BARRIERS TO AND CHALLENGES OF SUSTAINABLE FACILITIES MANAGEMENT PRACTICES – EXPERIENCES FROM THE NORDIC COUNTRIES

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Abstract: The development of sustainable Facilities Management (FM) practices requires active and integrated engagement of the FM organisation and their users. The aim of this paper is to list the challenges that face FM practitioners when implementing sustainable FM within the Nordic countries. We start by looking at the barriers, which we identified within this field in the literature. The systematic literature review focuses on articles referring directly to FM, sustainability of FM and stakeholder involvement. The empirical material is based on input from a one-day workshop involving more than 40 practitioners and academics interested in sustainability and FM aspects as well as in-depth interviews with stakeholders in four ongoing refurbishment projects. We look into how FM suppliers and users benefit from a sustainable approach in refurbishment projects, and we highlight the current barriers and challenges in developing sustainable FM practice. We find that the involvement of FM, end users and other stakeholders is crucial for achieving a set of sustainable goals. Informal dialogue is useful for revealing barriers, and workshop arenas offer a stage for a participatory approach to developing sustainable FM practice. However, FM companies still seem to lack concrete tools to ensure users behave according to the new requirements of the facilities.

Keywords: Facilities Management, Stakeholders, Sustainability In Refurbishment Projects, User Involvement

1. INTRODUCTION

Sustainability concerns have created new demands regarding the collaboration between Facilities Management (FM) providers and their customers. The realisation of sustainable goals requires active participation from the users. FM managers in various sectors are striving to motivate their users to take part in implementing sustainability goals. Sustainability is widely accepted as "*improving the quality of human life while living within the carrying capacity of supporting ecosystems*" (IUCN/WWF, 1991).

When discussing sustainability aspects in the building sector, we talk about planning, designing, constructing and using a building in a way that serves the purpose of the users with optimal resources and a low carbon footprint over its life cycle. The building sector has mainly embraced its environmental responsibilities but not so much the social, cultural and economic responsibilities (Kaatz et al., 2005). In order to change that, Kaatz et al. (2005) argue that the sustainable development of a building "*is fundamentally about fostering participation through communication and dialogue, commitment and cooperation with stakeholders to exchange ideas, opinions and information grounded in mutual respect and shared responsibilities*". The owners of real estate are slowly becoming aware of the need for partnership and collaboration with stakeholders as well as developing communication with the users in order to understand their needs and requirements. To date, a participatory approach has been adopted, using

different business models and planning systems (e.g. public–private partnership, partnering models, best value procurement, LEAN or other production planning models).

The sustainability of buildings has been explored broadly in the literature. However, few studies have looked into the interaction between the owners/investors and other stakeholders and their different requirements from the perspective of a sustainable retrofit of existing buildings (Storvang & Clarke, 2014). Such a collaborative and participatory approach would align the contrasting perspectives on how and why a building should have sustainable retrofits. The questions then is two folds: first how to integrate the targeted users and their behaviours in this design process and then, how to ensure that once the improvements are realised, the users will align their behaviours with the comportments these new features require.

In order to discuss the development of sustainable FM and the integration of users we want to:

(1) identify common barriers and challenges that hinder implementation of sustainable FM practices by integrating users,
(2) discuss the user role and the need for information and tools that motivates change, and
(3) discuss the FM role as a proactive player and motivator for reaching sustainable goals.

2. THEORETICAL FRAMEWORK

2.1 Sustainable refurbishment

ISO 15392:2008 defines sustainable development as "*a building that creates the required performance and functionality with minimum environmental impact and at the same time encouraging improvements in economic and social as well as cultural aspects at local, regional and global levels"*. In this paper, we use this definition when discussing the role of the FM organisation when developing a sustainable building in practice.

2.2. Barriers and challenges

Why do we study barriers and challenges when new technology and new knowledge should make it easy to reach sustainable goals? Obviously, there are still socio-technical barriers that hinder sustainability. We studied the barriers in achieving a sustainable approach when dealing with refurbishment projects and FM practice.

