The ESCO municipalities also argue that the FM organisation needs a certain capacity to manage an ESCO project. One spearhead ESCO municipality argued that a strategic purpose of ESCO was to demonstrate to the politicians that if you reduce the FM organisation too much, you actually lose money as you have to hire expensive consultants to provide basic energy saving services. Another ESCO municipality argued that if you want to get the most out of an ESCO, you have to have the in-house capacities to challenge and control the ESCO supplier, as well as to take advantage of the learning generated during the partnering process. A conclusion of this discussion is, that in order to get capacity building regardless of models, you need to have a powerful FM organisation, or at least a strategy for enhancing the organisation, in order to take full advantage of ESCO and the in-house approach.

**Fix point of political strategies**
Proponents of ESCO argue that the contractual agreement forces local government to stick to the energy strategy, thus making it very unlikely that eventual change in city council priorities affect the energy retrofitting strategy. This commitment in a political strategy is not enforced in the same way in the in-house approach. Proponents of the in-house approach on the other hand argue that the long repayment period of loan financing is strong enough in itself, and that commitment to other political strategies in Denmark such as “Curve-Cracker Agreement” and “Climate Municipality” are altogether sufficient to keep the energy retrofitting strategy fixed.

The argument for keeping competences in-house also might reflect more ideological views on public-private partnerships. However, in practice the option for an in-house-strategy is limited to major municipalities with a large staff, more competences and better economic resources. As our interviews also show, it is practically impossible for smaller municipalities.

In Table 2 we have summarised the different characteristics of the in-house and the ESCO strategy.
Perspectives

Different ESCO approaches and market development

The different ESCO approaches reflect possible developments of the ESCO market. One development could be a relatively standardised market. An ESCO supplier compared this with the Swedish market, which is the most mature market in Scandinavia, but where ESCO to a higher degree has also become a ‘standard commodity’ and the ambitions for using ESCO in a more innovative (integrated and strategic) way, is limited. Typically, ESCOs are run as projects in the property administration, and receive limited attention, whereas in Denmark the political attention paid to ESCO is great, and often presented on the political level of the municipality.

Consultants and ESCO providers see the more integrated approach as the future trend, and they also advocate for this solution. A main challenge is that the traditional approach of the ESCO, the guarantee for energy savings, also becomes a lock for more innovative development with ESCO, including a limitation of the volume of buildings and goals included in the contract; ESCO suppliers and consultants advocate for partnerships instead of guarantees. “In Denmark we are used to buying a commodity. But if you want to get the most out of it, you should buy a partnership. Thus we preach ‘partnership’ in the tender, and to think flexibility. It is not legislation hindering this, it is culture” (ESCO supplier).

Table 2: Main differences between municipal ESCO and in-house strategy

<table>
<thead>
<tr>
<th></th>
<th>In-house</th>
<th>ESCO</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Financing</strong></td>
<td>• Step-wise renovation due to budget limitations</td>
<td>• Guarantee for energy savings is politically attractive</td>
</tr>
<tr>
<td></td>
<td>• Long-term financing uncertain</td>
<td>• Energy savings from ‘day one’</td>
</tr>
<tr>
<td><strong>Transaction costs</strong></td>
<td>• Low transaction costs</td>
<td>• Transaction costs in partnership, require minimum building volume to make ESCO profitable</td>
</tr>
<tr>
<td><strong>Capacity building</strong></td>
<td>• Keeps competences in-house, more hands-on influence on solutions</td>
<td>• Learning and innovation from ESCO partnership (also depends on ESCO approach)</td>
</tr>
<tr>
<td><strong>Fixation and flexibility</strong></td>
<td>• Flexible in relation to uncertainty on future building portfolio</td>
<td>• ESCO reduces the risk of reductions in future investments in energy savings due to possible changes in political priorities</td>
</tr>
</tbody>
</table>

However, we argue that the different approaches to ESCO have been a main precondition for the growth of the concept. The approach chosen in the municipality generally is conditioned by the local context (institutional history; the existing capacity of the municipal FM organisation) – but also by the long-term political and administrative visions of the individual municipality. For instance, the standard ESCO model in Vallensbæk corresponds with a small municipal FM organisation being trained in outsourcing, with no ambitions of using the ESCO as a learning
process. The strategic ESCO approach in Middelfart reflects an ambitious overall municipal strategy, where the concept of ESCO fits in well, and the strategic ESCO project becomes a potential strategic innovation: the municipality adopts the strategy of network governance hoping to generate green growth. The ambition of Kalundborg Municipality is to use ESCO as lever for being a ‘first mover’ on energy retrofitting, setting the scene for national capacity building in this sector through establishing collaborations with industries in the municipality.

It illustrates that the potential for ESCO contracting is not a simple question, but depends on the strategy and the political commitment in the municipality. The future success of ESCO will depend on how the ESCO concept develops in practice in the municipalities: as a standardised and easily applicable product, or as a non-standardised smaller, but more innovative concept?

ESCO or in-house?
Our findings also suggest that the attention on ESCO projects inspires some municipalities to carry out energy refurbishment as in-house projects. What we see is perhaps a growing trend that some municipalities ‘copy’ some functions of ESCO as a concept: replacing the ESCO expertise with own staff; having an already experienced staff capable of doing the building analysis and tendering themselves. However, we still need proofs of actual municipal action on extended in-house retrofitting; we have little data and overview of in-house initiatives, and less documentation in terms of baselines and accounting of the initiatives. Because of limited data, it still remains a point of discussion to which extent the in-house ESCOs lose some energy-saving potential by having a prolonged analysis and implementation phase. Moreover, the results over time for the in-house strategy remains open, as most projects are just a few years old.

The discussion of ESCO versus in-house strategies raises an important discussion about the capacity and role of the municipal FM organisation. We agree with Colburn et al. (2005) that in-house competences and ESCOs should not be seen as contradictions, but as two concepts reinforcing each other. Municipalities involved in strategic projects sees internal capacity building as a central part of the ESCO project, both in the short term and in the long term: The ESCO project might be seen as a first step in developing a strong in-house capacity over time.

Yet, for many municipalities, it is not practically viable to carry out an ‘in-house’ model comparable to the ESCO project, due to the small size of the FM unit. In this respect, ESCOs have promoted major progress on energy savings for smaller municipalities that would not have been possible to carry out as in-house projects.

The observations on in-house projects and different approaches to ESCO support our thesis, that ESCOs, and an entire ESCO market, should not only be judged on the number of ESCOs, but on the way in which it helps to reach a target, namely energy efficiency in municipal buildings, adequate buildings for the users, as well as stimulating innovation and capacity building in the municipal FM organisation.
PRACTICAL IMPLICATIONS
For municipalities with ambitions to improve their own building portfolio on energy efficiency, our results so far can be used to qualify decisions on choice of in-house model versus different ESCO approaches. In short, we can characterise the options:

• The basic ESCO approach is politically attractive, with limited investments, guaranteed energy savings and low pay-back time. It requires little innovation for the FM organisation, and can be run as an outsourcing project. What you might fail to achieve, compared with an integrated approach, is a more ambitious and widespread upgrading of the buildings, as well as potentially developing the FM organisation in a partnership with the ESCO supplier.
• The integrative ESCO approach can be used to pursue goals for a general improvement of the municipal building stock. This approach requires a greater degree of partnership with the ESCO provider, and more political commitment as payback-periods will be longer. This approach might lead to more ambitious and innovative concepts on how to achieve energy savings, as well as how to develop the role of the FM organisation in the municipality.
• The strategic ESCO approach implies an ambitious attitude to energy reductions in the entire municipality, building competences inside and outside the FM organisation, using public-private collaboration and networked governance, and thereby redefining the role of the FM organisation in the municipal organisation. This approach implies that the FM unit form partnerships with the ESCO provider, and increasingly works in partnerships and networks to involve a wider range of actors to work for energy savings in the municipality as a geographic entity.
• The in-house model is viable for municipalities with a relatively large FM organisation. The potential for the in-house model include saved costs for the ESCO provider, more control of the specific solutions on the municipal buildings, and a more flexible strategy, not being bound to a contract. What you might miss in the in-house model is a guarantee on energy savings, a faster pace and instant energy savings, plus the safety in the contract, meaning that possible political shifts will not take away the investments on energy savings. For the FM organisation, the in-house project might however not hold the same innovation potential as an integrated ESCO project.

It is important to be aware of the different long-term implications of the different models. Therefore professional support is recommended in defining the visions for the project, as well as in formulating the tender (in case of an ESCO project). We argue that the large potential for energy savings in public buildings should be exploited by the municipalities to formulate and gain political support for more visionary projects on the municipal buildings, and to develop innovative strategies on how to realise energy savings and improve FM functions. Finally we argue that ESCO is not necessarily a contrast to improving the internal capacity building. Instead, the partnership included in ESCO projects might include great innovation opportunities for the municipal FM organisation, giving it a more active role in developing urban sustainability.
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IDA (Ingeniørforeningen i Danmark) (2010), Survey on energy savings in the municipalities with ESCO. November 2010.


5 INNOVATION AND USABILITY IN FM

5.1 CHAPTER INTRODUCTION

Jan Bröchner

Introduction to the topic
What innovation and usability have in common might not be immediately evident to either FM researchers or FM practitioners. There was thus an interesting challenge for both presenters and audience in the session on Innovation and Usability in FM.

The session included 3 presentations.

Ada Scupola, Roskilde University: “Innovation Insights in the Danish Facility Management Sector”
The paper is based on an interview study of innovation in the Danish FM sector, based on a review of the existing literature on FM innovation and on interviews with twelve practitioners. Her findings raise the issue of how the respondents had understood and used the term ‘innovation’. We are hardly witnessing Schumpeterian destruction in the case of FM innovation, and it is rather to be analysed along the lines of mainstream research into services innovation, as represented by Sundbo and Gallouj. One possible development would be to relate FM innovation to changes in the structure of business models, as when firms enter partnerships relying on incentive contracts. It would be useful to classify innovations into mainly cost-reducing or mainly value adding. An international survey for comparative purposes would be desirable but would also require access to relevant data bases with company addresses, and a first step should then be a Nordic survey.

This paper presents an overview of ten years of Norwegian usability studies at the Faculty of Architecture in Trondheim. During this period, researcher interest has gradually shifted from a focus on the buildings to the users and their activities. Exploring concepts such as “the effectiveness of a building” has led to new insights. For spaces and their use, asking why in an operational context is important. Outcomes of the research include a typology with six types of users and the USEtool with its five process stages. Blakstad sees usability studies as having a potential for driving innovation, thus establishing a link with the first paper in the session. The presentation could also be seen as a follow-up on the usability workshop held in the morning. In the discussion, Blakstad emphasized how much can be learned from how children use kindergarten space intuitively; here, it is also easy to identify the conflict of interest between the children (running wildly around) and their teachers. When thinking about innovation in this context, it is more about use of facilities than design. The possibility of actually measuring usability, at least on a best-practices scale, was aired, although the individual and subjective values of individual users of facilities present an obstacle.

This paper describes Nordic usability studies within the framework of the REBUS project: national case studies had been performed and then discussed coming together in joint workshops. Given the results, what is it that one could tell an architect who is about to design a new facility? This turned out to be a difficult question; there is always the response that new knowledge is available. A related question is whether more general knowledge is produced in the REBUS project or more project specific, and ultimately whether findings express peculiarities of a Nordic culture.

General discussion

A final debate concluded the session. Everybody agreed that children are inventive, but that architects are not really innovative. Architects are not known for visiting their products after say two years, and this points to a usability communications problem. Mainstream services research talks about user-driven innovation, and this is worth taking seriously and not least the issue of communicating user-driven innovations. However, there is probably also a tension between usability and innovation, although this depends on how we choose to define FM innovation and how we divide innovation into phases.

The following sections 5.2, 5.3 and 5.4 include the papers, that the three presentations above were based on. The last paper on Facilitating User Driven Innovation in section 5.5 was not presented, because the author was not able to attend.

5.2 INNOVATION INSIGHTS IN THE DANISH FACILITY MANAGEMENT SECTOR

Ada Scupola

ABSTRACT

Purpose: This paper investigates innovation in the Danish facilities management sector and addresses the following research question: “Do Danish FM organizations innovate and if so what are the major types of innovations in the Danish FM sector?”

Background: In the last three decades, Facilities Management (FM) has established itself as a key service sector, with a diverse and highly competitive market of FM contractors, in-house FM teams, FM suppliers, FM consultants, and professional FM institutions. Traditionally, innovation processes in service firms have often been characterised as being unsystematic and not science-based and often resulting into ad-hoc innovations that were not really strategically planned. Recent literature, however, has showed that service firms also innovate and their innovations are also of strategic, organized nature.
In the last three decades, Facilities Management (FM) has established itself as a key service sector, with a diverse and highly competitive market of FM contractors, in-house FM teams, FM suppliers, FM consultants, and professional FM institutions (Nutt, 2000). Facilities manage-
Innovation and usability in FM can be defined as the integration and alignment of the non-core services, including those relating to premises, required to operate and maintain a business to fully support the core objectives of the organization (Pitt and Tucker, 2008). Therefore the facility management sector is an example of a service sector that has developed over the last few decades as a result of corporations outsourcing their non key-competences and activities. A number of studies have investigated innovation in the facilities management sector (e.g. Cardellino and Finch, 2006; Pitt et al., 2006), however with the exception from the study by Cardellino and Finch (2006) which had a UK perspective, these studies are mainly theoretical or address innovation in relation to other kind of issues as for example in relation to benchmarking (e.g. Pitt and Tucker, 2008).

The purpose of this article is to investigate innovation and innovation types in Danish FM service organizations. The research question is: Do Danish FM organizations innovate and if so what are the major types of innovations in the FM sector? The answer to this question will provide knowledge about innovation in Danish FM service firms that can be useful to innovation researchers, facilities management researchers and facility managers alike.

The article is structured as follows. This introduction presents the background and the research question of the study. The second section provides a literature review of the main concepts and definitions used in the paper as well as a brief review of the literature concerning innovation in facilities management. The third section presents the research methodology. The following section presents and discusses the results of the study. Finally the last section presents the practical implications.

LITERATURE REVIEW

Facilities Management (FM)

Facilities management is a new field of study emerging within engineering as well as a new service sector that has been developing due to outsourcing of non core competencies such as cleaning and office management to third party providers. As a consequence there are many definitions and understandings of facilities management (e.g. Then, 1999; Nutt, 2000). One way to understand facilities management is to look at it as the integration of the organizational processes in order to maintain and develop the services supporting and improving the effectiveness of the primary processes (Jensen, 2009). Another definition of facilities management frequently used describes FM as an integrated approach to operating, maintaining, improving and adapting the buildings and infrastructure of an organization in order to create an environment that strongly supports the primary objectives of that organization (Pathirage et al., 2008, p. 5). These views are implicitly based on the concept of the value chain that distinguishes the primary from the secondary activities of an organization (Porter, 1980).

Pathirage et al. (2008) argue that the FM literature (e.g. Amaratunga, 2001) identifies four generations of FM that focus on the changes to the management of facilities over the last few decades. In the first generation FM was considered as an overhead to the organization and was something that had to be managed for minimum cost rather than optimum value. In the
second generation, FM took a process perspective and promoted the process focus between the organization’s individual businesses and the FM organization by making FM activities within the organization a continuous process (Amaratunga, 2001 in Pathirage et al., 2008, p. 8). In the third generation, FM becomes more concerned with resource management, concentrating on managing supply chain issues associated with the FM functions. Finally the fourth generation focuses on the alignment between organizational structure, work processes and the enabling physical environment arguing that the organization’s strategic intent must clearly reflect the facilities dimensions in its strategic business plans. This paper does not take into consideration such strict distinction and is mainly positioned in the third generation of FM according to Pathirage et al. (2008). These are however just background concepts for investigating and understanding innovation and innovation types in FM organization.

**Services and Service Innovations**

There are certain key differences that distinguish manufacturing firms from service firms, and FM services as a subset of this (Cardellino and Finch, 2006). In this section we mainly present service and service innovation definitions and categorizations. Services are typically distinguished from products by four distinct characteristics: intangibility, perishability, inseparability, and heterogeneity (Alam, 2006). Scupola et al. (2009) summarize the major characteristics of goods and services. For example goods are tangible, can be inventoried and patented. Their use usually implies consumption and their consumption can be shared among different consumers. In addition they are homogenous and are easy to price. On the contrary, services are intangible and it is impossible to inventory them, to copy or patent them as well as they are heterogeneous and hard to price. The nature of services can be also understood through the characteristics of the service act, type of the customer relationship, customizability of the service, nature of demand, delivery mechanism, and attributes of the service product.

A number of classifications of service innovations can be found in the literature. For example, Avlonitis et al. (2001) categorize them as new-to-the-market, new-to-the-company, new delivery process, service modifications, service line extensions, and service repositioning types of service innovations. In general terms, services innovation can be expected to either improve services productivity or to develop new service models. Debackere et al. (1998), in turn, talk about breakthrough projects, meaning fundamental changes to existing products; platform projects with new product lines; and derivative projects resulting in incremental changes. However, a common element in most service innovation classifications is the element of novelty that adds commercial value to the service provided (Narvekar and Jain, 2006).

**Facilities Management and Innovation**

A number of studies have investigated innovation in the facilities management sector or have made a link between the innovation literature and the facility management literature. Cardellino and Finch (2006) examine the nature of “service innovation” in the facilities management (FM) context and describe case studies of 11 innovations in different British FM organizations. These include both in-house client-based innovations and third-party innovations. Cardellino and Finch (2006) found that FM organizations are highly active with service innovations, but
Innovation and usability in FM

that these are generally one-shot commitments. They also found that primary determinants for the success of an innovation in FM organizations were the awareness of the external market, the development process and the firm’s strategic and business fit.

Noor and Pitt (2009) in a critical review of innovation in facilities management service highlight that the creation of strategic supply chain partnerships to gain long-term benefits are an important aspect of FM innovation. This implies that new business models that include partnering are also types of FM innovations. Among the mutual benefits that partnering can offer to the service provider and the client are increased customer satisfaction, better understanding between partners as well as lower costs, better predictability of cost and time and shorter overall delivery periods. Noor and Pitt (2009) conclude that the role of innovation in FM services is not just to produce innovative solutions, but also to establish and develop a creative environment in which solutions can be conceived, developed and implemented.

Goyal and Pitt (2007) in addition state that innovation achieved as partnering between organisations maximise the opportunity to think and act beyond an organisation boundaries, bringing together aspirations, skills and knowledge of all stakeholders involved who work to gain profits and competitive advantage. They conclude that innovation in facilities management should be a mindset and not a one-time event. Innovation management principles should be incorporated as a part of daily schedule for each employee at all levels, strategic, tactic and operational. In addition Pitt et al. (2006) by investigating different issues including innovation in relation to building maintenance also state that innovative solutions to maintenance issues are essential for continued efficiency and are brought about through the creation of an environment in which creativity is able to thrive. Finally Pitt and Tucker (2008) through a theoretical analysis of performance measurement, benchmarking and innovation in facilities management conclude that benchmarking is a technique that can be used in measuring facilities service performance and a catalyst in generating innovation to the performance process.

METHODOLOGY

The empirical data for the study were gathered from archival sources, interviews with companies as well as attendance to practitioner conferences and workshops on different FM related topics such as partnerships in FM, innovation in FM and IT systems in facilities management. The participant lists of these seminars and conferences, the web site of the Danish Facilities Management Association (www dfm-net.dk) as well as discussion with industry experts were used to find relevant companies and people to interview. Altogether, twelve interviews with representatives from twelve organizations were conducted. These included three FM service providers, five FM service customers and four consultancies/ICT service providers.

A mix of FM service providers, FM customers and FM consultants was chosen to help reveal different sources of innovation in FM organizations. In all the companies high level managers and directors were interviewed. FM consultants have been selected as we believe that they have a good insight about innovation sources both in the FM service providers and the customers. Table 1 summarizes the companies interviewed.
Table 1: Characteristics of the companies interviewed

<table>
<thead>
<tr>
<th>Company Type</th>
<th>Person Interviewed</th>
<th>Number of employees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Big FM provider</td>
<td>A1 Senior Manager</td>
<td>250 in Denmark 4000 in Scandinavia</td>
</tr>
<tr>
<td>IT System provider</td>
<td>A2 Senior Manager</td>
<td>25</td>
</tr>
<tr>
<td>Big Consulting Company in the Building and Facilities Management Market</td>
<td>A3 Director of the Facilities Management Department</td>
<td>45 in the FM Department</td>
</tr>
<tr>
<td>Big FM provider</td>
<td>A4 Director of the Development Department</td>
<td>(Company prefer to keep size undisclosed)</td>
</tr>
<tr>
<td>Big Parma Company</td>
<td>A5 Director of the Facilities Management Department</td>
<td>90 Employees in the FM Department (Company prefer to keep size undisclosed)</td>
</tr>
<tr>
<td>Consulting Institution</td>
<td>A6 Construction Consultant</td>
<td>850</td>
</tr>
<tr>
<td>FM Public Organization</td>
<td>A7 Senior Manager</td>
<td>170</td>
</tr>
<tr>
<td>Big Public Organization</td>
<td>A8 Manager of the Facilities Management Department</td>
<td>45,000 Employees in Total 15 in the FM Department</td>
</tr>
<tr>
<td>Big State /Private Organization in Experience Services</td>
<td>A9 Senior Manager of the Facilities Management Department</td>
<td>Approximately 1100</td>
</tr>
<tr>
<td>ICT System Provider for FM</td>
<td>A10 Director of the Danish Subsidiary</td>
<td>6 in Denmark Approximately 12 in the Main Office Abroad</td>
</tr>
<tr>
<td>Big Financial Service Firm</td>
<td>A11 Senior Manager of the Facilities Management Department</td>
<td>FM is Organized as an Intern Function with 160 Employees</td>
</tr>
<tr>
<td>SME Providing FM Service to Mostly Big Corporations</td>
<td>A12 Senior Manager also in charge of the FM IT systems</td>
<td>Approximately 145 Managers Approximately 430 FM workers</td>
</tr>
</tbody>
</table>

All interviews lasted about 1.5-2 hours. Interview questions were semi-structured (Miles and Huberman, 1994) attempting to understanding innovation activities within companies. The interviews were tape-recorded and transcribed. Notes were also taken during the interviews. To increase the reliability, an interview protocol was used and a database was developed (Miles and Huberman, 1994). This protocol was slightly adjusted depending on the type of company interviewed: FM providers, FM customers or FM consultants. The protocol questions were organized into two parts. The first captured the company background information, such as, the type of business, years in business, and facilities management activities. This information was supplemented by information provided on the companies’ web sites, annual reports, sales brochures and other material provided by the companies or collected in the practitioner workshops and conferences where the author participated. The second part focused specifically on innovation and innovation types in the company. The data were analyzed and coded manually.
RESEARCH FINDINGS
The results are presented according to the three different categories of companies interviewed: FM Service Providers, FM Service Customers, ICT suppliers/consultants.

FM Service Providers
This study found that for the big service providers, innovation is a strategic activity and is conducted as a planned and systematic process. These companies have an innovation strategy and innovation is a strategic priority. For example a senior manager in a big FM service provider answers to the question whether his company has an innovation strategy in the following way:

To a large extent..each country is measured according to how much innovation they make per quarter (Department Senior Manager, A1)

Similarly, the development director in another FM service provider states that innovation is a strategic area in the company as the following statement shows:

Yes, every year we do what we call a top down bottom up strategic process and that goes for every country. The global Head Quarter get a vision that they communicate to the countries and ask them to look at it, each country say what is important to them to work with in the coming year and decide what ideas they want to work on and send it to Head Quarter, who decide what ideas to choose, and that is obligatory for every country. Every country makes plans about what to do about it, every country has permission to change and develop things. (Development Director, A4)

This study finds that Danish FM service providers have established innovation laboratories and "development departments" with the purpose to continuously come up with new, often incremental, service, contract, process or even partnership innovations. Such service innovations might be small incremental developments of existing ideas or services, often driven by market requirements or changes. This is clearly showed by the following three statements from three different service providers. For example a senior manager in company A1 pointed out that they have a change management department that works together with some developers in order to come up with FM service-related innovations:

We have some service developers within the big service areas for example catering, security, post restructuring, reception, and similar. They constantly try to update on what happens on the market and then they have people in each country they play together with, most often with our change management department. (Department Senior Manager, A1)

Similarly the development director of A4 pointed out to the development department as a place where many FM service innovations are developed:

It is here (referring to the development department). This is one big war room, whether it is a sale person, transaction, calculation, if there is something going on, anybody can step in and say: hei could you solve that.. We are responsible all of us to come up with ideas. (Development Director, A4)
Benchmarking is found to be an important tool to identify important areas where to get ideas from or where to innovate. However the development director in A4 differentiates between incremental innovations that he identifies with development and where benchmarking has an important role and more radical types of service innovations, which according to him are mostly bought in. This is clearly illustrated by the following statement:

*I see difference between development and innovation.....All our operation, our managers have different ways of solving daily issues with our clients, so there is a lot of development going on on-site.... A lot of innovation and know how we buy, by buying competitors or sub-supplier.* (Development Director, A4)

The FM service provider that was classified as a small and medium size enterprise also innovates, but they do not have innovation as a strategic priority. Their innovations are mostly ad-hoc and driven by the requirements of the big customer companies.

**FM Service Customers**

For FM service customers with their own FM department, the results show that some of the FM departments have innovation as a strategic priority and clear innovation strategies while FM departments in other customer organizations state that they do not innovate, but mostly develop their service offerings in very small steps and that innovation is extremely rare. For example the FM manager in A8 states:

*In this department (FM department) we do (have a strategy) ...upper management arranges a strategy seminar once per year where the strategy gets formulated. Innovation happens as an interaction between the employees and upper management* (FM Manager, A8)

An opposite view is provided by the FM Department Director at A5 that instead states that they do not have an innovation strategy and they do not really innovate, rather they develop services and service offerings further. This is clearly showed by the following statement:

*No.......we are absolutely a developing department...We develop our services, but innovation is very rare* (FM Department Director, A5)

This view is further supported by one of the consultants interviewed in A6 as he believes that not much innovation is taking place in the Danish FM sector as illustrated by the following statement:

*Is there any innovation in that (FM)? Until now facility management has been a dry area, so now things have been put in a better frame...I do not think there is much innovation* (Construction Consultant, A6).
ICT suppliers/consultants
The organizations belonging to the category “ICT Supplier/consultants” state that they are innovative and their innovations are both driven by the user needs and the market as well as by the desire to improve their competitiveness. In addition they innovate due to their own innovation drive and desire to provide FM software solutions that are ahead of the market needs, therefore providing more radical types of FM software solutions. For example the department manager of a smaller provider of FM software (A2) states:

“We live by innovating new ideas in the software, because if we had the technologies and ideas that were modern 10 yrs ago and still provided these ideas now, we would not be in the market, so we need to develop constantly to meet new demands, that is innovation for us, and of course creating some solutions that the users have not thought of or could not see that they needed that, but now they need them and there is also where we use a lot of focus in our innovation, making things better, more simple” (Department Manager, A2).

Types of FM Innovations
The types of FM innovations found in this study can be mainly categorized as service, contract, process as well as business model innovations. Among the service innovations mentioned were a new customized way for the company employees to choose and bundle the Christmas gift through the web site or a new menu in the cantina. A special focus was put on contract innovations as most companies, both FM service customers and providers, are constantly looking for new ways of making contracts with the customers/suppliers. For example a senior manager in a big FM provider (A1) stresses that the employees working in their development department have a special focus on contracting as the following statement shows:

“They develop new contracts, they try to make innovations concerning contracts, and how we can work smarter, but not harder, how we can find other ways to do things, by using best practice...” (Department Senior Manager, A1)

FM service customers also pointed out that contract innovation are important. For example the FM manager in A8 when asked whether he has an example of innovation answered:

“Function contracts, a new form for contract...” (FM Manager, A8)

Business model innovations including partnerships between the FM service provider and customer were also found to be very important in the FM industry. For example the respondent in A8 states that they are working with “development steps” in order to move from “being a janitor company” to be a “portfolio developer”, where the goal is to look into how more actively to use the buildings. In addition they are developing operational partnerships with service suppliers with the objective, among others, to increase innovation and decrease costs.
As it is typical of service delivery, also in FM the service innovation cannot be completely distinguished from the innovation concerning the service process/method as a department senior manager in A1 makes it very clear:

**Int:** Is this a process or a service innovation?

**Resp:** Both, to a large extent. We introduced a new method to do cleaning within sterile cleaning and since we are looking at ways to use some specific types of cleaning products, to use some microfibers that can work faster and give a better service quality and put some of those people that do cleaning to do something else. Higher efficiency and service quality... (Department Senior Manager, A1)

Innovation in facility management as in many other service sectors is often associated with the use or introduction of new technologies and especially information technology such as FM ICT systems to assist the facility management supply chain or in new ways of visualizing the buildings and related facilities services such as the use of 3D. The introduction of FM ICT systems has not only given rise to service innovations, but also to new ways for FM organizations or departments to organize and deliver their service. This is for example the case of FM services related to the digital construction initiative as a facility manager in a public FM organization clearly states:

*If we are talking about innovation inside the frame of our own house I think ... we’ve been ... doing great leaps forward moving from paper to chips in a very short time ...and that’s a very high priority ... I know that we want to also because we have been pushed into the arena by the digital construction initiative. We want to show the world that we are in front, so on a management level, at least on the parts of management which is involved in digital construction, they have innovation as a high priority. They want us to be known as someone that is moving forward and moving forward somewhat more quickly than the rest ....* (FM Manager, A7)

As already said, FM service innovations are mostly small improvements of the existing, but sometimes some more radical changes take place mostly associated with development of ICT systems or with their use as for example the following statement shows:

**Int:** Do you think about small changes or also new products, new software.

**Resp:** Both, you need to make new products, new projects and improve the one for customers by adding some minor improvements or correcting some minor mistakes and the process of developing the software, our consultancy products, must be balanced between these two. We cannot sit here and say to our customers in 10 years we are releasing new software that solves all your problems, we need to address them here and now. (Department Manager, A2).
DISCUSSION
This study provides a picture of the companies in the facility management sector in Denmark as companies that are innovative, have innovation on their strategic agenda, and have innovation strategies, development departments and innovation laboratories. These results are for example different from the results presented by Cardellino and Finch (2006) who found that innovation activities in UK based FM companies were mainly one shot commitment, even though FM companies were found very active regarding innovation. In our study, especially the big FM service providers and the ICT/consulting companies are innovative, have innovation strategies and have innovation as a strategic priority. The FM departments in FM customer companies show different patterns. Some of them have innovation strategies and innovation is a strategic priority, while others claim that they do not innovate and see themselves mainly as janitor departments trying to service the main organization. This view was also supported by some consultants who believe that there was very little innovation going on in the facilities management sector and by one SME stating that their innovation was mainly driven by their (mainly big) customers. This SME interviewed was mainly innovating on an ad-hoc basis in order to solve small operational problems or to accommodate the requests and wishes from the clients, which implied normally bigger innovation and development. In many interviews the word innovation and development was used interchangeably and some firms specifically said that they mainly develop, that is make small incremental changes, rather then make huge leaps. The big companies use also benchmarking as innovation drive as for example stated by Pitt and Tucker (2008) as something that FM companies should do. A major focus was put on contract innovations as contracts are very important tools especially when FM services are outsourced from the customer to the FM service providers. Important innovations found in this study were business models innovations. These business models mainly take the form of customer-supplier partnership as more and more often FM providers and customers try to establish partnerships in order (among others) to increase innovation and decrease costs. This was also recommended by Noor and Pitt (2006) and Goyal and Pitt (2007).

PRACTICAL IMPLICATIONS
These results can be used by FM managers, innovation researchers, especially in the service sector and FM researchers alike. For FM managers the results provide some useful information about how innovation is addressed especially in big FM provider companies. It might also inspire managers of FM departments in customer companies to put innovation on their agenda if they have to continue being a department in the companies and avoid the risk of eventually being outsourced to potential FM service providers. FM researchers on the other hand can get a picture of what is going on in the FM innovation landscape in Denmark. Finally service researchers can get some insights about service innovation in a specific and under-researched service field: facility management services.

REFERENCES


5.3 USABILITY REVIEWED: SUMMING UP NORWEGIAN RESEARCH ON USABILITY

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ABSTRACT
Purpose: This paper sums up the Norwegian research on usability, reflects on the experiences from the studies, and discusses impacts and directions for future research within the field.

Background: The true value of buildings lies in the support and shelter which they provide for their users. For both users and owners, it is this ability that creates long-term benefits. Usability can be understood as the extent to which a building can be used by users to achieve goals with regards to effectiveness, efficiency, and satisfaction. The main focus and motivation for usability research has been the improvement of workplaces and facilities for users and organizations to add value to their core business. There has been a lack of knowledge about the usability of buildings and how it can be assessed.

Approach: The paper is based mainly on experience gained from a number of Norwegian case studies, and also relevant theory and literature studied during the corresponding period. To consider the results of case studies and the methods used, a series of interactive “best practice” workshops have been conducted.

Practical Implications: The value of such evaluations for feed forward into new projects or improving existing facilities lies mainly in the ability to understand users’ experiences and to translate them into adequate products and solutions. Consequently, the results of research related to evaluation should be quickly and easily accessible. Development of knowledge and tools within USEframe will help structure the further implementation of usability knowledge and tools in practice.

Keywords: Usability, Evaluations, Improvement, Methods, Value

USABILITY OF BUILDINGS – AN EMERGING FIELD OF KNOWLEDGE
The concept of usability was first developed in the 1950s, and while its origin relates to applications within product design the concept was later applied in information technology software development and web design (Leaman 2000). The concept has recently been adapted to buildings through the work of the International Council for Research and Innovation in Building and Construction (CIB) Working Commission on the Usability of Workplaces (CIB W111) (Alexander et al. 2004). ISO 9241-11 defines usability as “the extent to which a system can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use” (ISO 1998).
The main focus and motivation for usability research has been the improvement of facilities for organizations in order to add value to their core business. From a user perspective, the qualities of a building may be described using a number of terms such as quality, functionality, efficiency, effect, goals, and usability. As van der Voordt (2009) points out, there are numerous indicators of architectural quality, and measures related to users and clients have typically not been the main focus in debates on architecture.

In Norway we have had a strong focus on functionality and a tradition for user involvement in the planning and design of buildings since the 1960s. The Norwegian researchers joined CIB Task Group 51 quite from the beginning, bringing their experiences from several projects on post-occupancy evaluations, briefing, knowledge workplaces, and other projects focusing on the relations between building and users. Early in the usability work, the meaning of functionality and usability was heavily debated. From a Swedish case study of a university hospital, Granath et al. (2004) argued that one should distinguish between the terms functionality and usability. They stated that functionality alone does not make a certain artifact usable, but rather the usability is dependent on the situation in which the artifact is used, the context in which the artifact is designed, and the values of the persons involved. van der Voordt and van Wegen (2005) discuss the criteria for functional quality and relate usability only to physical accessibility. Their description of the concept of functional quality is, however, quite close to the usability definition used in our work.

In the work of Davis and Ventre (1990) and Davis et al. (1993) we also find a similar understanding of buildings’ delivery to an organization’s value creation. Davis distinguishes between the terms performance and serviceability. In Davis’ reasoning, serviceability seems to be quite synonymous with the understanding of the concept of usability defined by ISO 9241-11. The approach of looking at buildings as a means to fulfill strategic objectives and not only as a way to house people and activities is supported by the work of Becker and Steele (1995), Horgen et al. (1999), and Grantham (2000). This approach is also in line with Joroff et al. (1993), who describes corporate real estate as the fifth resource for production.

Studies of the usability of buildings originate from the field of facilities management (FM) and construction management, where the focus and interest have shifted from building quality from a technical perspective to a use of building perspective. This shift represents a significant change from looking at buildings as end products and measuring their technical qualities and functional performance to looking at buildings as a means for the core businesses to achieve their overall goals and objectives. Another consequence of this shift has been for buildings to be regarded as artifacts which interact with organizational processes and information technologies (Gjersvik and Blakstad 2004a and b, Fenker 2008, Neonen 2005).

The shift in perspective and understanding has also revealed a lack of theory and relevant, valid, and reliable methods and tools to assess the usability of buildings. Even though there are a number of different methods that have been used regarding post-occupancy and building performance evaluations, to a large degree they have dealt with limited or specific aspects of
building in use, and not necessarily the buildings’ usability for users and core businesses. Usability can in many ways been seen as a “wicked problem” (Granath and Alexander 2006, Rittel and Webber 1973). Complex problems or topics need a much more holistic approach and a multi-method strategy to give valuable and transferable knowledge (Blakstad et al. 2008). The CIB W111 group was established to develop concepts of usability for application in practice and to promote, develop, and share methods, processes, and techniques for the evaluation of buildings in use. The research presented in this paper has aimed to establish usability as a knowledge area that covers several disciplines (Klein 1983, Holland 2008).

In this paper we sum up the Norwegian research on usability from the last 6–8 years. We present the development of this field of knowledge from the first understanding of the concept of usability, to the development of theory and methods, and to the presentation of the USEtool framework. The paper reflects on the experiences from the studies, sums up the learning, and discusses impacts and directions for future research within the field of usability.

METHODS AND APPROACH

The Norwegian contribution to development of usability as a “body of knowledge” has mainly been on developing methods and tools to assess the usability of workplaces with a specific focus on the effects of buildings for the users and core businesses. Parallel to the development of the theoretical field, we have carried out several case studies to explore usability and to test and develop the applicability of the methods. The case studies have been carried out in close collaboration with our business partners in “real life,” i.e., in ordinary working situations within the organizations. Our case studies have been university colleges, offices, and secondary schools. The presented research is based on action research (Lewin 1946). Our work can be described as a “real world enquiry” focusing on practice, with the limitations and challenges this implies (Robson 2002). The validity, reliability, and the generalizability of the methods in general will be discussed later in this paper. Our research and development has proceeded through a program of action research, combined with a series of associated workshops with international researchers in connection with the CIB W111 Usability Group (Alexander et al. 2004). The different cases have used different approaches, focus, and methods to explore the concept of usability. We have worked in association with occupying organizations to produce research findings within a “business” framework. A key element was to work through a series of interactive “best practice” workshops to consider the results of case studies of buildings in use. The workshops involved the participation of organizations, which were organized as clusters of “stakeholders” to represent the interests of owners, occupiers, and operators of buildings. Research data were assessed at the level of holistic cases (projects) and embedded cases (incidents within projects), and through cross-case comparisons at both of these levels (Alexander et al. 2004).

One of the success factors in our work has been the development of theory, methods, and tools through a continuous learning process, both within the international CIB group and our national case studies (Jensø et al. 2004, Hansen et al. 2005, Hansen and Knudsen 2006, Blakstad et al. 2008, Blakstad et al. 2010, Hansen et al. 2010 a).
DEVELOPMENT OF THEORY
The development of the concept of usability was essential to be able to analyze the cases. It became clear that there was a need for building a firmer theoretical grounding. An important field of research relevant to mention in this regard, is post-occupancy evaluation (POE). According to Preiser et al. (1988), one of the pioneers from the 1960s, a post-occupancy evaluation is the process of evaluating buildings in a systematic and rigorous manner after they have been built and occupied for some time. Both theory and methods have since been developed from a more technical focus to a more holistic, process-oriented approach, as described in the book *Building Evaluation* by Preiser (1989) and later developed in the works by Kaplan and Norton (1996), Preiser and Schramm (1997), the Federal Facilities Council (2001), and Steinke et al. (2010), Preiser and Vischer (2005), to mention some important contributions. The Norwegian approach to this research was to establish a preliminary theoretical background for understanding and exploring usability of buildings partly based on the four case studies already carried out by the CIB network and partly based on our own research and experience (Jensø et al. 2004). During the first case study it became evident that there was a need for a more operationalized understanding of the three main elements of usability: efficiency, effectiveness, and satisfaction (see Figure 1). From this case we also recognized a need for further development of the theoretical framework, and criteria, methods, and tools for measuring usability from different users’ perspectives. The framework shown in Figure 1 (Arge 2004) was developed and based on earlier theoretical work from CIB TG 51 (Alexander et al. 2004, Jensø et al. 2004).

**Figure 1: Framework for usability criteria (Arge 2004)**

<table>
<thead>
<tr>
<th>Related to organisation</th>
<th>Related to building</th>
<th>Added value</th>
<th>for employees</th>
<th>for customers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Efficiency</td>
<td>Effectiveness</td>
<td>Satisfaction</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Production time/cost per unit produced (services or products)</td>
<td>• Operation cost/sqm</td>
<td>• Increased potential for ...</td>
<td>• Improved conditions</td>
<td>• Improved</td>
</tr>
<tr>
<td>Development time/cost of new products</td>
<td>• Sqm/employee</td>
<td>• Innovation</td>
<td>• Accessibility</td>
<td></td>
</tr>
<tr>
<td>Time/cost because of interruptions due to changes in the use of area</td>
<td>• Number of users/sqm/h</td>
<td>• Productivity</td>
<td>• Image and identity</td>
<td>• Accessibility</td>
</tr>
<tr>
<td></td>
<td>• Time/cost per change in the use of area</td>
<td>• Flexibility and adaptability</td>
<td></td>
<td>• Value of products and services</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Communication</td>
<td>• Air quality</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Learning/development of knowledge</td>
<td>• Lighting conditions</td>
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<td></td>
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<td>• Temperature</td>
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<td>• Aesthetics</td>
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<tr>
<td></td>
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<td></td>
<td>• Image and identity</td>
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<td></td>
<td></td>
<td></td>
<td>• Functional performance</td>
<td></td>
</tr>
</tbody>
</table>
An important outcome of the early theoretical discussions was the conclusion that usability should be related to organizational, technological, and spatial factors in a wider framework, not just to the individual user. Chan, Beckman and Lawrence (2007) argue that despite a long tradition of studies on organizations there has been relatively little systematic work linking the built environment with organization theory and vice versa. On the other hand, we find literature that strongly underlines the effect that the built environment has on several aspects of organizational functioning (e.g., Becker 1981), and the fact that the built environment defines the context in which work processes, services, social interactions, and outcomes take place (Becker, 1981; Bitner, 1992). Alexander (2008) underlines that when seen in an organizational context buildings usually will be part of a portfolio of buildings and are evaluated in terms of their asset value. He argues that the tools and metrics for considering the use value of buildings are less well developed and understood. This is in line with Granath and Gilleard (2008), who state that usability cannot be evaluated simply on the basis of the product alone but should also be evaluated with respect to how the product is perceived by and interacts with the user. Fenker (2008) relates usability to user experiences and social relations between users and facilities, and argues that usability is a process that only can be understood as a social construct.

An important objective has been to explain the concept of usability in a way that makes it easier to understand and more manageable for evaluation. We focused on the following questions:

- **For what?** The definition of usability emphasizes the fact that there are specified objectives to be achieved. We have seen that there is a need to define the activities that are to take place.
- **For whom?** As the definition of usability designates specified users, it is important to define which user groups are in focus. There is a need to define both the user level (individual, group, user organization) and the type of user (user group). Different user groups may have divergent or even conflicting views of usability.
- **Where?** Users’ experiences should be related to space or place. This means that in usability evaluations there is a need to relate users’ experiences to specific physical surroundings.
- **Why?** Discovering factors that enhance/inhibit effectiveness is not sufficient. The next step is to understand why. This is essential when the knowledge acquired is to be applied in order to generalize and provide knowledge for the benefit of later projects, or to improve existing solutions.

