An interactive tool for citizens' involvement in the sustainable regeneration

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Abstract

Purpose – The purpose of this paper is to test possibilities of real participation in FM field in response to the energy sustainable demand by using new technologies for better communication. It is acknowledged that the technological innovation is a necessary condition to make a city sustainable, though the challenge is not primarily on technology but on service transformation and improvement. Improving service quality requires the participatory and synergetic processes that attract an extra attention to the social and management aspects of urban planning.

Design/methodology/approach – This is an evidence-based research, which shows how FM can extent its impact on the build environment and society by bringing the socio-physiological aspect and the community in the central of the planning and design process.

Findings – An "urban" facility manager, through integration of multiple disciplines in a human-centre approach, can become the enabler and implementer of sustainable urban ecosystem, i.e. balancing social, economic and environmental pillars. This requires central involvement of FM in the planning and decision-making processes; therefore, its role and impact should be enlarged and better communicated. The enlargement of the FM's role initially requires an effective communication with people, whose behavioural

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change are prerequisite for the sustainability transition. The communication between FM and people should be interactive and iterative, in which they both define problems/needs and co-create the relevant solutions.

Research limitations/implications – This paper depicts an evidence-based FM practice, in which the website as an interactive tool is co-designed by the "facility management" students and the citizens to contribute to the real citizen participation in an effective communication process.

Originality/value – The high value for both, citizens and facility manager, is co-created information platform for upgrading the sustainability level and well-being in the communities. The tool is seen as an important starting contribution for the Paris climate agreement, and as a step toward human-centric-oriented urban sustainable regenerating project.

Keywords Facilities management, Urban areas, Communication, Citizens' involvement, Interactive tool, Sustainable regeneration

Paper type General review

1. Introduction

The expansion of cities has faced a variety of challenges, indicating a loss of basic functionalities to be a liveable place, such as human health and well-being concerns and inadequate, deteriorating and aging infrastructures (Nam and Pardo, 2011). The urbanization process and urban activities generate environmental impacts both within and beyond city boundaries. Smart City' is a new approach, which aims at operating cities in an innovative way to solve the tangled and wicked problems inherited in the rapid urbanization. To explore the effective implementation of the Smart City in response to the challenges of sustainable socio-economic and urban development, global competitiveness and improved quality of life, the literature has already spotlighted the technological aspects. However, the social and political aspects of sharing different resources, governing co-development processes and fostering knowledge flows within innovation projects are still limited. Bai *et al.* (2010) argue that urban policy can play an important role in shaping and changing the regional, national and global linkages of cities. Therefore, coordination of policies across spatial scales, organizational practices and multi-levels of governance can foster innovation in cities (Nam and Pardo, 2011). A poor coordination, fragmentation, overlap and/or conflict between policies can undermine sustainable development, rather than facilitating it. However, the integration and coordination between policies are not easy because temporal, spatial and institutional aspects of policies are mismatching (Gohari *et al.*, 2020). The European Green Deal lays out the European Commission (2019) strategy to implement the United Nation's 2030 Agenda and sustainable development goals. Parts of this strategy include a "renovation wave" of public and private buildings and the enforcement of the legislation in relation to the energy performance of buildings, as well as examining initiatives that combine societal pull and technology push in local communities to work towards a sustainable future (Kristl *et al.*, 2019). This paper argues that ambition of cities to prepare for the future by means of smart sustainable technology and efficient use of resources in the continued urbanization first and foremost requires enhanced citizen participation. However, how exactly the real citizen participation can be established and, more specifically, which types of citizen participation we should aim at are still under the question (Williems *et al.*, 2017).

This paper calls for the contribution of facility management (FM) to improvement of the quality of life for the citizens by stimulating and facilitating their synergistic participation in innovation processes. FM integrates people, place, process and technology to ensure the functionality of the built environment; FM is the interface between an organisation, its employees and physical space (Donald, 1994). FM is defined as the one that can influence the efficiency, productivity and economies of societies, communities and organizations, as well

as the manner in which individuals interact with the built environment (ISO, 2017). Thereby, it can affect the health, well-being and quality of life of the societies and population.