We looked at barriers and challenges reported in the literature reviewed by international researchers over the last twenty years. We, among others, consider these barriers to be general both for private housing and non-residential buildings (Sarpin et al., 2016; Jensen & Maslesa, 2015; Storvang & Clarke, 2014; Mensaasa & Bauer, 2014 Häkkinen & Belloni, 2011; Elmualim et al., 2009, 2010; Itard et al., 2008 and Kaatz et al., 2005). Kaatz et al. (2005) also considered the barriers to participation in the construction process as well as the need to develop innovative mechanisms to broaden membership of the construction project team.

The list of barriers and challenges are assessed by the authors of this paper as social (S), environmental (E) or financial (F) related to the business organization, users, competences, technology or policy instruments (see Table 1).

Table 1: Barriers and challenges that hinder the implementation of a sustainable FM practise found in the literature

Related to:	**Barriers**
Business organization	• Cost-effectiveness (F) • Lack of consensual understanding and focus on individual and organisational understanding of sustainability (S) • Concise decision-making framework due to complex processes (S,E and F) • Conflicting stakeholder requirements and agreement of sustainable goals for retrofit (S, E and F) • Lack of distribution of power, empowerment and capacity building (S, F) • Lack of information and knowledge about the building (S and F) • Lack of understanding of contextual issues (S) • Lack of integration of stakeholder knowledge (S) • Lack of strategic leadership and responsibility of driving essential change (S)
Users	• Awareness of the behaviour of the building's users (S, E and P) • Lack of understanding of contextual issues (S) • Lack of commitment to project goals, as well as enhanced process legitimacy through transparency and credibility of the decision-making process (S) • Lack of information and knowledge about the building (S and F)
Competences	• Awareness of the behaviour of different users of space (S, E and P) • Lack of professional competence and information (S and F) • Lack of strategic leadership and responsibility of driving essential change (S)
Technology	• Perception that sustainability-certified buildings do not guarantee energy savings (S)
Policy instruments	• Lack of incentives for private investors (also called the landlord/tenant dilemma by Jensen & Maslesa (2015)) (S, F) • Lack of funding for private owners (F) • Reluctant stakeholder commitment due to low energy prices (S and F)

The literature points towards two specific ways of overcoming these barriers: (1) the FM role can be a change agent, taking the strategic lead role to enhance the steps of development or implementing new practices (Nardelli & Scupola, 2014; Støre-Valen et al., 2014); (2) focus on stakeholder involvement and user integration (Buser et al., 2017; Menassa & Baer, 2014; Nardelli & Scupola, 2014).

2.3 FM Role

In Scandinavia, the FM role has developed from that of a property manager and janitor role as "hard FM" towards "soft FM", focusing on the social and service needs of the organisation

(core business). This change has happened over the three last decades (Pemsel et al., 2010). Several researchers discussing the FM role state that the FM role needs to increase awareness of sustainability aspects. In best practice, the FM role can have a proactive role and take the lead in inviting and implementing change (Elmualim et al., 2010; Pemsel et al., 2010; Støre-Valen et al., 2014; Jensen & Maslesa, 2015). The FM role is important beyond the remit of a janitor, for example fixing problems and changing light bulbs; the best practice FM role also initiates and implements new sustainable processes. However, this requires the FM manager to take a strategic position to influence and direct change both in relation to the owner and the core business organisation. The researchers call this user-FM or client-FM related processes (Kaatz et al., 2005; Storvang & Clarke, 2014; Jensen & Maslesa, 2015).

2.4 Stakeholder involvement – the participatory approach

Another way to overcome barriers is by stakeholder involvement and user integration related to change management. Storvang & Clarke (2014) looked at how to set up a space for stakeholder involvement. They argued in favour of creating and facilitating a workshop as a socio-technical space across boundaries, to overcome barriers and improve stakeholders' involvement. In this way, the stakeholders would provide better insights about their values, needs, concerns and ideas. This process was important for creating trust and confidence; too many times the stakeholders have been involved in creative meetings to discuss needs and ideas but further along the road, either the architect or the engineer takes some decisions and forgets the sustainability goal that the stakeholder agreed upon earlier. The process of stakeholder involvement is crucial in order to increase knowledge and consensus about the sustainability goals and transparent decision-making.