Our work on usability has created a need to elaborate on the question “Who is the user?” The ISO 9241-11 definition of usability clearly underlines that usability is dependent on context and specified users’ perception and experiences. In one of the first workshops we distinguished between employees and customers regarding user satisfaction and discussed efficiency related to organization and building (Figure 1). Quite early on we found it necessary to nuance the understanding of the user concept, because there had been tendencies towards a simplification in how users were addressed. Most discussions about users tended to more or less implicitly assume that there is only one group of users. However, previous work has distinguished between different aspects of the user concept and different user categories have been addressed in some stakeholder literature (Jones and Wicks 1999; Samset 2003; Atkin and
InnovatIon and usaBIlIty In FM

According to Atkin and Skitmore (2008), stakeholders can be categorized as either internal or external: internal stakeholders are directly involved in a project, while external stakeholders are not directly involved in decision making, but are nevertheless influenced by a project. Kernohan et al. (1992) make a distinction between stakeholders on the demand and the supply side, and defines three different kinds of users: occupants, visitors, and owners’ or tenants’ organizations. Alexander (2003) highlights two important roles representing the users’ side in facilities management: the intelligent client and the informed buyer. In Norwegian facility management literature, three fundamentally different roles are described: the user, the owner, and the facility manager (NOU 2004, Haugen 2008, Sæbæe and Blakstad 2009).

We have built on these findings, and attempted to take the issue of identifying the user one step further. In the latest contributions from Norwegian usability research, a model for user categorization is proposed (Olsson et al. 2010). We have chosen a supply chain approach. In the supply chain approach, services are produced, and have their origins in a building. In our model we therefore look for customers in a number of steps of the supply chain, originating in the building itself and focusing on activities taking place in the building. The user categories included in the model are:

- Owners
- Facilities management (operating the building)
- Management of the organization based in the building (representing the strategic level in the user organization)
- Service providers (employees performing activities in the building)
- Service receivers (users benefiting from the service provided, typically customers of the service providers)
- Indirect service receivers (people with a relation to the service receivers, such as customers of the service receivers)

This model can contribute to a nuanced understanding of users and user needs in different parts of the supply chain. The model may also question the concept of “end user,” as it focuses on a set of users with different perspectives rather than highlighting one particular user group as the most important.

DEVELOPMENTS OF METHODS

According to Steinke et al. (2010), there is no industry-accepted definition of building evaluation, nor is there a standardized method for conducting such evaluations. In contrast, different building evaluation methods and tools evidently range from specifically assessing limited aspects to generally assessing whole building designs. A search of the literature on building evaluation revealed a number of different evaluation tools that have been developed to assess a certain design or building in use. An overview of different tools can, for instance, be found in Baird et al. (1996) and van der Voordt and van Wegen (2005). However, in practice, we found that several of these methods look at buildings as a physical object and do not associate them with their usability. This observation is supported by Alexander et al. (2004) who claims that
conventional approaches to building performance often focus on technical, functional, and operational aspects of their use. Similarly, in a study by Steinke et al. (2010) four dimensions were defined: service, functional, physical, and financial performance. From 17 building evaluation tools in their study, only one tool covered all four dimensions simultaneously.

As mentioned previously, one of the strong traditions in this context has been post-occupancy evaluations (Preiser et al. 1988). The methods and focus have shifted towards a more holistic, process-oriented approach. This means that not only facilities but also other aspects such as organizational, economic, social, and political aspects are taken into consideration (Preiser and Schramm 1997; Federal Facilities Council 2001; Steinke et al. 2010). An interesting framework to mention here is the Building Performance Evaluation (BPE) Scorecard based on the multi-dimensional framework Balanced Scorecard (Kaplan and Norton 1996). The BPE Scorecard views facilities from four perspectives or performance dimensions, and allows a variety of existing evaluation tools to be incorporated into the methodology.

The OECD (2000) defines an evaluation as a “[s]ystematic and objective assessment of an ongoing or completed project, program or policy, its design, implementation and results”. In general, we can distinguish between different approaches in ex post-project evaluations. Evaluators, especially those who aim at including a user perspective, typically prefer holistic evaluations based on a diverse set of approaches and indicators which are typically combinations of quantitative and qualitative evaluations (OECD 2000). The development of methods and tools has been conducted parallel to the development of understanding and theory related to usability. From our starting point in the ISO standard definition of usability, it was quite clear that usability evaluations should be based on different user’s experiences and assessments of how well buildings perform. In order to assess usability one has to focus on the effect of a building in relation to the core business’s fulfillment of goals as well as the end user’s satisfaction and experience (Blakstad et al. 2010). Consequently, usability evaluations should be based on different methods and aspects, depending on objective, purpose, focus, competence, and resources.

As described earlier, we aimed to answer not only questions of what, when, and how much, but even more importantly why, where, and for whom. The first Norwegian case study focused on how different users experienced and evaluated usability, and discussed the validity of current use in relation to the original plan and brief. The main conclusion from this case study was that different stakeholders and organizational levels in the university college had different perspectives regarding the usability of buildings. The term usability is interpreted and understood in different ways, and these are mainly a matter of perspective and context. (Hansen et al. 2005). Several traditional qualitative methods, such as interviews, document analysis, structured group interviews, walkthroughs, and workshops have been applied in order to study their relevance and applicability for different aspects of usability.

As a part of the development process, also questionnaires such as ASTM (American Society for Testing and Materials) and DQI (Design Quality Indicators) have been tested. Each test has concluded with a discussion with the user representatives on how the methods and parameters
worked. Based on methods and tools from the field of post-occupancy evaluation, we have developed and refined the methods by discussing their relevance for different aspects of usability evaluations. In this context, aspects such as purpose of evaluation, user perspectives, user categories, parameters for evaluation, scales and measurement, and levels of evaluation have been discussed (Blakstad et al. 2008). Blakstad et al. argue that the complex nature of usability highlights the importance of triangulation of methods (multi-methods strategies) and interdisciplinary research or evaluation teams with different backgrounds and skills to perform the evaluation. Parallel to the work of developing the theory and methods used, we also had to discuss the validity, reliability, and applicability of the results of usability evaluations from a more theoretical perspective (Hansen et al. 2010b).

**IMPLICATIONS IN PRACTICE – GUIDELINES AND HANDBOOK**

An important objective for the Norwegian research was to make the concept of usability operational. As a result, a common usability framework or methodology named USEtool has been developed. It should be emphasized that USEtool was to be used by organisations themselves for evaluation. Methods and tools should be easy to use but give both an overview and more in-depth knowledge. The recommended process consists of five stages (Figure 2), together with a description of the goals, methods, and tools used and the expected results from the application of each method and at each stage (Blakstad et al. 2010, Hansen et al. 2010b).

**Figure 2: framework: the evaluation process (Blakstad et al., 2010, Hansen et al. 2010 b)**

USEtool and the evaluation process are described in a handbook (Hansen et al. 2010b), which guides evaluators through five stages, as shown in Figure 2, including an introductory identification stage (topic and scope of evaluation, and investigation of organizational objectives and relevant user groups), a systematic general usability mapping (collection of project documentation and structured group interview), and a walkthrough with more in-depth qualitative studies of specific usability topics. The last stages of the process include comparing the findings with the objectives (in a workshop with end-users and managers), and developing recommendations for improvements to existing buildings or briefing on new facilities. The framework reflects the importance of understanding and taking in consideration the contextual conditions that may determine the outcome of users’ experiences of a given building or workplace (Hansen et al. 2006; Fenker, 2008).
Methods used in the USE-tool methodology comprise document analysis, interviews, structured group interviews, walkthrough, and workshops. The USE-tool provides a rather open framework, within which different topics and issues may be focused on, according to the need and possibilities in the studied situation. Within the framework, other methods may be added in the different phases, such as additional quantitative surveys in stage 2 (mapping), observations or other qualitative methods instead of walkthroughs in stage 3, and different workshop techniques in stage 4. For a more extensive description of the methodology, see Blakstad et al. (2010 a) and Hansen et al. (2010 b).

RESEARCH VALIDITY, RELIABILITY AND GENERALIZATION

An important matter for discussion is whether the results or findings from usability evaluations can be considered valid and reliable, and whether context-dependent knowledge from usability evaluations can be fed forward into new projects or be generalized and added to a more generally applicable body of knowledge. Generalization has traditionally been a concern related to qualitative research (Fellows and Liu 2008). On the other hand, Flyvbjerg (2001) argues that the key advantage of qualitative research is its ability to give insight into local practices and to develop a nuanced view of reality.

Reliability is related to consistency of a measure. A key question is whether research can be repeated with the same results. Moisander and Valtonen (2006) suggest two ways to improve reliability in qualitative research: one is to make the research process transparent, and the other is to pay attention to theoretical transparency. The methods to summarize information may be affected by judgmental subjectivity. To a certain extent such subjectivity is desirable, as we want to map the perceptions of different user representatives. The problem of reliability may therefore be considerable in each of the sub-studies. To compensate for this, several studies should be made.

Validity concerns how well a given measure does in fact measure what it is intended to measure. To address validity using our model, several evaluation methods are used, allowing for method triangulation. The combined use of methods gives a better measure than each of the methods independently. According to Yin (2003), case studies using multiple sources of evidence are generally rated as having a higher quality, compared to those that rely only on single sources of information.

Generalizability refers to the extent to which findings from one study apply to a wider population or to different contexts. In relation to usability, generalizability can be discussed along two dimensions: generalizability of experiences from the use of the proposed method, and subsequently generalizability of the results of studies. The experiences of using usability evaluation methods are likely to have a higher degree of generalizability than the actual evaluation results. However, more generalizable results from usability evaluations may be established through a series of replications and validations. As the number of studies with consistent results grows, the degree of confidence in the findings should increase. As the number of case studies increases, it will be possible to perform meta-analyses of the cases, similar to the way meta-studies...
Innovations and usability in FM studies are commonly used, for example, in medicine. In our case, a uniform way of conducting usability evaluations, such as USEtool, will enable us to perform meta-analyses of our evaluations and hence improve the generalizability of the findings.

Further, from what we have seen in the case studies and tests, the described methods and tools truly assess usability within the given context, with special focus on the effectiveness of the facilities and their ability to support value creation in the user organization. One may argue that the contextual knowledge gained from applying the methods described is as important as the generic results for building performance. The main contribution is the way these methods are combined in a structured framework with process descriptions and easy-to-use guidelines, as well as the operationalized relation to effectiveness and usability (Hansen et al. 2010 a).

**IMPLICATIONS FOR PRACTICE**

The development of theory and methods related to usability has been conducted in close cooperation with business partners. Partners had an impact on critical choices to ensure that the methods incorporated in USEtool are possible to perform in “real life”. The long-term relationship with the partners were continued in the Nordic project REBUS (2007–2009). During the project, researchers in Sweden, Finland, and Norway continued to develop usability as an emerging field of knowledge in an action research setting. In REBUS we saw usability evaluations as phases in continuous developments loops within the “context of use” (Blakstad et al. 2010 b).

The USEframe framework (Figure 3) was developed in order to map and understand the different research approaches used within REBUS (Lindahl et al. 2011).

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**Figure 3: The USEframe model (Blakstad et al.2010b, Lindahl et al. 2011)**

- **Context of use**
- **Context of action**
- **To be**
- **As is, use**
- **Knowledge development process, info, data**
- **New knowledge**
- **Guiding principles, governance**
However, we believe that USEframe has a wider implication than mapping research. It may also be used to frame innovation and development processes within different contexts of use. Together with two of the Norwegian research partners this has been developed further to implement assessments of usability and knowledge gained from usability evaluations to formalized briefs (Statsbygg) and systems for governance and workplace management (Statoil).

One example is Statoil, where usability evaluation has been used as means to improve workplace management. Statoil has developed a set of process descriptions for workplace management, guiding the entire process of relocation and management of corporate office space. The communication between end users, managers in the user organization, facilities management, and consultants developing briefs and designs is crucial for improvements in workplace design and management. In USEtool this is facilitated by bringing together different actors to discuss and learn from each other, always focusing on the strategic issues (organizational objectives). Blakstad and Torsvoll (2010) explore the possible uses and benefits of implementing usability evaluations in different phases of the workplace management processes in Statoil. Their conclusion is that the knowledge development process (as shown in Figure 3) is especially relevant to the workplace management process prior to large-scale construction or renovation projects. New ways of working or new technology require the development of new types of workplaces. In addition, innovative concepts need evaluation for future development and adaptation. Usability evaluations may also be useful to assess workplaces with undiagnosed problems.

Statsbygg, one of the other partners involved in the usability work, has been a major driving force in work on standardization of briefing structure and information in Norway and has developed several standard procedures and routines for their projects. Statsbygg’s interest in this work has been to develop their briefing processes both for new buildings and the improvement of existing facilities in order to gain a better understanding of users’ needs and expectations and also how buildings and facilities can support the achievement of organizational objectives. Statsbygg uses major user participation in their briefing and design processes, but has not had a systematic system in place for evaluating buildings in use. The users’ contributions to the briefing process and responses from user surveys were usually based on their own experiences and views, and not necessarily related to their respective organizations’ objectives. To improve the input to the briefing and design process, it was important to also understand why and for whom the different solutions were failures or successes.

One important motivation regarding existing facilities has been to use evaluations in order to be more proactive regarding facilities management, and play a more strategic role towards their tenants. The biggest advantage of using USEtool has been gaining contextual knowledge of how various solutions work and how to avoid copying bad solutions from one project and user organization to another. By using the methodology, Statsbygg was able to develop a systematic dialogue between owners, occupants, and Facilities Management staff in order to improve briefing for new buildings.
Usability evaluations give feedback on users’ experiences of their environment. The value of such evaluations for feed forward into new projects or improving existing facilities lies mainly in the ability to understand users’ experiences and to translate them into adequate products and solutions. Consequently, the results of research related to evaluation should be quickly and easily accessible to clients, designers, decision makers and others involved in the building process. We believe that development of knowledge and tools within USEframe will help structure the further implementation of usability knowledge and tools in practice.

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5.4 FACILITIES IN USE – NORDIC STUDIES ABOUT USABILITY OF WORKPLACES

Göran Lindahl, Suvi Nenonen, Geir K. Hansen and Siri Hunnes Blakstad

ABSTRACT

Purpose and background: The stakeholders and end users in the field of construction and real estate need versatile and systematic feedback data about the usability and functionality of the buildings and the quality of the facility they use. This is needed to support and govern the design, construction and FM processes when developing facilities. To achieve this, methods concerning project management of the design process are needed as well as methods to capture the characteristics and aspects that support usability.

Approach: Based on the three national studies in the research project, User-oriented Benchmarking for Usability and Sustainable Performance of Real Estate, REBUS, knowledge has been developed concerning issues related to usability of facilities in use.

Results and practical implications: In the project it was confirmed that previous research on briefs and methods to capture user needs is relevant. It also became clear that these methods need to include management of action and be supported by information technology. The role of the users as well as effective feedback systems crossing project barriers also needs to be developed. The identified need of development also affects project management and the role of the project manager. In addition, the focus on methods and processes needs to be complemented also by a theoretically based discourse.

Keywords: Facilities Management, Usability research, End-users, Construction clients, Methods

INTRODUCTION

The field of construction and real estate is often accused of not utilizing experiences from earlier construction projects and repeating the same mistakes and irregularities. The same accusation goes for the selection of design solutions and the resulting usability and functionality of premises and buildings from the end users’ perspective. The stakeholders and end users in the field of construction and real estate therefore need versatile and systematic feedback data about the effects of the buildings they use. This is needed in order to develop operations and provide operational environments and services that support the core business. The focus of customer-orientated construction and real estate business should be on recognizing and meeting the users’ needs as well as including the users in the process. This requires development of the design, construction and Facilities Management, FM, processes. To achieve this, methods concerning project management of the design process are needed as well as methods to capture the characteristics of aspects that support usability.

The REBUS-project, which is reported in this paper, was based on three research projects. The Finnish group came from Construction Economics and Management in Aalto University. The
Norwegian University of Science and Technology (NTNU) in Trondheim was represented by researchers from the Faculty of Architecture and Fine Art and collaborated with SINTEF, research institute within the building, construction and housing sectors. Sweden was represented by a team from the departments of Construction Management and Architecture at Chalmers University of Technology. In addition to these there have also been participants from Denmark and Iceland.

The REBUS research project addressed two perspectives/approaches where end-user orientation has a major role. These two were:

- How to achieve usability by the support of the project management processes in construction, *The project and facilities management approach*
- How to achieve usability through benchmarking of usability and of buildings in use, *The benchmarking approach*

The first is connected with defining and setting the criteria and values guiding the construction process and concerns the processes to capture information about usability as well as to develop processes to transform this information to knowledge between different stakeholders. The second approach is on the information and data gathered to be used in benchmarking buildings’ usability and functionality from the end user perspective. Such perspective is needed to develop a systematic and continuous feedback system based on end-user expertise and influencing the value chain from everyday use to design, construction and maintenance of real estate.

The objective of the research project was to develop and suggest methods that would enable innovative and effective project management in the provision of facilities as well as to develop methods to assess usability of facilities based on end-user requirements. The REBUS-project took its starting point in a user-orientated approach, an approach that starts in the use of facilities and not in the construction process that delivers the facilities. The overall aim was to achieve more efficient use of buildings and develop processes in design and construction enabling this. It is not only about reorganisation of processes but also about a change of values and roles during the processes. For the research group as a whole the aim was also to develop a framework model that could communicate and relate different approaches to understanding use of facilities (Lindahl et al. 2011).

**THE REBUS PROJECT – STARTING POINT**

New structures and rapid change of conditions in businesses as well as a growing global mobility are new conditions for design and provision of buildings and building services. An increasing speed of change makes general rules and values less relevant and conceptions tied to time, place, situation and context become more important. In addition sustainability, adaptability and life cycle costs have come into the agenda. Consequently the conception of what is useful and adequate for businesses and organizations must be related to use and effect rather than specification and function. Experiences from research on usability indicate that cultural differences are important issues when developing more useful and sustainable environments.
This has changed our conception of both the meaningfulness of buildings and the process of designing and managing buildings. Other significant development also occurs in ergonomics, work organizational and management research. In ergonomics, for example, more integrated and participative processes of continuous involvement are considered proactive and beneficial to achieve a fit to the requirements (Berlin 2009). It is also known that, at least in some situations, participation in workplace design is a powerful vehicle to development of the work organization and learning in organizations (Lindahl & Granath 2006). This is especially important in knowledge organizations where commitment and trust is crucial to staff performance (Fenker 2008).

Depending on how well buildings serve their purpose and produce good experiences for their users, they contribute to the efficiency of the user organization. Traditional programming of buildings focuses on the properties of the building itself. However, this has caused difficulties when the design and effect have not been working along the intentions that governed the original project. Issues like value-management, process orientation and studies of how to incorporate users in the construction process have been the result. The outset for the research presented in this paper is that it concerns usability of facilities in use.

**Usability**

An aspect often discussed when studying a building’s attributes is functionality. *Functionality* can be defined as a property given to an artifact to create a *practical effect* (Warell, 2001). An important effect can be described as *usability* (ISO 9241-11). As usability is an experience of facilities in use it is also important to recognize functions that may have been unintended, therefore the use as such has to be the starting point rather than defined functions. In ISO 9241-11 three factors are described that determine usability. *Efficiency* means that the artifact allows the users to perform with ease and with little use of resources. *Effectiveness* describes the ability of the artifact to deliver a certain desired effect. The third factor is *satisfaction* that describes the users feeling and attitudes to the artifact and its effects.

It is also important to recognize that the technical and physical properties of the artifact and its theoretical potential to deliver a certain effect do not automatically make it usable in the real world. As a result of the definition of usability it also depends on the *situation* in which the artifact is used, the *context* the artifact is designed and used in and the *values* of the designers and users. A similar finding in ergonomics state that “political sensitivity” is needed to understand and change the workplace (Berlin et.al. 2009). Both context and values change with *time* and *place*. Usability may through the connection to time and place also be understood as the relationship between users and buildings (Blakstad 2001). This is always socially constructed (Fenker 2008). This means that the usability of a building never only depend on the building. Usability must be understood in *context*. The contextual aspect of usability also highlights that usability is affected by cultural differences. *Culture* can be defined and interpreted related to both organizational and societal aspects. More broadly Hofstede (1984) suggests “Culture is the collective programming of the mind which distinguishes ... one group ... from another” It is a simple but effective definition that is easily recognized even though international standards are...
being imposed in many places, however, it is clear that in different settings different behavior, and use, is appropriate.

**The project and facilities management approach**

The purpose of the REBUS project was to develop and suggest methods that would enable innovative and effective project management in the provision of real estates and facilities as well as to support client organisations in their continuous development of use of their facilities. The conditions and prerequisites for the project management professional, or other external consultants acting as the client’s representative was found to be of great importance. This also puts a focus on the logic governing the actions of the project manager as well as the client, both acting to effectively achieve client’s goals in the construction project management process and in FM processes. Knowledge regarding these processes should make it possible to create innovative methods for facilitating the management of the construction process from conception to completion.

In much of the recent debate on the construction industry, clients are pointed to as the major actor for directing the construction processes and results and there is an increased interest in a more value based and operational-oriented management process (Bertelsen, et al. 2002; SOU 2002:115, Kamara et al. 2002, Ryd, 2003; The Danish Government 2003). This questions the role of design managers as well as construction managers and their relationship to and integration of client’s objectives. The client’s goal of raising quality and implement end user focus and at the same time outsource the management process of finalizing facilities, points to a fundamental gap between two different logics, the one of the client and the one of the construction project professional (Lindahl & Ryd 2006a; Blyth & Worthington 2010). It is reasonable to believe that the development described above will lead to a need for experts who understand the differences between a strategic/external or operative/internal management processes without focusing too much on building-related solutions. In a situation where there is an increased need for professional clients and the aim of the construction project professionals to engage in a wider range of tasks, there is a need for an innovative approach that develop roles and relationships that satisfy the client’s objectives and contributes to collaboration between stakeholders in the construction process. This implies a possibility for project management professionals in construction and FM to develop and provide expanded services to clients. Alternatively, new actors among other professionals in the construction sector may appear with a starting point in areas like value management, value engineering, agile management, lean concepts etc.

**The benchmarking approach**

Along with a growing focus on efficiency and customer orientation, the significance of paying attention to the needs of the end-users has grown. It is not enough to produce premises and buildings to the market; they must also support the companies’ business and the various actors in the field (contractors – developers – owners – managers – companies providing maintenance services – FM companies and organizations) require detailed and up-to-date information about the buildings’ user and their experiences (Preiser W. et al 1988; Preiser W. et al. 2002).
In the beginning of a construction project or a development project of existing properties, the user’s demands are often sketchy. In order to obtain a more concrete basis for the project, the demands must be recognized and interpreted so that designers, contractors and other professionals can understand them. Most of the end-users’ demands are based on their needs and the operations taking place in the building. Additional demands are made by the environmental conditions and the regulations set by the society and the authorities. The designer has to filter and adapt the end-user’s needs and demands for drafting a plan of action (Kärnä 2004).

The significance of indicators of user satisfaction indicators has increased in the entire field of construction and facilities management. The actors in the field of construction, real estate and FM need versatile and systematic feedback data in order to develop and improve their performance, management and operations (Kernohan et al. 1992; Lindahl & Ryd, 2006b). The focus of customer-orientation should lay on recognizing the users’ needs, giving and obtaining feedback, and supporting the customer’s business. This needs to be done based on benchmarking methodologies that allow for capturing relevant KPIs and/or other data. The methods also need to be able to map changes and development concerning real estate and its capability to meet end-users requirements, thus achieving appropriate usability experiences (Kärnä et al. 2009).

THE REBUS PROJECT – RESEARCH APPROACH AND COMMON GROUND

The research approach had its outset in the fields of FM, real estate, briefing and project management in construction. The three participating universities have cooperated before in network based research projects and could utilize the possibilities to achieve significant research results by combining national projects. Several of the participants are also active in CIB W 111 – Usability group. The group was created to apply concepts of usability, commonly used in the fields of IT and engineering, to provide a better understanding of the user experience of buildings and of workplaces (Alexander et al. 2005).

The work of the research group proceeded through a program of action research, comprising an intensive series of case studies and workshops, in association with occupying organizations, to produce research findings within a ‘business’ timeframe, to satisfy a practice audience, and to identify the scope for further collaboration amongst research partners. The work is based on studies of “facilities in use”. As pointed out in earlier works, evaluation of usability requires multi-method strategies, and combination of both qualitative and quantitative methods (Blakstad, Hansen & Knudsen 2008).

Important tools in the research have been design interventions, walk-through and observation studies, narrative descriptions, structured or semi-structured elaborated interview techniques and workshops based on case reports, made by participants but also more open workshops intended to develop frameworks of concepts in the early exploratory phase.

The Finnish study

The focus of the Finnish study was to develop a systematic feedback method for indicating the key points of usability in the feedback flow in different phases of user processes connected to
the building. The representatives from the industry represented a variety of companies from construction to suppliers as well as client organizations. The main interest was on the use and maintenance phase of buildings. The intention was to focus on usability information, which is indicative and quantitative by its nature. This information serves the purpose to identify the interfaces in user-building relationship, which need deeper investigation in the context of usability. In order to work more with the diagnostic knowledge one has to use more qualitative methods.

The framework for the feedback method was created by analysing existing methods concerning user-satisfaction and customer as well as building performance evaluation methods and tools (e.g. Leaman and Bordass, 2001). Additionally participatory workshops, user panels and interviews were conducted with organisations in the project. The development of the framework, known as PROPAL, consists of the following key phases:

1. Identification of stakeholders connected to the user experience in office facilities and identification of feedback flows between them
2. Determining systematic of collecting feedback
3. Exploring the content and structure of feedback surveys

After mapping the main processes and identifying the entities involved in feedback, the content of each survey was outlined. The usability attributes were defined and the important topics related to them were modified. Lists of various usability attributes already identified in the previous studies were useful in the selection process (Hansen, 2004; Nielsen, 1993). Additionally a comparison with Norwegian projects was conducted. Once the set of relevant usability attributes had been determined, measurable factors for each of these attributes were defined.

The developed feedback system, PROPAL, was piloted and tested in 2009. The case study focused on office users in the Department of Engineering and Building Technology at the Helsinki University of Technology. The questionnaire used contained 93 questions and background information about the respondents. The questionnaire questions were classified according to accessibility, navigation, services, use of office areas, functionality, suitability and comfort. The questions were set as statements and used a scale in which answer (1) described the operations very inaccurately and answer (5) very accurately. No opinion (N/A) could also be chosen as an answer. The sample of the surveys was 80 and the response rate was 71 %. In general, results indicated relatively poor or acceptable level of usability. There were also noticed differences between user groups, which indicate the versatile needs and experiences which are important to investigate further with other methods.

**The Norwegian study**

The purpose of the Norwegian work was to provide building owners, users and Facility Managers with knowledge of usability in order to support continuous improvements. The Norwegian research and development project was divided into two main national projects.
The first part of the Norwegian REBUS project was a post-occupancy evaluation (POE) of an outpatient psychiatric clinic for children and youth. The purpose of the POE was to inform the hospital top management about how effective and efficient the work place concept is for the clinic’s work and activities. The clinic’s work place concept is a pilot project for both psychiatric and somatic units in a new hospital planned to be built after 2010. The results of the POE indicated that apart from the physical and functional shortcomings of the workplace design, the concept as such may have worked better if the clinic’s work modes were collaborative and not individual (Arge 2009). Research and development asserts that programming is a process closely connected to organizational strategies and that programming and development of work place design are concurrent processes. This was not the case in the process of the psychiatric clinic in this study. The case provided valuable insight into the relationship between briefing and usability in the building, as well as more experience of different evaluation methods and their applicability for usability evaluation. The main methods used in this case were group interviews and walkthroughs. Walkthrough was a very effective method to capture different user’s opinions on existing design solutions and to discuss possible alternatives and improvements relating to the same references. (Arge 2009)

The second part was conducted on commission of 3 partners, all of them organizations that develop and manage facilities on behalf of large user organizations. In a number of case studies several methods and ways of doing usability evaluations were studied. (Blakstad et al 2008) The cases were workplaces (offices), a high school and several university colleges. The project aimed at developing a tool that can be used by the Facilities Managers of these organizations in order to evaluate usability of their buildings. The usability mapping tool, later known as USE-tool, was developed in close collaboration with the project partners. The researchers and the project partners used participatory workshops to develop the project’s aims and approach to evaluation, as well as to reflect on the results of various tests. This approach also highlighted the need for a more operationalised perspective on usability, as the evaluations should be carried out by Facilities Managers and not by researchers.

A key product of the research project is a common framework named USEtool, detailing how building owners and Facilities Managers can gather user experiences from existing buildings as a basis for improving existing buildings, as input when planning new buildings, or as a reference when choosing new premises. The recommended process consists of five stages. For each stage there is a description of the goals, the methods and tools used and the expected results from each method and stage (Blakstad et al, 2010). Methods used in the USEtool methodology have been; Document analysis, interviews, structured group interviews, walkthrough and workshop. The framework reflects the importance of understanding and taking in consideration the contextual conditions that may determine the outcome of the user experiences with the building or workplace (Hansen et al. 2006; Fenker, 2008).

From what was found in the case studies and tests, the described methods and tools really assessed usability within the given context, with special focus on the effectiveness of the facilities and their ability to support value creation in the user organization (Hansen et al, 2008).
We acknowledge the fact that one cannot generalize directly from the results of highly context dependent evaluations such as USEtool. The main contribution is the way these methods are combined in a structured framework with process descriptions and easy-to-use guidelines, as well as the operationalized relation to effectiveness and usability.

The Swedish study
The Swedish study was carried out in cooperation with public authorities in Göteborg, Sweden. The authorities that participated were the Premises Office, an organization representing the city as construction client concerning pre-schools, schools, housing for elderly and housing for special needs and two public maintenance organizations for the facilities built by the Premises office. The public forum that characterizes the public sector has multiple stakeholders in several layers of organizations with the added complexity of politics. In this setting projects and project actors need to have reliable information and data to deliver projects that meet the end users requirements and expectations. This requires that the user’s needs are articulated and communicated to documents and briefs as well as related and understood in the management of projects. Issues addressed in the Swedish study were how to measure usability in order to make it possible to communicate in a broad forum as well as to feed into the construction process, more specifically to enable discussions on the actual use and to understand how to manage the outcome of this in the construction project management process.

The objective of the Swedish project was to understand what was considered as usable by the staff in the studied facilities and if aspects or process activities could be measured. The researchers were doubtful if the qualitative aspects could be framed as to create measurements but wanted to try an approach based on the idea that trying to measure at least would support development of more distinct indicators of usability.

The study investigated four projects. Each project was chosen based on that it was completed within the last two to four years. This made it possible that there still would be staff working in the premises that also took part in the design process. The facilities were a preschool, school, housing for elderly and a unit of housing for people with special needs. The focus in the study was how the use of the facilities today was experienced by the staff and if the premises met the expectations that had been discussed in the design process. The study was based on observation, interviews and study of documents. Interviews were only carried out with staff as they were the ones active in the design process and that they also had acted as representatives for the needs of children and elderly. This limitation is valid when the objective is to improve the process of understanding how to implement users’ needs in planning and design processes; however a further investigation of the cases should consider the inclusion of also the people/pupils the staff represents.

The study found that the staff in general was positive to the facilities. The main comments regarding the facilities considered details that to various degrees affected daily use. An example concerned a discussion whether the doors to toilets in the housing for people with special needs should be sliding doors for functional purposes or a traditional door as this better represented
normal standard in housing. In this case there was also a discussion concerning choice of floor-
ing material. The staff argued that as these facilities were the homes of the people living there
they should have a home-like character rather than an institutional. Another example was the
housing for elderly were the comments concerned the effects of decisions made outside of the
project, in the political structure, to locate the district central kitchen for services of also other
facilities to the new home for elderly. This made waste management and cleaning functions
more cumbersome and affected they way you reached the lifts and staircases in the building.
It did not hamper the use in general but was not an ideal solution. Most of the comments in the
interviews, however, concerned how the staff had experienced the process of discussing their
needs and requirements with the project manager brought in to deliver the project. The staff
experiences put focus on several issues, e.g. PM and the impact of interaction and behaviour,
how users can argue and discuss their experiences of use and how users understand manage-
ment processes and what governs these.

RESULTS – FRAMEWORK AND PRACTICAL IMPLICATIONS

Based on the three studies knowledge have been developed concerning several issues related
to usability of facilities in use. The projects have highlighted the need for thorough evaluation
and briefing as key processes to achieve usability and effective facilities. The continuing devel-
opment of PROPAL and the utilization of the USEtool, walk-troughs and other methods will
have an impact on the documents and briefs produced for and by the organizations that took
part in the REBUS-project. The notion of the need of development of project management and
the role of the project manager will also affect how processes will be run.

The REBUS-project was concerned with knowledge of usability and how this can be bench-
marked to be used to improve use and operation as well as development of new buildings. It
has addressed evaluation of usability as such as well as the process of implementing knowl-
edge of usability in the construction of new projects and in improvement and management of
existing buildings. The approach has been broad and, as noted before, it is not only about new
methods and better processes, it is also about the actors and what governs them. It concerns
both how we benchmark and how we manage and it has indentified a need to raise awareness
of usability in benchmarking and management of facilities.

There was also a perceived need to bring the national studies into one structure, and to relate
what had been done in the different national studies. During the project several descriptions
had been discussed in order to grasp the different approaches in the national studies and to de-
fine and relate the different projects to each other. This led to a discussion about a framework
that also would enable to position previous research by the research team members as well as
positioning other research related to the REBUS-project. A framework was developed by the
research team and is illustrated in Figure 1 and further discussed in Lindahl et al (2011). It il-
lustrates steps in a process of understanding and mapping use to support action in projects or
FM-processes. It is a framework that can be used to describe processes as well as to map and
relate projects or studies. A typical FM loop could be from “As is, use” via development of new
knowledge, supported by the USEtool, and back to daily use, i.e. to “As is, use” in “Context of
innovation and usability in FM. This is an iterative process of change and possibly improvement. New knowledge can also be forwarded in a structured form, carried by e.g. PROPAL, to projects and action to create new workplaces via projects in the “Context of action” domain. This then results in plans for new or changed facilities, the future use, “To be”.

The feedback software developed in the Finnish study will be tested more in variety of office environments in order to gather more data for benchmarking. Additionally the application to other space segments will be investigated. Further work based on the Norwegian study also concerns methods, the USEtool was tested and further developed during 2010 as a basis for projects focusing on implementation of the tool. In the Swedish study it became obvious that what needed to be measured were the effects of the project management process as this has an impact on how the users experience usability and the design process. The different studies did not point to specific functional aspects of the facilities studied, rather to aspects of the process, from feasibility study to completed building, that has an impact on how the staff experience the facilities they are set to work in. The results underline the importance of the briefing process and a need to develop the role of the project manager representing the construction client.

The practitioners that have taken part have brought back with them an awareness of the importance of understanding and documenting user needs. This is a complex process requiring skills and time. A challenge for the participating organizations, or any other organization wanting to dig into the issues of usability, concerns how they actually do it. How do they relate the methods and tools provided by researchers and experts to what they actually do? Usability is an effect of use and as such not prescriptive which makes it an intangible aspect to discuss, a challenge that requires an organization that is able to connect theory to practice and vice versa. The methods and tools concerning usability also need to be utilized in the organizational devel-
Opment processes, to have effect they need to integrate with management processes. Usability can also be associated to sustainability and finding the most effective solution integrating the two areas is a real challenge for practice.

How projects are run and which actors that shall take part is a question for organizations to address. With tight budgets and need for effective use of resources the what, who and why will also encompass usability. Or shall all facilities be of general and flexible type rather than adapted to the specific use, or rather, where and when does usability matter?

FURTHER RESEARCH AND DEVELOPMENT
In the REBUS-project it was confirmed that previous research on briefs and methods to capture user needs is important. The research approaches in the Finnish and Norwegian projects also focussed development of parameters for measurements and descriptions and were based on established traditional methods. The tools to map and assemble information are there but they also need to be managed in such a way that the information gathered is disseminated and acted upon. The role of the users in these methods as well as effective feedback systems crossing project barriers also need to be developed further. Especially where projects are being owned by several stakeholders as for example a school were the building is provided by a facility provider and the school activities run by another authority or organization. This also raises the question of how to benchmark across organizational units. Studies of integration and inter- and intra organizational transfer of usability data is one area of research developing out of this. It is also important to study how the processes of evaluating usability are managed, not least in the “Context of use”, as in the USEframe, where there is usually no project to carry information.

It is clear from the REBUS-project that there is a substantial amount of R&D concerning facilities in use. The framework USEframe gives a possibility to map and discuss this material. With the initiation of W117, Clients and users, in April 2011 and the previous CIB workgroups W65, Organization and Management of Construction, W070, Facilities Management and Maintenance, W096, Architectural Management and W111, Usability, the field of understanding and delivering what the users need seems well covered. However, much of the research focuses methods and processes. This is relevant, but one could say that we already know that clear information, participation and knowledge dissemination is beneficial. Further development of methods and processes is needed, but there is also a lack of research and development of theory concerning users and their activities in the facilities the construction and FM sector delivers. As much as researchers like the practice nearness in cases, there is now a need to step back and reflect to develop theory to sustain the field of understanding the effects of facilities in use.

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5 INNOVATION AND USABILITY IN FM


5.5 FACILITATING USER DRIVEN INNOVATION – A STUDY OF METHODS AND TOOLS AT HERLEV HOSPITAL

Aneta Fronczek-Munter

ABSTRACT

Purpose: To present the preliminary research results of user driven innovation methods at healthcare facilities and their relevance to research and practice.

Background/Approach: The paper is based on a case study conducted at the Gynaecologic Department at Herlev Hospital as part of Healthcare Innovation Lab, which is a public-private collaboration project testing the simulation and user-driven innovation between users and companies at Hospitals in the Danish Capital Region. The theories presented are user driven innovation, usability and boundary objects.
InnovatIon and usaBIlIty In FM

Results: This article presents different methods used in planning of new hospital facilities and the experiences with using them in practice to improve usability of the built environment. The study focuses on the initial stages of the design processes, specially ‘user driven innovation’ – the participatory design process in which users are actively involved as co-creators. The paper describes the process and its phases, as well as reflects on the results of the user involvement and specific methods. Depending on the methods used at the workshops the participants/users had different focus, changed the priorities and developed different solutions.

Practical Implications: Advice on process and use of boundary objects for future workshops with user groups

Keywords: User driven innovation, Hospitals, Methods, Boundary objects, Usability

INTRODUCTION

Healthcare facilities are recently getting a lot of attention in Denmark, because there are planned 28 hospital projects in next 10-15 years. This includes both new hospital sites and buildings and redevelopments of existing ones. There is also focus on the initial stages of the design processes, specially ‘user driven innovation’ – the participatory design process in which users are actively involved as co-creators, with the aim of acquiring modern hospitals that support the needs of future patients, healthcare professionals and society.

This article aims at presenting the results of user driven innovation at healthcare facilities, which are particularly relevant and interesting for research and practice, because of the variety of different users and major changes in treatment and technology. Best practice examples of the facilitation methods and objects are also relevant with concluding general advice for future workshops with user groups to achieve innovative and usable building designs.

The paper is based on a case study conducted at the Gynaecologic Department at Herlev Hospital as part of Healthcare Innovation Lab, which is a public-private collaboration project testing the simulation and user-driven innovation between users and companies at Hospitals in the Danish Capital Region. The case study is a part of my PhD project about usability briefing for hospitals, which includes studying the methods and results of user involvement in design. My interest in participating in this case was to observe the ways of involving users in planning healthcare facilities.

The article is structured as follows. First, the relevant theories of user driven innovation, usability and boundary objects are shortly presented. Then, the approach is described. The following section presents the results from the case study and provides further analysis of the different methods and tools used at the workshops in planning new hospital facilities. The experiences and results of using them in practice to improve usability of the built environment are sum-
The process of user involvement is described with the phases, and specific methods and objects used are evaluated. Finally, general conclusions are taken and subjects for further study are drawn.

**STATE OF THE ART**

**User driven innovation**

According to von Hippel (2005), innovation is nowadays being democratized, and it is no longer just manufactures, but users of products and services that are innovating. In the traditional, manufacturer-centric model of innovation, the users’ role is to have needs and the producer’s role is to identify them and satisfy them by new products. In a user-centric model, manufacturers invite lead users for usability testing and simulations, where the advanced users can find additional improvements for developing the next prototypes. Furthermore, he claims that most innovating users have characteristics of lead users – they are ahead of the majority of users in their populations with respect to an important market trend.

Ehn & Kyng (1987, in von Hippel, 2005) define *user driven innovation* as introducing a ground-breaking change – now innovation and design is not done ‘with’ nor ‘for’ users, but ‘by’ users! In the recent years, we have seen in some fields that it is truly the users, who are first to develop new consumer products, as the computer software and communication possibilities are steadily growing, resulting in user-centric or user driven innovation (von Hippel, 2005).

The recent research in the Nordic region defines user driven innovation as “the process in which knowledge is being retrieved from users to develop new products, services and concepts. A user-driven innovation process is based on an understanding of user needs and a systematic involvement of users” Rosted (2005), Wise and Høgenhaven (2008).

According to Danish Enterprise and Construction Authority (2010), user driven innovation methods can be divided into three groups:

- **Lead user approach** – first mentioned by von Hippel, where lead users are gathered with the project team at workshops, make rapid prototyping, then R&D department develops the product further
- **Ethnographical approach** – the aim is to find the needs, both known and tacit, by studying the users in their everyday situations, the used tools can be: observations, workshops, interviews
- **Participatory design /innovation** – the users are co-designers, methods can vary and are chosen to fit the exact project

Research in user driven innovation has had a strong focus on products and software. As innovation by users is predicted to grow in the society (von Hippel, 2005), it is worth further examining the possibilities of and experiences with user driven innovation in the building sector. Furthermore, the different methods of user participation and involvement like workshops, rapid prototyping, simulations, interviews and observations can be applied in the process of user driven innovation and tested further in different stages of the design process.
Usability

The concept of *usability* has its origins in product development and the definition by ISO 9241-11 is following: “The extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use” (ISO, 1998).

Usability has been researched in a number of studies, with different focus topics and a variety of understandings are widespread. The main direction of usability research has been the development of theory and methods to capture and evaluate usability to improve existing facilities and to feed forward to new building projects. As my research is focusing on developing the process of usability briefing for healthcare facilities, I am interested in how to plan the facilities, which are usable for the users. I will therefore in this article use the following understanding of usability (Fronczek-Munter, 2011):

Usability of a building is a quality, where

- the building supports and shelters the users and their activities, buildings true purpose (Blackstad, et al 2010).
- depends on context, culture, situation and experience (Alexander, 2008, 2010)


The literature shows a possible focus shift towards usability and user involvement. Alexander suggests that to improve usability “users must be empowered and communities must be offered the opportunity of meaningful involvement”. He argues that there is needed a change of perspective, “from building and its production, to users and the community” (Alexander, 2010). If the Usability of future buildings shall be improved in general, there should also be focus on Usability in preliminary design stages for facilities, for example in idea generation and briefing for new built environments. The important role of briefing on the final result of built environment was stressed in various publications, for example by Barrett and Stanley (1999) and Blyth and Worthington (2001), Jensen and Petersen (2009) and REBUS project (Blakstad et al, 2010). Recent work by CIB W111 on usability highlighted the importance of briefing as a means to achieve usability. The characteristics of traditional, inclusive and usability briefing were listed by Jensen et al. (2011). Furthermore, there are a number of common issues of usability and user driven innovation, which lead to conclusion that user driven innovation can be seen as one of user involvement methods to achieve usability of planned facilities (Fronczek-Munter, 2011).