The current practices of FM are mainly translated into the office, higher education, hospital and retail sectors (Price, 2004; Boge *et al.*, 2018). This paper highlights the underlying potential for FM to act in a wider urban context. To retain FM's relevance as a profession and strengthen and maintain its role and impact, in the first place, FM should be seen in the broader urban context (Alexander, 1994). The understanding of FM's leverage should be extended beyond the impact on individual organisations and buildings to recognize the full contribution that facilities make to the local economy and community. In addition, its policies and strategies should take more account of the factors of community and the public interest (Alexander and Brown, 2006). However, in an era in which governments and communities are demanding "more community", there are limited conceptual and practical tools for assessing the social outcomes of facilities (Alexander and Brown, 2006).

FM, as a people-based discipline, is seen as a vehicle for providing the opportunity for involvement of the communities in the co-design process. Therefore, current knowledge areas of FM (EN-15221-4) on strategic, tactical and operational level need to be enlarged with urban planning, data modelling, public – private – people partnerships (PPPP), financial and multi-criterion optimization models, social infrastructure in dynamic development, forecasting methods, demographic models, communication methods, spatial statistical methods and visualisation methods (Xue *et al.*, 2019a; Salaj *et al.*, 2011). Focusing on engaging citizens in formal and informal networks and groups for climate mitigation and adaptation, responds to the importance of social strategies to achieve behavioural changes (Salaj *et al.*, 2018). Participating in climate groups and networks takes advantage of social norms, status, cooperation and competition. This may lead people to copy attitudes, behaviour and concrete measures (Hauge, 2007). The motivational and socio-psychological theories are important for raising the willingness to change behaviour (Grum *et al.*, 2013; Kobal-Grum, 2018). The combination of different mechanisms are relevant to addresses different social groups in the neighbourhoods or urban areas (Hauge, 2007).

In the model (Figure 1), the impact of the primarly stakeholders (state/central gov., municipality/municipal government and FM) in materializng the real citizen participation is evaluated by the last five stages of citizens participation of Arnstein (1969), namely, inform, consult, involve, collaborate and empower (Xue *et al.*, 2019a, 2019b).

As it is shown in Figure 1, the impact of the central government (the state) is focused on the information, with a potential to extend to the consultation stage. The impact of the
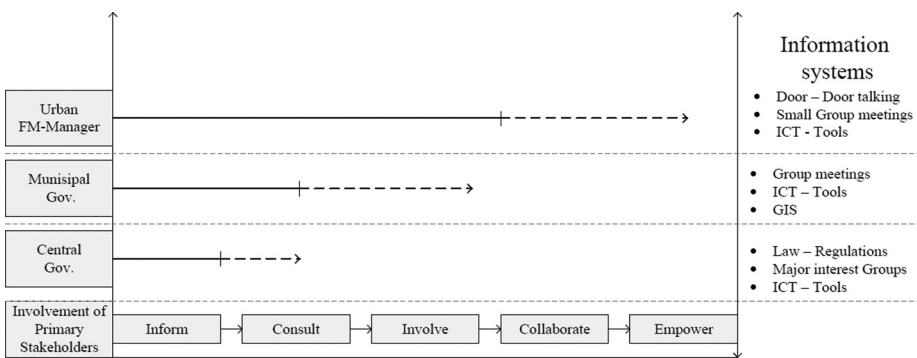
Figure 1.
Comparison of main
actors' contribution to
citizens' participation

municipal government starts with information and consultation, but can elaborate to the involvemnet stage. Our argument is that the nature of the urban FM allows the full achievement of the participation. Their task to deliver services to the citizens, business companies, and public institutions, requires FM to have an effective collaboration with these partners. Although their systematic technical knowledge is an essential element for the partnership, without an effective communication skill and full understanding of the social aspect of their task achieving sustainable built environment is impractical. Facility managers' day-to-day interactions with their partners provide an opportunity, particularly in relation to the citizens, to have closer contacts and improve mutual understanding about the sustainable challenges and solutions, thereby building the trustful relationship. Still, the current FM system has been unsuccessful to put the collaboration and empowerment stages of the participation into practice.

The recent approach in the FM field is to develop new models, systems and tools to put sustainable development at the heart of planning and decision-making, changing the way people think and behave to create a sustainable culture (Putnam, 2001). This will help to achieve the positive social outcomes, such as community identity, sense of belonging, respect, trust and mutual understanding. Due to cost-efficient and multimedia-rich interaction opportunities offered by the internet and the existence of online communities, various internet-based tools are created and designed to enable people to actively participate and engage in co-creation activities. Thus, virtual co-creation has become a desired goal of creating social value and improving the overall success of FM. By this way, people are invited to actively participate in the creation of new tools, in generating and evaluating new ideas while discussing and improving optional solution details. People can select or individualize the preferred virtual prototype, testing and experiencing the new features by running simulations and demanding information about or just using the tool (Fuller *et al.*, 2009). In a virtual environment, people can communicate their knowledge through an electronic interface with no direct personal contact. Since they do not get immediate personal feedback, there is a need to find a way to enable and motivate people to continue their active role and participation.