We are not only talking about the end users, but also the engagement of all stakeholders that can influence the decisions in a sustainable way. Sezer (2012) studied environmental assessment tools for housing and office refurbishment and found that assessment tools in general focus on energy consumption and technical aspects like air quality, and light, noise, water and material consumption and rarely on the socio-technical side of sustainability. In this paper, we look at whether a social aspect can be a way to remove such barriers as found in the literature.

3. RESEARCH METHODOLOGY

This paper is based on the findings so far from the Nordic built project "Sustainable Operation of Buildings". The project is a collaboration between four Nordic educational institutions: Norwegian University of Science and Technology (NTNU); Chalmers Technical University in Sweden; Copenhagen School of Design and Technology (KEA); VIA University College Horsens in Denmark and the Association of Building Professionals (Konstruktørforeningen). The goal is to strengthen and develop FM competence in the Nordic countries. The paper is based on complementary sources of information:

- A short literature review accomplished between December 2016 and June 2017.
- A one-day workshop and start-up conference: *"Nordic Sustainable Operations of Buildings"* held at KEA, 4 February 2016, Copenhagen.
- Interviews and workshops with selected stakeholders and project owners used as case studies at the Nordic Built Summer school: *"From Sustainable Refurbishment to*

Sustainable Facilities Management – A Summer School", 13–17 March 2017, NTNU, Trondheim.

3.1 Short literature review

The literature review was used to inform the theoretical approach and aimed to answer the following questions: firstly, what hinders implementation of sustainable FM practice? Secondly, what is the user role and the user role's need for information in relation to the building? And thirdly, how does the FM role help to achieve sustainable goals?

We looked at journals listed on the Web of Science, Scopus, Google Scholar and ARC using a combination of the following search keywords: *barriers and challenges, sustainable refurbishment or renovation, sustainable FM, user involvement/user behaviour, stakeholder involvement, energy performance, sustainability and innovation*.

3.2 "Nordic sustainable operation of buildings" (4 February 2016)

The conference gathered 48 people from practice and academia to share experience and their points of view of sustainable practice in a one-day workshop on 4 February 2016 in Copenhagen. The participants represented public and private owners, property managers, FM providers and suppliers, contractor companies, architects and consultants as well as researchers and academic staff with an interest in sustainability aspects of FM. The purpose of the conference was to share knowledge and experiences with sustainable operation and FM to identify barriers and challenges that hinder sustainable practice, and to discuss future needs of education and requirements.

The workshop divided the participants into small groups to discuss six different perspectives:

1. The design perspective
2. The FM supplier and provider as an interplayer
3. Certification as a method and incentive for sustainable operation
4. ICT as a tool for sustainability
5. Commissioning
6. The end user as change agent

Each group then had to reflect on the following questions:

- *What are their experiences with sustainable operation of buildings and what does a sustainable building mean from their perspective?*
- *What are the barriers to and challenges of a sustainable refurbishment project or what makes the operation more sustainable?*
- *What are the main drivers for change?*

The research team took notes and appointed referees in the group discussions. Each group summarised their findings on a poster that they shared in the plenum. The materials were analysed and discussed by the project team (notes, referees, presentations, posters and pictures).

3.3 Interviews and workshops with stakeholders (Jan-March 2017)

The project team arranged a "Sustainable Operation" summer school for 34 students from the four education institutions. The school was held at NTNU in Trondheim from 13 to 17 March 2017. The authors and the project team gathered information from the stakeholders and project owners using semi-structured interviews during January-February 2017. The workshops arranged for the project owners and the students, were executed during the Nordic Built Summer school, 13 to 17 March 2017. The choice of projects was made on the rationale of one project for each of the four educational institutions. Their choice of projects were naturally since the institutions were involved in these projects or had connections to the project owners. We also wanted to present a diversity of sustainable issues to the students. The projects varied, including social aspects of FM in social and private housing; issues of an FM supplier delivering technical installations; future sustainable FM solutions for a historical building for commercial purposes; and refurbishment of an education building for research and educational purposes.