Boundary objects

The term *boundary object (BO)* was developed by Star and Griesemer (1989) as a concept of problem solving by means of translation.
Boundary objects are described as media of communication between communities. They can be abstract or concrete objects that arise over time from durable cooperation and understood or misunderstood in equality between the participants. The concept has been described further by several researchers, eg. Clarke and Fujimura (1992) define boundary objects as including things, tools, artefacts and techniques, in addition to ideas, stories and memories of community members. Several researchers, e.g. Kjølle and Gustafsson, (2010), Carlie (2002, 2004), Wenger (2000) and Broberg et al. (2011) have been studying the use of BO in literature reviews and case studies of briefing and design processes or product development, and concluded with dividing them into following types and categories:

- Repositories (ie. cost databases, parts libraries),
- Standardised forms and methods (ie. drawings, handmade sketches, lists of problems, questionnaires),
- Objects, models and maps (ie. slideshow, CAD 2D-3D, fishbone chart, mock-ups),
- Discourses (ie. questioning situation, typical action situation),
- Processes (ie. prototyping, visiting other departments)

In addition to that, Broberg et al. (2011) made a list of characteristics of boundary objects. The 4 most relevant for this case analysis are the following:

- BO are not ready made, but objects-in-the-making, need to be created by participants
- BO have built-in affordances, possibilities for action, interaction instruments
- A facilitator of the events selects the BO, develops rules and instructions and guides the workshops
- BO are used in discrete events, workshops with a temporary learning space, enable a collaborative design process, enable participants into “design mode”

Several other publications on boundary objects can be studied further, Boujut and Blanco (2003), Vinck et al. (1996), Wenger (2000).

METHOD / APPROACH

I will use the concept of boundary objects in an understanding of different tools and objects used in workshops. My criteria for analysing and evaluating results with BO are the following: First, how well do they help communication and innovation? Are they easy to use and understand for all participants? Are they bringing new ideas? Second, what is the effect of BO on design solutions?

The three theories described in the previous section can be combined to describe and analyse the case study. In the case study, the involvement of users was executed as a user driven innovation process. Furthermore, the boundary objects were used as tools at workshops and the goal, among others, was to generate ideas for a new workplace, a healthcare facility of high usability.
I, as a Ph.D. student at the Technical University of Denmark, participated in the HIL A project as one of the facilitators, whose role was mostly to observe and facilitate the process, but at few events we were also participants and co-creators of the result. It means that user driven innovation is then of two types: design “by users” and sometimes “with users”. Compared with the traditional design “for users” the case provided an excellent best practice of the extensive user involvement.

RESULTS FROM CASE STUDY
This section will present the case study. First sub-section includes general information about the case study. In the next sub-sections the three phases of the HIL project A process will be described separately. For each phase the characteristic methods, tools and boundary objects used in the workshops will be described with accompanying reflections on the process. Each phase findings are the evaluations of the methods and objects, as well as their impact on the design results. The last sub-section presents general findings and conclusions about the whole process and involved users.

Description of the case – general information HIL
The case study was conducted at the Gynaecological Department at Herlev Hospital as part of Healthcare Innovation Lab (HIL). HIL is a development project which aims to demonstrate the feasibility of establishing a permanent healthcare innovation laboratory. It involves users, hospitals, scientific and research institutions, patients and relatives, as well as companies. The users at HIL are widely understood as the medical staff. The HIL project is funded by the Danish Enterprise and Construction Authority's program on user driven innovation.

Figure 1: Chronological overview of the process and methods at HIL project A
In the beginning of 2010 the objectives and success criteria of the HIL project and its part projects were specified. The studied case is the HIL project A, focusing on functional and organisational planning of hospital facilities. It consisted of observations, workshops and simulations with users at the Herlev Hospital in the period September 2010 – June 2011. The chronological overview of the process and methods is presented in Figure 1.

**Description of process and findings of Phase 1 – Exploring**

At the first meeting the facilitators and users discussed the developing of a future concept. It was important for the group to start with an agreement on the aims and expectations, so the planned activities would run smoothly.

The methods and boundary objects used were post-its with written individual wishes and comments, which were placed on a round bull-eye target poster in order to communicate and prioritise the needs of both groups (Figure 2). The result of the prioritising game 1 about expectations was a set of rules and agreements for further observation at the department, staff and patient involvement in the project. It provided a common understanding of the special legal and ethical conditions of user involvement at the healthcare facilities with respect for clinicians, patients and relatives. It also secured goodwill of cooperation with the user team. The boundary objects seemed to be easily understandable and fitted to the task.

Workshop 2 was an exciting experience for all participants, where the user group and the facilitators were innovating together. The goal was defined as: creating visions for future, defining patient flow in steps through department and prototyping of treatment room. The workshop was loosely structured and the roles of participants were not defined clearly. The boundary objects were blank posters, colourful post its, markers, Duplo figures and blocks. The workshop was very productive, but created opposite and unpredictable results from the two subgroups. One user group was bound to present reality, while defining the patient steps through physical design, but was innovative in prototyping phase and future patient types/needs. They invented a Royal Model, where medical staff comes to a patient room with mobile equipment instead of patients going around the department for specific treatments. The other user group, on the other hand, had untraditional visions, but reduced them to traditional solutions when doing prototyping. The positive conclusion was that in general it is possible to change and innovate with staff and the workshops are very productive. The critical conclusions of the facilitators were the awareness of a need for clearer rules to user exercises in future workshops and the need of clear roles for both users and facilitators. Another critical conclusion was the need for a more specific definition of expected aims and structure of each exercise to achieve a uniform result, as the user groups seemed a bit too free and unfocused at times. Nevertheless, the workshop resulted in some useful results: defined a typical patient flow in steps, provided with some expectations of future patient types and needs and invented a Royal model concept.
The following step was a number of observations at the department (Figure 2), where the facilitators observed specific topics: staff-, patient- and journal-flow and how well the physical environment supports the activities. The individual lists of issues on the three topics were gathered into a common list of challenges in the department. The facilitators achieved a better understanding of the daily routines and issues that need to be addressed in the future plans. The following presentation of the list of challenges in a short and condensed form was recognised by users as an understanding of their recent position and the need of changes.

The Boundary Objects used in the phase 1- Exploring were of three categories. The first two workshops used objects: posters and post its. The third activity, the department visit, was of BO category processes, but also used the standardised forms in the lists of issues. All of the BOs were easily understood by the users and had strong characteristics of BO – they were actively created by participants, gave possibilities for action, and enabled participants into “design mode”. The facilitators learned the fourth important characteristic of BO during the workshops – the need of rules and instructions.

**Figure 2: Phase 1 – Exploring, 1 – Workshop about expectations and 3 – Observations at the outpatient department**

The **Description of process and findings of Phase 2 – Development**
The next stage was a new series of 4 workshops with users which took place at Herlev Hospital. The facilitators prepared the process thoroughly at meetings beforehand and chose potential best tasks, tools and objects that can ease the collective process of communication and design. The expectations to outcome were addressed as well. The facilitators took single roles to play – some were structuring the meeting, some asking questions to specific topics, some were observing and taking notes and some videotaping. The users exclusively discussed the future needs and designed the future possible solutions with each other. The facilitators could inspire or provoke for other solutions than mentioned, but it was the users taking decisions and working on the design. The boundary objects were paper posters, post its and markers and the facilitators were guiding the users through the task by asking relevant questions and helping drawing the maps according to the given answers.
The results of the event 4 were communication maps showing the variety of tasks involving others, different to each specialisation. Exercise 5 resulted in an overview of different task processes of the specialisations. Finally the break downs were identified and marked visually on both of the maps. The conclusion after the tasks 4 and 5 was that structuring the process and roles was helping to gain a comparable result for each user group. The process maps- 5 showed also how the view on the patient flow and staff process varies and depends significantly on belonging to particular professional group of the medical staff.

The workshop with design games – 6 and 7 – was very productive and remembered by all participants. The first task for users was a design game called Ovals – 6 – or Flower. The boundary objects were a poster with abstract oval forms, small papers with icons/photos/names of rooms, and a possibility to make new ones and placing them according to users’ own rules and common agreements. The task was to translate the drawing freely and organise the functions accordingly (Figure 3). The participants were very excited and discussed the understanding of the task and possible solutions. The ideas were innovative and discussions covered both physical and organisational topics. The result was a design of 3 levels with common areas in a central position, and all patients arriving at the same place. Another new idea was a command bridge with a coordinator.

The next design game was Squares – 7. It was meant to continue and further detail the solutions from previous exercise. The boundary objects were also a poster, but this time with a square grid printed on it, yellow and blue squares, icons and names for room functions and Duplo person figures to play staff or patient flow through. The task for the user group was to distribute functions and rooms and organise them with yellow squares for rooms with access to staff only, and blue squares for areas with patient access (Figure 3). The participants felt more restricted by more realistic square rooms, and only one level solution, but tried to keep and translate previous ideas to new rules – kept the central place and many related functions close to each other.

The design results of the exercises 6 and 7 was a functional plan of rooms, first divided in 3 levels, then forced to 1 level, defined physical proximity of functions, corresponding to wishes of the group and imagined expectations of the future patient. Another, unexpected result was a list of needed organisational changes for the future and the awareness of many assumptions and preconditions to organisation, technology, etc. Those were listed by the facilitators on a separate poster while the users discussed the issues.

Phase 2 used BOs of several types. The Standardised methods were drawings and handmade sketches. The Objects and maps examples were communication map, printed posters, Duplo person figures. There were also following Repositories: parts libraries in form of icons, names and pictures for rooms. Another type of BO was Discourses in the form of typical action situation in tasks 4, 5, 6 and 7 or questioning situation in design games 6 and 7, where the standard design and organisation solutions were questioned and new ones provoked. All BOs used in phase 2 worked well as interaction instruments with the given rules and enabled a collabo-
Innovative design process. They were prepared by facilitators and were created by users during workshops. The combination of boundary objects in form of well prepared design games with Objects and Discourses was the most entertaining, productive and innovative.

Nevertheless, the designing process with ovals – 6 – seemed more playful for the users and more frustrating when using squares – 7. The interesting question is what was special about the design game 6 and 7 that the group responded so differently to them and the innovative results seemed easier/harder to obtain? The boundary objects and the task seemed quite similar, but it was much easier for the users to freely distribute the functions, have an overview of the whole department and innovate in the abstract oval forms, than in the more realistic squares. The conclusion is that the abstract BOs were more playful, free and easy to use and enabled the users into “design mode” easily. The BOs in squares on the other hand, were more serious and started many new discussions about details, for example access to daylight and the solutions changed several times depending on the current focus.

The general conclusions from phase 2 are the following. First, the tasks for users shall be structured and planned in advance and boundary objects chosen carefully to give the expected type of results, which can be for example more innovation and new ideas or specifications of details and prioritising of focus areas. Furthermore, the facilitators must be open to hear also other relevant results than planned, and support them too – here the facilitators got aware of a new topic with preconditions and started listing it simultaneously on another poster.

Description of process and findings of Phase 3 – Validation
At workshop 8 – square concept validation – the results from previous design game were developed further and validated through playing specific patients’ flow through them. The boundary objects were the previous posters with room arrangements, but included also typical patient stories to be played through a Duplo person that was being moved around the plan. The finding from that workshop is that the patient stories and the playing of the real patient through the future hospital helped the participants to change and optimise the plan further to fit as many
patient’s and staff’s future wishes and needs as possible. On the other hand the changes were minor and innovative spirit was missing.

The task 9 – 3D – design aimed at further validation and development of the users’ concept for the future facility. The boundary objects used were 3D visualisations of specific areas in the future department (Figure 4). The pictures and plans were prepared beforehand by the facilitators and students according to the notes from the previous user workshops. It seemed to be a great start of new discussions about new topics like the atmosphere and look of the areas, the organisational issues together with interior details and furniture, as well as technical solutions to medical treatments and glass doors. The reality of the pictures allowed the user group to make their previous thoughts more precise. The users presented their results to the department management. The facilitators prepared the slides with updated notes on specific topics and the updated visualisations of the specific rooms. The group seemed very content to see their results looking so professional and real and were very engaged in telling the story. The structured and visual presentation slides may also have eased the process of presentation and explanation of the complex problems and solution ideas. Unfortunately the photorealistic 3D visualisations of the solutions had a weakness of focusing on the room sizes, furniture design and colours, and not so well showing the innovative solutions of the users, which were the organisational changes, proximity and arrangement of functions. If both should be represented in a professional way, then the user group should have had the designing architects involved in the workshops too.

The last event type was a number of simulations – 10. The boundary objects in simulations were paper sheets, empty boxes representing rooms, colourful post its, markers, Duplo figures representing patients and medical staff, egg timers, typical patient flows and typical disruptions. The tasks were to arrange the room boxes on the table and play typical patient flows through department in steps with specified time use (Figure 4). The users and facilitators were playing one figure at a time, moved it between the rooms, drew the walking lines with markers and set the allowed time for each step with the timers. Time in the simulations was played with the
speed x3, so the simulations were fast. The first simulations were representing single patient, doctor, secretary and nurse, but later the number of participants was 10-15 and more realistic. The aim was to test the basic models of functional and organisational plans and evaluate the effectiveness, quality and overview. The exercise was very dynamic and quickly the previous solutions were abandoned and new ones developed by the group. The Royal model from phase 1 was tested too and found ineffective, because of waste in staff time use. Several other concepts and new “what if” ideas were tested. The common reflections of users and facilitators led to development of a new model – the “star concept”. It has a coordination function, like in phase 2, now placed in the central room for medical staff. From here the doctors and nurses have access to the patient's examination rooms arranged around it, in which the patients stay for both the conversations and examinations. The central coordination room is innovative for outpatient clinic both functionally and organisationally. It was easy to make an immediate simulation of the new concept and later test it with users from other hospitals that proved its potential qualities.

The boundary objects in phase 3 were various. Exercise 8 reused “old” BOs from squares – 7 – and was lacking innovation. The 3D models – 9 – were not made by the users directly, their ideas were translated and modelled by others. The table simulations – 10 – were flexible, quick, easy to use and surprised by not only allowing the quick tests of models, but also the strong potential for new innovations. The validation of concepts, turned into innovation and development of new, improved concepts.

**GENERAL FINDINGS – PROCESS AND USERS**

The workshops concentrated on the physical environment. The facilitators got aware that most of the workshops actually had not one, but several parallel themes of innovation. They could be divided into 3 themes:

- physical environment, rooms, needs, qualities and locations, functional plan
- organization, professional roles and activities,
- preconditions for the future solutions,

The finding was that some of the organisational roles have to be redefined and there are a number of political and technological preconditions for the future solutions to be possible to achieve and turn the basic functional schemes to hospital of high usability.

Each workshop and the used boundary objects, previously described in the phase descriptions are summarised and evaluated in Figure 5.

The active workshop participants in the HIL project A can be divided into two groups: users and facilitators. The users in this case were the medical staff including doctors, nurses and medical secretaries, while the facilitators were researchers, consultant companies and various specialists. There were also professionals, who followed only parts of the process as observers, i.e. management from the department and the architect representing new building processes at the hospital, responsible for the client briefing process, competition and coordination with external architects and designers.
There were no patients or architects involved actively in the workshops. There were users participating only in some workshops, e.g. the Senior Hospital Physician at the event 1 and 2, which disturbed the continuity of the user involvement process, as the Royal Model did not get support and ownership from the new user group. The observing architect, representing the client was not co-creating the results, which could have been helpful in the designing and 3D modelling, which in this case was done by others, who were neither part of the group, nor the responsible architects. Moreover, the competition for new facility was already running at the time of the workshops, so the designing architects already received a functional brief, but also couldn’t participate in workshops, as there were several competing companies.
There are several types of users of the built environment. Recent research organised them in some groups, depending on various criteria. Kernohan et al (1992) divides them into demand and supply side, Alexander to client-buyer; Norwegian studies, like Haugen 2008, Sæbøe and Blackstad 2009 – mention the user, the owner, the facilities manager. The article “Who is the user?” (Olsson, N.O.E. et al. 2010) divides the users into 6 user categories, including client organisation professionals, service providers and receivers.

Users actively involved in the case were limited when looking at the panorama of potential users. The workshop participants were mostly medical staff. Patients were not involved at all in the workshops, but were represented alone in the focus of staff on patient needs and types and a few interviews. There are several other types of users of the built environment mentioned in literature and some groups were strikingly missing at the workshops, for example the architects and FM Managers or support staff.

I see a broad picture of the users/stakeholders in hospitals. Apart of medical staff, there are patients and their relatives, client organization (managers, facilities managers and architects), support staff and various external consultants (architects, engineers, designers, work environment specialists etc). The society is an important user in two understandings. First, the individuals are potential patients and relatives, or users of hospital facilities, e.g. public spaces, meeting rooms, cafes. Some are direct neighbours. Second, society is an owner of public hospitals as taxpayers and voters, organised in governmental, state and regional authorities as well as media.

CONCLUSIONS AND PRACTICAL IMPLICATIONS
After the series of workshops with user groups, some main conclusions can be made. The series of workshops had 3 phases and each resulted in a main innovative idea. The exploring phase resulted in a Royal Model, where the different doctors visit the patient’s room. Phase 2 developed the Coordination Bridge and central room for patients. The Validation phase 3 not only tested the previous models, but further developed them into a new Star Model, with central room for medical staff and coordination.

Depending on the methods used at the workshops the participants/users had different focus, changed the priorities and developed different solutions. Some of the BOs, the Ovals design game – 6 – and Simulations – 10 – were most innovative. Both can be characterised by being flexible, open for translation and abstract. The conclusion is that those BOs were more playful, free and easy to use and enabled the users into “design mode” with focus on future needs and design of innovative solutions. On the other hand, other BOs, as Squares – 7 – and 3D design – 9 – were more serious and seemed to lock the participants to current situation and details or were more demanding.

The users actively involved in the case workshops were extremely limited when looking at the panorama of potential users and did not include patients, architects or facilities managers. The user categories at hospitals could be studied further with their potential roles in the planning of new facility and type of involvement.
The use of the workshop results at HIL could also be studied more thoroughly. The workshops in the case did not result in usability briefing; the architectural competition was running parallel already. Nevertheless the results might be used in future workshops with the architects that won the competition for the new hospital. The question to be answered is: how will and could results of such workshops be used?

My recommendations for future workshops about planning hospital facilities are following. First, start the process early, so the results can be used for competition brief. Second: invite a broader range of users and keep the same people in the group. Furthermore, make a strategic plan of user involvement, some shall be actively involved, some only informed and some make decisions. Moreover, plan the aims of each workshop exercise, structure the tasks and roles of individuals, and finally choose the tasks, games and boundary objects carefully to fit the expected focus and type of result.

Further study is recommended in other methods of user involvement for briefing for new facilities apart of involvement in design workshops and simulations. Another method, which was not tested, is evaluation of buildings in use. All relevant methods could be described and results compared. The questions to be answered are: Which methods could improve the design processes with the ambition of creating better and innovative buildings of enhanced usability? How optimal process could look like?

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6 PARTNERSHIPS IN FM

6.1 CHAPTER INTRODUCTION

Geir K. Hansen

Introduction to the topic
The field of Facilities Management has developed and emerged from an operational level 20 years ago, to today's more strategic and holistic view on FM. Still we can have hard discussions about WHAT Facilities Management is? Which activities does this concept cover? What kinds of competences are required? What is core business and what is support? Further questions can be asked on HOW to organize the activities and services required? Which concept is the best regarding organization, resources and outcome?
The answer is probably that there is no one solution or answer to that question, and we can see different concepts depending on several factors like tasks, responsibility, resources, risks, capacity to mention some.

The topic of this session is Partnerships in FM. The most known and discussed concept the last years, at least here in Scandinavia, has been Public-Private Partnerships. Of course this is one of several other possible types of Partnerships. In this session three papers were presented, bringing different perspectives and reflection on this topic.

Kristian Kristiansen, DTU: "To Procure for Better Buildings – FM and Public-Private Partnerships in Denmark"
The paper questions the assumption that PPP's is an advantage for the integration of FM considerations in the planning, design and construction of facilities. The study covers literature review and interviews of participants in Danish PPPs. The results indicate that the effect of PPP’s on the integration of FM is exaggerated, and that FM practitioners should pay more attention to issues related to the sociology of the construction process rather than legal arrangements like PPP.

Nils O.E. Olsson, NTNU: "Flexibility – Implications on Project and Facilities Management"
The paper analyzes flexibility in both a facilities and project management perspective and discusses project flexibility categorizations, perspectives of analysis, flexibility enablers and drivers. The author presents a framework with four approaches to flexibility management and possible implications on facilities management. The paper concludes that is in the interest of facilities managers that projects have an approach for flexibility management to be able to adjust for future changes.

Kresten Storgaard and Jacob Nordvig Larsen, Danish Building Research Institute, Aalborg University: "Long-term buyer-supplier relations in Facilities Management"
The authors elaborate on the anticipation that productivity might rise through long-term collaboration and that the quality of solutions will be better. Four types of collaboration are ana-
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analyzed based on experience and expectations of the firms and customers from empirical findings of a survey and case studies of the Danish facilities management sector. The types of collaboration are assessed with regard to factors encouraging productivity, quality, innovation and economic benefit on customer’s business. The case studies do not bring any single answer to the question of long-term relations between buyer-supplier regarding all the indicators, but a more nuanced and diverse picture. One of the conclusions was that thrust-enhancing mechanisms and a focus on joint problem solving were decisive factors in creating mutually benefiting long-term relationships within facilities management.

General remarks
The session brought three different perspectives discussing several aspects of partnerships in facilities management. The topic of flexibility in the context of facilities management has to be examined further, but indicates that there are some interesting and relevant relationships to other disciplines. Two of the papers were based on studies of Danish facilities management sector, and showed quite clearly that this sector still is immature and under development. There are also still quite few experiences from different concepts regarding partnerships in FM, and that the results from studies being conducted has to be considered critical in terms of validity and reliability.

6.2 TO PROCURE FOR BETTER BUILDINGS – FM AND PUBLIC PRIVATE PARTNERSHIPS IN DENMARK

Kristian Kristiansen

ABSTRACT
Purpose: The paper is based on a research project investigating whether PPP’s are good for the procurement of FM, i.e. are PPP’s advantageous for the integration of FM considerations into the planning, design and construction of buildings?

Background: In Public-Private Partnerships FM services are procured together with the building. This is often assumed to be an advantage for the integration of FM considerations.

Approach: So far literature on PPP has been reviewed, participants in Danish PPPs have been interviewed, the Danish market for PPP projects has been described and a review of literature on issues related to integration of FM considerations in the planning, design and construction of facilities has been made. Some case studies on the influence of elements in partnerships to the integration of FM are being prepared.

Results: The results indicate that the effect of PPP’s on the integration of FM is exaggerated. It is disputed whether PPP’s really deliver better value for money. It is far from evident that PPP’s lead to improved integration of FM consideration. Interviews with actors from Danish
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PPPs projects and review of literature indicate that the structure of the construction process and the relationships between the actors are paramount for the integration of FM.

**Practical Implications:** The results imply that FM practitioners should pay interest to issues related to the sociology of the construction process rather than legal arrangements like PPP.

**Keywords:** Public-private partnerships, Facilities management, Value for money

INTRODUCTION

Background

Buildings are more than just buildings. They are more than just artifacts in the urban landscape. We need to understand buildings in their complexity. We need to understand them as assets that shape the activities that take place inside. Buildings are also costs, because we need them to be heated and supplied with a number of services, not to mention maintenance, repair and renovation. They are also investments that can yield revenue. Buildings are even more than that. They also have serious impact on the environment, they form the urban environment and have impact on the daily life of a great many people, they can drive the national economy into crisis, they are bearers of cultural meanings – the list is almost endless.

In recent years, the Facilities Management profession has argued for the need for integrating FM considerations into the design and construction phases. Similar themes have been discussed in relation to other professional and scientific issues like value, whole life costing and post occupancy evaluations.

This paper is about procurement of FM through Partnerships in general and Public Private Partnerships in particular. PPP’s have been suggested by some as a possible way to secure integration of FM considerations into the design and construction of buildings. The idea is obvious: The so-called special purpose vehicle or consortium between usually the contractor, the FM firm and the financing part is made responsible for both delivering the building and the management of the facility over a long period. Therefore, it is natural to assume that since both the incentive and the expertise for integrating FM considerations are present within the consortium – plus the risk and consequences of not integrating the FM considerations – it will take care that the building will perform at least better than usual in respect to use value, whole life costing etc.

**The approach and method**

The results of the research project that will be summarized in this paper attempts to question this assumption: Are PPP’s a good way of procuring FM facilities? Do PPP’s realize the potential advantages of buying FM services together with the building?

The research project started in 2008 and will close soon. A reference group with experts from both the public and the private part of Danish PPP projects closely follow the research. The project is conducted by the author alone during the person-hours of one year. A number of small projects have been concluded within the larger project.
Firstly, a review of literature on PPP’s was made in order to sum up the experiences gained in respect to integration of FM considerations. PPP’s have been made in great numbers in a great number of countries, so the literature on the subject is overwhelming and was narrowed down to some of the most quoted reports and a number of scientific papers reviewing literature. Though some authors argue strongly for PPP’s, there does not seem to be agreement on whether PPP’s lead to better value for money or not.

Secondly, the wish for integration of experiences from existing buildings is far from new. A review of literature on this has been made, looking for the reasons behind the apparent difficulties. The fragmentation of the construction process or the whole structure of the construction industry limits the possibilities for developing the build environment.

Thirdly, the Danish market for PPP’s was looked into. Not many PPP’s had been initiated and though more were underway at the time and more have been initiated later, it seems like the Danish market for PPP’s is too small. A number of participants in Danish PPP projects have been interviewed and their experiences have given an insight into the complexities of integrating FM in construction projects.

Finally, it is discussed where all this leads to. PPP’s do not seem to be the answer to the need for integration of the use phase and the construction phase. The problem goes deeper and is about the relationship between the actors in the construction industry and the limits to a production conducted in projects with little attention paid to the connections between the projects. No easy fix seems to be available, but then what should the FM profession do? This is discussed in the final paragraph of the paper in connection with an outline of the last part of the research project that study what is called the sociology of the construction industry through some cases of PPP’s where partnering elements have been included.

**STATE OF THE ART**

**Experiences gained from PPP’s**

Public-Private-Partnership is a concept that has been implemented in countries all over the world. In some countries to a great extent, but in others only a few examples have been attempted. One of the frontrunners have been the UK, but also other countries close to the UK in respect to policy and culture like Australia, New Zealand and Hong Kong have also applied the concept. The literature on the subject of experiences gained is extensive. However, it is noteworthy that there does not seem to be an agreement on the advantages of PPP. Some books and scientific papers report on great results from PPP projects, while others are very critical. It seems like there are great as well as disastrous projects, though much will be in the eyes of the beholder.

The concept of PPP can be narrowed down to two elements: One is the private financing of public facilities. The other is about giving the responsibility for financing, design, construction and management of the facility to a private part – a so-called special purpose vehicle – that after
a long period of time hand over the facility to the public part to an agreed price and standard. Since private financing in general will be more expensive than public financing and the private part should be allowed to make a decent profit, something special is supposed to happen in PPP’s. It is assumed, that the sharing of the responsibility between the parties and the potential coordination of all the phases of the life of the facility, will lead to innovation in an order that will outweigh the extra costs and thus offer better value for money.

Does the literature suggest that this fundamental idea of the PPP concept is actually realized? There are a number of reasons why it is difficult to come up with a definitive answer.

PPP’s last for a long period of time, often 30 years, which means that so far no projects have been concluded and no final accounts have been made. More importantly: since 30 years is such a long period of time and many vital social and economic changes can take place during that time, it will always be complicated to uncover the realities of PPP’s based on through life data. Normally, a decision on whether to turn a project into a PPP is based on a model – a public sector comparator – allowing to compare costs in a PPP to the costs of the same project organized in conventional ways. This of course is speculative and the quality of these comparators has been discussed.

Another complication is the variation in types of projects. Schools, hospitals, prisons, roads, bridges etc. etc. have been procured through PPP’s and they have of course individual characteristics that make it difficult to draw a conclusion to the PPP issue. For instance, great improvements have been reported for procurement of prisons in the UK through PPP’s, but according to a report from Construction Industry Council (Kristiansen, 2009a) the past records for prison authorities in procuring and managing buildings have been poor, giving PPP’s an easy background for excellence.

The expertise of the client is naturally also of significance. Contrary to what might intuitively be believed, skilled and experienced clients perform much better when it comes to PPP’s. A PPP is a complicated way of handling a construction project.

Moreover, the complexity in comparing the same type of project does not make things easier. For instance, it is reported that another reason for cost savings at the PPP prisons is the abolishment of the favorable pensions for prison staff. Or innovations that do take place might not be caused by PPP concept. For instance in certain road projects a new type of asphalt was applied, but not only in the PPP road projects.

Therefore, there are reasons for the divergent results of the research in to PPP’s. The idea behind PPP might seem evident, but it is reported that often the good intentions are not realized. One reason might be that PPP’s start with a complex and condensed process of agreeing on price and specifications in detail before the contract is closed. According to some this does not always lead to sufficient influence from the FM industry in the early phases and does not always lead to the best projects.
Numerous actors are involved in a construction project and the results are to some extent determined by the struggle for influence and profit. In PPP’s, the main contractor move up in front of the process and gain influence on the very early decisions on what to build. This does not always lead to sufficient emphasis on design. In addition, the financing part is moved up the ladder to the early phases, and this is said to promote some conservatism or emphasis on well-known solutions. And, PPP’s can be said to further a game where the public part might be tempted to take advantage of the possibilities for transferring risks to the private part.

According to some, the creation of relationships based on trust is crucial for successful construction projects, and it is well worth mentioning that PPP’s are not partnerships in fact as well as in name. Between the client and the SPV is a lengthy contract and more of an arm length relationship. The PPP form does not in itself lead to changes in the relationships between the parties in the construction project or in the way the design and construction processes are handled. (Kristiansen, 2009a, 2009b)

**Integrating FM considerations into design and construction**

However, why is it so difficult to integrate FM considerations in design and construction?

Logically, a number of conditions for the transfer of knowledge by facility managers from buildings in use to design and construction need to be in place.

- **Facility Managers** need to have the relevant knowledge. Facility managers will know a lot about buildings in use, but the knowledge needs to be collected systematically from a wide range of buildings and verified. It also needs to be based on information from a number of sources like users or tradespersons besides the facility managers themselves.
- **The knowledge facility managers** have about buildings in use needs to be adaptable to the knowledge that other professions have about buildings. Architects have an understanding of the overall design, the contractors know about the construction on site and this piecemeal knowledge has to be put together. Also, FM knowledge is about buildings in use and does neither include the newest materials nor the newest technologies.
- **There needs to be a demand for knowledge** about buildings in use phase. Somebody up front in the early phases where the building is planned and designed must ask for the knowledge, but the construction process is complex, and often the client will be different from the later owner or the manager of the buildings or the user(s). It is not always that it will be important for the client or the architect to consider the use phase as much as other issues.
- **And finally the knowledge** of the buildings in use will need to be able to survive through a long design and construction process where the ownership of the process changes, the knowledge will need to be handed over to a new party several times and each new party will need to understand and appreciate the knowledge about buildings in use.

The issue of transferring knowledge from buildings in use to new construction projects has been discussed in other contexts than PPP’s. Post Occupancy Evaluations (POEs) have been
Partnerships in FM

Tried implemented since the 60’ies, but have never had much success. In general, there are a number of obstacles for creating learning in the construction industry. Structural characteristics make it almost impossible.

The construction industry is organized in projects. The great difficulty for project based production or one-off production is to establish relationships between the projects. There is a potential conflict between the flexible organization in projects and the matrix organization for continuous business processes.

The construction process needs many competences, which makes it complex with many actors. The responsibility for the project is handed over several times during an ordinary construction process.

Firms in the construction industry are living dangerously. Let alone upswings and downturns in the economy, the firms have to win tenders. Bidding on projects is a central activity and winning projects and securing a flow of activity is a key to success. Often this is more important than finishing projects successfully and delivering a building of excellent quality.

Prices are fixed backwards. In manufacturing industries, better and cheaper products are developed continuously in order to be competitive in the market. But in the construction industry, prices are fixed at what can be accepted and then prices are put under pressure down through the supply chain in order to increase the profit.

The firms in the construction industry are not specialized towards delivering specific types of buildings such as schools or hospitals. Firms are acting at several submarkets where various types of buildings are in demand. In order to do that, firms specialize in competences that can be used in relation to various construction projects. A certain craft can be used in both new buildings, renovation of older buildings and in relation to many types of buildings. This makes it easy for the firms to relate in construction projects – but makes it difficult to learn from existing buildings.

It has been said that the construction industry is a loosely coupled system: outside the projects the firms are independent of each other. Inside the projects, the firms are highly dependent of each other, but the independency outside the projects makes it difficult to create double loop learning. (Kristiansen, 2010a, 2010b)

RESULTS

The Danish market for PPP’s

In Denmark in 2008, only five PPP projects had been out for tender. Since then a few more have been initiated, but the supply of PPP projects is very small. Out of the five projects one is not really a PPP project, but what in Denmark has been named “PPP light”: a private company construct and manage the facility for a period of time, while the financing is still public. Additionally, two more projects resembled PPP, but were more like leasing arrangements. At the time, more PPP projects were on their way, but still in small numbers.
On the supply side a number of consortia (12) had been formed to bid for the PPP projects that had been discussed widely at seminar and conferences. However, nine consortia had made bids only for one or two projects. Out of the three that made bids for several projects, only two had survived at the time for the investigation. One of these consortia had won three projects and, the other had won only one, but was also engaged in several PPP projects in other countries. I.e.: only two consortia had been formed that to some extent can be said to have a possibility for developing expertise in handling PPP projects.

Behind this very weak market for PPP’s in Denmark is a decision that order local municipalities – if they engage themselves in PPP projects – to deposit an amount equaling the private financing. The idea behind this is to prevent local authorities from over investing in infrastructure through borrowing from future generations of taxpayers. In Denmark the focus on PPP’s is not at private financing, but solely at the possibilities for delivering better value for money. It is possible that the lack of interest in PPP projects is due to scepticism of PPP’s as a measure for better buildings, but it should be noted that the total market for public buildings and infrastructure is small, and that only some investments are suited for PPP’s.

Though it is difficult to define a minimum size for a PPP market, clearly there must be one. In order to develop a certain level of expertise at both the private and the public side a minimum number of projects are required. To maintain competition a number of consortia have to be ready to bid and this requires a certain number of projects to be invited to tender and an expectation of a flow of invitations. Cost is also an issue in this respect. Transaction costs on PPP projects are high and have to be spread on several projects.

It can be argued of course that the market for PPP projects is international, but in order to be interesting for foreign investors the Danish market need to have a certain size. To offer a home market for Danish firms it also needs to have a certain size. (Kristiansen, 2009a, 2009b)

**Reflections on PPP’s in Denmark**

Ten participants in PPP consortia and client organizations from PPP projects were interviewed. Originally, it was planned to interview about the methods used for integration of FM considerations in the planning, design and construction and how experiences from the projects were collected and analyzed. But, it soon turned out that nothing systematic had been done along these lines. Therefore the interviews were conducted as loosely structured talks about impressions of and lessons learned from the PPP projects.

In general, there was a positive attitude towards the PPP concept. The respondents felt that the design and construction had been coordinated with the management of the facilities and that whole life issues had been considered. It was believed that the consolidation of the responsibility for all phases in the life of a building with the PPP consortium led to better value for money. It was particularly emphasized, that it was a great advantage that a certain sum was contracted for the maintenance of the building, because this prevented the politicians from making constant cuts in the expenses for proper maintenance.
However, also a number of disadvantages of PPPs were mentioned. It was noticed that transaction costs were high and made it difficult to bid for projects, unless chances for winning were considered very good. The lengthy and complicated contracts were considered a challenge and made it necessary to discuss in details possible actions towards events that might never occur. That the contracts needed to have a specific end date might – it was argued – give an incentive to construct buildings that would perform excellently, but only for the agreed number of years. The interviewed also argued that it would be difficult to develop the knowledge about design, construction and maintenance of certain buildings, unless a consortium succeeded in winning a certain number of contracts. In addition, it was questioned whether PPP’s could promote innovative and more interesting constructions: innovation means higher risks and the consortium will need to reduce and control its risks.

It was said that reductions in the expected costs for maintenance and the daily running of the facilities, would not amount to much when it came to being competitive in the bidding on PPP projects. Winning depends on having the best project from a general perspective. The difficulties related to integrating FM consideration were emphasized. Cultural differences in the team were said to be an obstacle. One said that the Facility Manager tended to isolate the issues related to maintenance; the architect was typically interested in the overall appearance of the building, while the contractor was mostly interested in the challenges on site. Some argued that whole life calculations were uncertain, which made it a challenge for FM interests to win terrain in the design discussions, and also made it difficult for the FM side to say yes to maintain the facility to a certain lower cost.

The results from the interviews corresponded well to the results from the literature review and supported the impression that though the idea of PPP seems convincing, PPP’s do not in themselves lead to better value for money. (Kristiansen, 2009a, 2009b)

**PRACTICAL IMPLICATIONS**

This paper opened with the question: Are PPP’s good for procuring FM? Is it an advantage for FM to buy FM services together with the building? Based on the research behind this paper the answer is “no”.

It is not documented in the literature that there is such an advantage. Some evaluations and scientific papers argue that there is an advantage, while others hold the opposite view. There are a number of difficulties for reaching a definitive conclusion based on data and observations, but there are sound reasons for assuming that PPP’s in general do not lead to the acclaimed innovation in respect to integration of FM considerations in the design and construction phases.

The analysis of the Danish market showed that this was probably too small for PPP’s and though the interviewed Danish actors had a positive attitude towards the idea, they also reported a number of difficulties for realizing the idea behind PPP’s. Successful integration of FM considerations is also about issues such as the culture in the construction industry, building relationships based on trust instead of lengthy contrast and about daring new solutions.
Finally, a literature review showed that the issue of integrating FM considerations in the design and construction is related to a wider issue of creating learning from buildings in use. The structure of the construction industry with many firms with very loose relationships and a production process based on projects makes it difficult to establish learning processes that link the projects.

However, this could lead to a dismissal of the whole idea of PPP’s, but it might also lead to a restating of the research question: How could the construction process be organized to ease the integration of FM considerations and make it possible to learn from buildings in use? The final part of the research project is looking at this through case studies of PPP projects where demands have been made for changing the organization of the construction process through use of elements from partnering.

In PPP’s, it is possible to include partnering in several ways:

- Partnerships between the private and public part can be made in order to avoid the lengthy and complicated contracts, the condensed pre-contract negotiations and make the management of the buildings more flexible to changing demands from the users of the buildings. Partnership in this sense might lead to some learning from buildings in use, since the construction firms will be more deeply involved in the user’s perspective on the buildings.
- Partnerships can be made between the consortium and the firms contracting to the consortium making it more likely that the whole design and construction process can reflect the fundamental interests of the consortium in delivering a building that offer value for money.
- Teams can be made among the firms contracting to the consortium in order to improve the possibilities for integrating FM considerations and other lessons from buildings in use in the design and construction process.
- Strategic partnerships that will allow the same consortium – or team – to build more of the same type of building and thus facilitate a feedback mechanism.
- Moreover, various methods of partnering like workshops and open books can be taken into use.

The research so far suggests a few more points that might be worth considering. Firstly, a PPP can first of all be said to be a legal arrangement. It is a procurement method and a type of contract. But it does seem like what might be termed “the sociology of construction”, i.e. the relationship between the parties in the construction process and the structure that forms the rationality of their behavior, should be taken into consideration. The question is not so much about whether buildings and FM should be procured in one way or the other, but about how the construction process might be reorganized in order to facilitate learning from buildings in use.

As stated above, there are at least four conditions for an integration of knowledge about buildings in use: The knowledge needs to be collected systematically and verified; there must be a demand for the knowledge up front in the design and construction process; it needs to have a form that allows for coordination with other necessary considerations; and the design and construction process needs to allow the knowledge to go undiminished through the process.
The client might be the one to create the demand for knowledge about buildings in use. However, few clients are big and experienced enough. Moreover, it is not always the client has an interest in implementing knowledge about buildings in use.

Alternatively, the pull for knowledge can come from an anonymous market for buildings, but few markets for buildings have a volume that make mass production possible.

A third possibility is the formation of markets at a lower level. If buildings were not designed from scratch every time, but to a greater extent build through assembling prefabricated parts and elements, constructing firms might create a demand for building products with build in knowledge of the use phase.

In addition, the design and construction phase has to be made more coherent and integrated. Probably, also the market for second hand buildings would need to be developed so that buildings with high maintenance cost and low functionality pay off considerably less than excellent buildings.

At times the issue of establishing learning from buildings in use seems like a Gordian knot. It will be worthwhile to learn to untie it, because buildings are not just buildings.

**REFERENCES**

This paper is based on the previous publications of the research projects. Two reports (in Danish) have all the literature reviews and document the research. Since the literature reviews are extensive and based on many papers and books, the references in this paper have been made to the reports and papers by the author in order to avoid a huge number of references. The interested reader can find all the references needed in the original publications. The research papers (in English) have been reviewed.

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ABSTRACT

Purpose: This paper analyzes flexibility in both a facilities and project management perspective.

Background: In a facilities management perspective, flexibility is desired to face changes in the business environment for the core activity in a building. On the other hand, flexible projects are generally not described as desirable from a project management perspective. These conflicting approaches to flexibility have justified an analysis of the dynamics related to project flexibility, both from a theoretical and an empirical perspective.

Approach: Flexibility is related to a capability to adapt to new, different or changing requirements. The paper discusses project flexibility categorisations, perspectives of analysis, flexibility drivers and enablers. The study addresses both flexibility relating to planning and construction processes, and flexibility as a characteristic of buildings. The study is based on three types of data related to Norwegian public investments.

Results: The paper identifies some characteristics of successful project flexibility management. Four approaches to project flexibility management are presented, and the implications on facilities management are presented.

Practical Implications: It is in the interest of facilities managers to ensure sufficient flexibility in projects. For efficient operation and maintenance, it is desirable to be able to adjust the facility being built.

Keywords: Flexibility, Project Management, Facilities Management, Adjustments

INTRODUCTION

Project flexibility is related to a capability to adapt to new, different or changing requirements. Project flexibility can be seen as a dilemma, a problem or an opportunity. Traditionally, projects tend to strive for increased predictability and robustness, by managing details and attempting to bring all variables under control (Kreiner, 1995; Mintzberg, 1994; Christensen & Kreiner, 1991; Packendorff, 1995; Engwall, (2003; Söderlund, 2004). According to Blyth and Worthington (2001), it is normal to find some very strong contradictory conditions in projects. One such contradiction involves alternative perspectives on projects when two parties are involved. Project management and facilities management may have different incentives related to project flexibility.
From a facilities management point of view, buildings are means to an end. Work on usability highlight that the purpose of a building is to support people using the building, while they are performing their activities and living their lives (Hansen et al. 2010). Depending on how well building supports their users’ activities, they can contribute to value creation in the user organizations (Alexander 2008, Fenker 2008). In such a perspective, flexibility is typically a positive attribute (Blakstad and Arge, 2010).