In addition, the challenge is how to create appropriate incentives to motivate people to freely share their knowledge with FM and how to create and apply tools to capture customers' tacit and explicit knowledge in a virtual setting (Hemetsberger and Godula, 2007). On the other hand, while several studies explore the impact of tools and technologies on effective problem solving (Thomke and von Hippel, 2002), or saving people's time and money (Dahan and Hauser, 2002), little research exists on the impact of these virtual tools on people' experiences. Fuller *et al.* (2009) did research on the way, in which internet-based tools and technologies contribute to people's empowerment and individual experience. Their results revealed the importance of IT tool support as a trigger of consumers' experienced empowerment and enjoyment. In addition, they figured out that consumers' sense of control and self-determination depends on possessing a domain-specific knowledge and creativity-relevant processing skills.

However, their result indicates the contribution of virtual tools to the people's participation and empowerment; they include only a rather small number of consumers, who possess specific creative or technical skills. This challenges the mass democracy and inclusiveness. In addition, consumer' empowerment, a sense of self-efficacy and enjoyment, does not result from their actual strength of influence on product policy. To make them feel empowered and enjoy co-creating new products or tools together with FM or other actors is especially important in this study. Besides, FM can build on the smartness through the knowledge they have within established services such as workspace management,

maintenance management and energy management by scaling up their skills from singular organisation/building vision to a city vision (Lindkvist *et al.*, 2019).

In the next section, we will give a short description of the refurbishment of the Karolinerveien neighbourhood in Trondheim, which aimed at designing a virtual interactive tool, in which the residents can engage and involve in the co-design and co-creation processes.

1.1 Karolinerveien case of sustainable regeneration

The Co-operative Housing Federation of Norway (NBBL) has decided to take actions towards the Paris Agreement to contribute to the constructions of high environmental standards. The focus is on the existing stock of buildings that have high energy consumption and poor performances. One of the cases is a sustainable regeneration of the area Karolinerveien, which consists of seven apartments buildings from 1967 (Figure 2). The responsible housing cooperative company is TOBB. Within the implementation process, the executive facility manager, faced the residents' resistance for renovation.

The issue was consulted by the Department of Civil and Environmental Engineering at the Norwegian University of Science and Technology (NTNU), who assumed the lack of communication with the residents as the main problem. NTNU organized a four-week workshop to investigate how the urban FM can bring the residents back to the process. The task given to the students from ESTIC (School of Civil Engineering) from Caen was to co-design an interactive tool to solve the communication problem and the lack of citizen participation in the refurbishment of the Karolinerveien as a technological innovation in accordance with Errichiello and Marasco (2014) statement. The role that FM can play in regeneration has been recognised in East Manchester through the creation of an FM Academy to provide skills training and enterprise support, driven by community demand and supported by research and development (Williems *et al.*, 2017).

Source: Google (June 12, 2019); www.google.com/
maps/place/Karolinerveien,±7021±Trondheim

2. Methodology and results

The methods used are survey, interviews, active participation and co-design. Figure 3 shows the interconnection between the methods and data sequentially.

Step1 – Survey: students used the results of the survey, which was collected from 100 participants, to identify the citizen's need for the refurbishment process. The results were two main things:

(1) The bad quality of indoor environment, including the high humidity level, bad ventilation and drafts from the windows and doors, causes acoustic disturbance; and

(2) The majority of the residents are young, between 25 and 35 years old (real estate agency).

Based on these two important facts, students used their technical backgrounds to find relevant solutions for possible upgrades such as an improved ventilation system, replacing windows and adding an extra layer of insulation. Considering the age of the community, they came up with an idea to design a digital tool with a playful interface, creating a website as visualization, communication and co-creation tool together with some technical 3-D modelling solution.

Realizing such technical solution would challenge making the real participation ambition into practice (Arnstein, 1969). Students realized that they and FM do not know how their tool would lead to the real citizen's contribution towards a sustainable refurbishment/ regeneration. While they are not in a direct dialogue with people, their vision/solution is simply based on the available data, rather than the real facts.