4. RESULTS

We present our findings of barriers and challenges from the literature review and compare them with the barriers reported from practice. The barriers found from practice is based on the information shared from the practise on the Workshop on 4 February 2016 and the Nordic Built Summer School at NTNU (13 – 17 March 2017). We compare the barriers and sort them related to social (S), environmental (E), financial (F) or physical (P) aspects related to business organization, users, competences, technology and policies and instruments, see Table 2. We discuss the barriers and drivers briefly in the DISCUSSION chapter 5. The drivers we found from practice are listed in Table 3.

4.1 Barriers and challenges

Table 2: A summary of findings of barriers from the literature review and practice (Source: literature review; «Nordic Sustainable Operation of Buildings", 4 February 2016;Nordic Built Summer School, NTNU, 2017)

Barriers		**Theory**	**Practice**
Business organization	• Cost-effectiveness (F)	yes	no
	• Lack of consensual understanding and focus on individual and organisational understanding of sustainability (S)	yes	yes
	• Concise decision-making framework due to complex processes (S,E and F)	yes	yes
	• Conflicting stakeholder requirements and agreement of sustainable goals for retrofit (S, E and F)	yes	yes
	• Lack of distribution of power, empowerment and capacity building (S, F)	yes	no
	• Lack of information and knowledge about the building – at a strategic level (S and F)	yes	yes
	• Lack of understanding of contextual issues (S)	yes	yes
		yes	no

	• Lack of integration of stakeholder knowledge (S) • Lack of strategic leadership and responsibility of driving essential change (S) • Lack of information and communication between the FM organization and client/user at tactical and operative level	yes	yes
Users	• Awareness of the behaviour of different users of space (S, E and P) • Lack of understanding of contextual issues (S) • Lack of commitment to project goals, as well as enhanced process legitimacy through transparency and credibility of the decision-making process (S) • Lack of competence and knowledge about the building (S and F) • Perception that a certified building is the same as a sustainable building	yes yes yes yes no	no no not explicit no yes yes
Competences	• Awareness of the behaviour of the building's users (S, E and P) • Lack of FM professional competence and information (S and F) • Lack of competence and information about the building • Lack of strategic leadership and responsibility of driving essential change (S)	yes yes no yes	no yes yes yes
Technology	• Perception that sustainability-certified buildings do not guarantee energy savings (S)	yes	no
Policies and instruments	• Lack of incentives for private investors (also called the landlord/tenant dilemma; Jensen and Maslesa (2015)) (S, F) • Lack of funding for private owners (F) • Reluctant stakeholder commitment due to low energy prices (S and F)	yes yes yes	yes no yes

Table 3: Drivers for sustainable operations of buildings (Source: Nordic built Workshop and conference of sustainable operations, 4 February 2016)

Drivers for sustainable operations from practice (FM suppliers, FM operators, FM managers, public and private owners, researchers, consultants)
• Digitisation and interoperability of ICT • Commissioning • A proactive FM provider in dialogue with the user • Policy and regulations • Social sustainability increases with user involvement • Industrialisation – reduced construction costs when the construction is based on standardised components • New competences and education

We address the need for new competences and education in another paper presented by Buser & Støre-Valen at the IRWAS2017 conference. This is a follow-up to a paper on learning using a problem-based approach (Buser et al. (2017).

4.2 Experiences from four Nordic refurbishment projects

The most common sustainable goals that project owners relate to are energy retrofits of buildings, including retrofitting insulation, changing windows to reduce drafts and heat loss, and improving the indoor environment by balancing heating, ventilation and air conditioning (HVAC), as well as considering the total energy balance of the building.

We found in the literature that the theoretical energy use per m^2 is not technically achievable on its own; rather, it is also affected by the involvement of users and this creates ownership and motivation for behavioural change (Itard et al., 2008; Meistad, 2015; Pedersen & Blomsterberg, 2016).

Table 4 provides an overview of the four refurbishment projects and their challenges and sustainability aspects used as cases at the Nordic Built Summer school (13 – 17 March 2017).