From a pragmatic project management point of view, experience shows that the chance of realizing a plan without major amendments decreases with increasing time horizon, which point to a need for flexibility, or adaptability (Hall, 1980; Bahrami & Evans, 2005; Koskela, 2000; Ballard & Howell, 2003, Mikkelsen & Riis 2003; Lee & Xia, 2005; Olsson, 2006). This notion is consistent with previous works on flexibility, that view managing flexibility as an orderly response to a changing world (Sager, 1994; Moseng & Bredrup, 1993; Sink & Tuttle, 1989; Volberda, 1997; Abbot & Banerji, 2003; Turner, 2004).

STATE OF THE ART
Flexibility can be studied from the perspective of different stakeholders, in different project phases and related to efficiency and effectiveness. Finally, drivers and enables of project flexibility are listed and discussed. Uncertainty, project duration, conflicts, and insufficient project preparations are highlighted as flexibility drivers. The enablers are degree of redundancy, incentives open to the stakeholders, and modularity.

Flexibility in the project and in building design
Flexibility can be divided into flexibility in the construction project decision process and flexibility in the building itself. Flexibility in the decision process is based on an approach where decisions and commitments in the projects are made sequentially over episodes. The use of decision gate models provides a successive commitment to a project. Flexibility in the product means that the design of the building has taken into consideration possible future changes in use or requirements, and that the building is prepared for alternative use (Brand 1994 and Blakstad 2001). According to Arge & Landstad (2002), a commonly used classification of building adaptability was made in Sweden during the 1960s and 1970s. Based on this classification, generality is the ability of the building to meet shifting demands without physical changes. In this terminology, flexibility is related to possibilities for technical changes with minimum cost and disturbance. Lastly, elasticity means the potential for adding to or reducing the size of the building. In this thesis, all three characteristics collectively are referred to as flexibility. Bjørberg and Verweij (2009) describe a similar terminology.

Perspectives of analysis
Project flexibility can be studied from both efficiency and effectiveness perspectives. A case in favour of flexibility emphasise the possibility to increase a project’s effectiveness. Effectiveness is primarily addressed by external flexibility. Project scope is adjusted to utilise benefit opportunities. Regarding efficiency, such adjustment of project scope typically causes change costs. The net effect come from a balance between the values of benefit opportunities and incurred change cost.
The flexibility for one project stakeholder can be another’s risk. Project stakeholders are persons or groups of people who have a vested interest in the success of a project and the environment within which the project operates (McElroy & Mills, 2000). A study of large engineering projects found that it is important for a project management team to identify stakeholders that can affect a project, and then manage their differing demands throughout the project stages (Olander & Landin, 2005).

**Flexibility drivers**

This paper discusses “drivers” as factors that create needs or pressure on projects to be flexible. Uncertainty is the key driver for project flexibility, and arguably the only one. The other drivers mentioned below are in fact only highlights of selected types of uncertainty. Uncertainty can be defined as a gap between the amount of information needed to make a decision and the amount of information available (Galbraith 1973). In order to manage this information gap, flexibility is primarily a way of reducing the amount of information needed. Other project management approaches may focus on increasing the available amount of information.

The longer duration a project has, the more likely it is that some pre-requisites are not longer valid (Mintzberg 1994; Lee & Xia, 2005). Long duration is likely to result in more or less suppressed need for scope changes. Both cost and demand estimates are more uncertain the longer the time perspective is. What is “long” duration is highly depending of the type of project. Experiences from previous projects of the same type provide indications of for how long prerequisites are likely to stay stable enough.

Project flexibility can be an issue of conflict. Stakeholders who benefit from the initial decisions are less likely to favour a continued flexible decision process. Flexible decision processes are likely to be valued by those who do not prefer an initial decision. In this way, availability of flexibility options and redundant resources can serve as an invitation to adjustments. However, conflicts that arise during the preparation or execution of a project have also created a need for projects to be flexible, as a response to conflicts.

**Flexibility enablers**

This paper refers to ‘enablers’ as factors that contribute to making it possible for projects to be flexible. Redundancy can be an enabler for flexibility. In a project perspective, redundancy can be applied for flexibility in both the product and decision process. Flexibility in the product may be achieved by over-specification of future functionality. A flexible decision process calls for redundant resources and time to perform analyses of alternative project concepts. The rationality behind the use of redundancy is that this use of resources is cost effective compared to later major changes.

Incentives faced by stakeholders affect their approaches to project flexibility. Incentives for different project stakeholders are strongly related to the contracting structure of a project and other financial obligations. Flexibility has a value for those that can benefit from adjustments, and it is a cost for those who have to adopt. Related to incentives, project management and
facilities management do not have to have a common interest. In a facilities management perspective, adjustments that make maintenance and operation of a building easier are typically desirable, and a common topic in user involvement. An experience from user involvement is that users often struggle to point to practical details that increase efficiency in operations during the early phase of projects. Proposals for improvements may therefore come during detailed planning or executing, which typically is at a later stage than project management would prefer. Project management may therefore have incentives to downplay such late improvement proposals (Andersen et al. 2011).

Modularity can serve as an enabler for flexible project management. Modularity is related to the possibility to divide a project into more or less independent sub-units. Modularity can enable projects to cope with uncertainty because individual components do not have a critical role. Modularity can be applied on a micro and macro level. On a micro level, design modularity is a tool for efficiency, because it may reduce negative effect of changes. Design modularity is a common approach to achieve flexibility (Hellström & Wikström, 2005; Thomke, 1997). Modularization in product development projects has primarily been treated as a tool to improve project efficiency (Thomke, 1997). On a macro level, modularity can be an enabler for flexible decisions processes because decision makers can make the incremental commitments. An approach of minimal commitment at each decision stage is a part of the “anti-disaster methodology” proposed by Hall (1980). Macro modularisation of projects usually means that each module can be produced over a shorter time period than would have been the case for an integrated project. Shorter execution time reduces the probability for major adjustments during the project (Lee & Xia, 2005).

**APPROACH**

Several different information sources have been used. The main sources are:

1. Evaluations of Norwegian public investments
2. Ex-ante uncertainty analyses of major governmental investments
3. Case studies of Norwegian hospital projects

In the following, the main information sources are described. In the study of evaluations of Norwegian public investments, a set of independent project evaluation reports was collected. Personal experience from projects was also utilised. To analyse the information related to the projects, codified data were entered into a database. This included information on the general characteristics of the project. On the basis of the descriptive information, an assessment was made of approaches to project flexibility.

Hospital projects were chosen because flexibility is an important concern in hospital buildings (de Neufville, Lee, and Scholtes, 2008 and Miller and Swensson, 2002). The benefits of projects materialise after the projects have been commissioned, calling for a rather long time perspective of the analysis. This called for analysis of hospitals built some time ago.
Being a multi-case study, the study is based on multiple information sources (Yin, 2003). The most important sources to the case studies of Norwegian hospital projects were:

Documents from the involved organisations, as well as publicly available information. This includes reports, evaluations and quantitative information, such as statistics. Interviews Participant observation in meetings and other arenas where the projects have been discussed.

A summary of the most important information used in this paper is shown in Table 1.

### Table 1: The primary information sources upon which the paper is based

<table>
<thead>
<tr>
<th>Information</th>
<th>Content</th>
<th>N=</th>
<th>Type of information</th>
<th>Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluations of Norwegian public investments</td>
<td>Public and private sector projects from different sectors. Projects initiated 1986-2000</td>
<td>18</td>
<td>Primarily qualitative</td>
<td>Evaluation reports; personal experience</td>
</tr>
<tr>
<td>Case studies of Norwegian hospital projects</td>
<td>Investment projects 1986-2000</td>
<td>4</td>
<td>Qualitative and quantitative</td>
<td>Interviews; statistics; evaluation reports; personal experience</td>
</tr>
</tbody>
</table>

### RESULTS

The longer the time-frame of a project, the less likely it is that prerequisites will remain unchanged. This means that the longer the time-frame of a project, the more important it is to prepare the project to either avoid or manage changes. Even though the results are based on studies of a few projects, the results indicate that the potential drawbacks of flexible projects are substantial, both in terms of efficiency and effectiveness. There are also indications that the drawbacks are largest when projects do not prepare for subsequent adjustments.

In the beginning of this research, it was expected that the decision process related to the project can be fairly straight forward if flexibility in the product, such as a building, was high, because the result of the project was prepared for alternative use. Furthermore, it was assumed that a low flexibility in the product could be combined with high flexibility in the decision process because scope definitions could be postponed in order to gain as much knowledge as possible. These assumptions are only partially confirmed by the study.

Two explanations are proposed to this result:

- If there are possibilities for flexible decision processes, they are highly likely to be utilised
- Flexible decision processes can always be applied in response to unforeseen events
Regarding the first alternative explanation, possibilities for flexible decision processes may come from planned flexible decision processes. Availability of flexibility options and redundant resources can serve as an invitation to adjustments. If there are possibilities for adjustments and iterations, it is likely that flexibility options will be utilised. This means that the presence (or knowledge) of flexibility enablers can work as a flexibility driver. Flexible product designs may therefore serve as enablers for flexible decision processes.

The second alternative explanation means that even though it comes at a cost, and frequently at a high cost, plans can be changed. While the degree of flexibility in the product generally must be established at an early stage in a project, a flexible decision process may either be indented or ad hoc. Flexibility in the product is to a large extent an attribute that is designed into a delivery in the front-end of a project. On the other hand, a highly flexible decision process can be achieved even if it is not prepared for. It may therefore work as a kind of “security valve” for unforeseen development. This is similar to Galbraith’s notions that if a firm fails to actively create other strategies to address uncertainty, a slack resources strategy will occur by default (Galbraith 1973).

As a response to uncertainty, projects can either isolate themselves in order to execute the defined task efficiently, or prepare the project to manage flexibility. A third, often unintended strategy occurs when projects plan for isolation, but cannot maintain the isolation. Projects are then forced to be more flexible than they have prepared for. Both of the first mentioned strategies have advantages and disadvantages. The research that this paper is based on indicates that the strategy to plan for isolation mainly has disadvantages, especially in a facilities management perspective. If some of the original assumptions that a project is based on prove to not be valid anymore, it is the facilities managers who have to live with a building that is not optimized for its purpose. Project management can just deliver according to the specifications that were set up, and then move on to another project.

Successful strategies for project flexibility either aim at avoiding flexibility in projects or enabling projects to manage flexibility. Projects avoid adjustments or live with them. The main drawback of project flexibility that has been observed in this research is not necessarily flexibility itself, but flexibility applications in projects that lacked structure and preparation for flexibility. It is therefore in the interest of future facilities managers to ensure that projects have a certain amount of flexibility.

One indication from the analyses is that project flexibility requires a structure. In the referred studies, the potential drawbacks of flexible projects are substantial both on efficiency and effectiveness. It has also been shown that the drawbacks are the largest when projects did not prepare for flexibility. To avoid cost overruns, but also to obtain desirable benefit from a project, it is advised that flexible decisions are supported by a structural framework of strategies and guidelines. There are indications that if a structural framework for a project is established, flexibility options could be utilised without destabilising the project organisation.
The paper has identified some characteristics of successful project flexibility management. These findings can be of value in front-end preparations of future projects. The following summary is based on results presented in the literature, along with results from the studied projects. Four approaches to project flexibility management are presented in Table 2, together with a summary of implications on both project and facilities management.

The indicated strategies are described in the following.

1. **Late locking of scope and fast execution**
   After an extensive front-end phase, the project scope is defined and the project is executed. This is similar to a traditional project management approach, but emphasises a fast transition from front-end to execution. The approach means minimising external flexibility after the scope is established.

### Table 2: The primary information sources upon which the paper is based

<table>
<thead>
<tr>
<th>Objective</th>
<th>Approach</th>
<th>Project management implications</th>
<th>Facilities management implications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avoid adjustments (after locking of scope)</td>
<td>1. Late locking of design and fast execution</td>
<td>Depends on fast locking of scope and execution. Lack of decisions in front-end phase can cause frustration.</td>
<td>Requires involvement of users and future facilities management representatives.</td>
</tr>
<tr>
<td>Manage (limited) adjustments</td>
<td>2. Shield off areas of uncertainty, for example technical installations in buildings finally specified later than the rest of project</td>
<td>Allows the major part of a project to be executed without adjustments. Still-open items must be of limited size.</td>
<td>Users and future facilities management representatives are expected to point to areas that are likely to have need for adjustments.</td>
</tr>
<tr>
<td>Avoid adjustments (in modules); Manage adjustments (between modules)</td>
<td>3. Incremental commitments. Buildings divided into sections, built independently</td>
<td>Allows each module to be executed without changes. Longer total implementation time</td>
<td>Fast collection of facilities management experiences from the first modules delivered is important, to be able to adjust specifications for future modules.</td>
</tr>
<tr>
<td>Manage adjustments</td>
<td>4. Over-specification of functionality. Redundant engineering capacity</td>
<td>More cost effective than dealing with adjustments with no available resources. Amount of adjustments can escalate beyond control</td>
<td>Opens for continuous input, but may increase project cost.</td>
</tr>
</tbody>
</table>
2. Shield off areas of uncertainty

In the process of defining project scope, certain parts may be defined later than others. This can be manageable, provided that the still-open items are well defined and of a limited relative size. Areas where there is substantial uncertainty can be identified. The bulk of the scope can be defined in the front-end phase, while some issues remain unsettled until later stages.

3. Incremental commitments

In an incremental approach, projects are committed to piece by piece. Large projects are decided upon and executed as a series of smaller projects. Each module can be executed relatively isolated due to a relatively short implementation period. Modularising (on the macro level) of major projects offer flexibility options for decision makers. For modular projects, effectiveness may be low unless each module is designed to provide benefits as individual deliveries, and not only providing a foundation for future improvements.

4. Absorption

Absorption can be obtained by redundancy or decoupling of dependencies. Regarding the physical design, redundancy includes over-specification and other types of flexibility in the product. Decoupling of dependencies can be achieved by a modular design, which reduces domino effects from changes. As for the project organisation, ‘slack’ is a keyword, including budget reserves, time slack in plans and organisation capacity to manage changes. In the studied projects, the lack of available resources has been observed more frequently than availability of such resources.

The study indicates that successful strategies for project flexibility either aim at avoiding flexibility or at enabling projects to be flexible. Projects can avoid adjustments or live with them. One key to successful flexibility management in projects lies in the transition from an initial open-minded environment to the subsequent focused phases. Even though the results are based on studies of only a few projects, there are indications that the drawbacks of flexible projects are largest when projects do not prepare for future adjustments. This notion is consistent with previous works on flexibility, which highlight that flexible decisions require a structural framework of strategies and guidelines. The suggested approaches and categorisations related to project flexibility are intended as an input to such a structural framework. It is in the interest of future facilities managers that projects have an approach for flexibility management.

REFERENCES


6.4  LONG-TERM BUYER-SUPPLIER RELATIONS IN FACILITIES MANAGEMENT

Kresten Storgaard and Jacob Norvig Larsen

ABSTRACT

Purpose: To analyse long-term collaboration between buyers and suppliers in the facilities management sector and its advantages and disadvantages as regards stimulation of productivity, quality, innovation, and earnings in customers’ businesses.

Background: Recent studies of collaborative relationships indicate that reciprocal trust and mutual knowledge sharing furthers the potential for improvements and innovation of service quality. A long-term perspective is expected to facilitate and augment the effect of collaborative approaches to the benefit of productivity, the quality of service solutions and general economic sustainability. Long-term collaboration may take place as an on-going informal process in the same customer/supplier relationship, or can be based on contracts such as partnership agreements.

Approach: Theories and earlier studies of FM innovation and collaboration are confronted with empirical findings from a survey and from case studies in the Danish FM sector. Four types of collaboration are analysed based on experience and expectations of FM suppliers and customers in the sector.

Results: The survey showed that generally operational long-term partnerships were assessed as beneficial, particularly by FM suppliers and respondents which were both suppliers and customers (mostly from the public sector). Private customers were more unwilling to accept the possible benefits of long-term formal partnerships. The case studies showed a need for devel-
Partnerships in FM

Development of capabilities at an operational level such as trust, responsibility, communication, and user orientation, especially in markets where the quality of FM service has a direct impact on customers’ core business. These dimensions are crucial but difficult to elucidate and are often tacit.

**Practical implications:** More focus on sociological elements at the operational level concerning responsibility, trust and user orientation is needed in order to obtain bigger customer satisfaction. This may be furthered by long-term collaboration, albeit it is a challenge to make these elements more explicit in operations as well as in tenders and bids. Without support from trust-based inter-firm relations at the top level, collaborative practices at lower levels are not encouraged. On the other hand, the development of innovative solutions and the potential for new service solutions require bottom-up innovation brought about through close interaction at operational and middle-manager level on a regular, if not daily, basis.

**Keywords:** Long-term collaboration, Productivity, Innovation, Tacit dimensions of operation

**INTRODUCTION**

In small economies like the Danish, only few firms have the potential to deliver service solutions or products that do not include a multitude of inputs from other firms. Therefore the potential for innovation is greater in a collaborative setting than in each firm individually. It was the result of a Danish study that partnership favours the increase of providers’ productivity, provided that the client allowed the providers freedom to plan their activities (Jensen, 2010). However, the barriers to collaboration are many. In the past decade, the management of supply and customer-supplier relations in facilities management (FM) have increasingly favoured very specified and detailed contractual governance forms and tools aiming at meticulous and exhaustive regulation of inter-firm relations. As regards FM, much effort has thus been put into supply management and the definition of service level agreements (SLA) and key performance indicators (KPI) in order to achieve well-specified services at a fixed low price. Whereas these may have beneficial impact on immediate cost savings in the short term, it is increasingly becoming clear that there may be unintended effects and costs as well. It is nevertheless still relatively little that is known about how other forms of inter-firm relationships may improve the collaboration that has knowledge sharing, learning and service innovation as its core features. Such a collaborative effort requires mutual and justified trust among the suppliers and procurers as well as new ways of organising.

Other effects of the existing practice and focus of FM include transaction costs related to the search for and supervision and control of agreements and contracts. Moreover, very detailed contracts and monitoring may incur unintended long-term effects such as deterioration of mutual trust between partners and, consequently, choice of sub-optimal solutions to user needs. Mutual exchange of knowledge is also hampered, which in turn causes poorer quality of delivered services. From previous studies of inter-firm collaboration in the construction industry we know that interaction between firms may develop in many different forms between the two
alternatives of market and hierarchy (integration) and that informality and trust as governance mechanisms may be surprisingly efficacious (Storgaard 2006). It is the aim in this paper to explore this within the FM market by means of a survey as well as exploratory case studies. Rather than merely viewing inter-firm collaboration from a purely organisational economics viewpoint, we suggest that the social nature of inter-firm collaboration contains social, knowledge and learning aspects that are equally important.

**INTERNAL RESOURCES AND EXTERNAL COLLABORATION**

A standard definition of a business is that it consists of enterprises that produce replaceable products or services, for example the car industry, pharmaceutical industry, cleaning services, ICT-service providers etc. According to this definition, most FM-service enterprises would be considered to belong to the business service industry. FM-service providers supply services to professional clients. Some of these services are characterised by their tangible nature, some are completely intangible and others are combinations, for example heated, clean, bright offices with all necessary ICT functions, sterile operation rooms, school classrooms that facilitate learning, safe airports, well-maintained properties, etc. In short, facility management products are mostly intangible rather than physical. Some of these may be knowledge intensive, while many others are more labour intensive.

FM services can be produced in-house or be outsourced to specialised FM suppliers. Mostly FM services do not directly influence a company’s strategy, core business or competitiveness but mainly relate to operational levels. Consequently, FM suppliers can in most cases easily be replaced by other suppliers (Lehtonen 2006:456). If viewing the firm from a resource-based perspective, outsourcing of FM services would be the natural choice in most if not all cases, as the firm’s competitiveness and possibilities are defined by its resources (Penrose 1959; Wernerfeldt 1984; Prahalad and Hamel 1990; Wernerfeldt 1995; Teece, Pisano and Schuen 1997). It is important to acquire the strategically relevant resources, to protect them well and to develop them through learning to establish and maintain core competencies. It may be similarly important to dispose of redundant or obsolete resources (Lorentsen et al. 2004), and to outsource activities.

Long-term collaboration with other firms, such as suppliers of FM services and other firms as well, points at company-external elements that are not fully understood by traditional resource-based theory. However, its later development, particularly the notion of dynamic capabilities (Teece, Pisano & Schuen 1997) contributes to a better understanding of the contributions that come from the firm’s environment, network and professional partners in addition to the key role of strategic management in re-configuring internal and external skills, resources and competencies. The relational, or collaborative, element is central when examining the long-term external collaboration of a company. Dynamic capabilities that strengthen the ability of the company to orientate and act relationally towards external partners are specified in the third column in the Figure 1, which is an expansion of a table in Larsen (2001).
Partnerships in FM

Organisation of collaboration between firms

In business economics, inter-firm relations have been thoroughly discussed in for example Dyer (1997) and Dyer & Singh (1998) in which trust and opportunism are discussed and contrasted a transactional economics view. Long-term collaboration between firms is a well-known phenomenon in much businesses literature, e.g. in relation to outsourcing and supply-chain-management (see e.g. Hoecht & Trott 2006, Bechtel and Jayaram 1997), learning and innovation in networks (Grabher 2004, Håkansson and Ford 2002, Gadde et al. 2003), and open innovation (Chesbrough, Vanhaverbeke & West 2006). Partner relations are designed to support competitiveness and theories are developed to understand why some companies or complexes of companies grow stronger, thus enabling innovation, while others do not. Collaboration based on trust, knowledge sharing and ability to mobilise existing organisational resources carries advantages that are not always possible to specify and manage contractually.

Hardy, Phillips and Lawrence (2003) examined the interaction between strategic elements such as management of critical resources and knowledge sharing, learning and knowledge transmission between organisations and the behaviour of organisations in networks. They found that especially two dimensions contribute to a successful collaboration between organisations, one of which is how deeply the inter-organisational collaboration is rooted in the organisation; the other is the nature of the involvement. The prerequisite for a successful inter-organisational collaboration seems to rest within the participating organisations as much as in the relationship itself. Moreover, it seems that the social dimension is of great importance just as pointed out by for example by Wenger (1998) and Duguid (2005), who both explore the ability of enterprises to establish and encourage organisational learning, knowledge and innovation. Partnerships are fundamentally social partnerships, be it internally between individuals and teams inside the firm or between actors across boundaries between supplier and buyer.

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**Figure 1: Static versus dynamic competencies, capabilities and collaborative abilities (after Larsen 2001)**

<table>
<thead>
<tr>
<th>Static</th>
<th>Individual / team</th>
<th>Organisation / company</th>
<th>Collaboration / network</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Qualifications</td>
<td>Resources</td>
<td>Contractual relations, arms’ length, project partnership, strategic alliances, closed</td>
</tr>
<tr>
<td></td>
<td>Formal educatio</td>
<td>Structured rule-based organisation, learning-before-doing</td>
<td></td>
</tr>
<tr>
<td></td>
<td>General knowledge</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Dynamic | Competencies relational situation-specific knowledge | Capabilities, development/change, few rules, learning-while-doing (iteration) | Collaborative/relational abilities, on-going network activity rather than project, open |

---
Lehtonen (2006) discusses moving from a transactional to a collaborative approach in the management of firms’ relationships with FM-service providers. Based on detailed case studies, it is suggested to differentiate between what characterises the collaborative relationship in FM services as such and factors that contribute to the successful development of the relationship, see Figure 2.

Figure 2: Attributes and success factors of collaborative relationships in facilities management (Lehtonen 2006:459)

<table>
<thead>
<tr>
<th>Attributes</th>
<th>Success factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commitment</td>
<td>Ability to meet performance expectations</td>
</tr>
<tr>
<td>Continuous development</td>
<td>Clearly defined and mutually-agreed goals</td>
</tr>
<tr>
<td>Involvement of different organisational levels</td>
<td>Joint problem solving</td>
</tr>
<tr>
<td>Mutual trust</td>
<td>Mutual involvement in development and planning</td>
</tr>
<tr>
<td>Openness</td>
<td>Two-way information sharing</td>
</tr>
<tr>
<td>Promise of mutual benefit</td>
<td></td>
</tr>
</tbody>
</table>

On the side of the buyer of FM services, the innovative potential for collaboration is hindered – or fades away – if there is too strong a focus on “exploitation” and detailed contractual regulation of external as well as internal relations, rather than on “exploration” (Storgaard, Larsen and Olsen, 2010; Jensen, 2010). While there may be economies of scale associated with specialisation, explicit articulation, specification and contractualisation, there may be diseconomies of scale as well. These obviously include all sorts of transaction costs as well as counterproductive specialisation that excludes competencies demanded by the customer. Exploration implies that smaller errors are allowed, and that cooperation is characterised by trust, reciprocity, responsibility and communicative behaviour. It is not a question of either-or, but of striking a balance between detailed scientific management-style contractual regulations on the one hand, and trust-based joint problem solving on the other hand.

An important dimension of this is how deeply the inter-organisational collaboration is rooted in the respective organisations. At top-level, there is a need for explicit visions and values for the partnership. These values need to filter down through all levels of the entire organisation. Meanwhile, at operational levels, problem solving and development can take place continuously, based on ad hoc procedures rather than ex ante prescribed directives (Lehtonen & Salonen 2006). This is very similar to findings as regards for example innovation in professional business service organisations (Larsen 1996). It is, nevertheless, crucial to keep in mind that contractual regulations and the development of collaborative relationships are not alternatives but rather complimentary tools when managing inter-firm relations in facilities management. Kadefors (2004) has studied the difficulties of establishing and maintaining trust in project relationships. She points out that “some relations may need fostering of trust, while others are better helped by more formal control and a bit of distance” (Kadefors 2007:37). It should be noted that this may be valid within the same relationship between two firms and not just between different relationships.
With more outsourcing generally including outsourcing of integrated FM services, there may be considerable development opportunities associated with the development of strategic (long-term) collaboration between buyers and providers of FM services. This phenomenon may be relatively new in the FM-service sector, but is well known and well recognised in other fields. Therefore, the aim of the research reported in this paper was to clarify to what extent and with what kind of experience Danish firms engage in collaborative relationships when trading FM services.

METHODS AND DATA
Given the nature of the research issue, it was deemed necessary to combine quantitative methods with qualitative ones. In order to map the attitudes and experience of FM-service providers and buyers with different types of inter-firm relations, from arms’ length contractual relationships to collaborative relationships, data were collected by means of a survey distributed to all members of the Danish Facilities Management Association. Issues of mutual trust, ad hoc joint problem solving, two-way information sharing etc. are only with difficulty, if at all, addressed with a written questionnaire. Consequently, a number of case studies were realised in order to acquire in-depth information about actual cases of collaborative relationships. These were mainly based on personal interviews with executives of both FM-service buying firms and FM-service providing firms.

Survey
An internet-based survey was conducted in the summer of 2010 (Storgaard, 2011). All members of the Danish Facilities Management Association representing 214 individual entities (firms or persons) received a web-based questionnaire. Answers from 103 respondents were received (48 pct.), and 40 of them had answered all questions (19 pct.).

Case studies
Special focus was put on the private sector, where demands for effectiveness and value for money were supposed to be high. Four case studies were conducted in the spring of 2011 (Storgaard, et al. 2011). Two represented business property companies buying FM services and two case studies represented FM suppliers selling FM services – one a specialist on operational partnerships on estate maintenance, the other on delivering integrated services, including operation and maintenance of buildings. Supplementary key-person interviews were conducted with public customers and FM suppliers, focusing especially on the emergence of the FM sector.

RESULTS
Types of collaboration
In the survey, respondents were asked about their experience of the type of collaboration between customer and supplier and factors like productivity, quality, innovation and economy. The types of collaborations were:
Type 1: spot-market arrangements,
Type 2: long-term non-contractual agreements,
Type 3: long-term period-based contractual agreements,
Type 4: long-term operational partnership agreements.

Respondents place in the value chain and sector
At table 1 is shown the distribution by sector and place in the value chain by those respondents which have answered the two questions (sector and place in the value chain). The supplier side is dominated by firms from the private sector, especially private services (76 pct.). The customer side is dominated by the industry (59 pct.), while firms from public service and private service make 27 pct. and 14 pct. of the customer, respectively. The firms which are both supplier and customer are especially making up by respondents from the public sector (79 pct.).

In the following analysis will be presented distributions of how supplier and customer assess a covariance between type of collaboration and productivity in FM service, quality in delivered FM service, innovation at the customer and economic benefit for customer. In these tables the supplier side is primarily dominated by private firms in the service sector, the customer side mainly by private firms in the industry, while the compounded group of firms which are both suppliers and customers are dominated by public institutions.

Table 1: Respondents by sector and chain in the delivering chain (supplier-customer) (Storgaard 2011)

<table>
<thead>
<tr>
<th></th>
<th>Supplier</th>
<th>Customer</th>
<th>Both supplier and</th>
<th>Total (pct)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Abs</td>
<td>Pct</td>
<td>Abs</td>
<td>Pct</td>
</tr>
<tr>
<td>Industry</td>
<td>1</td>
<td>6</td>
<td>13</td>
<td>59</td>
</tr>
<tr>
<td>Private Service</td>
<td>13</td>
<td>76</td>
<td>3</td>
<td>14</td>
</tr>
<tr>
<td>Public Service</td>
<td>3</td>
<td>18</td>
<td>6</td>
<td>27</td>
</tr>
<tr>
<td>Total</td>
<td>17</td>
<td>100</td>
<td>22</td>
<td>100</td>
</tr>
</tbody>
</table>

Type of collaboration and productivity
In table 2 is shown the answers on a covariance between type of collaboration and productivity at the supplier. At the table the results are split up between answers from supplier, and customers. The result showed a linear covariance between the four types of collaboration and productivity. The lowest productivity was at the type 1 collaboration: spot market arrangements – the highest at the type 4: long term operational partnerships. But the suppliers were more positive on the potential of partnerships in these judgments, than were the customers and the compound group of both suppliers and customers. Actually customers accessed that type 3 collaboration was to give the highest productivity.
Type of collaboration and quality
In table 3 is shown the answers of connection between type of collaboration and quality in delivered service by the position in the value chain.

<table>
<thead>
<tr>
<th>Table 2: Assessment of productivity and type of collaboration, by respondents’ position in the value chain. Average assessment on a scale from 1 (least) to 5 (most). (Storgaard 2011)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respondents</td>
</tr>
<tr>
<td>Total</td>
</tr>
<tr>
<td>Spot-market arrangements</td>
</tr>
<tr>
<td>Long-term non-contractual agreements</td>
</tr>
<tr>
<td>Long-term period-based contractual agreements</td>
</tr>
<tr>
<td>Long-term operational partnerships agreements</td>
</tr>
</tbody>
</table>

Type of collaboration and quality
In table 3 is shown the answers of connection between type of collaboration and quality in delivered service by the position in the value chain.

<table>
<thead>
<tr>
<th>Table 3: Assessment of the quality of delivered FM service and type of collaboration, by respondents’ position in the value chain. Average assessment on a scale from 1 (least) to 5 (most). (Storgaard 2011)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respondents</td>
</tr>
<tr>
<td>Total</td>
</tr>
<tr>
<td>Spot-market arrangements</td>
</tr>
<tr>
<td>Long-term non-contractual agreements</td>
</tr>
<tr>
<td>Long-term period-based contractual agreements</td>
</tr>
<tr>
<td>Long-term operational partnerships agreements</td>
</tr>
</tbody>
</table>

The pattern is the same as in table 2. A co-variation between type of collaboration and quality, with the lowest quality in on the spot market agreements and the highest in long term operational partnership. Again the supplier and the compound group of both suppliers and customers are more confident that partnerships deliver the highest quality, while customers are much more reluctant to distinguish, finding the highest quality in the type 3 agreements on
collaboration – and only with small differences between the types of collaboration and quality in solution.

**Type of collaboration and product innovation of the customer**

In table 4 is presented the assessment of what the type of collaboration may bring to the customers process of product innovation.

The general pattern showing a co-variation, where spot market arrangements contribute least – and long-time operational partnerships contribute most. Suppliers are much more positive in this assessment, while customers only assess a minor difference. Respondents which are both suppliers and customers are assessing an even more positive effect on the innovation at the customers when FM services are delivered through long-time operational partnerships.

**Type of collaboration and economic benefit**

At table 5 are shown the answers on co-variation between type of collaboration and effect on economy at the customers’ business.

| Table 4: Assessment of the effect of delivered FM service on the buyer’s product innovation and type of collaboration, by respondents’ position in the value chain. Average assessment on a scale from 1 (least) to 5 (most). (Storgaard, 2011) |
|---|---|---|---|---|
| Respondents | Average | Supplier | Customer | Both supplier and customer |
| **Spot-market arrangements** | 42 | 2.79 | 2.50 | 3.14 | 2.29 |
| **Long-term non-contractual agreements** | 37 | 3.32 | 3.36 | 3.42 | 3.00 |
| **Long-term period-based contractual agreements** | 42 | 3.67 | 3.69 | 3.68 | 3.57 |
| **Long-term operational partnerships agreements** | 33 | 4.18 | 4.36 | 3.87 | 4.57 |

The supplier side and the compound group of both suppliers and customers assessed that operational partnerships would give a high positive contribution to the business of the customers. But the assessments given by the customer were quite different. For the supplier lowest positive effect is found in long term operational partnerships – and highest both at the spot-marked agreement and on continually collaboration with a specific running time of period. But also on this topic, the differences are minor.
A sum-up
To sum-up, the surveys showed a strong common assessment that operational partnerships had a lot of benefits concerning suppliers’ productivity, innovation and on quality in solution compared to other types of collaboration – especially compared to the spot market type of collaboration. But it also showed that especially suppliers and the compound group of suppliers and customers which was dominated by the public sector were strong in this experience. Customers, make up by industry, were more disinclined in their assessments. Actually they assess that longer term collaboration for an agreed time period was more effective and gave more quality in solutions.

When it came to implication for economy concerning the customers’ business this difference between the assessment of suppliers and (the private) customer were even clearer. Suppliers’ assessments were that operational partnerships were more productive, gave higher quality in the solution – and gave the highest positive output on the customers’ business. The assessments of the customers were quite different. Operational partnerships were the type of collaboration which influenced the business of the customers on the least positive way.

Table 5: Assessment of the effect of delivered FM service on economy of the customer's business and type of collaboration, by respondents' position in the value chain. Average assessment on a scale from 1 (least) to 5 (most). (Storgaard, 2011)

<table>
<thead>
<tr>
<th>Respondents</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Satellite</td>
<td>Total</td>
</tr>
<tr>
<td>Spot-market arrangements</td>
<td>37</td>
</tr>
<tr>
<td>Long-term non-contractual agreements</td>
<td>36</td>
</tr>
<tr>
<td>Long-term period-based contractual agreements</td>
<td>37</td>
</tr>
<tr>
<td>Long-term operational partnerships agreements</td>
<td>29</td>
</tr>
</tbody>
</table>

Case studies
Customers
Two firms were chosen for an intensive interview: a property company working for a pension fund, and a property company working for a real estate investment fund. For both companies, the FM services were of crucial importance for their business: renting of offices, especially for administration and business purposes. The value of an investment in private estate was seen as directly proportional with the outcome from the renting business – estimated empirically at a factor 25. That is to say that a change in the cost of running an estate was followed by a change in its book
value with a factor 25 of the change in cost. That implied that a very accurate balance was to be found between a low cost for the FM services (and for other operational costs) and a high level of rent from the renting businesses. If the low cost of FM services led to such a decrease in the quality of solutions that it affected the businesses of the user/customer renters in a negative way, the problem was immediately to be seen in the book value. So the FM customers had to navigate very precisely between a wish to lower the cost of FM as much as possible, and a wish to maintain an accurate level of quality corresponding to their customers’ businesses.

In these cases they were searching for FM suppliers – not too expensive – but it was especially important that they were trustworthy and capable of accomplishing their task according to the demand of the property companies’ customer. Here SLA and KPIs were assessed not to be adequate tools for management. In both cases, the suppliers not only had to be cheap, effective and good at their job. Not least the local dimension/local presence was considered important, but also knowledge of the estate and the customer as well as communication and behaviour at the tactical and operational level were seen as crucial factors for the selection and choice of the right suppliers. In both cases, they found it difficult to express these “soft” factors in invitations to tender. Therefore they both preferred to stick to the suppliers with whom they had good experience. By making invitations to tender now and again, they were convinced that they had a good idea of the price level.

Both companies preferred long-term collaboration with firms. However, they were reluctant to formalise the time factor, and they didn’t want to establish formalised operational partnerships. Actually, what they got was un-formalised collaboration with operational partners often running for a long time, with some of the characteristics ascribed to formal operational partnerships: service mind set, trustfulness, knowledge sharing, and responsiveness to the tasks as well as to the user of the buildings.

Both companies also felt a pressure from their stakeholders (the investment/pension companies) to document that they were practicing the most effective relationship management. They felt that they were doing it right – it worked – but it didn’t work convincingly.

**Suppliers**

On the supplier side, two firms were interviewed. The one delivering integrated services to the public and the private market, with a yearly turnover of DKK 450 million and 600 employees. The other specialised in formalised operational partnerships, especially for building maintenance, had a turnover of DKK 106 million and 100 employees.

For each of the firms the market was expected to be found to be expanding, because of the process of outsourcing FM activities that private and especially public organisations were engaged in. For both suppliers long-term collaboration was seen as a means of more effective organisation of work, higher productivity and better service for customers. Therefore, both companies were seeking contracts with long-term operational partnerships with their customers.
In the last twenty years, focus in the FM sector has been on enhancing the efficiency through scientific management of process and organisation. At the operational level, this has resulted in extensive focus on a higher degree of division of labour, specialisation and development of technology (materials and tools) for operational tasks (e.g. for cleaning operations). At a strategic and tactic level, tools were developed to be part of the contracting process. It was the experience in leading FM firms that FM services had to be implemented even at a strategic level at the customers, and not as it had hitherto been the practice, at a tactical level. This meant a focus on relationship to the central management in the buying organisations, and it meant a negotiation between CEOs and not between local caretakers and local firms (source: Interview with PS Experience, 2011). Definition of tasks through SLAs, and monitoring through benchmarking as well as on KPIs were important parts of this process. Resources and tools for administration and control were to follow. This use of scientific management and the language connected with this explicitation had other effects as well. Firms without competencies for this ‘scientification’ of FM tasks, measuring and contracts were outperformed.

The two supplier firms in this study had brought the process of scientific management a step further. A side-effect of the focus on efficiency is a tendency to change the focus from the need of the customer to the relationship between SLAs and KPIs. What was agreed on – and what was delivered. In other words, a project mind-set that sees the task to be done from the supplier’s side and not from the users/customer’s side. This was to be changed to a service mind-set, where the task to be delivered as well as the situation in which the task was conducted had to be seen from the users/customers point of view – and still, of course, be delivered in a cost-effective way. There was focus on widening the responsibility of the individual operators at the operational level, not only to take responsibility of own tasks – but to have a view for the entire delivered service situation – even when not defined in an SLA. The local dimension had also taken a new strength. Both in on-site communication with users/customers, in taking immediate action if problems arose, as well as in the (innovative) planning process of the task of tomorrow.

In this way more focus was put on soft parameters linked to persons even at the operational level. Not only on competency to solve a specific task, but also to take responsibility for the whole service situation, ability to communicate and understand the user/customer. Therefore much more effort was put into the recruitment process of employees also at the operational levels.

For both suppliers, it was the experience that such a change was necessary if they were to deliverer the needed service. However, it was also the experience that especially the public market was difficult to operate in. The public market was governed by a focus on price – and price only. A complex decision structure implied a long time-lag between delivered low-quality services, and a change in a contract, not to say new invitations to tender and new suppliers. It was also recognised that it was difficult to explain the soft dimensions like responsibility, communicative abilities. High numbers of SLAs and KPIs were much more convincing.
DISCUSSION
We set out to explore advantages and disadvantages of intensified and extended inter-firm collaboration between suppliers and buyers in markets for facility management services. From the point of view of the supply-side there will often be advantages associated with long-term rather than short-term contracts as uncertainty to future sales are reduced. From the point of view of the buyer, however, short term agreements may be preferable, as this leaves open access to alternative suppliers and a more or less continuous negotiation of price. Although survey data showed generally that operational long term partnerships were assessed as beneficial, customers were more disinclined in their assessment. This was particularly the case as regards customer from manufacturing. Public sector customers often both consume and produce public FM services, and were therefore in the category of both supplier and customers. The assessment of this mixed group was very similar to the assessment of the suppliers. So, private customers seem more unwilling to accept possible benefits of long term partnerships than do public sector actors. This difference between private and public customers challenges FM practitioners differently depending on whether FM users are from the private or the public sector. The private market focus strongly on cost efficiency and the potential effect of FM services on core business. Furthermore, market-based actors have the freedom to choose between tendering and non-tendering depending on context and what is judged most appropriate under different circumstances. Public sector actors do not have this choice. In public procurement of FM services it is mandatory that contracts are put out to tender. There is often an explicit focus on lowest price, which may result in low quality of delivered FM services, which however not necessarily resulting in an immediate change of supplier, as would often be the case in private business. Change of suppliers in a long term contract may be a complex process involving proceedings and legal action.

From an FM practitioner’s point of view, supplier as well as user, the findings of both survey and case studies point to crucial ‘soft’ factors in developing and maintaining successful collaborative inter-firm relationships. Although soft in comparison with purely techno-economic ‘hard’ performance indicators, even some soft elements may be subject to systematic evaluation and measurement. For example mutual trust between organisations may appear to be a very intangible concept, not least from a strategic point of view. Nevertheless, many activities and day-to-day arrangements are clearly effective in furthering mutual trust-building. This includes for example genuine two-way information sharing on a continuous basis, social communication and exchange of information at the strategic, tactic and operational levels between two organisations, and joint problem solving in contrast to antagonistic and strictly contract-dictated governance of inter-firm relations. Other examples that originated from the study were the capability to assume responsibility and demonstrate reliability, i.e. to meet user requirements, apply an all-inclusive view of the service needs of the customer, ensure timely delivery, and be able to communicate with and understand end-users.

Thus the respondents in case-study interviews strongly emphasised that effective governance was not limited to operational factors, measurable indicators, contracts and control. A tacit dimension was observed to consist of soft, social and sociological mechanisms. Here informality
and trust were central elements and social, knowledge and learning capabilities at the operational level were of increasing importance.

Besides the ability to do the job in the operational situation, responsibility not only for own tasks, but for the situation seen from the user point of view, as well as communicative and social competencies were seen as crucial factors. This implies a change in the focus on the labour force management from unskilled, low-cost labourer, a high degree of specialisation and division of labour, with control and responsibility at the tactical level, to a change in the division of labour, with responsibility, control and communicative abilities of the agents at the operational level.