Step 2 – Action research/fieldwork: to ask the resident's opinion about their needs and problems, students started with their fieldwork in Karolinersveien, trying to initiate contact. The language was a barrier for (international) students to communicate with Norwegian residents. Through a use of creative action research techniques (posting pictures, maps, messages, key words, questions, etc. on the walls in Karolierveien) they initiated the dialogue, presented themselves and their project and asked questions about people's opinion (Figure 4).

However, only few residents were willing to have a dialogue with students due to the lack of time, which can also explain about the lack of motivation for participation. Thus, the students needed to manage the second challenge, finding out how they should attract, motivate and increase citizens' curiosity to participate in design process and use the designed tool. They needed to collect citizen's ideas and listen to their voices. In such
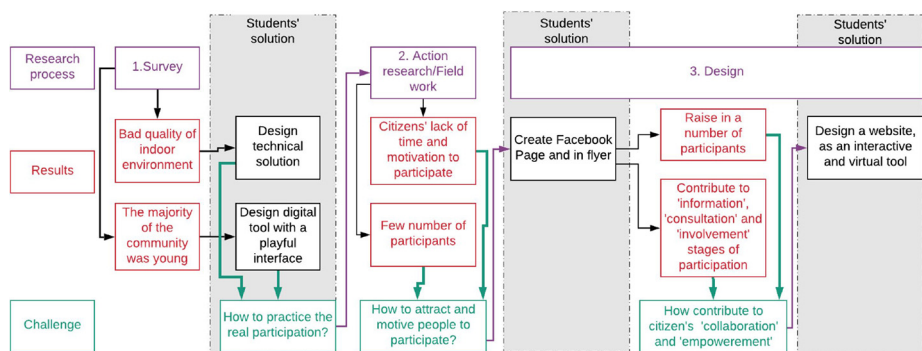
Figure 3.
Progress development of a design process

Figure 4.
Prepared material

Source: Authors (2019)

environment, where the time was scarce, students could not "inform", "consult" and "involve" citizens at one and the same time (Figure 1).

Step 3 – Design: opening a Facebook page as an informative and interactive digital platform could manage all the above challenges. To attract the citizen's attention and willingness to use the Facebook page, they came up with an inspiring name "La oss samskape Karolinerveien sammen" (let us co-create Karolinerveien together). To inform the citizens about the Facebook page, they created a business card and flyer (Figure 5), in which they provided the contact info. This new idea has resulted in a raise of the participants' number.

Statements below show some of the students' reflection on this participatory process:

> Taking the results of the field trips into consideration, we went back to reflect on our initial ideas and suggestions for improvement. We dropped some of our suggestions as they did not match the residents' needs! We decided to refocus on what they had expressed as a problem. We experienced that people reacted less defensively when the idea comes from themselves, rather than we impose the suggestion. This has also helped them to feel more comfortable to open up their daily life experiences.

> One thing we noticed, being familiar with the Norwegian culture is that people tend to «renovate» their home quite regularly, which often results in hiding signs of deterioration for a short period of time until the paint cracks again. This could also explain why people would be more reluctant to take actions towards refurbishment as they don't see the problem and therefore the need for it.

During Step 3 (design), students managed to meet the three stages of the participation ladder (Arnstein, 1969). To ensure the last two stages, namely, "collaboration" and "empowerment", they needed to design a tool, which would not be limited to their temporary presence in the workshop. They needed to safeguard the longitudinal across the life of facilities and vertically amongst all the players involved in cycles of planning, design, management and use of facilities that assure the long-term impact of their interactive tool. An effective interaction tool that enables people to actively engage in virtual co-creation needed to allow a realistic understanding and enhance people's creative articulation. Before people could make competent contributions, they needed an understanding of the innovation problem to be solved. This requires citizens to iteratively inform about their

Figure 5.
Facebook invitation

Source: Authors (2019)

problems and needs and to co-create solutions and be informed/aware about the technical and sustainable aspects and challenges of their apartments, buildings and neighbourhood. This would also enable people to play different roles in the co-design process. In the ideation phase, they can serve as a resource, and the interactive multimedia tools, virtual brainstorming, or virtual focus groups can support the users/residents in creating new ideas. In the design and development phase, they can assume that the role of co-creators and tools, such as Web-based conjoint analysis, virtual user design, internet-based design competitions and tool kits, allows them to express their preferences and design their own products. In the test and launch phase, IT tools such as virtual concept testing can help to provide valuable feedback on products (Nam and Prado, 2011).