Table 4 Overview of the projects' challenges and sustainability issues as well as characteristics of the projects

Case projects	**Ai-2, Åbyhøj**	**Grøndalsvenge**	**Britannia Hotel**	**University building**
Building category	Residential housing/ cooperative apartments	Residential housing	Hotel	Education and office building
Owner	Ai-2 Bolig	KAB (residential company)	EC Dahls Eiendom	Chalmers University of Technology
Management, operation and maintenance	Ai-2 Bolig	Residents' responsibility	EC Dahls Eiendom	Chalmers Property Management AB
Goal of the project owner	Improvement of indoor environment and reduced heat loss by focusing on the residents' behaviour as a value-creating factor by 50% of the residents	Make affordable and sustainable housing for families living in the neighbourhood	To recreate the most magnificent and dignified hotel in Norway with focus on guests' perceived quality of the hotel. High ambitions of low energy use .	To create an attractive environment that inspires and supports the interaction between researchers, students and companies.
Sustainability concept	Environmental, economic and social aspects (energy use and indoor climate and user behaviour)	Low-energy housing for people, with low cost of construction and social sustainability based on active involvement of the residents through self-management of common areas	Environmental issues – low energy use challenged due to high guest demands, e.g. for comfort and temperature .	Upgrade to become environmentally certified at the silver level.
Challenges	How to involve the residents to reduce energy use and improve indoor climate	Maintain motivation of the residents to self-manage and operate housing and common areas. Ensure correct operation of technical installations. Information and communication platform.	The main building is protected, only the original façade remains. A lot of rot in the wooden beams and studs was detected.	Learning and workspace for students and academic staff. Physical meeting place for industry and research environment. Meeting place between both architecture and civil engineering education.
Innovation	A tool that can motivate the residents to actively participate in the operation and maintenance of the housing	Low cost due to industrial production. Idea of keeping the FM cost down by residents.	New ceiling material and design of indoor roof. Standard temperature setting and +-2 °C temperature adjustments.	Modern facilities and work places, and more group rooms and lecture rooms.

5. DISCUSSION

In this paper, we aimed to: (1) identify common barriers and challenges that hinder implementation of sustainable FM practices by integrating users, (2) discuss the user role and the need for information that motivates change, and (3) discuss the FM role as a proactive player and motivator for reaching sustainable goals.

5.1 Common barriers and challenges for sustainable FM practices

Several barriers and challenges that hinders implementation of sustainable goals are identified in the literature. We found that the major barriers to sustainable refurbishment projects are: Lack of knowledge and information, paucity of cost-effective actions and low level of understanding of the FM and user role. Elmualim et al. (2009; 2010) and other researchers (Menassa & Bauer, 2013; Kaatz et al., 2005) confirm this.

The stakeholders from practise confirmed this. In the Britannia Hotel project, the project owner considered several technical installations to gain sustainability e.g. separation of grey water, thermal energy well, photovoltaic cells. This was not been implemented due to the cost issue. The hotel project mainly focused on technical installations that control the temperature in the rooms with an accuracy of +-2 °C. For the Chalmers project, all actions suggested was feed-forward to the project owner, but the user role was not specifically involved in finding good solutions. In the two housing projects that struggled with finding ways to motivate the users to engage and take part in the operation, lack of information and incentives was found to be the stumbling blocks.

5.2 FM role as a proactive player

The literature points towards the proactive FM role of engaging users to reach sustainable goals by agreed measures (Elmualim et al., 2010; Pemsel et al., 2010; Støre-Valen et al., 2014; Jensen & Maslesa, 2015). Jensen & Maslesa (2015) and Støre-Valen et al. (2016) also highlight immaturity among FM practitioners in relation to value-based management regarding what gives value and addresses the service needs for the users. The stakeholders agree on this and say there is a lack of awareness about what it means to reach sustainable goals in practice.

The clients and users are driven by their individual and organisational values while the incentives for sustainable FM practice among FM organisations are driven by customers' needs and how well they are fulfilled. The digital revolution has already started and we will see more ICT tools and communication platforms in the future that we believe can become enablers for user integration and stakeholder involvement.