In Figure 3 is presented four types of the organisation of FM services distributed by user orientation and by efficiency. In the first quadrant is found traditional in-house FM operation. Efficiency may be low but operators may be near to users. In the second quadrant the FM services is typical outsourced, orientation for users has been lowered, and efficiency may not be significantly higher. The third quadrant illustrates the change in use of scientific management of the FM services. Here efficiency has been increased, but the user orientation may not have changed. In this quadrant a measurement trap exist in which much inter-firm collaborative effort risks to end, if focus is excessively concentrated on specialisation, scale economies, and quantitatively measurable outcomes only. The fourth quadrant of the figure illustrates the combination of a quantitatively oriented intention to measure performance with a service mindset’s qualitative focus on the nature and character of users’ needs. This might be a challenging position answering both needs of efficiency and the demand of customers, where price is not the only factor that counts.

In the empirical analysis it was indicated as a problem that these new sociological competencies were difficult to explain, but had a tacit character. This was seen as a problem. Not because it couldn’t be managed between the customer and supplier at the tactical and operational levels, but because it was difficult to describe explicitly this type of management as efficient, compared with traditional benchmark-based management at a strategic level.

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<tr>
<th>User orientation low</th>
<th>User orientation high</th>
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<td><strong>Efficiency low</strong></td>
<td><strong>Efficiency high</strong></td>
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<tr>
<td>II. Integrated FM production; low degree of specialisation (Small FM-providers)</td>
<td>I. Dialogue-based collaboration, knowledge sharing (In house provision)</td>
</tr>
<tr>
<td>III. High degree of specialised and division of labour; well-defined FM-services (Large FM firms)</td>
<td>IV. Combines scientific management methods with strong user-orientation; service mind-set (Collaborative FM-service-providers)</td>
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CONCLUSION
It became clear from the case studies that there were severe limitations of a short-term, transactional FM-purchasing strategy that focused on own prosperity rather than the building of reciprocal relations between FM seller and buyer. A relational purchasing strategy that implied close, long-term collaboration with a high degree of coordination and sharing of knowledge provided both parties with opportunities for mutual development of innovative FM-service solutions. Risks included uncertainties such as vulnerability because of a high degree of dependence and exposure to opportunistic behaviour. As findings of the case studies showed there were nevertheless ways to deal with such uncertainties. Thus, the findings of Lehtonen (2006) were confirmed in so far as trust-enhancing mechanisms and a focus on joint problem solving were decisive factors in creating mutually benefitting long-term relationships within facilities management. From the case studies, we furthermore observed that openness (and thus possible exposure to opportunistic behaviour) and commitment are core attributes of trustful inter-firm relationships. Moreover, findings stressed that in inter-firm collaboration it is crucial that different organisational levels – strategic, tactic and operational levels – in both organisations be involved in communication on a continuous basis in order to develop and maintain a collaborative momentum. Without support from trust-based inter-firm relations at top-level, collaborative practices at lower levels are not encouraged. On the other hand, development of innovative solutions and potential for new service solutions require bottom-up innovation brought about through close interaction at the operational and middle-manager level on a regular, if not daily, basis.

REFERENCES


7 KNOWLEDGE IMPLEMENTATION

7.1 CHAPTER INTRODUCTION

Per Langaa Jensen

Introduction
Knowledge implementation is an aspect of knowledge management, which focuses on how knowledge can be transferred and shared. In a FM context this often regards knowledge transfer from FM to building projects, but it can be applied to many other inter- and interorganisational contexts.

There were three papers presented at the session.

Sofia Pemsel and Gunnar Blomé, Sweden: “Knowledge as a Source of Power in Real Estate Organizations”
The paper presents a study based on questionnaires to 71 real estate representatives in Sweden on (1) how knowledge sharing activities are perceived in real estate organizations, (2) what motivates individuals to share information and what incentives are applied and (3) if insufficient knowledge sharing results in additional costs. They found that knowledge sharing were insufficient between different subunits in the organizations, that the main motivation for employees were assuring good jobs for colleagues, incentives for knowledge sharing was not in use and all could report on additional costs due to missing knowledge sharing.

Anders Peder Hansen and Torben Damgaard, University of Southern Denmark: “Communities of Practice as a Learning Challenge in Construction Projects: How Facility Management Knowledge can be Integrated in the Learning Process”
Based on a combination of a case study and literature review the paper addresses how FM knowledge can be integrated in the design phase in light of the dominating principles of managing construction work emphasizing standards in contracts, role and skills in combination with informal exchange of experience in communities of practice. They recommend that priority should be given to integrating facility managers into design phase and secondly that boundary objects (i.e. objects facilitating a dialogue between different communities of practice) should be given more attention.

In this paper a methodology – tested in two projects – for integrating FM knowledge in construction processes were presented. 18 experienced facility managers were involved in developing the methodology. It comprises four elements to take into account when following a predefined screening process. The first experiences from using the methodology in a specific case are promising.
General discussion
In the discussion following the presentations the following issues were addressed:

• There was a general agreement that knowledge feedback from practice to design is weak concerning FM. It was pointed out that difficulties in feedback from operation to design are important problems in many areas within production management. Lessons might be learned by analyzing other work in this field.
• The participants had difficulties in relating the theoretical concepts presented in the second paper to their daily practice.
• Finally, more participants found that methodologies for assuring feedback are not difficult to establish. The difficulties are to assure priority to feedback in construction and design processes.

7.2 KNOWLEDGE AS A SOURCE OF POWER IN REAL ESTATE ORGANISATIONS

Sofia Pemsel and Gunnar Blomé

ABSTRACT
Purpose: The purpose of the paper is to explore how knowledge contributes to value adding activities within real estate organisations. More specifically, the study aims to investigate; (1) how knowledge sharing activities are perceived in real estate organisations, (2) what motivates individuals to share knowledge and what incentives are used to support them, and (3) if employees in these organisations have experience of insufficient knowledge sharing activities resulting in additional project costs.

Approach: The study includes a literature study and the findings from a questionnaire survey of 71 representatives of real estate organisations in Sweden are presented.

Results: Knowledge sharing activities were perceived to be insufficient between different subunits in the organisation. Employees’ main motivation for learning was to achieve a good job for their customers. Rarely did any of the organisations use incentives to increase knowledge sharing activities. Almost every respondent acknowledged that a lack of knowledge and knowledge sharing resulted in additional project costs: a majority rated it as 10% of total project cost.

Practical Implications: The contribution of the findings is an increased understanding of how employees in real estate organisations perceived knowledge sharing between organisational units. Sensible knowledge management can possibly facilitate the organisation’s ability to improve its profitability.

Keywords: Knowledge, Motivation, Construction projects, Real Estate Organisation, Profitability.
INTRODUCTION
There has been an ongoing discussion on knowledge sharing and knowledge creation in organisations over many years. Much of the management theory and theories of knowledge assume organisational permanence or, at least, its desirability (Daskalaki and Blair, 2004). This tendency is unfortunate as organisations vary widely in structure, duration and meaning, which affects the learning, knowledge sharing and knowledge creation within them. The ability to learn is, for example, higher in a traditional functional matrix organisation than in a project based organisation (PBO). In PBOs, the knowledge that individuals possess is not effectively shared, as all parts tend to be separate, isolated units. There are some advantages of using a PBO, for instance, its capacity to meet clients’ needs through a close engagement with the end users (Hobday, 2000). Some research has been conducted with this focus, see for example Hobday (2000) and Lindström (2004). However, these studies focused mainly on PBOs in manufacturing industry and there is still need to improve the understanding of how knowledge is shared and created in organisations in the construction and real estate industry.

Real estate organisations incorporate both project (temporary) and property management (permanent) operations and can be regarded as a project matrix organisation in accordance with Hobday’s classifications (Hobday, 2000). The focus on real estate organisations is of particular interest as the industry plays a major economic role in many countries, which implies that efficient knowledge sharing and creation would most likely impact not only the companies, but society as a whole. Unfortunately, real estate organisations have over the years been characterised by insufficient knowledge sharing activities. From the 1940s to the 1970s, many countries, particularly in Western Europe, focused on production of prefabricated buildings. It was a technically and functionally-oriented way of producing houses with divided responsibilities for each function which resulted in poor information and knowledge exchange between different operations (Lindberg, 1994b; Johansson, 1998; Franklin, 2000). Since the 1970s, the focus has shifted from production of houses to maintenance and production of services, e.g. a focus on clients’ and end users (Lindberg, 1994b; 1994a). The new demands resulted in new ways of organising management function locally. Housing management focuses nowadays on, for example, allocating decision-making powers and responsibility in projects or local organisation (Blomé, 2006; Blomé, 2010).

The industry as whole is still, however, characterised by inefficiency like increasing costs, conflicts and client dissatisfaction, low competition, cost overruns and delays (Latham, 1994; Egan, 1998; Dubois and Gadde, 2002; Lind, 2003). Over the last decade, property-related services has become more specialised and a client-and-provider concept is now characterising many organisations. This puts extra demand not only on creating new skills but also on improving knowledge transfer between different activities in the projects as well as in day-to-day property management.

The purpose of the study presented here is to explore how knowledge contributes to value adding activities within real estate organisations. More specifically, the study aims to investigate: (1) how knowledge sharing activities are perceived in real estate organisations, (2) what mo-
tivates individuals to share knowledge and what incentives are used to support them, and (3) whether or not employees in real estate organisations find that insufficient knowledge sharing activities result in additional project costs. In order to address these objectives, a questionnaire and a literature review were conducted, focusing on knowledge and knowledge sharing endeavours. The survey revealed that knowledge sharing between different organisational units in real estate organisations is insufficient and was regarded by respondents to result in 10-25% additional project costs.

STATE OF THE ART
Polanyi (1983) asserted that knowledge has a tacit and an explicit dimension as “we can know more than we can tell” (Polanyi, 1983:4), meaning that knowledge can be, for example, facts, logical relations and emotional awareness. According to Polanyi, tacit knowledge is not a thing but a process, implying that tacit knowledge is, in fact, tacit knowing. There is widespread agreement among different researchers that tacit knowing, or tacit knowledge, is acquired through experience and is context dependent (Gourlay, 2004). Polanyi (1983) considered that the tacit and the explicit parts of knowledge have different natures and cannot be converted into the other, while Nonaka (1994) advocates that they can convert into each other in a knowledge creating process consisting of: socialisation, externalisation, combination and internalisation. Others have claimed that knowledge is rarely completely tacit or explicit, but contains elements of each, and that knowledge has to have both dimensions to be useful (Wong and Radcliffe, 2000).

Knowledge sharing in organisations
Depending on which perspective is adopted, knowledge can either be regarded as transferable or not. Functionalistic and economic studies usually advocate that knowledge is transferable, which has been criticised by those who adopt a behavioural and sociological approach. The former have been more interested in the costs of transfers and have not bothered about the tacit and explicit nature of the knowledge, but whether knowledge is of specific or general kind (Yang and Wu, 2008). The latter advocate that knowledge creation and knowledge sharing requires human activity, for example interpretation, either individually or socially and distinguish between different knowledge dimensions (Nonaka, 1994; Marshall and Brady, 2001; Fernie et al., 2003; Mariotti, 2007). Kaplan and Henderson (2005) advocated that it is fruitless to argue whether an organisation should be regarded as a complex social system (from a behavioural and sociological perspective) or as an institution with a number of self-interested individuals (from an economical and functional perspective). They highlighted the importance of comprehending the interaction between the two perspectives in order to recognise how local routines emerge and are used, i.e. the processes whereby an individual learns about how things are done and whereby the individual learns what kinds of behaviours are likely to be rewarded (Kaplan and Henderson, 2005). The complexity of sharing and creating knowledge in organisations has been addressed in a number of studies; for example, Treleaven (2004) argues that it is not enough to provide communication technology alone. Instead, a true understanding of the social processes in the organisation is necessary and, moreover, there has to be a willingness to interfere with them. Boer et al. (2004) mapped out previous research of why knowledge sharing
is absent in organisations and found the reason to be the characteristics of the knowledge, for example, a high degree of tacitness, personal characteristics such as their absorptive capacity and contextual organisational aspects.

As mentioned before, organisations that conduct a major part of their operations in projects struggle with a complex contextual situation. The situation is complex as the organisation needs to consider, for example, the character of assembled resources (financial, human and technical) that are presented on a one-off basis, with the explicit intention that they will be dispersed on completion of the task (Daskalaki and Blair, 2004). There is therefore a need to find efficient strategies to take care of generated knowledge in order to be able to improve business operations before the knowledge becomes dispersed at completion of the project. It is also necessary to ensure that knowledge accumulated in the organisation is properly used to improve projects and their outcome (Hansson et al., 2010; Pemsel et al., 2010). The strategy needs, for example, to encourage cross-project communications (Hobday, 2000).

**Personal motivation and the use of incentives**

Knowledge gives power to the holder which can affect the willingness to share it with others in organisations (Treleaven, 2004). Yang and Wu (2008) reviewed earlier findings of factors that motivate individuals to share knowledge in organisations and found them to be competition, reciprocity, reputation, ego, satisfaction and the organisational climate.

A study analysed the relations between **motivational** and **relational** factors for knowledge sharing in organisations and described four relational models of why knowledge is shared or not: **communal sharing** i.e. what is mine is yours; **market pricing**, i.e. achieve compensation for sharing; **equality matching**, i.e. a moral desire of equality; and **authority ranking**, i.e. share to higher ranked people. The study revealed the importance of understanding the cultural implementation rules, the motivational factors and the nature of the social relations in order to identify how knowledge is being shared in an organisation (Boer et al., 2004).

**Organisational culture** is the system of artefacts, shared values and basic underlying assumptions (Schein, 1990) that affects how the organisation operates, how employees interact and how decisions are made to influence knowledge sharing and knowledge creation. A study, with a social information processing and behavioural theoretical approach, revealed the importance of creating a culture that encourages knowledge sharing and that the employees regard knowledge as an asset to be shared with others, rather than as just belonging to them. The employee’s **reputation** was also found to have a positive effect on whether knowledge sharing takes place or not (Lucas and Ogilvie, 2006) which is in line with the model of equality matching and authority ranking (Boer et al., 2004).

Corresponding to the market pricing model are findings from a study by Yang and Wu (2008) that takes a **self-interest perspective**, meaning that if knowledge owned by other people is valuable to them, they are unlikely to share it with others. As their current advantage in holding knowledge might suffer if they too freely share it, they need to feel that there is a payoff
from sharing knowledge (Yang and Wu, 2008). In order to deal with self-interested employees, researchers commonly advocate implementation of different incentive systems in the organisation.

Optimisations of return on investment in organisations have been found to require incentives that motivate employees to share knowledge in the organisation. The incentives need both to be measurable and to align with the individual’s interests to be effective (Milgrom and Roberts, 1992; Kaplan and Henderson, 2005). In contrast with those findings other studies have highlighted the restrictive effects of using incentive system to make people share knowledge if a culture of sharing does not exist within the organisation (Lucas and Ogilvie, 2006; Yang and Wu, 2008).

In the project-oriented organisational context, Eskerod and Skriver (2007) uncovered six assumptions that influence knowledge sharing between project managers. Those assumptions were: (1) masculine values were most valuable, (2) perception of time as scarce, (3) no concern about the past, (4) limited concern about the future, (5) relationship based on respect and no unrequested interference, (6) private ownership of projects and a role conception stating that project managers are independent and do not appreciate when others interfere or try to help. This organisational culture surrounding project managers hampers willingness to become involved in knowledge transfer activities and lessons learned (Eskerod and Skriver, 2007).

In summary, depending on the perspective adopted, knowledge is regarded differently. It impacts the perceptions of proper methods for knowledge sharing endeavour, the impact of organisational culture, personal motivators and the usefulness of incentives in organisations.

**APPROACH**

The survey was based on a questionnaire which was distributed to managers in the real estate industry. The managers came from municipalities, privately and publicly-owned real estate organisations and were mainly found through contacting well-informed persons or by using the southern Swedish real estate branch organisation’s (CFF) network. The questionnaire consisted of 16 questions split into four sections: (1) background information, (2) management of information and knowledge sharing, (3) motivation and use of incentives and (4) economic influence. Not all information from the questionnaire was used in this paper.

The selection of relevant respondents within every organisation was not obvious from the start, since most organisations differ in their structure and role responsibilities. The optimal respondent should be familiar with all activities related to real estate projects or property management. The questionnaire was not tied to job title and the aim was to find the most suitable person to answer the questionnaire. The questionnaire was reviewed and tested by a number of people familiar with these issues before being sent to the respondents in order to reduce misinterpretations and increase the reliability. In the event, the questionnaire was sent to 140 individuals and 71 of them responded which gave a response rate of 50%. Two reminders were sent out to increase the response rate. The respondents were encouraged to provide a written comment on all questions and many of them justified their responses in this way.
RESULTS
The respondents were project managers and property managers working in real estate organisations in both the public and private sector; 56% and 44% respectively (see table 1). A majority of the respondents had experience of managing both premises (i.e. office, retail and industrial properties) and housing and, moreover, engaged in both projects and property management activities. In many real estate organisations property managers undertake smaller projects such as those involving operations and maintenance, which helps to explain this duality in work.

The questionnaire revealed that many respondents had worked for a long time in the real estate sector, but few had been in the same organisation. In the construction sector, it is rather common for people to switch between client, contractor and designer roles during their career, which implies that even though respondents had been working for a long time in the sector it is no guarantee of experience of project management.

Knowledge and knowledge sharing
31% state that knowledge sharing activities are insufficient. The main explanations for this deficiency were:

- lack of measurement, follow-up and evaluations
- lack of time
- insufficient communication between the project management department and the property management department
- insufficiently competent board group with regard to project management and property management activities, i.e. they do not understand their needs and area of expertise

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<th>Table 1: Background information of respondents</th>
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<td>Public organisation</td>
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<td>Management of housing only</td>
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<td>Both management of housing and premises</td>
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In general, respondents said they had sufficient knowledge about technology and their customers but that they lacked knowledge of leadership and group dynamics. This finding may be explained by the large number of respondents working with both projects and property management. Property managers’ main role is to be experts on technical and customer-related questions. But they are not so experienced when it comes to project management. A large number of respondents stated a lack of customer knowledge. This situation highlights the importance of creating more efficient knowledge sharing between the different organisational units in the real estate organisations. The questionnaire moreover demonstrated that the respondents considered themselves to be skilful in developing knowledge of technical aspects, customers and project management competences such as scheduling and budgeting. Yet, they considered themselves to have insufficient competence in sharing knowledge with other intra-organisational units and in collaborating with them. In some cases, the respondents also experienced insufficient follow-ups and evaluations due to a perceived lack of time.

The most commonly used tools and methods for communicating and sharing information and knowledge were telephone and meetings: meetings to other intra-organisational units like the property management, project management and the board group department; but also meetings within their own department. Not so commonly used tools and methods were mentorship, evaluations, work-rotation, benchmarking, databases, network meetings, and policy documents and guidelines.

Even though real estate organisations cannot be considered to be a pure PBO the questionnaire uncovered that they struggle with many of the same issues that the organisational structure gives, for example the loose-coupling between different subunits. As mentioned before, respondents prefer first hand, direct communication and interaction to others in knowledge sharing endeavours and consider themselves, in general, to be competent when it comes to technical aspects, budgeting, scheduling and their customers. Their competence concerning leadership, group dynamics and communication with other department was however limited. It appears as if the culture in a real estate organisation encourages the development of those more explicit knowledge areas.

The characteristic of sharing explicit knowledge on harder issues raises the question of the efficiency of doing this directly with just a few people. They did not commonly use guidelines and policy documents which would have been more efficient when sharing explicit knowledge with a larger number of people. This tendency might imply that the knowledge is not totally explicit and needs to involve more interactional forms of activity in order to fit to the more tacit parts of the knowledge and make those documents useful. It can also imply that they are stuck with old habits and that the prevailing culture allows them to continue to do as they always have done.
Many respondents expressed a need to further develop knowledge that is characterised by involving more tacit knowledge dimensions, or more tacit knowing, for instance leadership and group dynamics. Those activities would probably require richer forms of interaction to be more efficiently shared, like mentorship, collaborative evaluations and work rotation. Unfortunately, those activities were not commonly used among the participating organisations.

**Job motivation, incentives and economical consequences**

Respondents’ primary motive for succeeding in their work was the willingness to make it better for the customers and their secondary motive was to attract more demanding tasks (see Figure 1). 84% of respondents replied that their organisation does not use incentives to encourage knowledge sharing activities and, perhaps as a consequence of that, none of the respondents was motivated to learn and develop knowledge by, for instance, a salary increase.

![Figure 1: Respondents’ primary motivation to succeed in their work](image)

96% of respondents believe that lack of knowledge and knowledge sharing results in higher project costs. Up to 57 percent of the respondents considered the size of these additional costs to be 10% or more. All together as much as 94 percent of the respondents thought lack of knowledge leads to additional project costs (see figure 2). The survey, however, does not make known what they count into those numbers but a number of comments were given that those additional costs are referred to:

- financial uncertainty
- lack of monitoring and control
- unclear contracts leading to opportunistic behaviour
- lack of knowledge resulting in knowledge being bought in from experts
• insufficient documentation and inefficient knowledge development in the organisation
• poor management of existing competences within the organisation
• knowledge from experts and intra-organisational subunits were introduced too late in the project resulting in rework and delays
• customer often lacks knowledge of their own organisational needs and requirements in terms of space layouts leading to additional costs
• changes and added work during the project process
• lack of follow-ups and evaluations

Whether their ratings are accurate or not is unclear, but the additional costs are probably higher than 10% since it is difficult to derive activities causing additional costs due to insufficient knowledge and knowledge sharing. Of interest with these findings are that the respondents acknowledge that additional costs occur due to insufficient knowledge and knowledge sharing.

Figure 2: Additional cost from a lack of knowledge sharing

The questionnaire finally showed that additional costs are mainly set against the project, but the property management also get additional costs from completed projects (see figure 3). Since both parties were cost aware, this has potential to act as a driver for increasing knowledge sharing between project and property management. It appears that it exist a room for improvement for decreasing the additional project costs.

Since the real estate industry plays a major role in many countries it is noteworthy that the respondents believe that a lack of knowledge sharing results in 10% additional costs. Altogether in all projects performed in every real estate companies in Sweden this is a remarkable sum of money, which highlights the importance of improving knowledge sharing activities within
real estate organisations. Even though budgeting was regarded as one of the better developed areas of expertise among respondents, awareness of costs in relation to knowledge sharing can be questioned.

Financial uncertainty appeared to be a major problem in many projects. It was remarkable that a lot of projects were launched without committed funds. This seemed to be common in public organisations, but also occurred in private organisations. To cover additional project costs, caused by the financial uncertainty other funds were frequently taken out from other activities which led to tighter future budgets and savings in other parts of the organisation. This can be related to insufficient monitoring, control and knowledge sharing between projects but also in some cases absence of proper knowledge. The research also revealed that prestige projects in the public sector sometimes were conducted even though they were not economically justified. This due to a hope among some project members to achieve more resources along the project process, i.e. the project covered a number of budgets and sometimes even political periods. One of the respondents claimed that management was very confident about the project managers, which led to a culture in which it was acceptable to add new things on to the project as long as it improved the final product. Some part of this can be explained by poor preparation and lack of customer and client skills when the project was initially ordered, i.e. the respondents’ comments suggested that lack of adequate scope definition, related to lack of knowledge probable is the largest single cause of cost and time increases. Further research is required to understand this phenomenon, but it adds another perspective to why costs increase in projects.

Figure 3: How the additional costs are shared between project- and property management

- Mostly project but also property management 50%
- Mostly property- but project management 19%
- Only property management 15%
- Only project management 8%
- Project- and property management equally share all additional costs 8%
DISCUSSION
The purpose of the study was to explore how knowledge contributes to value adding activities within real estate organisations. The study included a survey of 71 respondents from real estate organisations in Sweden. A majority of the respondents conduct both property and project management activities. This duality can be explained by many property managers undertaking small projects in real estate organisations even though that is not their expertise.

Perception of knowledge sharing activities in real estate organisations
Knowledge sharing activities were perceived to be insufficient between different subunits in the organisations. The survey revealed that the organisations in general are rather fragmented when it came to knowledge sharing between different departments and that the respondents preferred to have direct contact when sharing knowledge and to use methods such as meetings and telephone. The respondents regarded themselves to be skilful in technical and customer-related aspects and harder project management skills like budgeting and scheduling, but weaker when it came to softer and more tacit aspects like leadership and group dynamics.

Efficient knowledge sharing in project-oriented organisations has also been found difficult in previous studies. For example, a study by Eskerod and Skriver (2007) exposed that project managers are surrounded by a culture that promotes them to invent their own routines and checklists and not to interfere with others, i.e. project managers value the freedom and independence their role gives them and they want to manage the projects themselves. This study involves several property managers and most of them execute projects, although on a small scale. It would have been interesting to explore how much ‘project management’ subculture they have adopted when it comes to sharing knowledge and, furthermore, the subculture that surrounds property managers in general. This study does not cover this latter aspect.

Treleaven (2004) argued that in order to improve knowledge sharing in organisations there is a need to dare to interfere in established social processes. Such intervention implies that, in order to improve the knowledge sharing activities in real estate organisations, especially in Sweden, there is a need to overcome the focus on consensus building and pleasing everybody and demand a change in behaviour.

Motivation and use of incentives
The employees’ main motivations to learn were to make a good job for their customers and to attract more demanding tasks. Rarely any of the organisations used incentives to increase knowledge sharing activities. Since a number of employers use more demanding tasks as a motivational factor, the organisations must be rewarding improvements in some way otherwise employees would probably lose their motivation. This implies that the organisation might reward employees according to individual performance and customer satisfaction, but not their internal knowledge sharing behaviours.
It seems like individuals in the organisations are very dependent on personal contacts to knowledgeable experts. If this is the case, these actors appeared to have an equality matching or marketing pricing approach to the personal contacts (compare with Boer et al., 2004). But to others with whom they have not developed a strong relationship or respect for concerning their area of expertise, they seemed not to care about sharing. For example, the board group is considered unable to understand their needs and area of expertise and one can question what efforts they invest in interacting with them. This relation to the board group is also a sign of that real estate organisations have characteristic features of a PBO, in this case being decentralised. Employees in those organisations do not seem to be encouraged to share knowledge to individuals in a hierarchical better position, i.e. authority ranking, but instead they give the impression to rather appreciate individual experts. Knowledge as such does not seem to be perceived as something that should be shared with one and all; they seem to want something in return or regard it as a source of power.

Some respondents highlighted unclear contracts leading to opportunistic behaviour, which has previously been observed in real estate projects, as well as in other industries (Ntiyakunze, 2011). Incomplete information contributes to a typical principal-agent and moral-hazard dilemma, i.e. that each person works selfishly and favours his or her own part in the project and does not share knowledge (see Milgrom and Roberts, 1992). A lack of knowledge in different parts of a project may contribute to increased costs. The respondents felt that the desire to create something new was a major and important motivational factor. This innovative opportunity should not be undermined by tougher management control. Instead transparency, knowledge transfer before, during and after completion of projects must be encouraged and new ways of working should, as an alternative, be considered.

The real estate organisations seemed to encourage a culture of unwillingness to give time to critical reflection of both project results and the process, since people do not want to interfere with the work of others (compare with Eskerod and Skriver, 2007). It is unfortunate from a knowledge sharing and development perspective, as well as from an organisational and an individual perspective that such practices should persist. The absence of incentives is perhaps not all bad (Yang and Wu, 2008 and Lucas and Ogilvie, 2006), since those initiatives probably would have been fruitless without an organisational culture of sharing and reflecting of the work. If the findings of Milgrom and Roberts (1992) are regarded as valid then incentives would probably be useful if they succeed in appealing to individuals' interests.

Additional project costs
 Almost every respondent acknowledge that a lack of knowledge and knowledge sharing resulted in additional project costs; a majority rated it to be 10 % or more of the total project cost. Even though budgeting was regarded as one of the well developed areas of expertise among the respondents, their awareness of costs in relation to knowledge sharing can be questioned. Transparency, knowledge transfer before, during and after completion of projects must be encouraged and new ways of working should, as an alternative, be considered to reduce cost.
increase due to lack of knowledge. Particularly, there seemed to be a need for clearer funding, more control and better preparation before the projects started to improve project effectiveness and to avoid additional supplements during and after project completion.

CONCLUSIONS

The implications of this study are that, first, organisation must acknowledge different knowledge perspectives and dimensions, and match them with proper activities to improve knowledge sharing activities. It appeared that organisations would, in some situations, need to introduce new, richer forms of collaborative endeavour and give time and support for those activities in order to improve knowledge sharing in the organisation.

Second, it is important to realise what factors motivate employees to share knowledge and, if using incentives, adapt them to employees’ interests and the prevailing organisational culture and support knowledge sharing activities in general. The results from the study suggest that more sensible management of knowledge would facilitate the organisation’s ability to improve its profitability as the additional costs due to lack of knowledge sharing would then decrease.

REFERENCES


7.3 COMMUNITIES OF PRACTICE AS A LEARNING CHALLENGE IN CONSTRUCTION PROJECTS – HOW FM KNOWLEDGE CAN BE INTEGRATED IN THE LEARNING PROCESS

Anders Peder Hansen and Torben Damgaard

ABSTRACT
Purpose: How FM knowledge can be better integrated in the design phase of construction projects?

Background: In the construction industry a high reliance on standardization in contract formulas as well as in roles and skills, provides what is known as “standards of workmanship”. Thus there seems to be a paradox between the “silent” coordination mechanism of this institutionalization and community of practice on the one hand and the reliance on norms and standardization of procedures and roles which provides challenging terms for learning in construction. It seems FM knowledge integration in the construction design phase is mainly done through norms and standardization of procedures and roles. With a construction industry heavily built on “silent” coordination mechanism, how can FM knowledge be integrated in the design phase.

Approach: Knowledge management and learning. Facility management knowledge. Literature review. Case study

Results: Facility Managers and others with equal practices/practical experiences need to be connected to or integrated in the design phase of construction projects as translators or knowledge brokers. At the same time there is a need for greater emphasis on boundary objects between construction communities and facility management communities.

Practical Implications: See results

Keywords: Communities of Practice, FM knowledge, FM in construction projects

INTRODUCTION
Construction projects are temporary constellations of specialized actors from different organizations comprising several professional disciplines and backgrounds that need to be coordinated (Holmen et al, 2005; Bygballe, 2010). This creates a learning challenge for the construction industry and especially for larger construction projects that tend to be one-off in nature, which does not motivate relationship building outside projects. Therefore, construction projects often result in building functionality errors, lacking or costly operation routines and general time and budget overruns (Love et al, 2004). More than often the construction industry is accused of poor innovation capability and poor learning from previous experience from projects and existing buildings.
This has huge implications as how to integrate FM knowledge in construction projects. With a tradition focusing on regulation and standardization of procedures the use of FM knowledge will face difficulties – when learning is more informal and linked to professionals’ communities of practices.

Much research on project based learning has focused on how knowledge created in the project can be captured and used in the permanent organizations (e.g. Le et al, 2008; Bresnen et al, 2003; Brady & Davies, 2004; Scarborough et al, 2004). However as pointed out by Bygballe (2010) and Chan et al. (2004), there is also a need to look closer at how learning is supported or rather why it is not in the temporary construction project constellations, which should be a prerequisite for transferring it back into organizations. One of the most prominent reasons for poor learning is the lack of incentives for knowledge sharing due to the tendering legislation, which supports short term economic optimization and a strong reliance on well tested solutions (Dubois & Gadde, 2000; Holmen et al, 2005). Dubois & Gadde (2002) in their analysis of the construction industry concludes that the reason why actors in construction projects manage to coordinate activities and resources despite the adversarial relationships in the permanent network and the huge complexity of construction projects is a strong community of practice.

In this paper we will further discuss their conclusions, especially in relation to the possibility of strengthening FM knowledge integration in the building design phase.

In an earlier work Kadefors (1995) has described the construction industry as institutionalized due to a high reliance on standardization in contract formulas as well as in roles and skills, which provides what is known as “standards of workmanship”. Thus there seems to be a paradox between the “silent” coordination mechanism of this institutionalization and community of practice on the one hand and the reliance on norms and standardization of procedures and roles which provides challenging terms for learning in construction. The concept of communities of practice was originally developed to explain how informal groups within organizations function based on shared practice, experience and identity, where learning happens through practice and participation (Lave & Wenger, 1991). Since then communities of practice has been applied in many types of organizational contexts and has increasingly been recognized as a managerial tool for knowledge sharing and learning (Amin & Roberts, 2006; 2008).

Communities of practice in construction have mainly been investigated in intra organizational contexts (Ruikar et al, 2009; Love, 2009; Schenkel & Teigland, 2008). This article follows the line of thought from Dubois and Gadde (2002) about the importance of communities of practice in construction projects. Therefore the objective is to elaborate on the role of communities of practice in construction projects and the challenge it presents for learning, and furthermore to elaborate on the need for learning between communities of practice eg. between construction practices and facility management practices.

The one-off nature of construction projects and the low relationship building between construction actors in the permanent network is found to provide a special case, where the existence of
Communities of practice provide a challenge for learning, especially when the FM learning in time are separate from the construction process.

A case study focusing on the requirements for addressing Facilities Management (FM) knowledge in the design process illustrate the learning challenge. The case of FM is interesting in this context, as it draws on input from several professional disciplines, yet it does not have a strong presence and is not characterized by belonging to a strong community of practice in a construction project context (Tay & Ooi, 2001; Yiu, 2008). At the same time previous research has shown that learning from FM knowledge in construction projects remains a huge challenge, even though Facilities Management is seen as a discipline that can bridge the gap between buildings operations, usability and design (Jensen, 2009; Brøchner, 2003; Emmit, 2007). This also leads to a discussion of what actually supports learning between specialists in construction projects, which points at future project initiatives as well as future areas for further research.

The article is structured in the following way. First the theoretical background is presented. Second a literature review of communities of practice in general and in construction is given as well how learning across communities is supported. Thirdly the methodology of the literature review and the case study is presented. Fourthly the illustrative case study is presented including examples of FM learning challenges. The fifth section is a discussion and conceptualization of the learning challenge in construction projects based on the literature review and the case examples. Finally the sixth section concludes on the findings.

STATE OF THE ART
Theoretical background
FM knowledge should be better integrated in the design phase of the construction process to avoid FM functionality errors, lacking or costly FM operations afterwards in the building. How FM knowledge can be integrated in the design phase depends on the way the learning takes place in the construction industry.

This section starts by clarifying the role of knowledge management and learning in the construction industry, and then moves on to review the concept of communities of practice in relation to learning.

According to Polanyi (1966) knowledge can be either tacit or explicit depending on the epistemological view upon knowledge. Advocators of knowledge as explicit argue that knowledge can be extracted to data and information in documents and databases, thus making it independent from the individual (Hansen et al., 1999). Others believe that knowledge is inevitably bound to humans as they attach different meaning to information. This article does not wish to judge whether knowledge can be explicated or not, but follows the line of thought that knowledge is to a great extent embedded in routines and as experience held by individuals, which is difficult to extract as simple information.
Research of the construction industry in general indicates that construction companies often rely on individual knowledge rather than codified knowledge in organizational learning practices (Ruikar et al., 2007; Styhre et al., 2004; Kamara et al., 2002). However, the construction industry provides a special case due to its project-based nature. Projects have been described as the ideal form of organization for learning and knowledge sharing, as problem solving often requires the creation of new knowledge (Hobday, 2000), and indeed projects can be described as the primary learning entity in the construction industry (Grabher, 2004). Construction projects can therefore be seen as very knowledge-intensive units comprising several specialized actors whose knowledge must be utilized in order for a successful outcome. Yet the coordination and cooperation between specialists that is required is confronted by a “silo mentality” that prevents the benefits solutions might get from the diverse knowledge present (Scarborough et al., 2004). This stresses the importance of learning between actors in the construction project by motivating knowledge flows between actors. Dubois and Gadde (2002) argue that coordination in construction projects is based on a strong community of practice, however this actually hampers learning and innovation, and instead makes projects rely on norms and standardization. The concept of communities of practice was actually developed to explain how learning in groups is embedded in practice, thus also reflecting a view upon knowledge as tacit and individualized.

Communities of practice

The concept of communities of practice (CoP) was developed to describe and explain the way people in organizations often tend to form informal groups, where work is done based on shared knowledge and a common practice rather than within hierarchical boundaries based on formal rules (Brown & Duguid, 1991; Lave & Wenger, 1991). Tasks can be engaged by what Orr (1990) calls canonical and non-canonical practice. The first refers to that management in organization may believe that work can be structured according to directives, and the latter to what Orr (1990) in his study found that work was done as non-canonical practice, where solution are rather found based on narration, collaboration and social construction (Brown & Duguid, 1991). CoP’s exist in any organization and consist of groups of individuals who address the same type of tasks and problems and therefore over time develop a common knowledge and shared practice of solving these (Lindkvist, 2005). These groups form into tightly knit groups based on mutuality and shared understanding (Brown & Duguid, 1998). CoP’s usually span hierarchical structures and even organizational boundaries, and within organizations there will often be several CoP’s depending on the size and purpose of the organization, and people often belong to more than one. By performing similar tasks and solving problems CoP’s continuously generate new knowledge and learning, which becomes embedded in practice. Indeed according to Lave and Wenger (1991) knowledge cannot be separated from practice and in order to gain access and learn from knowledge you must become an insider in the community to learn. These authors used the term legitimate peripheral participation (LPP) to explain how newcomers in groups start by observing from the periphery and how they eventually learn through socialization. Table 1 summarizes some of the definitions of the concept of community of practice by the inventors of the concept.
Communities of practice have mainly been applied in intra-organizational contexts, as they form between groups who interact frequently (Brown & Duguid, 1991). However in their later work, Brown & Duguid (2000) distinguish between communities of practice and "network of practice". Networks of practice are thus described as groups with the same occupation, e.g. architects, but who do not work together in the same organization. This somewhat also answers some of the

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<tr>
<td>Brown &amp; Duguid (1991)</td>
<td>People in organizations tend to work and create mutual understanding in groups across formal hierarchical boundaries in what is called communities of practice. Based on Orr’s (1990) distinction between “canonical” and non-canonical” practice. Learning and problem solving happens through narration, collaboration and social construction. Learning through practice rather than formal job descriptions.</td>
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<td>Lave &amp; Wenger (1991)</td>
<td>Situated learning – knowledge cannot be separated from practice, thus you cannot simply speak of knowledge transfer, knowledge must be put in the right context to give meaning. Legitimate peripheral participation, you must become an insider to learn. Thus it is the member status that counts not the hierarchical status.</td>
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<td>Brown &amp; Duguid (2000)</td>
<td>Adds a distinction between &quot;Networks of practice&quot;, which has the following characteristics: • Occupational groups, practice in common • Reach over reciprocity, no interaction • Loosely coupled system • Everyone holds the same information &quot;Communities of practice&quot;: • Sub-sections of larger &quot;networks of practice&quot; • Knowledge distributed over the group (no knowledge redundancy) • Tightly knit groups, work directly together, high degree of implicit coordination as &quot;work practice&quot; • Reciprocity over reach, frequent interaction</td>
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criticism of the use of communities of practice. Handley et al. (2006) in a critique of situated learning (Lave & Wenger, 1991) argue that individuals may participate in several communities with different degrees of engagement.

Lindkvist (2005) also argue that communities of practice may not fit all types of organizational work, especially the work in temporary groups. It can be argued that the long term nature and tightly knit group structure of common practice characterizing a CoP does not describe the way temporary projects work, especially not when these count multiple organizational functions or even multiple organizations. Lindkvist (2005) has developed the term “collectivity of practice” (ClP) based on the argument that temporary projects consisting of members from different functions and with different specialties do not form a “tightly knit” group characterizing CoP’s. Often projects consist of people who have not met before, but who based on diverse professional backgrounds must solve complex tasks over a limited period of time. These groups often represent different thought worlds, due to a limited overlap in knowledge bases, and the limited time period of the single project inhibits establishing mutuality and shared knowledge. Therefore the characteristic of CoP’s does not fully cover how knowledge work is carried out in these temporary project organizations.

**Communities of practice in construction**

Table 2 summarizes the contributions of communities of practice in construction.

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<td>Schenkel &amp; Teigland (2008)</td>
<td>Intra-organizational</td>
<td>Investigates performance improvements through the formation of CoP’s in construction organizations</td>
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<tr>
<td>Dubois &amp; Gadde (2002)</td>
<td>Inter-organizational</td>
<td>The construction industry is built upon:</td>
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<td>• Tight couplings in individual projects</td>
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<td>• Loose couplings in the permanent network</td>
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<td>• Collective adaptations in the community of practice</td>
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Love (2009) has conceptualized upon communities of practice in the construction industry and what he calls “champions of practice”, which is formed as learning alliances between construction actors independent of an individual construction project. These are based on specialized communities of practice based internally among construction actors. However the author does not elaborate on what the underlying incentives should be to participate in a learning alliance.

Dubois & Gadde (2002), the main source of inspiration for this article, take a different perspective on CoP’s in construction by focusing on their role and consequences in the industry. The construction industry consists of loose couplings in the permanent network, as construction companies rarely form relationships outside construction projects. Construction projects on the contrary consist of tight couplings, as specialized actors need to coordinate activities sequentially within time, budget and quality constraints. Yet construction projects are often subject to huge complexity and uncertainty as specifications are often incomplete, while decisions taken early in the project may have unknown consequences that are not revealed until later in the project. Therefore the tight couplings on project level are also embedded in the permanent network, which according to the authors is held up by a community of practice. Thus the construction industry is characterized by “collective adaptations” in materials, contracting forms, tendering procedures etc. that makes it possible to coordinate activities. Kadefors (1995), although she did not use the CoP’s concept, has described the construction industry as institutionalized due to a strong reliance on building codes, norms and standard solutions. This is to some extent a result of the tendering system, which has promoted standardization within bidding procedures and contract specifications and this has again fostered generic project roles, which makes actors able to collaborate without any previous relationship.

CoP’s in a construction industry is seen as an organizational strategic management tool that can promote learning. However in order to understand the potential learning challenge in construction projects better, the level of analysis needs to be widened. The general theory of communities of practice as well as the application of it on the construction industry indicates that it should be understood on multiple levels. An important distinction that should be made is the difference between participation due to professional occupation and participation due to belonging to a community of practice (Brown & Duguid, 2000). Secondly individuals in organizations may participate in more than one community of practice (Handley et al, 2006; Brown & Duguid, 1998; Brown & Duguid, 2000). Thirdly Dubois & Gaddes (2002) view of the construction industry as one community of practice somewhat contradicts the collectivity of practice typology as suggested by Lindkvist (2005). Project organization involves a high degree of self organization within the limits of the project, and within these limits it is up to the project team to reach the project goals. However it can be argued that the knowledge specialties each participant brings to the group is anchored in their respective communities of practice, somewhat in line with Dubois and Gadde (2002), who characterize the construction industry as being held up by a CoP. However we would claim that several CoP’s exist within the construction industry as a whole, where some cut across organizational boundaries and instead form CoP between similar professions. The same will often be the case in construction organizations such as ar-
chitects, consulting engineers or contractors that CoP’s form in groups of persons occupied with the same type of tasks and problems and thus cut across functional or divisional hierarchies. At the same time people are assigned to projects, or what Lindkvist would call CIP’s, which include people from different CoP’s. These people would then work in temporary CIP’s both within their organization and in the project group consisting of consultants and client.