To collect the resident's inputs regarding their problems and needs in an interactive and participatory way, the students created a website, www.blimedoss.com/ for "et bedre boliv" (*join us in a better place to live*). The name/logo also includes BIM (building information modelling) and OSS (our sustainable society). This interactive website consists of three main visualization and informative parts:

(1) 3-D model of the present situation of the neighbourhood is a simple BIM and Google map, which allows the people to get more sense of the neighbourhood. It is mainly used as an attractive tool to encourage people to participate in mini-game and learning tool (Figure 6).

(2) Mini-game "Pick your Picto", which is designed for collecting the real problems, is divided in two parts. First, the people can find the typology of their apartments among five existing alternatives. Then, they are asked to pick the pictogram, which illustrates their problem (drafts, cold, smell, noise, etc [...]) and drag it to the exact place (Figure 7). They also have an option to give additional idea, suggestion or more details.

(3) Learning tool "Click and Learn" aims at improving the technical and sustainable knowledge of people, enabling them to collaborate in "co-solution making" (Figure 8). Thereby we are empowering them for the co-design process and co-creation of their own neighbourhood. It invites people to explore the picture of the building and the outdoor environment with a possibility to click on specific elements, such as facade, windows and playground and gain information about both the present situation and possibilities for future upgrades and benefits. By this way, citizens can be both users and sources of data, fuelling open data platforms (Williems *et al.*, 2017).

In the end, the students presented the designed model, an interactive website, to NBBL and NTNU to examine the practicality of the tool and discuss the possibilities for the future improvement. It was agreed that the next step should include the building information modelling technology to facilitate interoperability and cooperation between professionals. This would become even more interesting and idealistic to involve people in the further co-design of the website. It is a new way of sharing information and coordinating everyone's behaviours towards a more sustainable development.

Besides, more tools, including some financial and real estate value information, could be valuable for citizens. From the financial aspect, citizens' participation can increase opportunities for urban renewal, as it allows a large of citizens to share the high costs of urban development projects, making them more affordable and reducing individual risk. Citizens can not only make contributions to liveable environment around them but also get financial benefits as co-investors. Furthermore, the citizens can provide and discuss related needs for making new business model for projects, which will lead to a social sustainability through balancing the community interests.

3. Conclusions

This paper aimed at testing possibilities of real participation in FM field in response to the energy sustainable demand in an evidence-based practice. This was shown by a mutual
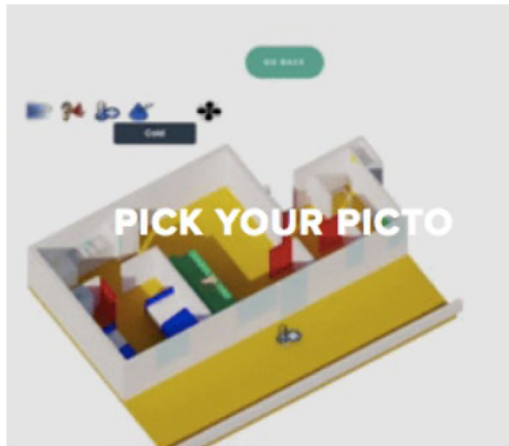

Source: Authors (2019)

Figure 6.
BIM model of
Karolinerveien

Figure 7.
Mini game

Source: Authors (2019)

Figure 8.
Learning tool

Source: Authors (2019)

partnership of the university, the co-operative housing federation and FM to provide a platform for the co-design of virtual tool together with the residents in the future. We have shown that there is a possibility to reach the initial stages of the participation ladder: informing, consulting and involving people. But, to really "collaborate" and "empower" citizens, we need a stronger interactive tool, which can safeguard their long-term participation.

The literature review shows that there is a risk that a co-design of an interactive tool leads to the exclusion of those, who do not have a required specific knowledge and creativity. However, our practice has proved that it is possible to ensure a real inclusiveness and complete democracy by involving and informing users/citizens before starting the

process of co-design. In addition, co-design process should not be something to be done once, it should be continued. The website designed in the case of Karolinerveien can ensure such ambitions. This requires a stronger collaborative network, in which FM, academia, citizens, decision-makers and other stakeholders share knowledge, skills and responsibilities and expand their impact and commitment in assuring the sustainability in the built and urban environment.

We also witnessed that the involvement of students, as the future professionals and decision-makers, in such evidence-based researches was crucial. This workshop gave them the opportunity to learn and experience the challenges and requirements of the real citizen participation in the sustainability practices. The open-minded, passionate, creative and responsive characteristics of students/young researchers are something that can be learned for a success of similar co-design processes was very fruitful.

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