5.3 User role and information – the participatory approach

The literature points out ways for involving stakeholders and expertise in the concept phase planning in order to collaborate to find creative and innovative solutions that fit with future needs, known as co-creation or the participatory approach (Støre-Valen, et al., 2016; Meistad et al., 2013; Menassa & Baer, 2014; Kaatz et al., 2005). People from practice (both the suppliers and those from the owner side) confirm the need for such a framework, as they find it difficult

to handle user integration in a resource-optimal way, especially for private housing associations (Workshop, 4 February 2016). In addition, the FM providers confirmed the need for a user integration framework, as they expect clients and workplace tenants' awareness of the social aspects of sustainability to increase. This is also confirmed by Buser et al. (2017) and Nardelli & Scupola (2014). From the literature, we recommend Storvang & Clarke (2014) that designed a space for the involvement of stakeholders (framework) with the power to influence sustainable decision-making. This framework can be further developed and tested in practise.

5.4 Strengths and weaknesses

This research was based on a short literature review, workshops and interviews with stakeholders from the Nordic FM practice. The literature and the findings from practice give the same conclusions; however, there is a gap between the theory and practice when it comes to user integration. The workshop (4 February 2016) pointed towards a need for greater stakeholder and user integration in the future but the user role was not represented. Two of the projects from practice did not report on user or stakeholder involvement either. Therefore, we find it necessary that the FM role takes responsibility to develop the relationship with the users (client) to see how technical solutions of the FM practice can overcome barriers when implementing sustainable goals in the future. However, it is quite interesting to see that the practice confirms the findings from the literature and the need to drive towards a more participatory and collaborative approach between FM and customer- or user-oriented practice.

6. CONCLUSIONS

- lack of understanding of the values, needs, concerns and ideas of the user (the users are not listened to or taken seriously),
- space for stakeholder involvement needs to be well designed,
- insufficient input from the users: users are an important source of information and it is beneficial to integrate the user in the design process in a participatory way,
- lack of tools to communicate and engage the users in acting according to the sustainable goals, and
- the FM provider needs to be more proactive: it is important that a proactive FM provider is an active participant and translator of the user needs to reach sustainable goals.

Other barriers like cost-efficiency and consensual agreement have not been confirmed in practice. There seems to be a movement towards a more social approach, as the case studies have looked into socially sustainable practice with a high degree of user involvement; the case studies also highlight that the challenge then is to have the competence and space to deal with user needs as the FM role is handled by the users.

Lack of understanding of the values, needs, concerns and ideas of the user: the literature points out that the users are not listened to and their needs and values are not taken seriously in the early and predesign phase (Jensen & Maslesa, 2015).

Stakeholder involvement: in order to succeed with stakeholder involvement, this needs to be facilitated in a way that ensures that user needs are implemented and not forgotten. The literature refers to several ways to do this and emphasises doing this in a participatory way

(Meistad, 2015; Pemsel et al., 2010; Menassa & Baer, 2014). The stakeholders interviewed in this research also confirm this.

View the user as an important source of information: the literature refers to the need to integrate the user in the design process in a way that influences the decision-making process. How such participatory approaches are practised are reported both from theory and practice perspectives (Meistad et al., 2013; Menassa & Baer, 2014; Pemsel et al., 2010; Workshop 4 February 2016; Nordic Built Summer School, 12–17 March, 2017). New technology and smart ICT platforms could contribute to bridging the gap in how to deal with this barrier in the future.

There is a *lack of tools to communicate and engage the users* to act according to the sustainable goals. The organisations we met are aware of the challenges that the users represent, and they have tried different methods such as participation, financial incentives, competition or nudging to engage the users to behave according to the new requirements of the facilities. However, they have not yet succeeded in securing the users' involvement and commitment on a long-term basis.

A proactive FM provider as an interplayer and translator of the user needs: the literature suggests that stakeholder involvement may contribute to possible FM service innovation as well as increased customer satisfaction and increased competitive advantage. This requires the FM provider to take the lead in collaborating with the customers or users to implement sustainable goals. The FM suppliers from practice confirm this.

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