Having emphasized the importance of viewing the learning challenge from several analytical levels, the next section looks closer at the need for facilitating learning between specialized knowledge areas and communities of practice at organizational and project level, which is believed to be especially important in the construction industry, as has also been stressed eg. by Fong (2003).

**Learning in and between communities and collectivities of practice**

According to Brown and Duguid (1998) knowledge tends to reside within communities and becomes “sticky” and difficult to diffuse across communities. Within communities learning is considered a matter of socialization by learning through action and participation (Nonaka, 1994; Lave & Wenger, 1991). However the sharing of knowledge “between” communities is important (Brown & Duguid, 1991), as learning and innovation is often fostered in the periphery of communities and their environment. Thus knowledge sharing between CoP’s becomes important whether these are intra- or interorganizational (Brown & Duguid, 1998). The means of facilitating knowledge flows between communities can be described by the terms translation, brokering and boundary objects as developed by Star and Griesemer (1989).

Translators are individuals who belong to neither of the communities but who can frame the interest of one community in the perspective of another community (Brown & Duguid, 1998). Thus translators must have knowledge of both communities and be able to carry out negotiation directed towards both communities. Knowledge brokers participate in the communities rather than mediate between them (Brown & Duguid, 1998), and thus they represent overlapping communities. In this context Granovetter (1976) suggests that diffusion of knowledge between communities is often facilitated by people loosely linked to both communities, which supports the importance of Lave and Wengers (1991) term legitimate peripheral participation.

Boundary objects are objects of interest to more communities but viewed or used differently by each of them (Brown & Duguid, 1998). Through these one community can come to understand what is common and distinct about another community and what their “world views” are. This may also cause the community to reflect upon its own practice and thus motivate second loop learning (Argyris & Schön, 1978). Examples of boundary objects could be contracts or architectural plans in a construction project context. But processes can also function as boundary objects, as they can allow project participants to negotiate and develop a shared interpretation of tasks and problems (Brown & Duguid, 1998). In this context processes can either be enabling or coercive depending on how well they support intercommunal boundary spanning or whether they preempt compliance (Adler & Borys, 1996). Carlile (2002) distinguishes between three types of knowledge boundaries, syntactic, semantic and pragmatic. The pragmatic dimension
sees knowledge as invested in practice and thus supports the view upon knowledge by the communities of practice concept.

**APPROACH**

This article is based on a literature review of communities of practice in construction and a case study of an ongoing construction project. The case study is part of a larger study of implementation of FM knowledge in construction projects, and here the primary function is to illustrate why learning across communities of practice is important in construction projects.

The literature review was done as a specific search in EBSCO Host Research Database on the words “communities of practice”, “construction” and “learning”, and furthermore snowballing was used, by viewing references in the found articles (Miles & Huberman, 1994). The purpose of the literature review was to identify the use of communities of practice in construction and furthermore to outline the role communities of practice play in organizational learning.

A single case study was chosen (Yin, 1994), as the primary purpose was to give illustrative case examples of learning challenges. The chosen case was a university construction project, where the authors had the chance to participate. The university case has been chosen as it represents a complex construction project involving many users and many complex and novel solutions. This also makes it more challenging to take the facilities management solution into consideration during design decisions. The specific focus on facilities management in the case is chosen as it is found to be a decision area involving multiple knowledge areas, which increases the learning challenge. Thus the case was selected for its information richness (Neergaard, 2007).

The case study has been done as interaction research (Goldschmidt & Elkjær, 2005), which is considered to be within action research. However the researchers have not intervened by forcing new agendas or methods in the project. Therefore the interaction research is carried out as participatory research, where the research team participates with one joint researcher and one observant. The data collection is done as real time observations as well as subsequent reflections. Triangulation is used to evaluate the subjectivity laid on the observations by consulting fellow researchers within the FM and construction industry as well as practitioners from a consulting company. Observations of facilities management decision areas were based on Jensen’s (2009) overview of FM tasks in the construction process. The main interest of this article is the design phase covering decision, briefing and design.

**RESULTS**

**The case study**

The case study section is divided into a short introduction to the construction project case followed by some of the observations made regarding FM related decisions. The subsequent discussion is based on the observations and the previous theoretical investigation.

The construction project is a new university campus being designed in Denmark. The vision has been to create a new landmark, and furthermore the goal has been to create an open campus
that facilitates the needs of several user groups, while at the same time giving an opportunity for students and researchers to interact. Besides this sustainability is a very important issue for the new campus. The project tender was won as an architectural competition and will later be tendered to a contractor. The current project group consists of two members from the architect, one architect and one design coordinator; four members from the consulting engineer, one all-round and three specialized engineers; the client; the facilities manager and a user group consisting of the university management and representatives from each user group.

**Observations**

The architectural competition was based on anthropological research, where users were observed and interviewed about their visions of a future university. This gave the bidding architects some inspirational key words such as “train-station of knowledge”, “cross fertilization between students and researchers” and “openness”, which not only served to guide who the winning project should be, but also serve as terms used by the architect to put the users into the right context when discussing space needs and design in the initial briefing phase. Furthermore the architect appears as a central actor for facilitating the involvement of the user group. The main tool here is actually dialogue, but furthermore each project meeting mostly involves documents about specific decision areas such as heating and ventilation, accessibility and acoustics. Besides this trips to other universities have been used as inspiration and a larger dialogue involving all employees on the university was initiated by the architect. The facilities manager plays a more neutral role and mainly participates in single technically focused issues such as insulation materials and heating devices. Below are three examples of observed decision areas. This is FM problems which can be perceived as traditional FM problems handled in the design phase.

**User access to different zones:** The new university campus is a multifunctional building giving access to students, researchers as well as the public, which presents a challenge for FM of controlling user access to different zones in the building. This problem was not addressed until late in the briefing phase, as neither architect, FM or user representatives had originally recognized the problem. But on initiative from the architect a workshop was held where all relevant user groups and their access needs where identified and by combining this with information from the facilities manager and local FM personnel about how access can be controlled, a solution has been found that fulfills both the FM need to control access and the aesthetical vision of keeping an open building.

**Integration of user needs in acoustic engineering:** The acoustic conditions is a strategically important area in a university as some work routines are dependent on a high soundproofing while other zones are designed for group work and conversation. This is mainly an engineering task, however the complex architectural design, and a great focus from both FM and user representatives on proof of what the acoustic conditions will be like at different places, has forced the acoustic engineers in collaboration with acoustic engineering consultants and the architect to focus on this issue very early on in the briefing phase and by presenting use scenarios for various contexts in the building.
Access to surfaces and lighting: Cleaning and maintenance is probably one the most often mentioned focus areas of professional facilities managers. Designing “easy to clean” and “maintenance friendly” buildings may often contradict with architectural visions. As the architectural competition of the university project also illustrates there is rarely focus on cleaning and maintenance when designing the building. Other cases have shown that the consequences are not realized until very late in the building process, where the necessary actions can no longer be taken. Based on questions from the user representatives and facilities manager the architect has taken effort to illustrate how wall height and shifting positions of floors influence whether cleaning can be done from the ground or should be done by ladder or even from a lift. Also a supplier of special designed lifts has been contacted to give an example of lift functionality and price.

DISCUSSION

The case study gives an example of facilities management as a decision area that has a tendency to fall outside common areas of interest and understanding of tasks in specialized communities such as architecture and construction engineering as well as the shared practice across these communities. Furthermore objects such as project documents cannot be said directly to support user involvement as they are often written in very technical language that mainly leads to discussions between the professional construction actors, ie. architect, engineer and sometimes the client.

We have observed the high prioritization of these problems only occurred after intense interaction between several FM translators and because of the presence of a FM oriented project manager.

Table 3 illustrates the indication about collaboration between several disciplines. The table proposes that FM knowledge may both be created and used through a specialized role and task approach but also by an interdisciplinary task approach, which the university project clearly illustrates.

A large construction project is complex and within each specialized area the task fulfillment needs professional skills, and there is a tradition in the industry that specialized personnel take care of their own area in which they are educated and experienced. For example engineers specialize in lighting, acoustics, HVAC, concrete etc., whereas the architect specializes in space planning and design and setting the aesthetical characteristics of the building. However it is the engineer and architect together with the client who have the role of supporting the learning process for integrating these subject specific areas towards a proper facility solution fulfilling the client and user requirements. The competencies to work interdisciplinary to integrate solutions in a well functioning way cannot be identified explicitly. It requires involvement of several actors such as users, facilities managers and external consultants during the building process in order to integrate all the areas involved. This integration creates the basis for fulfilling the expected user experiences of the total product.
But who takes care of the FM tasks during the process? It is very seldom to experience facilities management personnel actually leading this process and in other cases they may not even participate. The integration of facilities management knowledge in problem solving to a high degree depends on the architects’ and engineers’ interest and capability in doing so. The FM perspective has until now not been in focus from the client, and has not been clearly specified or described in the specifications for the contracts. Indirectly the FM perspective has been covered through user participation The competitive bidding system is one of the barriers lowering the incentives to do so, as it tends to fix the different actors’ attention on their subject specific tasks requiring specialized knowledge. They are primarily evaluated on this dimension, mainly because it is very difficult to evaluate their contribution to the total product. The case examples illustrates that in the studied project it appears that FM decisions areas were considered in the concrete cases, however the learning process appears uncontrolled as the

<table>
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<th>Decision</th>
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<td>Need formulation and specification on functional requirements</td>
<td>Planning and choices about the design and specifications</td>
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<td>Architect makes space plan</td>
<td>Engineer designs heating system</td>
<td>Carpenter build and assembly</td>
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</tr>
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<td>Interdisciplinary</td>
<td>To integrate ideas on building requirements, functional, aesthetic and financial solution</td>
<td>To integrate ideas and recommendations on building requirements, functional, aesthetic and financial solution</td>
<td>To integrate solutions</td>
<td>To integrate the subject specific contributions</td>
<td>To integrate the different user needs of the buildings</td>
</tr>
<tr>
<td>Actors</td>
<td>Client and consultants</td>
<td>Client, consultants, projecting architect and engineer</td>
<td>Client, consultants, projecting architect and engineer</td>
<td>Client, consultants, projecting architect, engineer and FM</td>
<td>Client and FM</td>
</tr>
</tbody>
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objects and roles involved in the process did not initially detect the challenges from a FM point of view. This proves the necessity of a proper interface especially between architect, engineer and facilities manager in combining knowledge from all three areas. What can be argued is that actors belonging to strong communities of practice play a more central role in the construction sector and thus also form a better established group within the community of practice in the construction sector, as advocated for by Dubois and Gadde (2002). This may affect their role in the construction project and the control of design processes. Therefore the project groups can be said to consist of different specialized actors belonging to different communities, but some with a larger degree of shared understanding than others. Furthermore it can be argued from the multidisciplinary nature of FM decision areas requires it to be reflected in the practice of each community within the construction project and a stronger representation of an FM community in the project group. Previous research claims that the latter is often not the case.

With mainly specialized tasks learning is most important between networks of practice or actors within the same professional group. Although these may not work closely together, they attach the same meaning to the same information based on their profession. The role of boundary spanning could be what Carlile (2002) referred to as syntactic, such as checklists and data processing. However this may not be the biggest contributor to new or improved solutions. The learning challenge becomes greater when tasks are solved interdisciplinary. Here the existence of dominating communities of practice may prevent a proper knowledge flow from less dominant communities. The requirements for boundary spanning are greater in this context, as actors may not attach the same meaning to objects or any meaning at all. Furthermore knowledge brokering and translation are important mechanisms, but a challenge would here be, who can actually fill this role, without being biased by a dominating community of practice. The industry wide community of practice, as indicated by Dubois and Gadde (2002) may also have stronger presence among some actors than others, especially the professional construction actors. This can also function as a barrier for involving facilities managers and users in the learning process.

Thus the learning challenge in construction project should be analyzed from more levels as depicted in Figure 1.

This research has been conceptual and future research should involve the role of the depicted levels of communities and networks on learning processes in construction projects. This could also be directed at a greater focus on how learning is facilitated between these levels, based on the theory of boundary objects and how well they support learning. In this context boundary spanning could be expected to play a very important role in the design phase of a construction project where overall decisions are taken, which affect later task areas solved by specialized actors. This would make the existence of dominating communities of practice a greater challenge in the earlier project phases. The practical implications of this research are that a greater focus could be given to identifying and evaluating design processes and objects on how well they support FM and other users involvement. Here one might wonder why the use of visualization is not used to a greater extent in construction projects.
CONCLUSION

The concept of communities of practice was originally intended for explaining how learning in informal organizational groups becomes a part of practice. Therefore an increasing focus has been put on utilizing communities of practice as a strategic managerial tool for learning and knowledge sharing believing to foster innovation. In the construction industry the concept has also been acknowledge, even though the literature only reveals a few contributions on the subject. These primarily deal with the innovation and learning potential. However Dubois and Gadde (2002) also argue that the existence of an industry wide community of practice supports coordination in construction projects but inhibits learning, as design becomes based on standards and norms. This illustrates the learning challenge that communities of practice may also provide.

Therefore this article has focused on conceptualizing the learning challenge through the lens of communities of practice. The literature review showed that this may be widened to include more levels of analysis including networks of practice, organizational communities of practice and temporary project based communities of practice. These are interconnected and thus the different levels affect the learning challenge on project level. Facilities management decision areas were used to illustrate the learning challenge, which according to the case study can be divided into specialized and interdisciplinary decision areas, where facilities management to a great extent is interdisciplinary. This also illustrates the necessity of facilitating learning between different communities and how design processes and boundary objects can foster knowledge sharing and learning within and between communities in the construction project.

PRACTICAL IMPLICATIONS

When seeking to integrate FM knowledge in the design phase of construction projects communities of practices must be taken into consideration. Instead of implementing even more
new standards and formal norms the practices and interaction between practices have to be considered.

Facility Managers and others with equal practices/practical experiences need to be connected to or integrated in the design phase of construction projects as translators or knowledge brokers. It is not as informers they should participate – they cannot know in advance what the relevant information is. They have to participate in the design process even represented by others with relevant FM knowledge or by themselves. The networks of practices taking FM problems in proper consideration can be possible. At the same time there is a need for greater emphasis on boundary objects between construction communities and facility management communities.

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7.4 POKI – A MANAGEMENT TOOL FOR THE IMPLEMENTATION OF FM KNOW-HOW IN CONSTRUCTION PROJECTS

Poul Henrik Due and Peder Stephensen

ABSTRACT
Purpose: This paper is based on a project initiated in order to develop methods to enhance the implementation of Facilities Management (FM) know-how in construction projects.

Background: It is well known that many Danish facilities are more problematic and expensive to run than necessary. Studies have shown that in many cases this is due to the lack of focus on the operational phase and implementation of FM know-how when new facilities are planned and constructed. A preliminary study has revealed that the use of FM know-how encounters many barriers.

Approach: The project is an empirical study involving the authors and a project group of 18 experienced Facilities Managers, architects and engineers.

Results: Based on discussions in a series of intensive workshops the group came up with the POKI management tool for screening the facilities management element of construction projects, where “P” represents the change within the Processes, “O” the changes in the Organization of the projects and the behaviour of the parties, “K” the necessary know-how and tools, and “I” a well planned and executed information and communication effort.

Implications: The lead author is currently involved in two major construction projects involving the creation of world class research and teaching facilities at two faculties of the University of Copenhagen. In both projects, there is intensive management focus on FM and user demands. Facilities Managers and User Coordinators have been placed centrally in the organization and several of the suggested features in POKI have been used in the projects. As a result, in the pre-construction phase of the projects, most of the barriers to the implementation of FM know-how in the projects have been overcome.

Keywords: FM knowhow, FM portal, FM screening, Management Tool, POKI,

INTRODUCTION AND BACKGROUND
Facilities managers in Denmark are often quoted as saying that the facilities they run are unnecessarily problematic and/or expensive to run, and that they are not adequately or well designed enough for the activities they cover. The reason, apparently, is that many facilities have been constructed without the necessary focus on the subsequent operational phase. The authors addressed this question in 2006 and subsequently decided to investigate whether this was correct, and if so why no meaningful corrective action had been taken by the construction industry in Denmark.
The conclusions from a workshop in 2006 attended by ten experienced representatives of contractors, builders, building owners, consultants and researchers were that it is true that many facilities are constructed with features which are problematic and/or expensive to run. This results in considerable challenges for the facilities managers and unnecessary costs for the building owners. Several reasons for this were put forward including: Focus solely on the economy and technicalities of the construction phase, a difference in status between the construction staff and the FM staff, and a lack of know-how, etc.

In 2008 to 2009 a preliminary study\textsuperscript{20} was carried out by the Department of Entrepreneurship and Relationship Management at the University of Southern Denmark in cooperation with the authors. The study was initiated within the framework of, and supported by the Danish Centre for Facilities Management – Realdania Research. The main result was the identification of a number of significant and important barriers preventing the use of FM know-how in construction. These are listed in Table 1.

Based on the results of the preliminary study, research was initiated that focused on the development of methods to increase the implementation of FM know-how in construction projects. The research was divided into two sub projects: An Action Research project and a Best Practice project. The sub projects ran concurrently and with interaction and mutual inspiration. The Action Research project was managed by Torben Damgaard at the Department of Entrepreneurship and Relationship Management at the University of Southern Denmark, and the Best Practice project was managed by the authors. The Action Research project was based on the “Triangle” construction project – a new research and teaching facility for The University of Southern Denmark. The main interaction between the two sub projects was the exchange of management information from the construction project to the Best Practice project and the transfer of FM know-how to the construction project. The university construction project has therefore been a case study for both sub projects.

This paper presents the results of the Best Practice project managed by Poul Henrik Due and Peder Stephensen. It should be emphasized that the paper is the result of a thorough empirical study based on the input from a panel of experienced practitioners.

**CURRENT SITUATION AND APPROACH**

Challenges of running less maintainable facilities are not new in Denmark. Back in the 1980s a number of engaged and experienced facilities managers from *Byggeriets Udviklingsråd* (BUR) (The Danish Construction Development Council) published “*Planlægning af driftsvenligt byggeri – en anvisning*” (Planning of operational friendly buildings)\textsuperscript{21}. Furthermore, other Danish public development and standards bodies put forward common suggestions on the principles

\textsuperscript{20} Damgaard and Erichsen, 2009: Implementering af drift i byggeri (The implementation of facilities management know-how in construction), The University of Southern Denmark.

and structures for the maintenance of facilities, e.g. the guide from the former Danish Building Planning System (BPS): “Fælles principper for vedligehold af ejendomme” (Common Principles for the Maintenance of Buildings). The Danish Association of Consulting Engineers also produced a guide to building maintenance and operations and maintenance planning “Bygningsdrift – Vejledning i udarbejdelse af håndbog for bygningsdrift og tilhørende driftsplan”. Today, the Danish construction and FM industries are hardly aware of these publications.

In the literature there are several references to different methods and tools that can be used for designing buildings that are efficient to operate and maintain, and evaluating product supportability, etc.\textsuperscript{22} There are, however, many aspects of these concepts. During the course of the project, which is described later in this paper, a suggestion for more precise definitions based

\textsuperscript{22}E.g. publications from The Building Services Research and Information Association, published at: http://www.bsria.co.uk/services.
on five categories was made. The first four focus on operation and maintenance, with the fifth being usability:

1. The “Built-in-characteristics” of the building elements, e.g. lifespan, energy consumption, environmental impact, costs etc.
2. The building sections that require cleaning and maintenance – products, methods and equipment, and their influence on the validity, lifespan, environmental impact, etc.
3. The building sections that require control, supervision, oiling, change of spare parts etc.
4. Accessibility for cleaning, operations and maintenance including access for the equipment used
5. Accessibility, flexibility and usability in relation to the activities taking place in the building.

RESULTS
The purpose of the Best Practice project was to develop methods to overcome the above-mentioned barriers in order to increase the use of FM know-how in construction projects and thereby enhance the operation and use of Danish property, both technically as well as financially and environmentally.

The Best Practice group
The group consisted of 17 experienced individuals from all parties within the construction and FM industries (see Table 2). The group held four all-day workshops focussing on the challenges of operating buildings, the methods for implementing FM know-how in construction projects, and the evaluation of input from the “Triangle” project. Furthermore, the group provided FM know-how to the construction project.

During the workshops the participants provided numerous examples confirming the barriers outlined in Table 1. The study also revealed that it may be difficult to elevate facilities managers sufficiently from their everyday tasks into “helicopter” perspective when seeking solutions to particular challenges.

Case Study
The study of the “Triangle” construction project, which was followed from the briefing phase, revealed that although FM know-how was incorporated at some decision levels, the focus on the operational challenges was temporary, unstructured, not prioritised, and solely based on the know-how and interests of each of the participants. In this respect, the case study confirmed several of the previously mentioned barriers.

Model
As shown in Table 1 the barriers to the implementation of FM knowledge in construction are multifaceted. The project group concluded that it was not simply a matter of new tools, but that a thorough change of the management mindset within the industry was also required.
The group has therefore suggested the use of the “POKI” management tool when implementing the main elements of construction projects. POKI involves the thorough FM screening of the four elements shown in Figure 1:

**Process**
- from feasibility study to use of the building

**Organization**
- with focus on FM

**Know-how & tools**

**Information & communication**

**Figure 1: The four elements of POKI**
Please note that although this paper focuses exclusively on the FM perspectives, these elements should be included in a matrix with the other traditional elements of a construction project.

This tool is designed for use by all parties in construction projects, but the initiative to use POKI in the projects is primarily the responsibility of the construction client and the client consultants. At a strategic level, the decision to use POKI at all stages of the process is essential to maximize the benefits of the tool, particularly because this calls for a more intensive effort at the start of a project than is usual.

The four elements of POKI related to a construction project are visualized in Figure 2.

*Figure 2: POKI in a construction project*

**The Process**

From the very start the construction client must create and send out the right signals for the project. The main signal is that the goal of an FM project is the creation of a user-friendly facility based on the vision, mission and values of the company. Furthermore, an essential element to guarantee the best possible planning and start of the project is to ensure that sufficient time and resources are deployed from the start of the project.

This is not new to actors in the construction industry, but nevertheless it is common knowledge that speeding up the process often results in quick and hasty decisions. It is worth emphasizing that resources spent on thorough planning are resources well spent.

It is also important to remember that the costs spent on planning a facility represent only a fraction of the final manpower costs of the enterprise that ends up using the facility. Therefore,
a 10% increase in the planning costs that enhances the productivity of the users a fraction is money well spent (see Figure 3).

**Figure 3: Costs spent on planning are well spent**

Planning can play an important part in ensuring that the process progresses smoothly. In many projects different processes and phases overlap each other. It is important to be aware of this to assure that the focus is maintained on each individual phase, thereby ensuring that each phase is completed and evaluated properly. Conversely, it is important to assure that any subsequent phase is based on the know-how gained as a result of the decisions made in the previous phase. The following sections outline the essential FM related aspects which should be handled in the different phases.

Construction projects are traditionally divided into four broad phases: pre-project; pre-construction; construction; and post-completion. In many projects the pre-project phase is divided into the Feasibility Study and Briefing, and the pre-construction phase is divided into System Design and Detailed Design. The project group therefore chose to work with 6 phases. The post-completion phase is called Commissioning and Handover. The overall tasks in the two first phases are to outline the construction client’s demands for the project, with the remaining phases to assure that the demands are met.

In the feasibility study the construction client, in cooperation with the client consultants, must set the project goals covering the vision of the project, based on the mission, vision and values of the enterprise. The overall aim must be to thoroughly and clearly describe the needs, wishes and expectations of the management and the employees of the construction client. It is important to note that the goal of achieving a user- and FM-friendly facility is often in competition with a considerable number of other elements such as construction costs, environmental issues, working environment issues, sustainability, etc. Management should therefore be clear and firm when prioritizing these competing aspects.
In the briefing phase the needs, wishes and expectations are transformed into a description of the requirements for the facility, which subsequently must be fulfilled by the architects, engineers and contractors. In this phase it is important that future end users and FM staff are consulted in order to ensure that the necessary end user and FM demands are accurately described. In this phase the management can use strategic programming which takes into account both the current requirements of the enterprise, and the requirements of the facility throughout its operational lifetime. In this context two strategic aspects come into play: The strategic development plans and possibilities of the enterprise, and the adaptability of the facility for alternative use.

In the design phases, systematic FM-screening of the choices is essential in terms of the architecture, the types of construction, the materials for the building envelope, the types of technical systems and the distribution and layout of rooms and spaces. The design phase is the one where the main demands must be specified, and where it is still possible to make major alterations to the plan without adverse financial consequences. Once the design phases are complete, the financial consequences of later changes increase rapidly. The FM screening must be an integral part of the process and may include e.g. sufficient accessibility for cleaning, servicing, maintenance and the use of lifts and other necessary machinery, the cost of maintenance, cleaning etc., expected lifetimes for the materials in question and the number and distribution of cleaning rooms, etc. Detailed lists of issues which must be addressed can be found in e.g. the Danish publication “Planlægning af driftsvenligt byggeri” (Planning of operational friendly buildings) and for technical systems the English guide “Maintenance Engineering and Management”. Both publications suggest FM relevant focus areas in most of the construction phases.

Furthermore, it is essential that the construction client and their consultants list their requirements in the FM documentation which will be prepared and transferred to the construction company’s organization during the construction. The documentation must be tailored for the building in question and structured in such a way that makes it as easy as possible for the future FM staff to use the documentation.

During the last decade the use of digital tools has increased considerably, and consequently the use of Building Information Tools and Simulation Models is expected to open up new possibilities for simulating the realtime use, maintenance, cleaning, evacuation procedures (e.g. fire), etc. in a building. This will enhance the quality of the evaluation of user and FM situations and thereby create a better foundation on which to base decisions. This also includes lifecycle cost analysis.

During the construction phase the main task is to ensure that the contractor fulfils the agreement concerning FM and user demands. Larger project changes must be evaluated from a

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23 Jensen, Per Anker, 2002: Byggeri. Fra vision til ny virkelighed (Construction. From vision to new reality), Kbh. Tegl.
lifetime cost perspective to ensure that the consequences over the operational lifetime of the facility are factored into the decision-making process.

**The Organization**

When the time comes to choose the project organization it is important to create a strategic overview of the competence profiles of the staff that will be involved in the project. Furthermore, staff continuity is of utmost importance to minimize the loss of information between the project phases. The authors recommend that the management designates a suitably motivated senior management person who should be responsible for fulfilling the requirements, and maintaining the focus on the milestones described by the management. Furthermore, the project organization staff must include: one or more representatives from the future users, a representative from the future FM staff, a technical client consultant and an FM consultant. In order to ensure that the information concerning FM and user information etc. is transferred from one project phase to another, one of these persons or another designated person must be appointed as the “linking pin”\(^{26}\) for the project.

**Know-How and Tools**

The third element in POKI is the necessary know-how and tools. During the course of its deliberations the project group has identified the lack of formalised know-how and the need for a number of tools which should be tailored to meet the requirements of the parties concerned and the construction phase at any given stage. In Denmark, formalised information is somewhat fragmentary, but naturally any existing know-how should of course be utilized when creating new tools and know-how. A number of Danish publications have been identified as well as international publications including the new British Standard “Facility Management Briefing – Code of Practise”\(^{27}\) and “Soft landings – a Process for Designers and Constructors to improve the Operational Performance of Buildings and provide valuable Feedback to Project Teams” from BSRIA\(^{28}\), all of which may be used as sources to create additional know-how and tools.

The project group has come up with a suggestion for the structure and content of an FM Portal of know-how and tools but it is too comprehensive to be presented in this paper. The authors can be contacted for additional information.

**Information and Communication**

Last but not least, an important element in POKI is the necessary Information and Communication effort. The importance of this is often underestimated and with the increased use of digital communication tools the volume of this information has increased to such an extent that it creates problems in information overload terms. It is, however, important to ensure that the right know-how and information is collected, prioritized, focused and communicated to the right stakeholders at the right time.


\(^{28}\) The Building Services Research and Information Association: http://www.bsria.co.uk/services/design/soft-landings/
As early as possible in the construction process the construction client and client consultants must define the information and communication strategies as well as describe the information and communication plans. Project Web is a tool that is increasingly used in the Danish construction industry. However, the tool is used in many different ways so it is important that the use of Project Web is properly planned, including deciding who has access to what, and how.

PRACTICAL IMPLICATIONS
The POKI management tool has been introduced to a group of experienced people within the Danish construction and FM industries and comments have been made that POKI is merely structured common sense, and that the principles can and have been applied to other areas. The need for initiative by top management, the required continuity and transfer of information from one phase to another and the necessary information and communication effort undoubtedly can also be applied to other areas. However, as this is the first time that the total context has been described for the FM area the authors are convinced that a change in management mindset is necessary if the implementation of FM know-how is to increase in the future. Although it is primarily a matter of management attention and innovation, the secondary consideration is providing the necessary tools for the industry.

POKI calls for the use of more resources (organization, time and manpower) within the first phases of a construction project, which presupposes that there is also a change of habits. POKI is a management tool for use by construction clients and client consultants who wish to construct user- and FM-friendly facilities. For many, the introduction of the complete tool may seem complex, but it is also possible to use elements of the tool as an icebreaker to get the process started. For example environmental and sustainability initiatives can be combined with the FM screening of projects because optimizing the FM organisation supports the efforts within these areas. In the United States LEED and BREAM certification schemes are very popular; linking the user and FM screening to the environmental aspects may break the ice.

There already are Danish examples of the POKI approach in projects. The 1st author is currently involved in two major construction projects for The University of Copenhagen which are currently in the transition stage between the feasibility study and the briefing phases. The Faculty of Science and the Faculty of Health Sciences need new research laboratories, teaching facilities, and office space. The faculties rent their premises from the Danish University and Property Agency and the size and complexity of the facilities reflect the rent that the faculties are capable of paying. Furthermore, the main goal of the projects is to create world class research and teaching facilities. Consequently, the management of the faculties want premises that are both tailor-made to the needs of the users, and are as cost effective to operate as possible.

Management focus is reflected in the organisation of the project as the facilities managers and the user coordinators (responsible for putting forward user demands for the projects) are members of the construction client committee. In addition, the organisation involves a commissioning group of which the Facilities managers and User coordinators are also members, and as such they work as the “linking pins” in these projects. All in all there are more than 50 user groups represented in the two organizations. This has resulted in intensive focus on
the operation and maintenance of the planned facilities, with the many involved professionals ensuring the broadest possible use of specialist know-how. Furthermore, the Danish University and Property Agency has developed standard requirements for the construction of laboratories based on many years of experience.

The description of the organisation also included detailed plans for the communication and information elements of the projects, with clear descriptions covering the responsibilities of the different parties, committees, groups etc. This has ensured clear communication paths and a common understanding of the interfaces. Due to a tight timeframe, the feasibility study and the briefing phase have partly run simultaneously. Nonetheless, the feasibility studies are finalized for both projects with comprehensive descriptions that have been checked and accepted by all parties as a basis for the subsequent briefing phase.

All four mentioned elements in POKI have been used in the first two phases of the projects described. Compared with most construction projects, this has resulted in the FM staff and the users having an enhanced status and greater influence on the outcome of the projects. Together with a clear organisation and a planned communication and information strategy, this has ensured that most of the project related barriers have been overcome (see Table 1). Furthermore, the focus of the construction client committee on the operational phase, the intensive involvement of facilities managers and user groups in the project, and the detailed standard specifications for the construction of laboratories have overcome most of the competence-related barriers. Finally, the whole organization of the projects with the focus on the creation of world-class research and teaching facilities has been instrumental in overcoming most of the sociological barriers in the initial phases of the projects.

With these examples in mind the author’s hope that POKI may serve as inspiration for people who see the possibilities and/or necessities for creating more user- and FM-friendly facilities that will complement and enhance Denmark’s efforts to reduce energy consumption and the overall costs of FM.

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8.1 CHAPrer INtroDUcTIoN

Suvi Nenonen

Introduction to the topic
Added value of FM has been a research theme in European and Nordic FM research for several years. The focus is on the significance of added value of FM to corporations, society and corporate social responsibility. The challenges of this focus are following:

• How to make the invisible added value to be visible?
• How to measure added value?
• How to develop added value?

These challenges are part of the reality of corporations in their daily life both in the public and private sector. The research in the field has made huge steps in order to visualize the processes, roles of different stakeholders and outcome of FM. This visualization provides different kind of maps and structures, which support the discussion about different value adding channels of FM.

The second challenge concerns the proof of added value. The development of both qualitative and quantitative measures to document how and how much facilities add value is also one achievement of both research and practice. The most forward-looking facilities managers are able to use these measures as a tool to convince the strategic management of the client organization.

The development of added value is the ongoing challenge, which has lately one strong driver: environmental issues and corporate social responsibility. The environmental friendly behavior can be supported by FM – this is the real channel to indicate the successful value adding policies both in short and long term perspective.

It is important to map, measure and develop the strategic FM and its value adding elements. The right position of FM organization and good partnership is a joint effort, which aims to the one exact goal: to improve the efficiency of the processes in the client organization and add value for them. The research of the topic makes this all easier to map, understand and develop.

The conference session on this topic had presentations of four papers, but only one of these is included in this book. The reason is that it has been decided to include two of the papers in a forthcoming publication with specific focus on the added value of FM, which also has Per Anker Jensen as the main editor, and the last paper has been withdrawn from this publication by the author after the conference.
Akarapong Katchamart, CFM: Classifying FM Value Positioning by Using a Product-Process Matrix
Section 8.2 presents a product-process matrix to be used for classifying the value positioning of FM organizations. The hypothesis is that FM value positioning located along the matrix diagonal will deliver greater customer value than FM value positioning in the off-diagonal positions of the matrix. The paper also demonstrates the applications of the matrix by examining the FM value positions in the FM organizations within the two multinational Danish based corporations LEGO group and A.P. Moller - Maersk Group.

8.2 CLASSIFYING FM VALUE POSITIONING BY USING A PRODUCT-PROCESS MATRIX

Akarapong Katchamart

ABSTRACT
Purpose and Background: Facilities management value position is conceptualized as the relative optimal point of value delivering of facilities management (FM). This paper argues that the degree of value delivering is based on the degree of facilities product customization and complexity compared with the type of facilities processes between FM organizations with their clients.

Approach (Theory/Methodology): This paper develops the facilities product – process matrix to allow comparisons of different facilities products with facilities processes and illustrate its degree of value delivering. The building blocks of matrix are a facilities product structure and a facilities process structure.

Results: A facilities product structure, characterized by degrees of facilities product customization, complexity and contingencies involved, defines four facilities product categories. A facilities process structure, characterized by levels of information, knowledge and innovation sharing, and mutual involvement, defines four facilities process types. Positions on the matrix capture the product-process interrelationships in facilities management.

Practical Implications: The paper presents proposition related stakeholder value to positions on the facilities product and facilities process structures and on the matrix. This framework also demonstrates the illustrative applications of the matrix to examine facilities management value positions from two FM organizations within two multinational corporations: LEGO group and A.P. Moller – Maersk Group.

INTRODUCTION

The main reason why facilities management (FM) exists as an entity in its host organization is to support the primary activities of an organization more effectively. FM needs to align organization’s primary processes with facilities processes that deliver facilities services or facilities products which are an essential support and/or add value to the client organization, CEN (2010). The supportive role of FM can be defined as a key function in managing facilities resources, support services and the working environment, supporting the core business of the organization in both the long and short term (Chotipanich, 2004, Tay and Qui, 2001).

The role and identity of FM is perceived among clients, customers and end-users at an operational level in their respective organizations, Grimshaw (1999). In order to deliver the better facilities service and solutions, many FM authors, (Grimshaw, 1999, Then, 2003, Yiu, 2008) propose that FM process has to be involved in a strategic process and to be seen and embedded in a corporate board. Some even assert that FM has to be core business itself (Waheed, and Fernie, 2009, Yiu, 2008) and owns its corporate authorities. However, boarding on strategic processes is neither FM’s arbitrary decision making nor FM’s claims. Chotipanich (2004)’s research shows that the processes of organizational decision-makings on the needs of facilities are inherently influenced by two main factors (1) Internal factors, such as, organizational characteristics, facilities features and business sector and (2) External factor, such as, economic, social, environment, legislation and regulation, FM market context, and local culture and context.

This paper asserts that the degree of value delivering by facilities service and solution is based on the degree of facilities product flexibility converging with the type of facilities processes between FM organizations with their clients. Facilities product: (What does FM offer?) is the overall perceived facilities offering from FM. It is the question of what FM organizations offer to its stakeholders. Facilities process: (How do facilities products be offered and be perceived?) is the relationship between FM and its client who acts a representative of the whole group of stakeholders. It is the question of give and take on how FM organizations offer facilities products to its clients and how clients perceive FM product offering?

The aim of this paper is to develop the facilities product and process structure matrix that illustrates facilities management value position is the relative value delivering position from FM to its stakeholders. This matrix allows FM organization to analyze its current value delivering position and projects the proposed added-value delivering position. FM organizations and their activities are presented systematically to allow comparisons not only of the positioning of facilities service but also of the restructuring of service within and reallocation between different types of facilities service.

The development of a product-process matrix requires the conceptualization of its two building blocks: (a) the facilities product structure - a classification scheme of product categories and (b) the facilities process structure - a classification scheme of process stage (Hayes and Wheelwright, 1979). This paper develops the facilities product and process structure and present propositions on stakeholder value corresponding to the product and process structures. The
last part of the paper presents the product-process matrix and proposition relating to the interrelationship between the categories of the facilities product structure and facilities process structure to the creation of stakeholder value. The product-process matrix is exemplified through two FM organizations in their host multinational organizations.

**FACILITIES PRODUCT STRUCTURE**

This paper conceptualizes facilities product as bundles of facilities provisions (software) and materials (hardware) that provide services, assets, tools, and consumables to make work easier/ to support the primary activity of the organization and its properties, CEN (2009). Facilities product covers not only building operation maintenance but also includes workplace, facilities, support services, property, corporate real estate, and infrastructure. The conceptualization of facilities products have been discussed and classified by many authors.

Varcoe (1993) groups a facilities product into three categories based on its capacity and capability of suppliers who offer related FM products. First, the comprehensive one-stop solutions, offering both the management and all of operational FM product from total FM supplier. Second, the management expertise and influence operational product from FM companies who supply related FM products. And third, the specialist facilities product from service suppliers who offer particular operational services. Nutt (2000) categorizes facilities products into four generic types of primary resource management central to the FM function: the management of financial resources, physical resources, human resources, and the resources of information and knowledge. He (2004) also identifies facilities products from its impact from time frame perspective: the “short-short” time focus of the support services sector, the “short-medium” time horizons of business, the “medium-long” time frames of the property market and the “long-long” time scales of environmental concern. Sarich (2004) classifies a generic scope of a facilities product by its application encapsulating eight clusters: (1) real estate and property development, (2) facilities project management, (3) maintenance and repairs, (4) building services and operations, (5) office services, planning programming, (6) space planning, (7) operations administration/management and (8) employee supports and services. Kaya and Alexander (2005) distinguishes types of facilities products from the output perceived by five different customer’s views from its host organization: (1) benefits to core business recognized by FM main board director, (2) viewed as property issue by property manager/director, (3) viewed as people issue by HR director (4) viewed as operational issue by operational director and (5) viewed as hard cost issue by financial director.

Based on the above views, the facilities product structure differentiates product offering on a continuum of flexibility of facilities products. The key factors in a facilities product can be categorized into two groups:

1. Input of facilities products including capacity and capability of suppliers, primary resource, and application
2. Output of facilities products including outcome from FM product, impact from time frame perspective
Figure 1: The four stages continuum of facility product structures

- **Mass transaction**
  - Office furniture and stationary provision
  - Internal move
  - Post and mail distribution
  - Courier services
  - Telephones
  - Records management
  - Print and fax
  - Storage and distribution
  - Reprographics
  - Reception, and telephone operator
  - Travel arrangements
  - Car fleet control
  - Transportation
  - Restroom
  - Landscaping and landscape maintenance
  - Building shell/ fabric maintenance
  - Maintenance and repair plant
  - Cleaning and Housekeeping
  - M&E/ Operations/ Run plant
  - Catering
  - Work Programming
  - File Services
  - E-mail Services
  - Directory Services

- **Standard contract**
  - Security
  - Space configuration and reconfiguration
  - Office allocation
  - Budget and cost control
  - Purchasing and contract control and negotiation
  - Energy distribution and management
  - Waste disposal & Environment management
  - Pest control
  - Disaster prevention and recovery
  - Space allocation, utilization and relocation
  - Space use audit and monitoring
  - Churn planning
  - Space planning
  - Relocation
  - Annual resource planning
  - ICT Management & Advisement
  - Service Desk IT
  - IMAC (Install, Move, Add, Change and Delete activities for the hard- and software for the workplace)
  - CAPM
  - Connectivity & Telecommunications

- **Customized delivery**
  - Health & Safety
  - Business hospitality
  - New Building
  - Landlord activities and Rent review
  - Leasing and sub-letting services
  - Location searching and selection
  - Acquisition and disposal of sites and buildings
  - Real estate/ Property portfolio strategy
  - Lease negotiation and management
  - Facilities planning/ Master planning
  - Mid-term resource planning
  - Extending & Alteration

- **Contingent relationship**
  - Public relations/ Governmental affairs
  - Community affairs
  - Long-term resource planning
  - Strategic development planning
  - Portfolio Optimization

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This paper differentiates between facilities product stages of facilities products based on FM literature, (Sarich (2006) and CEN (2009)) and adapted from the literature on service research, Tinnilä and Vepsäläinen (1995), Schmenner (2004). Figure 1 shows the facilities product structure and relates the four stages continuum of the product structure from lowest to highest degree of customization and complexity of contingent involved.

Mass transaction is the commoditized facilities product with standardization of offering and few options in term of product delivery. It is a staple facilities product for supporting organizational primary activities. It carries out the day-to-day basis operation creating the short-term impact to its host organization, which it directly influences the productivity and effectiveness of organizational primary activities. End users explicitly perceive and comment on the quality and effectiveness of this facilities product rather than other types of facilities products. Examples include cleaning and housekeeping, catering, reception and maintenance and repair plant.

Standard contract delivers the extended numbers of facilities product options providing complex specifications than mass transactions. The output of this product is primarily reviewed by customers who procure service level agreement (SLA) or key performance indicator (KPI). It focuses on short-medium impacts to its host organization. Examples include space/office allocation, utilization, relocation, space use audit and monitoring, space planning, and churn planning.

Customized delivery offers the more customized facilities products and contributes the medium-long impact to its host organization. Because of its more tailor-made product and longer-range effect, it requires a FM provider to be involved in strategic planning process with its customers and clients. Examples include landlord activities and rent review, leasing and sub-letting review, facilities planning/master planning, real estate and property portfolio strategy, acquisition and disposal of sites and buildings, and leasing negotiation and management.

Contingent relationships closely associate with or even embed in the organization’s primary activity. It contributes to the long-term impact and affects the whole organization’s bottom line perceived by clients and top management teams directly. Facilities managers particularly engage in an organization’s strategic planning process. FM and its host organization share the mutually agreed goal, for instance, benefit and risk sharing. Examples include retail outlets and space renting, community affairs and public relation, long term resource planning, and strategic development planning.

**Stakeholder value proposition**: FM stakeholders from different levels such as end users, customers, and clients are able to perceive the value delivering differently. By the increased customization and complexity of contingent involved of these facilities product stage, they move from mass transaction to contingent relationship. For example, mass transaction stage contributes to the value explicitly perceived by end users but clients who act on a strategic level hardly notify the significant impact or value to the overall bottom line. On the other hand,
contingent relationships stage encapsulated every stages of value creation; clients are able to acknowledge value delivering more than mass transaction that delivers the single stage of value creation.

**Hypothesis 1:** The greater degree of facilities product customization and complexity, the higher value delivering. Facilities product positioned toward the bottom of the product structure will deliver greater stakeholder value than facilities product positioned toward the top of the product structure.

**FACILITIES PROCESS STRUCTURE**

This paper conceptualizes facilities process as the collaborative relationship between FM organizations with their clients who act on the behalf of the rest of stakeholders, focusing on how does an FM organization offer facilities products to its clients? And how do clients perceive FM product offering? The success of a collaborative relationship leads to the success of value delivering to the stakeholder, Lehtonen (2006). The characteristics of a successful collaborative relationship consist of trust, the length of commitment and the willingness to coordinate activities, Mohr and Spekman (1991). In parallel with the discussions of the conceptualization of facilities processes, it has been discussed and classified by many FM authors as following:

![Figure 2: Facility process structure](image)
Barret (2000) classifies the hierarchy of FM relationship into five vertical levels based on levels of innovation through the supply chain. Starting from non-core FM functions (level 1) to a strategic level (level 5), he suggests that at the level 5, there is a high probability of creating value. The innovation network at level 5 represents the strategically collaborative efforts with FM supply; a concerted and sustained effort needs to be performed in order to build strong and creative relationships.

Burstow (1994) notifies facilities processes into two types based on the type of FM’s role: FM as a contractor, which provides the commoditized service, justified by activity rather than performance and FM as a business partner which provides the added value service and offers the wide range of service. Lehtonen (2006) categorized facilities processes into three categories of relationships between a FM organization and its client based on the length of relationship. First, arm’s length contract is the short-term relationship focusing on operational level. The contractual agreement is focused on price. There are no mutual goals and activities among FM organization and its client. Second, operational partnering is the medium-term relationship focusing on uncertain reduction and quality improvements while the level of strategic involvement is not so significant. Third, strategic partnering is the long-term inter-organizational relationship, usually setting three to five years, exceeding the operational partnering. There are mutually agreed goal and activity between a FM organization and its client.

Based on the above views, the facilities process structure differentiates processes related on a continuum of levels of information, knowledge and innovation sharing, and mutual involvement. This paper classifies between facilities process stages of facilities processes based on FM literature and buyer-supplier literature. Figure 2 presents the facilities process building block consisting of axis X: the degree of mutual involvement and axis Y: degree of data transferring. The degree of mutual involvement between FM organizations and their clients includes risk, benefit and trust sharing, mutually agreed goal, and strategic involvement. The degree of data transferring includes data, information, knowledge, and innovation between FM organization and its host organization.

Arm’s length is the conventionally spot market relationship of a FM organization with its client. The contractual agreement is cost–sensitive. Clients focus on cost reduction and FM providers aim for achieving service level agreement (SLA) and key performance indicator (KPI). There are no risk and benefit sharing equally among this partnership. The informative data transferred from a client to FM providers in a top-down manner. The role of FM involves only the operational level. Facilities product is a mass transaction, which has no significant difference among FM providers. Because of the commoditization of facilities products, there are many FM providers per client.

Market partnership is the equivalent information transferring relationship between FM providers and contract managers who are the representative of clients. FM providers and clients mutually share economic risk and benefit however, cost reduction still plays a key role in decision making process. There are two to three FM providers per client. FM engages in the opera-
tional and tactical level in order to align FM working processes with organizational primary processes.

Operational partnership is the shared mutual risk, benefit, trust and commitment relationship between FM organizations and their clients. FM organizations and their client’s relations move toward market-driven relationship becoming the preferred partners. There are one to two FM providers per clients. Facilities products are incorporated into organizations’ primary activities and the client’s core business. Facilities managers play a key role in tactical to strategic level. The degree of knowledge sharing between FM organizations and their clients is high. This is the maximum value delivering.

Strategic alliance is the mutually agreed goal relationship between the FM organization and its host organization. They share mutual risk, trust, benefit and commitment including the organizational bottom line. The roles and responsibilities of FM shift away from supportive roles becoming an organizational core business. Facilities products are the primary activity which the host organization’s activities heavily rely on. The scopes of FM activity are not only meeting the client’s needs but also meeting the client’s customer’s needs. It is only single FM provider per client because of the close relationship. The facilities manager can engage in an organization’s decision making process. At a strategic level, FM and client jointly create shared innovation and value.

**Stakeholder value proposition**: The rationale behind the facilities process structure building block is the communication channel between FM and its stakeholders. The right communication is the key success factor to deliver the right value to the group of stakeholders. FM organizations fully deliver stakeholder value when they could communicate to stakeholders what and how they offer. Stakeholders, who perceive the facilities products, will fully acknowledge the offered value when they understand FM working process and even jointly co create FM working process. The communication channel refers to spaces or arenas where data, information, knowledge and innovation can be transferred between both parties; FM organization and stakeholders that impact the organizational decision making. Typically, facilities managers act on the behalf of FM organizations and clients act on the behalf of stakeholders who perceive and impact from facilities products. Moreover, the flow of communication is one–way communication from client to facilities manager. Nonetheless, this facilities process structure asserts that if channels are broadened, the delivering value will be increased. Broadening communication channels means:

First, increasing the direction of data transferring from one-way to more than one ways, an example is shifting from arm’s length which is one way communication to two ways in market partnership.

Second, increasing representatives from both parties, for example FM employees at the operational level can play a key role in aspect of sharing the front–line knowledge to improve facili-
ties products and end users who considerably perceive and influence by facilities products can provide the hand-on input to improve facilities products. For example, operational partnership and strategic alliance create the venue to listen to the voices of end users, customers and even client’s customer. Involving the underlying needs of end users will help FM providing the right facilities products that get the job done.

Third, increasing the role of FM in the strategic decision making process, for instance, for the organization that FM is the organizational primary activities or the facilities product is the contingent relationship. It is necessary to engage the voice from FM organization in the strategic board. However, engaging FM in the corporate board would not be applied in the case that FM organization provides a facilities product at the mass transaction level because either being at the strategic level or embedding in operational level, it would not impact to an organization significantly.

**Hypothesis 2:** The value delivering from FM process is increasing from arm’s length to strategic alliance depending on degrees of mutual involvement and data transferring between FM organization and its client.

**FACILITIES PRODUCT – PROCESS MATRIX**

Figure 3 presents the facilities product-process matrix for FM value positioning.

**Figure 3: Facilities Product-Process matrix**
The two sides of the matrix are the facilities product structure and the facilities process structure. Positions on the matrix can be used to depict the interrelationship between the facilities product stage and the facilities process category of FM value delivering. Using the facilities product-process matrix as the reference framework, it shows the stakeholder value proposition and illustrative applications of the matrix to examine the FM value delivering of two FM organizations of multinational corporations. From this matrix, FM organization or provider that posit within the diagonal position will create the added value more than others posit off the diagonal. For example, FM organizations that provide mass transaction facilities, will serve the cost-reduction driven market. Facilities product is commoditized. FM needs to offer the cheapest facilities cost with the acceptable quality. Clients may not need to incorporate FM into strategic level. FM organizations that provide standard contract facilities, will serve the win-win market in term of sharing benefit risk between both parties. FM providers and their clients collaborate as a market partnership. FM providers are justified by achieving SLA and KPI. FM may be involved at a tactical level in order to share information and knowledge to co-create the right contract with the right service and the right cost. FM organizations that provide tailor-made facilities services, will serve the organization that facilities products are important but not be the primary activities yet. FM working process embeds organizational primary’s activities. Clients and FM providers collaborate as an operational partnership. Clients require FM engaging in medium-long term planning for instance real estate planning or space acquisition. FM organizations that provide contingent relationship facilities will be the organizational primary activities. FM organizations are responsible for organizational bottom line. FM organizations must have the strategic alliance relationship with their client.

Hypothesis 3: FM value positioning located along the matrix diagonal will deliver greater customer value than FM value positioning in the off-diagonal positions of the matrix.

ILLUSTRATIVE APPLICATIONS OF THE PRODUCT – PROCESS MATRIX
The applications of the facilities product-process matrix are presented to demonstrate the value delivering of two FM organizations of Danish multinational corporations: LEGO group and A.P. Moller – Maersk Group as shown in figure 4. This research is the part of the author’s on-going PhD project on facilities management and added value. The empirical data was collected by semi-structured interviewing with facilities managers from LEGO group and A.P. Moller – Maersk Group. The interview’s theme is thus related to this PhD project. Figure 4 show the result of an analysis of the empirical evident from these two types of FM organizations as described.

LEGO Group

The LEGO group’s core business is construction toys manufacturing. The FM department is part of LEGO Service Centre (LSC), the integrated business support unit consisting of five sub-units: information technology (IT), human resources (HR), facilities management (FM), indirect procurement (IP) and Travel. FM’s strategic objective is to be the right choice for LSC customers and LSC employees by providing more value than its competitors. FM enables its customers to improve and to focus on their core processes with the possibility to choose the right
balance between cost and customization that fit their and the LEGO Group’s goals. LSC perceive itself as an independent business unit in an LEGO group. “FM or LSC is a company within LEGO Company” says, senior director of LEGO Service Center Facilities. The main area of FM’s responsibilities are LEGO headquarters in Billund, Denmark which their central administration and separated production sites that covers Denmark, Czech Republic, Hungary, and Mexico. The facilities product is customized delivery spanning from LEGO workplace support service to acquisition of the new property. LSC aims to be the preferred partner with its stakeholders by using feedback analysis as a tool to improve its services to communicate FM working process to its three groups of selected stakeholders: 1 Client (LEGO top management team) 2. FM Employee 3. End users. To communicate with its client, LSC has established a Facilities Committee as a kind of strategic management coalition between top management and FM. For example, when LEGO want to expand with a new production line, the Facilities Committee ask for collaboration from head of global supply chain, chief financial officer (CFO) and corporate real estate management (CREM) to create the dialogue on the strategic level among the LEGO top management team, aligning LSC services with business process and prioritize LSC services and make decision across the board.
A.P. Moller – Maersk Group’s core businesses are oil and gas exploration, store retail, container tower, container shipping and related business unit. FM support service is a part of real estate department of group procurement focusing on Maersk’s non core business. Facilities products offer the mass transaction covering organizational support services, including, cleaning, catering, security, and travelling but excluding real estate. According to general facilities manager at A.P. Moller – Maersk A/S, FM’s task is outsourced to expert providers to get the best service with the cheapest price. Maersk has contracted most of FM’s task with Johnson Controls (JCI). He suggests that Maersk aims for the collaborative relationship with its FM providers by reducing risk between Maersk and its FM providers. For example, Maersk wants to receive the best facilities product with the cheapest cost. JCI as a service provider will ensure the benefits and reduce risks in turn. The intended Maersk’s facilities process can be the market partnership that creates financial a win-win situation among both parties.

**PRACTICAL IMPLICATIONS**

The facilities product and process structure matrix demonstrates FM value position. This matrix facilities a graphical representation of FM service positioning, as well as appraisal of different repositioning strategies. It is an analysis tool for FM to assess client relationships and clients to assess FM relationships. This matrix allows FM organization to analyze its current value delivering position and projects the proposed added value delivering position. FM organizations and their activities are presented systematically to allow comparisons not only of the positioning of facilities products but also of the restructuring of service within and reallocation between different types of facilities product and process.

**REFERENCES**


PART C

VISIONS OF FUTURES
9 FM FUTURES AND RESEARCH AGENDA

9.1 CHAPTER INTRODUCTION

Per Anker Jensen

Introduction to the topic
This final part and final chapter of the book is concerned with FM Futures and Research Agenda. The following four sections present results of CFM’s FM Futures project and workshops during the conference as well as presentations at the closing session called “The Final Countdown”.

Per Dannemand Andersen, Birgitte Rasmussen and Per Anker Jensen, DTU: Future Trends and Challenges for FM in the Nordic Countries
Section 9.2 presents future trends and challenges for FM in the Nordic countries based on CFM’s FM Futures project. This project was carried out in parallel with the planning of the conference in 2010 and 2011 with national workshops in Denmark, Norway, Sweden and Finland, a joint Nordic workshop during the conference and a questionnaire survey just after the conference. The results were quite different in the four countries with sustainability as the main general trend and challenge in all countries. These results were presented and discussed at a workshop facilitated by Per Dannemand Andersen and Birgitte Rasmussen during the conference and summarized by Per Anker Jensen in the final presentation on “Visions of the Future” at the conference.

Keith Alexander, CFM, Manchester, and Susanne Balslev Nielsen, CFM, DTU: How to Increase the Usability of Academic FM Research for Practitioners?
Section 9.3 summarises the results from two workshops during the conference about collaboration between researchers and practitioners – one facilitated by Steffen Gøth, COWI and Keith Alexander and the other by Flemming Engelhardt, DATEA and Susanne Balslev Nielsen. It is clearly a great challenge to disseminate research results to practice and mediators between researchers and practitioners can play a very important role, but direct collaboration in research and development projects can also be very beneficial.

Antje Junghans, NTNU: European FM Research Agenda
Section 9.4 is based on a presentation during the closing session by the present chairman of EuroFM’s Research Network Group. It presents a recent survey on European FM research and the ongoing work on a European FM research agenda. The survey covered 16 institutions and 10 research fields were identified. The objective of the research agenda is to contribute to the further establishment of the FM discipline.

Per Anker Jensen, Per Dannemand Jensen and Birgitte Rasmussen, CFM: Proposal for a Common Nordic FM Research Agenda
Section 9.5 is like section 9.2 based on CFM’s FM Futures project. It includes the main results of an online questionnaire survey conducted after the conference and presents a proposal for a common Nordic FM research agenda.
9.2 FUTURE TRENDS AND CHALLENGES FOR FM IN THE NORDIC COUNTRIES

Per Dannemand Andersen, Birgitte Rasmussen, Per Anker Jensen

INTRODUCTION

This chapter and chapter 9.5 are both based on CFM’s project on FM Futures. The main objectives for this project was a) to identify possible futures of FM in the Nordic countries and based on this b) to establish a Nordic FM strategy in research and education, which can stimulate research in FM and increase the collaboration between universities in the different Nordic countries and between researchers and practitioners. This chapter presents results of the first part – possible futures of FM in the Nordic countries. The main results of the latter are reported in chapter 9.5.

The project has been designed by use of methods from the tradition of strategic foresight. We have chosen this approach to ensure that the strategy reflects future needs and expectations among Nordic researchers and practitioners within the FM field.

The foresight process included the following four elements.

The first element was a preliminary survey of existing studies and foresight projects on the future for FM. In particular the survey included the results of EuroFM’s FM Futures project (Alexander, 2009). A report was produced about the FM sector and its status in the Nordic countries (Jensen and Dannemand Andersen, 2010).

The second element was four national workshops in Denmark, Norway, Sweden and Finland, respectively, held between October 2010 and May 2011. The workshops were arranged through national organisations, that are members of NordicFM and the participants were invited by these national partners. The workshops in Denmark, Norway and Sweden were arranged on the same day as workshops on CFM’s Nordic FM Market study facilitated by Per Anker Jensen and with the same participants. The aim of the workshops was to identify, evaluate and prioritize future trends, challenges and needs for new competences and knowledge in the FM sector. The results are expected not only to be of interest for creating a research agenda but they represents fundamental presumptions of the future of FM, that should be of interest for everybody with a professional and long term involvement in the Nordic FM sector and in other countries as well. The dates, location and number of participants in the four national workshops are shown in table 1. The intention was to have approx. 10 participants in each workshop besides the facilitators, which was achieved.

As a third element the preliminary results for the foresight project was presented and discussed at a Nordic workshop held in August 2011 as part of CFM’s Nordic conference. 9 experts from Denmark, Norway and Sweden participated in this workshop.
A fourth element is a Nordic Delphi-like questionnaire with aim of identifying and ranking the important trends and issues resulting from the three first elements of the process. The main results of this questionnaire are presented in chapter 9.5.

The project was initiated by Per Anker Jensen, head of CFM, and he has been overall responsible for the project, including contacts to collaboration partners in Nordic FM, arranging the workshops and coordination with CFM’s parallel study of the Nordic FM Market. The foresight project has been carried out by Per Dannemand Andersen and Birgitte Rasmussen, DTU Management Engineering, Section for Innovations Systems and Foresight, who have long experience in foresight studies. The project started in August 2010 and was finished in November 2011.

This chapter mostly reflects the result from the four national workshops.

**FORESIGHT**

Foresight is a structured process that empowers the actors (firms, organizations or public authorities) to design and enact their future rather than become the passive victims of an imposed future. Foresight as a strategic tool does not aim to predict the future or to unveil it as if it were prefabricated – but rather to support organizations and individuals to be strategic and proactive about the future pathways of products and processes. Foresight works systematically with a long-term perspective and tries to position the different expected developments on a time scale; in practice, the time perspective is often ten, twenty or thirty years, in some cases more. Foresight is often defined as “.. the application of systematic, participatory, future-intelligence gathering and medium-to-long-term vision-building processes to informing present-day decisions and mobilising joint actions. Foresight brings together key agents of change and various sources of knowledge in order to develop strategic visions and anticipatory intelligence” (European Commission, 2002).

During the recent decades, the concept of foresight has become an important tool in European science and innovation policy (Georghiou et al., 2008). In that context foresight has to a large extent diverged from forecasting and predictions to increasingly to focus on managing uncertainties and ambiguities (Cariola and Rolfo, 2004). Foresight is a holistic approach that at the
same time considers the interaction between not only technological, but also social, economic, political and cultural variables.

It is generally acknowledged that the theoretical rationale for foresight exercises is supported by the perspective (or school) of evolutionary economics, which comprises the innovations systems approach (Georghiou and Keenan, 2006; Martin, 1995). Consequently, the further analyses draw on this framework in the analysis of the FM sector as briefly described in the following.

**INNOVATION SYSTEM FRAMEWORK FOR THE FM SECTOR**

Several frameworks have been suggested to assist or guide different analytical needs for innovation systems. Generally speaking, the innovation systems approach is a framework embracing a set of powerful concepts such as: relationship, boundary, input, output, environment, feedback, communication, control, and identity. An innovation system can be defined as the ‘elements and relationships which interact in the production, diffusion and use of new and economically useful knowledge’ (Lundvall, 1992). In this approach focus is set on the flow of information and knowledge in contradiction to other analytical approaches, which focus on the flow of money or goods. As coined by Freeman: “Numerous case studies of innovation brought out the importance of flows of information and knowledge between firms as well as within firms. Moreover, the results of the empirical research pointed to the importance both of flows to and from sources of scientific and technical knowledge and of flows to and from users of products and processes” (Freeman, 1996).

For our purpose with focus on FM foresight, a simple sectoral innovation system framework of the FM sector and its strategic environment is regarded to be a useful tool to guide the analyses and processes, see Figure 1. The FM professional sector in this understanding consists of a number of providers that provides FM services to their customers or clients. Public FM research and FM educations and courses provide new (research based) knowledge and professionals (graduates) to the sector. The professional sector and the affiliated research and education institutions exist within a national (e.g. Danish) and international strategic environment.

One way of embarking on a foresight exercise is to classify the system under examination. In a foresight study, one ideally wants a classification of the domain that is at the same time operational, comprehensive and consistent. This implies a classification of the domain that delivers an overview of the object under analysis and identifies boundaries. This initial step of the foresight process is essential, because it has a significant impact on the structure of the subsequent steps of the process.

The foresight on FM is structured by three overall dimensions reflecting significant conditions and matters for development within the FM sectoral innovation system. The three dimensions provide in three different ways an indication and understanding of the flow and availability of knowledge and know-how.
Dimension 1: Megatrends in the strategic environment of FM
This dimension deals with megatrends in the strategic environment that are going to affect the FM sectoral innovation system over the next two decades. These megatrends can be characterised as external frame conditions and are mostly outside the influence of the actors within the FM sector. Ideally, we distinguish between the national (e.g. Danish) strategic environment and the international strategic environment, but in practice this distinguishing often is difficult.

Dimension 2: Current trends and challenges for the FM sector in Denmark/Norway/Sweden/Finland
This dimension deals with trends within the FM professional sector in each country. Some of such trends are shared by the professional sectors in each Nordic country (Denmark, Norway, Sweden, Finland) and others differ. In this context a trend is defined as an inclination or a tendency that has been observed during the recent few years and that is expected to prevail during the next few (3-5) years. These trends are mostly susceptible to influence by the actors within the FM professional sector – or results of a strategic or managerial decision taken by actors under consideration of developments in the external environment.
Dimension 3: Future need for new competences and new knowledge for the FM professionals

This dimension deals with the need for generation of new knowledge and competence building within the FM sectoral innovation system. The job profile and key qualification of FM professionals is cross-functional and of a generalist nature. The profession uses knowledge and tools from a number of other professions and disciplines. Hence, the key question dealt with was partly the sector’s general needs for new knowledge and new competences and partly the curriculum for a formal education in FM. In context we understand curriculum as the set of courses, and their content, that should be offered to students of FM at a university level.

MEGATRENDS IN THE STRATEGIC ENVIRONMENT OF FM

This part of the workshops was supported by a list of megatrends for the external environment of the FM sector based on results from ‘FM Futures workshop in Zürich 2008’ as part of the EuroFM project. The list with 26 megatrends was structured by use of the STEP approach grouping the megatrends in four categories: Social, Technology, Economy and Political.

This part of the workshop was structured by the following two questions:

Question 1: Which megatrends will impact the FM sector within a time horizon of 10-15 years?
• In small groups: Discuss and supplement the list of megatrends in the external environment.
• Each participant: Indicate by use of five ‘blue dots’ the five megatrends of highest significance for the FM sector in Denmark/Norway/Sweden/Finland.

Question 2: Identify the most certain and uncertain megatrends among the selected significant megatrends.
• Each participant: Indicate by use of five ‘green dots’ the five most certain megatrends among the selected significant megatrends.
• Each participant: Indicate by use of five ‘red dots’ the five most uncertain megatrends among the selected significant megatrends.

The discussions led to an addition of a large number of other megatrends. In the further process 24 megatrends from the initial list and 27 of the added megatrends were rated.

The most significant megatrends are shown in table 2 in order of priority for each country with 1 as highest ranking. It is remarkable that none of the megatrends are significant in all four countries. Increased focus on sustainability was ranked highest in Denmark and Norway and as 4 in Finland. It was not among the most significant in Sweden, where it was ranked as 9. Demographic change with labour shortage was ranked highest in Norway and as 4 in Denmark. Infrastructure of work space and work places was ranked highest in Sweden, but was not significant in the other countries. ICT was ranked as 2 in Norway and Sweden, but was not significant in the other countries. Globalisation was ranked as 2 in Denmark and as 4 in Sweden, but was not significant in the other countries.
Despite these differences two important megatrends might be determined. The first concerns the increased focus on sustainability as mentioned above. The other megatrend concerns demographic changes, but the effect of this megatrend is interpreted or experienced differently in each country. In Denmark and Norway focus is on a mix of cultures and shortage of labour on the labour market. In Finland focus is on area and urban development as both industry and dwellings are located differently. For Sweden four megatrends ranked as no. 1, 3, 5 and 6 basically concerned the overall megatrend of new ways of working and living, and that could also be interpreted as an effect of demographic changes. Issues mentioned were changes in the required infrastructure of work places and work spaces, and a new mix of working life and private life. Also increased job rotation, project based work and other new ways of working can be viewed as a part of this megatrend.

**CURRENT TRENDS AND CHALLENGES FOR THE FM SECTOR**

This part of the workshops focused on future trends and challenges in both the short term and the long term. It was supported by the following list of 10 current trends and challenges observed for the FM sector (Jensen and Dannemand Andersen, 2010):

1. Outsourcing.
2. From single service towards multi-service and integrated facilities.
3. From operational towards strategic focus.
4. From cost reduction towards added value before the financial crisis.
5. New forms of procurement - partnership based collaboration.
6. ICT development => changing needs for support of workplaces and infrastructure and for internal process development in the FM supply chain.
7. Increased focus on sustainability and corporate social responsibility creates new FM activities and opportunities.
8. Increased cross-border coordination of FM in multinational companies and use of international service providers.
9. Increasing need for educations on all levels as well as R&D.
10. Pressure for decreasing FM costs per workplace.

This part of the workshop was structured by the following two questions:

**Question 1:** Discuss and supplement the list of current trends and challenges for the FM sector in your country. Or phrased in another way: What keeps a professional FM awake at night right now?

**Question 2:** Identify the most significant trends and challenges in short term and long term.

### Table 3: Most significant trends and challenges for the FM sector in the short term

<table>
<thead>
<tr>
<th>Country</th>
<th>Current trends and challenges assessed to be most significant in a SHORT time perspective</th>
</tr>
</thead>
<tbody>
<tr>
<td>DK-1</td>
<td>Sustainability: energy, environment, branding.</td>
</tr>
<tr>
<td>DK-2</td>
<td>Focus on price efficiency (cost reduction) – not on added value.</td>
</tr>
<tr>
<td>DK-3</td>
<td>From internal (zero error culture) to EU contracts and uncertainty management.</td>
</tr>
<tr>
<td>DK-4</td>
<td>Elucidation of the FM costs used in-house (especially in politically-led organizations).</td>
</tr>
<tr>
<td>DK-5</td>
<td>Many new actors in the field: i) mature of the market, ii) increased competition, iii) from ‘small’ companies to ‘big’ which extends the assortment, iv) harder to overview the market.</td>
</tr>
<tr>
<td>DK-6</td>
<td>From multiservice to integrated service. The end user receives all-inclusive contracts.</td>
</tr>
<tr>
<td>NO-1</td>
<td>FM is not clearly defined. Spread out a common terminology.</td>
</tr>
<tr>
<td>NO-2</td>
<td>Immaturity of customers. Too much focus at the operational level. Not professional clients!</td>
</tr>
<tr>
<td>NO-3</td>
<td>More companies will develop long-term FM strategies – but reluctant to take the first step.</td>
</tr>
<tr>
<td>SE-1</td>
<td>Technology &amp; new way to work – meet needs</td>
</tr>
<tr>
<td>SE-2</td>
<td>Clarifying the FM role in organisation and it’s services, define core businesses, services</td>
</tr>
<tr>
<td>SE-3</td>
<td>How to increase productivity from vendors</td>
</tr>
<tr>
<td>SE-4</td>
<td>Added Value</td>
</tr>
<tr>
<td>FI-1</td>
<td>Energy saving in FM (active energy management, incentives for service providers)</td>
</tr>
<tr>
<td>FI-2</td>
<td>Sustainability</td>
</tr>
<tr>
<td>FI-3</td>
<td>Cost efficiency (multi users offices and places based on some common core, office buildings into leisure use in spare time)</td>
</tr>
<tr>
<td>FI-4</td>
<td>Marketing of FM (increase awareness, importance of certificates)</td>
</tr>
<tr>
<td>FI-5</td>
<td>Changing markets</td>
</tr>
<tr>
<td>FI-6</td>
<td>Comprehensive mix of services in business parks + offices (work life balance)</td>
</tr>
</tbody>
</table>
During the discussions a large number of additional trends and challenges were identified. In the further process 22 were rated in the workshop in Denmark, 12 in Norway, 18 in Sweden and 26 in Finland.

The most significant trends and challenges in the short term are shown in table 3 in order of priority for each country with 1 as highest ranking. In Denmark sustainability in terms of energy, environment and branding had highest priority, while the most important challenge in Norway was that FM is not clearly defined, indicating a need for further development and dissemination of a common terminology. In Sweden the highest priority was to meet needs in relation to technology and new ways of working and in Finland it was energy savings in terms of active energy management and incentives for service providers.

The most significant trends and challenges in the long term are shown in table 4 in similar order. Like for the short term sustainability in terms of energy, environment and branding had highest priority also in the long term in Denmark. For the other countries the priorities between the short term and long term were different. In Sweden the highest priority was how to balance the demand on standardised services and at the same time deliver a tailor-made FM operation in international FM solutions. In Norway the most significant challenge was the political development and in Finland housing FM had highest priority.

Table 4: Most significant trends and challenges for the FM sector in the long term

<table>
<thead>
<tr>
<th>Country</th>
<th>Current trends and challenges assessed to be most significant in a LONG time perspective</th>
</tr>
</thead>
<tbody>
<tr>
<td>DK-1</td>
<td>Sustainability: energy, environment, branding.</td>
</tr>
<tr>
<td>DK-2</td>
<td>General agreement on need for more education on all levels, but: low participation in new courses.</td>
</tr>
<tr>
<td>DK-3</td>
<td>Benchmarking, Structures, Standards.</td>
</tr>
<tr>
<td>NO-1</td>
<td>Political development</td>
</tr>
<tr>
<td>NO-2</td>
<td>Focus on sustainability</td>
</tr>
<tr>
<td>NO-3</td>
<td>Holistic understanding of value chain and clients needs (added value and new forms of procurement)</td>
</tr>
<tr>
<td>NO-4</td>
<td>Expectation management</td>
</tr>
<tr>
<td>NO-5</td>
<td>Shared service merges with FM services</td>
</tr>
<tr>
<td>SE-1</td>
<td>In international FM solutions. How to balance the demand on standardised services and at the same time deliver a tailor-made FM operation</td>
</tr>
<tr>
<td>SE-2</td>
<td>Manage increased costs</td>
</tr>
<tr>
<td>SE-3</td>
<td>Sustainability</td>
</tr>
<tr>
<td>SE-4</td>
<td>'More for less' – From a customer perspective</td>
</tr>
<tr>
<td>SE-5</td>
<td>How to succeed in delivering low price FM series and time deliver added value</td>
</tr>
<tr>
<td>FI-1</td>
<td>Housing FM</td>
</tr>
<tr>
<td>FI-2</td>
<td>Integrated technology solutions</td>
</tr>
<tr>
<td>FI-3</td>
<td>Sustainability</td>
</tr>
<tr>
<td>FI-4</td>
<td>Synergy hubs</td>
</tr>
</tbody>
</table>
Across these national differences three longer term trends and challenges are shared by several countries. Again the challenge related to sustainability and energy is common for all four countries. For Denmark, Sweden and Norway issues related to standards, expectations management, and benchmarking could be considered aspects of the same trend. Finally, workshop participants from both Norway and especially Sweden are focussing on issues related to costs and added value, and the pressure to provide more service for less cost.

NEW COMPETENCES AND KNOWLEDGE FOR FM PROFESSIONALS
This part of the workshops was supported by a list of FM competences suggested by EuroFM (Jensen and Dannemand Andersen, 2010) structured by use of the following six headlines: Managing services; Managing the work environment; Managing resources; Understanding business organization; Managing people, and Managing premises.

This part of the workshop was structured by the following two questions:

**Question 1:** Which needs does the FM sector have for new knowledge and new competences?
**Question 2:** Identify the most significant needs for new knowledge and new competences.

During the discussions a large number of other trends and challenges were added. In the further process 17 were rated in Denmark, 8 in Norway, 10 in Sweden and 8 in Finland. The most significant needs for new competence and knowledge is shown in table 5 in order of priority for each country with 1 as highest ranking.

For Denmark and Sweden the highest priority was given to quite soft areas. In Denmark this was to understand client needs, especially in development departments, and transfer the understanding to the operational level, and in Sweden it was social ability and personal competences. For Norway and Finland the highest priorities were more specific. In Norway consequences for FM of new ways of working and KPI (Key Performance Indicators) were highest with the same ranking, while urban FM, e.g. development of areas with former industrial properties, was ranked highest in Finland.

CONCLUSION
The workshops in the four Nordic countries to a large extend reflexes the special national frame conditions in each country. The only common megatrend in the strategic environments of FM for the next 10-15 years that was ranked high and seen as quite certain in the workshops on FM Futures in Denmark, Norway, Finland and Sweden was an increased focus on sustainability, but this was ranked lower and seen as more uncertain in Sweden than in the other three countries. The influence of globalization was ranked high and seen as quite certain in Denmark and Sweden but not in Norway and Finland. Demographic changes with labour shortage was ranked high and seen as quite certain in Denmark and Norway, but less so in Finland and not at all in Sweden. The influence of ICT was ranked high and seen as quite certain in Norway and Sweden, but less so in Denmark and not in Finland.

The most significant short and long term trends and challenges in the professional FM sector were completely different between the four countries except for an overlap on energy issues in the short term in Denmark and Finland. In Denmark sustainability in terms of energy, envi-
environment and branding was the highest ranked trend and challenge in both the short and the long term in Denmark. In Norway the most important short term challenge was that FM is not clearly defined and the need to spread out a common terminology, while the most important long term challenge was identified as the political development. The most significant short term trend and challenge in Sweden was to meet needs in relation to technology and new ways of working, while the most important long term challenge was how to balance the demand on standardised services and at the same time deliver a tailor-made FM operation in international solutions. Finally for Finland the highest ranking short term challenge was energy saving in FM including active energy management and incentives for service providers, while the most significant long term trend and challenge was identified as housing FM.

The future need for new competences and new knowledge for the FM professionals also varied between the four countries. In Denmark the highest ranking new competence was to understand clients’ needs. In Sweden the focus was also on soft competences in terms of social
abilities and personal competences. In Norway and Finland the focus was on more specific competences. For Norway competences related to the consequences for FM of new ways of working and KPI’s were both ranked highest with the same ranking. The most surprising result was that competences and new knowledge in relation to urban FM was ranked highest in Finland.

REFERENCES

9.3 HOW TO INCREASE THE USABILITY OF ACADEMIC FM RESEARCH FOR PRACTITIONERS?

Keith Alexander and Susanne Balslev Nielsen

FM RESEARCH FOR PRACTICE
“FM research for practice” was the title of the Nordic FM conference in 2011, pinpointing the organizers ambition that FM research should be used and have an impact on practice and for the benefit of society.

But how to ensure that research is used in practice? For researchers, academic journals are a vital means of communicating research. But those outside the academic world do not have access to academic journals, and even if they had, the language is often hard to understand and the topic too specific or too theoretical for their needs. An important debate at the conference
was therefore concerning how to improve the usefulness of academic research to practice, and the key messages from the many conference participants should have an impact on the design of future research programs and communication of research.

This chapter summarizes the essence of two workshops at the Nordic FM conference, where relationship between research and practice was discussed. The open and direct dialogue between researchers and practitioners about this topic is very unique, and the outcome is relevant beyond the FM-sector.

**COLLABORATING IN ADVANCING KNOWLEDGE**

The workshops proposed that, for Facilities Management to advance as a discipline and a profession, effective collaboration between research and practice is needed in order to develop a robust and reliable knowledge base.

The purpose of the two conference workshops was to generate discussion about how interrelations between research and practice can be improved for mutual benefit. Pairs of workshop facilitators, a practitioner and a researcher, presented the need for evidence-based FM from their respective positions, and set out the common mission - to improve the quality of knowledge available for decision making in facilities management.

The need for researchers to present results in a form that is accessible to practitioners is well-established and often a requirement of funding. But have we found the right ways? To stimulate discussion in one workshop, a number of leading FM practitioners were invited to reflect on selected CFM research themes and upon work presented at the conference and to comment on its relevance, novelty and usefulness to practice. In another workshop it was a clarification about stakeholders (representing: municipalities, consultants and universities) interests and motivations. The purpose of this workshop was to share and explore of what to aim for and what to expect from practice-research-education collaborations.

The overall conference theme implies a flow of findings from research to practice. Both workshops addressed ways to improve the dissemination of research to practice. However, they also stimulated discussion of research with and by practice and about action research to support reflections about own practices. The process of collective reflection might be the most important outcome of the conference workshops and a valuable contribution for the further collaboration about FM-research in the Nordic countries. However, to document and share the insights beyond the conference participants, we here summarize the main points about production of useful knowledge in collaboration between research and practice.

**EVALUATING THE VALUE OF RESEARCH**

In the paper-review workshop, the facilitators presented the need for evidence-based FM from their respective positions in practice and research. Then, four leading FM practitioners, consultants and service providers, each from different Nordic countries, gave their reflections upon papers presented at the conference and commented on the relevance, novelty and usefulness of the research to practice:
What to appreciate about academic conference papers:

• Confirms our experience
• Provides a very good overview, and sum-up of the tasks and dilemmas of the area
• Presents a good framework, a good model or a good tool

What was perceived less useful?

• It is somewhat relevant – but does not hit bull’s eye.
• Practice looking for solutions, what should we do? Solutions for tomorrow and for the longer term.
• The research shows that theory does not work in practice. It is much more difficult.
• I had hoped for something newer, give us more forward-looking research/input (lot of research is looking back)
• I do not need all the cross references.
• Include technical solutions and costs, not only strategy and organizational issues

From the researchers the wishes were:

• Help us define the questions to be answered, so our research is perceived relevant
• Give us access to your organization, so we can do empirical studies
• Allow us to present the results beyond collaboration partners, we have obligations to share knowledge and give public access to results
• We must contribute to theory generation and the academic debates to work at a university

Practitioners highlighted current characteristics of FM and identified three areas for research – sustainability, building operations and organizational development of FM. They recognised differing FM strategies and the need for alignment to find the best solution. As FM is often broadly defined, it was felt important to implement standards and to refer to available handbooks.

**INTEGRATING RESEARCH, EDUCATION AND PRACTICE**

The second workshop, ‘FM Research, Practice, Education’, created a similar discussion about collaboration within research and practice, and discussed the success criteria of the different parties. In contrast with the first workshop, this workshop specifically addressed education as an element in knowledge production and dissemination.

Participants in this workshop felt that FM is still an emergent discipline and vaguely defined in reality, this called for reflections on how to frame future research projects:

• FM is not clearly defined. Spread out a common terminology
• FM is often very wide, hold the European standards or refer to the FM handbook by Per Anker Jensen
• Always clarify the FM role in organization and its services, define core businesses, services
• Understand the organization of companies and their FM strategies
Ensure a holistic understanding of value chain and clients needs (added value and new forms of procurement)

Intelligent use of key figures, to communicate the type of organization

Different forms of communication to academia and practitioners-tuned to the target group

Research has been slow, primarily descriptive and remote from practice; it does not help the revenue to be used in practice.

Sustainability must be operational and must be made known among both architects and engineers. Is not today.

Committee’s (advisory boards) role is not reflection, but to challenge the applicability of the research.

Enter both strategically and tactically. The strategic target group is too small, even in the Nordic countries. There are few people.

FM is not known, even in their own professional circles. Need for dissemination, bridge builders, translators

Participants also saw FM education is also an emergent activity, and formulated ideas for the future:

- Rising demand for FM educated employees and post graduate training
- We are few teachers in FM, let’s collaborate about the development of new FM degree programs (construction/operation/service/business).
- Saves time, if research and development are integrated, instead of research first, usability afterwards.
- Lets motivate more students with attractive career opportunities
- Students must learn FM as a management discipline.
- Students looking for leadership skills when they discover this is required at the job marked
- Involve students in research

They also recognized the synergistic possibilities of interaction: involving students in mini research projects and in development work and researchers as sparring partner for the development of FM departments.

Participants concluded that FM should be established more clearly as an academic discipline, with a strategic emphasis and broad, multi-disciplinary outlook and called for different types of research to support these developments.

CONCLUSIONS AND RECOMMENDATIONS

The British philosopher Austin distinguished three phases in a process – debate, intention and action. He argued that most processes usually stop with good intentions. As the organizers had intended, the conference provided a unique opportunity to debate and clarify the benefits of engaging in FM research, to discuss how to collaborate more effectively and contribute to the development of an FM-research agenda.
The clear feedback from practitioners at the conference was that the current research is often to distant to practical challenges at tactical/operational level. A recurrent theme was the need for better strategies for communication, to a broader FM community and beyond committed FM individuals. To improve effectiveness, it is necessary to be clear of specific audiences and to use different channels of communication including social media e.g. Facebook and google+.

What is left is the action, to collaborate in the improving the quality of knowledge available for decision making in facilities management. The open and constructive dialogue generated many good insights of how researchers, practitioners and educators can support the FM knowledge generation.

The dice is rolled for the next generation of FM research!

ACKNOWLEDGEMENTS FOR FEEDBACK ON CONFERENCES PAPERS
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9.4 EUROPEAN FM RESEARCH AGENDA

Antje Junghans

ABSTRACT
Purpose: The study aims to contribute to the development of the European FM research agenda.

Background: Earlier research in the FM field and the European FM network, such as that conducted by Jensen, Alexander, and Pullen et al.

Approach: A survey was conducted within the research network group of the European Facility Management network (EuroFM). In addition, the research topics were discussed in relation to earlier research and feedback from survey participants.

Results: As an outcome of the survey, the most important research fields and research centres were prioritised.

Practical implications: The FM research agenda supports the collaboration of researchers, educators, and practitioners. The objective of the research agenda is to contribute to the further establishment of the FM discipline.

Keywords: FM research agenda, European FM network, FM discipline, EuroFM research network group
INTRODUCTION
The European research agenda has been and continues to be developed and used by researchers. It was initiated by the European research network to establish Facility Management (FM) as a discipline. The research agenda aims to establish a bridge between business and science, and its purpose is to increase benefits for both sides. On the ‘scientific side’ research develops knowledge which forms the basis for education and further research, while on the ‘business side’ the acquired knowledge leads to innovation and economic progress. To build this bridge, a common understanding of the FM work field is necessary. This in turn provides a sustainable structure for the changing demands and future challenges which FM research aims to find solutions to.

STATE OF THE ART
Initial FM research work in Europe started within universities in the UK, Netherlands, and Nordic countries, where professors and scientists founded research centres to pioneer the new discipline. Initially, most projects were funded by private partners: ‘The first European institute for FM was the Centre for Facilities Management (CFM) in Glasgow, also established in 1992. Since then CFM has been working with both education and research, as the majority of the research tasks were ordered and paid for by private companies’ (Jensen 2008: 17). More than a decade later, the FM research field was supported by public funding and research foundations, such as

Table 1: Development of FM research centres and institutes

<table>
<thead>
<tr>
<th>Name</th>
<th>Founding initiative, background</th>
<th>Research field and objectives</th>
<th>Date established and Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Centre for Facilities Management (CFM) at the University of Salford</td>
<td>Professor Keith Alexander, Architecture</td>
<td>‘The Centre for Real Estate and Facilities Management is concerned with the engagement of people and the innovation of processes and settings in order to leverage the power of operational assets in transforming organisations.’</td>
<td>1990, Glasgow; 2000, relocated at Salford</td>
</tr>
<tr>
<td>Center for People and Buildings, at the Delft University of Technology</td>
<td>Professor Hans de Jonge, Real Estate Management, Wim Pullen, Director of CIPB</td>
<td>‘The Center for People and Buildings (CIPB) is an independent not for profit scientific knowledge center that undertakes research into the relations that exist between people, work and workplace environments. The intention of the activities of the CIPB is to stimulate research, product development and knowledge transfer within the field. The research is set up and executed for generic purposes with participants from both the public and private sector. Through these activities the CIPB strives towards stimulating interdisciplinary exchange and cooperation between academics and professionals.’</td>
<td>2001, Delft</td>
</tr>
<tr>
<td>Metamorphose, at the Norwegian University of Science and Technology (NTNU)</td>
<td>Professor Tore Haugen, Architecture, Engineering</td>
<td>‘Our principle objective is to develop a centre and research school in the area of real estate and facilities management, capable of providing high quality education and knowledge for dealing with and for solving problems of strategic value for real estate owners, proprietors, facilities managers and developers, contractors and users. This includes to develop and establish a new master study in Real Estate and Facilities Management at NTNU, and to establish a doctoral programme with 5 candidates in Real Estate and Facilities Management. The Norwegian Centre for Real Estate and Facilities Management perform the foundation for a network between education, research and practice in the area of real estate and facilities management in Norway, with universities in all of the Nordic countries and in Great Britain, the Netherlands and in the USA.’</td>
<td>2002–2006, Trondheim</td>
</tr>
<tr>
<td>Centre for Facilities Management (CFM), at the Technical University of Denmark (DTU)</td>
<td>Professor Per Anker Jensen, Engineering</td>
<td>‘Centre for Facilities Management (CFM) was established in January 2008 in order to strengthen research within Facilities Management (FM) – a relatively new field. FM deals with design, operation and development of buildings and infrastructure so that this constantly is adjusted to user needs. So far there has been only limited research on FM in Denmark. This background combined with a steadily rising interest from companies as well as a reorientation of the working field formed the basis for establishing this research centre. CFM is financially supported by Realdania in 2008–2012.’</td>
<td>2008–2012, Copenhagen</td>
</tr>
</tbody>
</table>

the *Metamorphose* project at the Norwegian University of Science and Technology (NTNU) in the period 2002–2006 and the Centre for FM (CFM) at the Technical University of Denmark (DTU), financed with support of the private Danish foundation Realdania in the period 2008–2012. The history of the development of FM research centres and institutes is listed in Table 1.

33 http://www.cfm.dtu.dk/English/About_CFM.aspx (accessed 21 June 2011)
The growth of FM as an academic discipline was subsequent to the establishment of research centres and institutes at various universities. Prior to this development FM involved persons with diverse backgrounds in education and in various forms of employment. Jensen (2008: 16) recorded the institutionalisation of the work field as one of the main drivers for the development of the FM discipline: ‘A discipline arises when persons within a work field create a community to define the discipline and ensure its development through a kind of institutionalisation of the discipline. Disciplines do not emerge from technological and structural changes in society.’ Keith Alexander created a first structure for the FM work field and identified processes, services, facilities, and objectives as important categories with regard to organisations’ (business companies) primary activities and distinguishing FM from other disciplines: ‘It is the emphasis on process and service and the relationship between facilities and the objectives of an organization which characterize facilities management and distinguish it from the established professional disciplines of the industries which it calls construction, hospitality, support and other service industries’ (Alexander 1992: 6).

An important step towards the institutionalisation of the work field was the establishment of FM associations, which aim to develop professionalization within the field. The most important associations for international development are the International Facility Management Association (IFMA), established in the US in the 1980s. EuroFM was founded in the early 1990s through the initiative of three national associations in the UK, Netherlands and Denmark respectively. Today, researchers from throughout Europe participate in the research network group (RNG). RNG is a workgroup of the European Facility Management Network (EuroFM). The vision of EuroFM is: ‘Advancement of knowledge in Facility Management in Europe and its application in practice, education and research, in order to communicate best practice through Europe.’

EuroFM holds an annual research symposium and European FM conferences (EFMCs) at different locations throughout Europe. The topics of the research symposiums are related to the topics of business symposiums and serve to support cooperation and collaboration between those working in business and science. In total, 10 research symposiums have been held since 2002, and the 11th EuroFM research symposium will be held during the EFMC in Copenhagen in 2012.

RNG coordinates the research activities of EuroFM members and develops the European research agenda with regard to the members’ contributions and needs. RNG’s objective is to translate vision into strategy. The research agenda is a source of information for the public, politicians, and other interested parties, and is fundamental for the implementation of FM research in European research strategies, e.g. the replacement of the Seventh Framework Programme (FP7), and also the development of FM-related research programmes and financing options. An important outcome of the research symposium at EFMC 2011 in Vienna was the recognition that the FM discipline has not yet been fully established. Efforts are still needed to

convince scientists, politicians, and society as a whole that FM is an important domain (EFMC 2011, Research Symposium, Plenary III: Workshop European Research Agenda).

Jensen (2008), Alexander (2009), and Pullen et al. (2009a) have documented previous work on the creation of the research agenda. Per Anker Jensen was RNG Chair for the period 2007–2008 and initiator of the Centre for Facilities Management (CFM) at the Technical University of Denmark (DTU). Keith Alexander was founder member of EuroFM, Chairman of EuroFM, and RNG Chair for many years. Wim Pullen and Theo van der Voordt are RNG members and initiators of the Center for People and Buildings (CfPB), see Table 1.

In the future, FM will focus on resource management. In referring to the outcome of the FM conference in Glasgow in 2000, Jensen (2008: 191) states: ‘There was a surprising consensus that the future to FM is called Resource Management. … Bev Nutt defined the four most important types of resources to FM as: Financial resources – business; Human resources – people; Physical resources – property; Information resources – knowledge.’ The objective of the EuroFM project ‘FM future’ was the development of the research agenda for 2018. The concept for this project was formed in 2005, in Manchester. During the project’s execution period, 2006–2008, the original objective was changed: ‘Participants in the EuroFM Research Network Group decided that, in order to develop a research agenda, the changing role of Facility Management and how Facility Management will function in the future work environment, should be considered’ (Alexander 2009: 7) More than 200 participants joined three workshops and research seminars held in Helsinki, Manchester, and Zurich respectively. The political, economic, social, and technological (PEST) analysis (Atkin & Adrian 2007: 16) was used, and legal and environmental factors were added to define future factors, issues, trends, and technologies (PESTLE framework).

The input for the 2015 FM research and action agenda was developed in preparation for the 8th research symposium held at EFMC 2009 in Amsterdam, at the Centre for People and Buildings (Pullen et al. 2009). Following the symposium, three main steps were taken:

• Contributions were collected from three round table talks in the Netherlands. Participants comprised journalists, FM professionals, and academics.
• The research papers of the 8th research symposium were analysed.
• The findings were discussed separately, and the similarities and dissimilarities between the results from round table talks and paper analyses were compared. Finally, reflections and conclusions were summarized, and recommendations made for the 2015 FM Research and Action agenda.

The Centre for People and Buildings identified five research fields, all of which had been presented at the 8th research symposium (Pullen et al. 2009a and b):

1. The changing role of the Facility Manager
• From operational issues to steering on strategic goals and objectives
• From one-sided steering on cost efficiency to (also) steering on benefits and added value
• From steering on organisational performance to (also) steering on societal issues such as sustainability
• Need for new knowledge and skills
• Impact for FM education

2. Switching between scales: object and portfolio
• Steering on a large portfolio:
  • How to get the right data?
  • How to implement lessons learned from POE on building level into a strategic accommodation plan on portfolio level?
  • How to find the right balance between steering on cost reduction and steering on other added values
  • How context-sensitive is our present knowledge?
  • How can we improve the accessibility of available data and are we willing to share?

3. Sustainability
• Sustainability > green buildings, energy reduction, decarbonisation (CO2 reduction)
• How to find the right balance between the requirements from people, planet and profit?
• What do we know, what do we not know?
• Does it matter? If so, which data do we need, and how to measure?
• What is or should be the role of FM?
• How can we organise longitudinal research in depth?

4. Corporate social responsibility
• What is social responsible entrepreneurship?
• Smart marketing or a real interest?
• How can we put CSR into practice?
• What is the impact on employee satisfaction, organisational performance, business continuity and sustainability?
• Required actions e.g.:
  • Clear definition and operationalisation
  • Case studies – careful description, critical reflections
  • Papers in academic and professional FM journals

5. Building for the future
‘Another concept related to sustainability that is also of great economic importance is the design and construction of multi-purpose buildings that are suitable for different functions and different users and are flexible and easy to disassemble. … How will these changes be addressed? Will technological methods of dealing with change be replaced by 5 behavioral measures? Building for the future also means taking greater account of the needs of young people, the so-called “Einstein generation”. But what are those needs, and will they change as young people move on to new phases of their lives, gaining obligations and responsibilities? These questions are relevant in many areas. For example, what types of study and work habits will arise in the future? Will school buildings as we know them continue to exist? What is the role of e-learning
In primary school, secondary school, and the world of higher education?” (Pullen et al. 2009a: 4–5).

In addition, the topics of the 7th and 8th research symposium were compared in order to identify continuity and changes in the research topics (Table 2). The main theme of the 7th research symposium (2008) was ‘Facility Management: adding value to core business. Strategies – Opportunities – Functionality’, while that of the 8th research symposium (2009) was ‘One world, different problems – joint efforts, sustainable solutions!’

APPROACH

A survey was conducted within the RNG to develop the European research agenda. The scope of the survey was an overview of the future research objectives, existing research competencies, planned projects, and concrete proposals relating to the European FM research agenda. The survey was administered as a structured questionnaire, sent by e-mail to RNG members representing 22 research institutions. The method adopted is considered suitable for surveys within highly motivated and homogeneous groups. A high response rate was achieved as a result of prearrangements and accompanying measurements, such as an update of the RNG mailing list, preannouncements, reminders, answering queries, and providing alternative file formats on request.

<table>
<thead>
<tr>
<th>EFMC 2008</th>
<th>EFMC 2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facility Management: adding value to core business.</td>
<td>One world, different problems – joint efforts, sustainable solutions!</td>
</tr>
<tr>
<td>Strategies – Opportunities – Functionality</td>
<td></td>
</tr>
<tr>
<td>• Strategies in a Global World</td>
<td>• FM Strategies in a Global World</td>
</tr>
<tr>
<td>• Change Management and Process Orientation</td>
<td>• Partnership across Borders</td>
</tr>
<tr>
<td>• Adding Business Value and the Economics of FM</td>
<td>• (Re-) Defining Core Business of FM: FM Adding Value to Core Business</td>
</tr>
<tr>
<td>• Business Continuity and Risk Management</td>
<td>• Life Cycle Management</td>
</tr>
<tr>
<td>• Sustainability and Energy Management</td>
<td>• The Economics of FM</td>
</tr>
<tr>
<td>• Customer Services and Quality Management</td>
<td>• Sustainability and Energy Management</td>
</tr>
<tr>
<td>• Future Developments: Business and Technology Trends</td>
<td>• Future Developments and Innovation in FM</td>
</tr>
<tr>
<td>• Partnership across Borders</td>
<td>• Business Processes and Technology Trends</td>
</tr>
<tr>
<td>• Workplace Management</td>
<td>• Facility Operations: Usability, Customer Services and Management</td>
</tr>
<tr>
<td>• Usability</td>
<td>• Workplace Trends</td>
</tr>
</tbody>
</table>

Table 2: Key topics of EFMC 2008 and EFMC 2009 (topics in italics are the same as those in 2008) (Pullen et al. 2009a)
The survey questionnaire was structured in four categories, to document the future research objectives (Goals), existing research competencies (Reality), planned projects (Option), and concrete proposals (Will). The main questions relating to the four categories were as follows:

1. **Goals (G):** What do you think are the most important objectives in order to increase knowledge? (Please imagine future FM research agenda in Europe.)

2. **Reality (R):** In which fields do you have competencies which are important for EuroFM? (Please consider research results and publications of your institution.)

3. **Option (O):** What options do you see for your institution to contribute to the future research agenda? (Please refer to ongoing or planned research projects of your institution.)

4. **Will (W):** How would your institution like to contribute to the future research agenda? (Please name people and responsibilities within the future research agenda.)

The individual contributions were evaluated and a comprehensive analysis of research fields and research centres was performed. The evaluation was carried out in eight steps:

1. Sorting of the responses by keyword, in alphabetical order, within the pre-defined four categories: future research objectives (Goals), existing research competencies (Reality), planned projects (Option), and concrete proposals (Will).
2. Arranging the keywords in clusters within the four categories.
3. Classifying the clusters over all research fields.
4. Identification of European research fields, with the condition that clusters must have contributions from all four categories and cover a minimum of three countries.
5. Prioritisation of identified research fields, by number of participating institutions, number of contributions, and number of countries.
6. Alphabetical sorting of the participating institutions, and allocation of their research fields or individual research core areas.
7. Identification of European Research Centres, with the condition that the institution must participate in at least one European research field.
8. Evaluation of European Research Centres, according to number of European research fields, number of contributions, and number of researchers.

**RESULTS**

In the following, the results of the survey are divided into three categories: empirical findings, insights, and models. Insights are given concerning the research institutions and research fields related to earlier EuroFM projects. The models of the above-mentioned earlier studies (Jensen 2008; Alexander 2009; Pullen et al. 2009a) and the presented survey (Junghans 2011c) are systematically compared in terms of their objectives, approaches, methods, participants, project duration, and input for the research agenda. Finally, the results are presented as a worksheet for future studies relating to the research agenda development (Table 6).

**Empirical findings**

As a result of steps 1–4 in the evaluation of the survey results, the following 10 European FM research fields were identified (in alphabetical order): Added Value, Built Environment, Demand...
and Supply, Future, Health Care, Knowledge, Sustainability, Usability, Work Organisation, and Workplace. During the survey these research fields were prioritized according to publicity, intensity of research, and internationality:

1. How well known is the research field? A rough estimation was made by number of participating institutions (Figure 1, horizontal axis).
2. How intensive is the research? The number of entries per research field was evaluated (Figure 1, vertical axis).
3. How international is the research field? The number of participating countries was considered (Figure 1, bubble diameter).

The research field ‘sustainability’ was accorded the highest priority (Figure 1). This research field was very well known by 13 participating institutions, research intensity relating to the field is high (with 27 entries), and it is internationally important (7 countries responded) (Table 3). A summary of participants’ contributions in the category ‘Goals’ provided a first impression of the planned research activities in each of the 10 research fields listed in Table 3. The summary revealed the diversity of the research and interdisciplinary of FM:

1. **Sustainability:** ‘01 Environmentally sustainable FM processes; Impact of FM on sustainability, emissions, etc.; 02 Mapping the variety of ways to develop responsible facilities management – not only ecological perspective but also social and economical responsibility – the significance of sustainability indicators like wellbeing should be investigated from the perspective of facilities management; 03 Sustainable Facility Management theory and practice; 04 To develop understanding and models and investigate case studies of sustainable FM – new RNG workgroup; 05 sustainability; 06 Socially responsible FM including steering on Sustainable facilities; 07 Sustainable Facility Management in Public Real Estate Community FM; 08 Sustainable FM, Life cycle planning and management, methods – empirical data.’

2. **Knowledge:** ‘01 Apply FM Knowledge through technical guides; 02 In the context of EuroFM, the most important objective is the co-production of knowledge with practitioners and educationalists – this is EuroFM’s unique proposition; 03 Exchange the best FM practices within the members (journals, projects); 04 Development of strategies, models, and concepts to further professionalize FM and integrate FM into organizations; 05 Development of Guidelines on all aspects of implementation, operation and optimization of Fm (similar to GEFMA, perhaps we can evaluate GEFMA’s guidelines and try to translate and adapt the most relevant ones); 06 EuroFM must establish itself as the foremost, research-based FM organization in Europe if it is to become an authoritative voice; 07 The goal is to investigate and map, how facilities management as a multidisciplinary phenomena can get benefit out of variety of research methods with different scientific background; 08 Development of a unified European FM textbook; 09 Development of a common theoretical core for the FM research; 10 Develop use and integration of knowledge, information, and data in FM. Implications for leadership and management of facilities and providers; 11 Scientific Approach, FM Theory, Methodology, Tools; Important issue for the academic development, but difficult to finance from EU research programs; 12 In order to advance knowledge, it needs to be created first.’
Figure 1: European FM research fields

Table 3: Prioritisation of European FM research fields

<table>
<thead>
<tr>
<th>European FM research fields</th>
<th>No. of participating institutions per research field</th>
<th>No. of contributions per research field</th>
<th>No. of participating countries</th>
<th>Sum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sustainability</td>
<td>13</td>
<td>27</td>
<td>13</td>
<td>47</td>
</tr>
<tr>
<td>Knowledge</td>
<td>13</td>
<td>25</td>
<td>13</td>
<td>45</td>
</tr>
<tr>
<td>Added Value</td>
<td>9</td>
<td>19</td>
<td>9</td>
<td>35</td>
</tr>
<tr>
<td>Workplace</td>
<td>8</td>
<td>17</td>
<td>8</td>
<td>30</td>
</tr>
<tr>
<td>Demand and support</td>
<td>6</td>
<td>15</td>
<td>6</td>
<td>24</td>
</tr>
<tr>
<td>Built environment</td>
<td>6</td>
<td>11</td>
<td>6</td>
<td>22</td>
</tr>
<tr>
<td>Usability</td>
<td>5</td>
<td>11</td>
<td>5</td>
<td>21</td>
</tr>
<tr>
<td>Future</td>
<td>5</td>
<td>11</td>
<td>5</td>
<td>20</td>
</tr>
<tr>
<td>Health care</td>
<td>5</td>
<td>11</td>
<td>5</td>
<td>20</td>
</tr>
<tr>
<td>Work organisation</td>
<td>3</td>
<td>11</td>
<td>3</td>
<td>17</td>
</tr>
</tbody>
</table>

3. **Added value:** ‘01 To develop understanding and models and investigate case studies to demonstrate the added value of FM – existing RNG workgroup; 02 Understanding value added by FM; 03 Public Private Partnership; 04 Added value of FM: what is it, added value for whom,
how can we measure it; 05 Decision support tools that take into account the needs of different stakeholders and overall cost/benefits considerations, monetary and non-monetary; 06 Internal rent models / transfer pricing; 07 Engagement with practice to show added value of research in practice.’

4. Workplace: ‘01 User-oriented planning, delivering, and management of workplaces and learning environments; 02 Investigating continuously the new, alternative workplace strategies in user organizations – the change processes and the effectiveness on changes – long term research indications and comparisons between different countries are important; 03 Office workplace innovations.’

5. Demand and supply: ‘01 Understanding business on demand in relation to IFS; 02 Dutch approach of purchase management; 03 What is the ideal relation between demand manager and suppliers when integrated FM (all facility services outsourced) had been chosen for? Right balance between trust and control? When is the outsourcing situation ’in control’?’

6. Built environment: ‘01 Facility Management contribution to sustainable development of the built environment; 02 Research in existing building sites; 03 The fragmented space segments and services in the urban context are in the transformation: mix-use buildings, the areal service networks e.g. in services for elderly people, co-housing – all these phenomena need novel approach for the role of facilities management. The business logic of service networks is important; 04 Transformation and development of existing buildings and urban areas (urban renewal).’

7. Usability: ‘01 To develop understanding and models and investigate case studies to improve the usability of the built environment – with CIB W111.’

8. Future: ‘01 Future scenario’s for facility management (in these exponential times, it is necessary that we determine scenario’s of work and work environment; 02 Ongoing topic – the future scenarios should be updated in a constant manner; 03 What did we learn from 25 years of FM in Europe and 10 EFMC conferences.’

9. Health care: ‘01 FM for the changing world of healthcare; 02 Providing efficient public infrastructure (e.g. Hospitals); 03 Health care/hospitals, Hospitals construction and management.’

10. Work organization: ‘01 Need for more leadership instead of management.’

European FM Research Centres were identified through an alphabetical sorting of the participating institutions, and also an allocation of their research fields or individual research core areas. A participating institution was identified as a European FM Research Centre if it participated in at least one European research field. Moreover, individual contributions to all four categories – ‘Goals’, ‘Reality’, ‘Option’, and ‘Will’ – had to have been made. The institutions were evaluated according to the number of their European research fields, contributions, and researchers (Figure 2; Table 4).
Figure 2: European centres of FM research

Table 4: Prioritisation of European Centres of FM research

<table>
<thead>
<tr>
<th>Name</th>
<th>No. of research fields in which the institution is active</th>
<th>No. of individual contributions per institution</th>
<th>No. of researchers</th>
<th>Sum</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO-NTNU</td>
<td>7</td>
<td>27</td>
<td>11</td>
<td>45</td>
</tr>
<tr>
<td>CH-ZHAW</td>
<td>7</td>
<td>19</td>
<td>7</td>
<td>33</td>
</tr>
<tr>
<td>DK-DTU</td>
<td>5</td>
<td>16</td>
<td>11</td>
<td>32</td>
</tr>
<tr>
<td>FI-TKK</td>
<td>6</td>
<td>12</td>
<td>6</td>
<td>24</td>
</tr>
<tr>
<td>NL-Delft</td>
<td>4</td>
<td>15</td>
<td>4</td>
<td>23</td>
</tr>
<tr>
<td>UK-Bolton</td>
<td>5</td>
<td>14</td>
<td>3</td>
<td>22</td>
</tr>
<tr>
<td>NL-NHTV</td>
<td>3</td>
<td>12</td>
<td>5</td>
<td>20</td>
</tr>
<tr>
<td>D-KIT</td>
<td>5</td>
<td>13</td>
<td>2</td>
<td>20</td>
</tr>
<tr>
<td>NO-HIAK</td>
<td>4</td>
<td>12</td>
<td>3</td>
<td>19</td>
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<tr>
<td>UK-CFM</td>
<td>6</td>
<td>12</td>
<td>1</td>
<td>19</td>
</tr>
<tr>
<td>NL-Hanse</td>
<td>3</td>
<td>13</td>
<td>2</td>
<td>18</td>
</tr>
<tr>
<td>NL-Saxion</td>
<td>5</td>
<td>8</td>
<td>3</td>
<td>16</td>
</tr>
<tr>
<td>D-FHFFM</td>
<td>3</td>
<td>10</td>
<td>1</td>
<td>14</td>
</tr>
<tr>
<td>PT-IST</td>
<td>3</td>
<td>10</td>
<td>1</td>
<td>14</td>
</tr>
</tbody>
</table>
RNG plans to use the report for the development of the European research agenda and when conducting research projects together with the Practice Network Group (PNG), Education Network Group (ENG), and Corporate Associates Network Group (CANG) within the European Facility Management network. For this purpose a brief summary was published in the EuroFM journal (Junghans 2011b).

**Insights**

The response rate in the survey was very high: researchers from 9 countries and 17 universities returned questionnaires and provided 215 individual contributions to the European FM research agenda. The information gained from the survey supplements the information generated by earlier studies. The overall result is the latest update of the European FM research topics. More universities and research institutions from more countries participated than reported in earlier studies (Table 6). Compared with the results from workshops and research seminars, the survey resulted in a collection of keywords. However, the keywords will need to be explained and reworked, especially as most of them relate to earlier EuroFM projects. In addition, a search in scientific journals (e.g. *Facilities, Journal of Facilities Management*) on the following keywords indicated some relevant publications (listed in parentheses):

- Added value (Jensen 2008)
- Future (Alexander 2009)
- Workplace (Nenonen et al. 2009)
- Usability (Alexander 2010; Blakstad et al. 2010)
- Health care (Lavy & Shohet 2009)
- Sustainability (Nielsen et al. 2009; Junghans 2011a)

The keywords: ‘Work organisation’ and ‘Supply and demand’ indicate new fields of FM research. However, they do not relate to earlier EuroFM projects.

Two research symposiums have taken place since Pullen et al.’s publication in 2009. For consistency, the key topics of 9th research symposium ‘Integration of Core Business and Facility Management’ (2010) and 10th research symposium ‘Cracking the Productivity Nut’ (2011) were compared with each other (Table 5) and with those of the 7th research symposium (2008) (Table 2). Sustainability was not a topic for discussion in the 2011 symposium, but Knowledge Management was added as new subject. Since 2008, the topics ‘Added value of FM’ and ‘Workplace management’ have been discussed at the research symposiums (Table 5).

**Models**

The present article’s contribution to the development of the European research agenda is an overview of the discussed works by Jensen, Alexander, Pullen et al., and Junghans, which has been structured according to the categories ‘objectives’, ‘approaches’, ‘methods’, ‘participants’, ‘project duration’ and ‘input for the research agenda’ (Table 6). The worksheet shown in Table 6 may be used for the further development of the research agenda.
Table 5: Key topics of EFMC 2010 and EFMC 2011 (topics in italics are the same as those in 2010; bold font indicates topics also discussed in 2008)

<table>
<thead>
<tr>
<th>EFMC 2010</th>
<th>EFMC 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Integration of Core Business and Facility Management</td>
<td>Cracking the Productivity Nut</td>
</tr>
<tr>
<td>FM Innovation and Strategy</td>
<td>Workplace Productivity and Management</td>
</tr>
<tr>
<td>Workplace Innovations and Management</td>
<td>Performance Management</td>
</tr>
<tr>
<td>Performance Management: Assessments and Measurements</td>
<td>FM Positioning and Strategy</td>
</tr>
<tr>
<td>Sustainability in FM</td>
<td>Value Added FM</td>
</tr>
<tr>
<td>Performance Management: Operations and Benchmarking</td>
<td>Knowledge Management</td>
</tr>
<tr>
<td>The added value of FM: different research perspectives</td>
<td>An objective-driven approach to workplace design, management and use</td>
</tr>
</tbody>
</table>

Table 6: Worksheet for future development of the European FM research agenda

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Objectives</td>
<td>Theoretical by literature review</td>
<td>FM Future scenarios 2018</td>
<td>Input FM research agenda 2015</td>
</tr>
<tr>
<td>Approaches</td>
<td>Cooperative within peer group by 3 workshops and research sessions</td>
<td>Reflective with expert interviews in 3 business round tables &amp; analytical by paper review of 9 research symposiums</td>
<td>Empirical within peer group by survey within EuroFM members, &amp; analysed, presented and discussed, with feedback from discussions included</td>
</tr>
<tr>
<td>Methods</td>
<td>PESTLE</td>
<td>Round table talks</td>
<td>GROW</td>
</tr>
<tr>
<td>Participants (number, countries, background)</td>
<td>&gt; 200, from Switzerland, UK, Finland; practitioners, educators, researchers</td>
<td>Journalists, practitioners, academics in Netherlands</td>
<td>60 researchers, 9 countries, 22 research institutions</td>
</tr>
<tr>
<td>Input for the research agenda</td>
<td>Research topics with regard to financial, human, physics, and knowledge resources.</td>
<td>Discussion of future scenarios</td>
<td>5 research fields</td>
</tr>
</tbody>
</table>
PRACTICAL IMPLICATIONS
The results of the RNG survey may be used for further development of the research agenda. In order to develop the agenda as bridge between business and science it is necessary to define the FM work field. Thereafter, the research topics and the scientific and business background will need to be examined in more detailed. In this respect, the knowledge gained from earlier work will be useful. Round table talks with participants from different backgrounds (journalists, practitioners, and academics) may be transferred to other countries, supported by National FM associations. The preparations for the 8th research symposium could be repeated for the next research symposium. It would also be useful to connect science and business in order to develop research projects.

REFERENCES
9.5 PROPOSAL FOR A COMMON NORDIC FM RESEARCH AGENDA

Per Anker Jensen, Per Dannemand Jensen and Birgitte Rasmussen

INTRODUCTION

This chapter and chapter 9.2 are both based on CFM’s project on FM Futures. The main objectives for this project was a) to identify possible futures of FM in the Nordic countries and based on this b) to establish a Nordic FM strategy in research and education, which can stimulate research in FM and increase the collaboration between universities in the different Nordic countries and between researchers and practitioners. This chapter presents the results of the second part – proposals for a Nordic FM strategy in research and education.

METHOD

The method to arrive at a Nordic FM Research Agenda is based on the tradition of strategic foresight including an adapted Delphi survey. A Delphi survey is a systematic method for eliciting and collating informed judgements on a particular issue, through the circulation of a carefully designed questionnaire to participants, who are mainly experts in the relevant field. In this case a number of statements of the future development, favourable or just anticipated developments, of the FM sector were developed. Such a Delphi statement has been defined as “... a concise expression of the event, achievements or other phenomenon upon which views are sought. In as few words as possible, an unambiguous expression of what the questioner has in mind must be achieved, which incorporates any key conditions, but which excludes separate issues that warrant one or more additional topics” (Loveridge et al., 1995). The statements have been developed through the process described in more detail in chapter 9.2. The process included three steps. The first step was a preliminary survey of existing studies and foresight projects on the future for FM. This provided a rough overview of topics and issues of future relevance to the FM sector. The second step was four national workshops in Denmark, Norway, Sweden and Finland. As an iterative element participants in the workshops discussed and refined the topics and issues found in the desk study. As a third step the preliminary results of the foresight process including statements were presented and discussed at a workshop at CFM’s Nordic conference.

The statements have been developed as an iterative process with inputs from the literature review, the four national workshops and the Nordic workshop. In order to secure a high response rate the number of individual statements was reduced to 40, which were clustered in the following six themes:
- Working life and style: 4 statements
- Resources and sustainability: 8 statements
- Technology: 6 statements
- FM competences: 5 statements
- Management and new services: 8 statements
- Value and professionalization of FM: 9 statements

The full list of statements is shown in appendix.

To these statements the participants were invited to answer a number of questions derived from the objective of the foresight project. In this case four questions were asked to each statement. Each question had a number of predefined answers:

- Importance for the development of FM (Very important/Important/Less important)
- Period in which the statement will be important for the FM sector (Short term, 2-5 years/Long term, 5-15 years/Never)
- Most important activities to support the development (one or more of the following: Academic research, Industrial R&D, Teaching, Public regulation, Dissemination of knowledge)
- Most important actors to promote the development (one or more of the following: Private clients - in-house FM, Public clients - in-house FM, Facility service providers, Consulting companies, IT providers, Construction companies, Professional networks – associations)

In the following we will focus on issues that are assessed to be important for the FM sector and at the same time relevant for academic research.

RESULTS
The questionnaire was mailed to 117 experts, which had participated in the national workshops and/or in the conference. 5 questionnaires did not reach the experts for various reasons. 51 replies were received resulting in an overall response rate of 46%, which was very satisfactory. As background questions the responders were asked in which country they work. Most of the responders worked in Denmark: 27, 8 in Norway, 8 in Sweden, 6 in Finland and 2 in other countries. This might give the results of the questionnaire a bias towards the Danish FM sector. This bias issue will be examined briefly later in the chapter. The responders were also asked about their professional interests in FM. 25 indicated researchers, 9 client/in-house FM, 5 providers, 2 teachers and 10 indicated other interests.

Important themes
In figure 1 the average response of importance of the themes is depicted. On this aggregated level only few messages is clear. The theme of Management and new services seems to be the least important in this comparison whereas the theme of ‘Resources and sustainability’ seems to be slightly the most important.
Figure 1: Assessment of the average importance of the six themes

Figure 2: National differences in what is assessed to be the most important themes. Average percentage indicating ‘Very important’ for the question ‘Importance for the Development of FM’
As mentioned several times there are significant differences between the viewpoints of the FM sectors in each of the four countries. And as the results of the questionnaire survey might be biased due to an overrepresentation of Danish respondents it is natural to investigate this further. Even though, the number of respondents in the three other countries were low the respondents are all considered as leading FM experts. Therefore, some conclusions might be drawn with great deal of cautiousness. Figure 2 shows the national differences in what (averaged within each theme) is considered the most important issue, measured as percentages indicating ‘very important’ in the questionnaire. Only two significant differences can be determined. First the Finnish respondents seems to assess the theme ‘Value and professionalization of FM’ less important than the other respondents. Second the Swedish respondents seems to consider the theme ‘FM competences’ less important than the other respondents.

One can also raise the question about differences in viewpoints on importance between academia and practitioners. The study compared answers from at the one hand Researchers and Teachers (academia) and at the other hand all other respondents (mostly practitioners). No significant differences could be seen except that practitioners assesses the theme ‘Value and professionalization of FM’ significantly more important than respondents from academia.

**Important issues for academic research**

Figure 3 two shows the most important activities averaged within each theme. A few key messages can be drawn from the figure. First academic research is viewed to have an important role for all themes with particular emphasis on the theme of ‘Value and professionalization of FM’ and also within the theme of ‘FM competences’. Industrial R&D is assessed to have its most important role in the theme of Technology. Public regulation is assessed to have a very limited role except within the theme of ‘Resources and sustainability’. The fact that academic research is viewed to have an important role in general is of course a result of a bias, as the statements have been selected and formulated with a research agenda in mind, and not with policy regulation in mind.

The survey indicates national differences in the assessment of where academic research is considered to be the most important activity. The most significant observation is that the Finnish respondents for all themes consider industrial R&D to be more important than academic research. In contrast to this the Swedish respondents across all themes consider industrial R&D less important than academic research. Apart from reflecting national differences in the view on FM related research, these observations might also reflect general differences between Sweden and Finland in the perception of the role of research in society.

No clear differences can be observed on this issue between respondents from academia and practitioners.

**Time horizons**

The respondents have been asked about the period in which the statement will be important for the FM sector with three options for answers: Short term (2 – 5 years), Long term (5 – 15 years)
Figure 3: Most important activities averaged within each theme

Figure 4: Period in which the statements are assessed to be important for the FM sector averaged in each theme
and Never. For all statements 52% in average indicated short term, and 43 percent indicated long term, and 5% indicated never. Averaged in each theme shows a similar picture with the theme ‘Value and professionalization of FM’ having a significant higher short term percentage, see Figure 4.

The small differences in the distribution of short term and long term issues can be a result of the respondents’ view that the issues are important both on short and long term, and that this viewpoint was not an option in the questionnaire.

**Important issues**
As one of the objectives of this project was to formulate a common Nordic research strategy, we have ranked individual statements according to a summation of the score in importance and the score in ‘Academic research’ under ‘Most important activities to support the development’, see Table 1.

<table>
<thead>
<tr>
<th>Rank</th>
<th>Theme</th>
<th>Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Value and professionalization of FM</td>
<td>39. Introduction of methodologies for FM becoming a critical strategic management tool linking the role of facilities to the organisation’s core business strategy</td>
</tr>
<tr>
<td>2</td>
<td>Value and professionalization of FM</td>
<td>32. Introduction of a set of principles for measurement and documentation of the added value by FM services</td>
</tr>
<tr>
<td>3</td>
<td>Technology</td>
<td>16. Development of cross disciplinary, life-cycle oriented and holistic FM services for building development, delivery and operation</td>
</tr>
<tr>
<td>4</td>
<td>Resources and sustainability</td>
<td>8. Sustainability as a fundamental requirement in FM services across most client groups</td>
</tr>
<tr>
<td>5</td>
<td>Value and professionalization of FM</td>
<td>33. Introduction of a methodology to highlight and ascertain return of investment for the organisation of the FM costs spent in-house</td>
</tr>
<tr>
<td>6</td>
<td>Resources and sustainability</td>
<td>5. Introduction of methodologies for energy saving management in FM services</td>
</tr>
<tr>
<td>7</td>
<td>FM competences</td>
<td>23. Development of new strategic skills to identify and manage uncertainties and expectations in FM services</td>
</tr>
<tr>
<td>8</td>
<td>FM competences</td>
<td>20. Widespread use of knowledge transfer from scientific communities to FM providers and FM clients related to FM services</td>
</tr>
<tr>
<td>9</td>
<td>Value and professionalization of FM</td>
<td>37. Development of a common conceptual FM terminology applied within a professional FM management framework</td>
</tr>
<tr>
<td>10</td>
<td>Value and professionalization of FM</td>
<td>34. Introduction of FM services providing strategic value for FM clients with continuously changing functionality, technology and staff/customer demands</td>
</tr>
</tbody>
</table>
The result further confirms that two themes in particular might be in focus for a Nordic research strategy; namely ‘Value and professionalization of FM’ and ‘Resources and sustainability’. The key issue of statement no. 23 concerns uncertainties and expectations of FM services. We suggest that this issue is closely related to the issue of statement 37 on a common conceptual FM terminology. Statement 20 basically concerns the dissemination of knowledge between academia and practitioners, and we see this as a cross-cutting issue, indeed.

The survey also indicates something about the period in which the Top-10 statements will be important for the FM sector. For the 10 statements in average 55% indicates that the statements are important on short term (2 – 5 years) where as in average 40% indicates that the statement is important on a longer term (5 – 15 years). This indicates that the issues of the Top-10 statements by and large have the same urgency as the issues in general.

**Most important actors**

Above we have commented on the role of academic research and industrial R&D. As strategic research carried out by academia often happens in collaboration with industrial partners it is of interest to examine which actors is seen as the most important for promoting the statements. Figure 5 shows the averaging within each theme. As can be observed from the figure, IT providers and construction companies are assessed to play a less dominant role except in the theme

**Figure 5: Most important actors averaged within each theme**
of ‘Technology’. As mentioned above statements of the theme of ‘FM competences’ is on the top 10 list. In particular within this theme FM networks and associations is assessed to play a role. Other differences are considered to be insignificant.

**IMPLICATION FOR A COMMON NORDIC RESEARCH AGENDA**

Based on this project a common Nordic research agenda is proposed with two headlines: a) Value and professionalization of FM and b) Sustainability in FM services. Emphasis is set on the former.

Research under the headline of value and professionalization of FM can comprise issues such as: introduction of methodologies for FM becoming a critical strategic management tool linking the role of facilities to the organisation’s core business strategy and a set of principles for measurement and documentation of the added value and return of investments of FM services.

Research under the headline of Sustainability in facility management services can comprise issues such as: sustainability as a fundamental requirement in FM services across most client groups and methodologies for energy saving management in FM services and.

When a common Nordic research agenda for FM is proposed the national differences must be taking into account. Joint Nordic research must be relevant for all Nordic countries or at least relevant for several countries. The survey indicates some differences between the four Nordic countries. One difference concerns the view on the role of academic research compared to the role of industry R&D. To mitigate this potential area of conflicting interests we suggest that a Nordic FM research agenda include tight cooperation between researchers and industrial partners. Furthermore, transfer of knowledge between researchers and practitioners must be an integral element of a Nordic FM research agenda.

**REFERENCES**

APPENDIX: THE SIX THEMES AND THE 40 STATEMENTS

Theme: Working life and style
1. Introduction of FM services for working environments with a larger number of different work styles
2. Introduction of FM services to support highly mobile work wherever it takes place
3. Provision of FM services integrating new requirements for well-being and ergonomics
4. Introduction of adaptive and flexible FM services meeting the constantly changing work place conditions

Theme: Resources and sustainability
5. Introduction of methodologies for energy saving management in FM services
6. Provision of FM services meeting the increasing demand of corporate social responsibility (CSR)
7. FM services as a management tool to prevent environmental problems and improved use of natural resources
8. Sustainability as a fundamental requirement in FM services across most client groups
9. Integrating carbon emission reduction as a strategic management tool in FM services
10. Introduction of FM strategies to take advantage of the increasing governmental use of building regulations to impose environmental standards
11. Development of FM services meeting the requirements of robust operation of facilities due to uncertainties related to climate changes
12. Introduction of FM services comprising assessment and management of health risks and environmental risks of new technologies and materials

Theme: Technology
13. Introduction of FM services for sustainable building technologies and materials robust enough to function in challenging physical environments
14. Widespread use of merged FM services for both aging building stocks and new building systems
15. Introduction of FM services based on BIM (Building Information Modelling)
16. Development of cross disciplinary, life-cycle oriented and holistic FM services for building development, delivery and operation
17. Introduction of FM services based on integrated ICT solutions in intelligent monitoring, configuration and reconfiguration of facilities.
18. Introduction of FM services with specific focus on security to cope with techno-crime threatening internet platforms, ICT, etc.

Theme: FM competences
19. Introduction of a Nordic FM professional network for sharing of knowledge and experiences across industries and application areas
20. Widespread use of knowledge transfer from scientific communities to FM providers and FM clients related to FM services
21. Introduction of a wide range of attractive FM educations in order to counter shortage of FM professionals
22. New operational skills for FM providers and demand for flexible FM services by widespread use of wireless technologies
23. Development of new strategic skills to identify and manage uncertainties and expectations in FM services

**Theme: Management and new services**
24. Introduction of strategic management balancing the demand for modularisation and standardisation of FM services and at the same time deliver tailor-made FM operations
25. Introduction of agile and proactive FM services for use in management of complex spaces and project portfolios
26. Widespread use and integration of FM services in urban development of former industrial areas
27. Introduction of FM standards and services integrating human resource management
28. Widespread use of PPP relationships and markets in FM
29. Widespread use of FM services following the investments moving from ownership to leasing of real estate
30. Introduction of FM services integrating private and public sectors in the provision of community services
31. Introduction of FM services managing facilities across larger physical operating distances and various geographical locales

**Theme: Value and professionalization of FM**
32. Introduction of a set of principles for measurement and documentation of the added value by FM services
33. Introduction of a methodology to highlight and ascertain return of investment for the organisation of the FM costs spent in-house
34. Introduction of FM services providing strategic value for FM clients with continuously changing functionality, technology and staff/customer demands
35. Introduction of methodology for measurement of performance against service level agreement (SLA)
36. Development of reliable key performance indicators for FM services
37. Development of a common conceptual FM terminology applied within a professional FM management framework
38. Introduction of methodologies for benchmarking of FM services and standards across areas of applications
39. Introduction of methodologies for FM becoming a critical strategic management tool linking the role of facilities to the organisation’s core business strategy
40. Introduction of strategic communication tools to make FM services transparent and visible for CEOs
<table>
<thead>
<tr>
<th>Keyword</th>
<th>Section</th>
</tr>
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<tr>
<td>Action research</td>
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<tr>
<td>Adjustments</td>
<td>6.3</td>
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<tr>
<td>Boundary objects</td>
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<td>CFM</td>
<td>2.2</td>
</tr>
<tr>
<td>Communities of Practice</td>
<td>7.3</td>
</tr>
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<td>Construction projects</td>
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</tr>
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<td>Flexibility</td>
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<td>FM discipline</td>
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<td>FM in construction projects</td>
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<td>FM knowledge</td>
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<td>FM portal</td>
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</table>
Heart rate assessment 3.3  Scientific publication 2.4
Hospitals 5.5  Services 5.2
Improvement 5.3  Sustainability 4.3
Innovation 4.2, 4.4, 5.2, 6.4  Sustainable facilities 4.2
Innovation types 5.2  Sweden 2.4
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POKI 7.4
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Qualitative Study 5.2
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Realized strategies 4.2
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Restorativeness 3.3
In this book about research on Facilities Management (FM) leading researchers from the Nordic countries present their ideas and findings concerning:

- **Past**: The historical development and current trends in FM research in Denmark, Norway, Sweden, and Finland.
- **Present**: Ongoing FM research within the following six themes: Working Environments, Sustainability, Innovation and Usability, Partnerships, Knowledge Implementation, and Added Value.
- **Future**: Identification of future trends, challenges, and research agendas for Nordic FM.

The book is a result of a Nordic FM Conference arranged by the Centre for Facilities Management – Realdania Research. The conference was held on 22-23 August 2011 at the Technical University of Denmark. The title of the conference was: “Research for Practice – Vision of Futures.” The conference was arranged in collaboration with NordicFM and DFM – the Danish Facilities Management Association. There were 82 participants from Denmark, Norway, Sweden, Finland, and Iceland.

The book is targeted towards researchers, reflective practitioners, teachers, and students at advanced levels, including PhD students, in the field of FM. It is mostly based on papers from the conference with revisions and in a graphical attractive layout. It also includes results from CFM’s FM Futures project. The main purpose of this project was to create input to a joint Nordic FM research agenda. Thus, the overriding purpose of the conference, the FM Futures project, and this book is to support increased Nordic collaboration on FM research among researchers and with practitioners.