

CAN USABILITY EVALUATIONS DRIVE INNOVATION?

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During the last years, methods and tools for evaluation of usability have been developed. The evaluations are means to understand the usability as it is experienced by the building users. In order to improve and develop usability and the user's experience, the evaluations must impact on the actual practice of developing and operating facilities. This paper presents the implementation of tools for usability evaluation in 4 different building owners and facility managers in Norway. The purpose of this paper is to contribute to a better knowledge of user experience-driven approaches to development and management of facilities. By using the USEframe, developed in the Nordic project REBUS, the actual implementation of the usability evaluation is studied. In all the cases, informants that have used different tools and methods for usability evaluations have been interviewed in order to identify if the focus on usability and evaluations have led to new practices, new solutions, and consequently; new "contexts of use". The results show that usability evaluations can only be drivers for innovation in cases where key players have awareness and competence, and where the need for change is seen as urgent enough to justify the amount of resources needed to both analyze the situation and implement the change. To develop new practice, there is a need for sufficient resources, competence and incentives.

Keywords: building evaluation, continuous development, innovation, usability, user experiences

INTRODUCTION

Buildings are built to be used, and in a usability perspective, we focus on how buildings hinder or promote the users' activities. During the buildings' lifetime, demands and use will change. In order to improve existing buildings, and to learn and to develop new improved facilities, we need to know how buildings are used, and know the interaction between organization, facilities, and technology. During the last years, methods and tools for evaluation of usability have been developed. The evaluations are means to understand usability as it is experienced by the building users. In order to improve and develop usability and the user's experience, the evaluations must impact on the actual practice of developing and operating facilities. Do building owners, facilities managers and user organizations use the newly developed tools? Does usability evaluation improve practice and drive innovation; new solutions and new practices? After several years of experience with developing theory and tools for usability evaluation, we set out to investigate if the tools are used, and if they make a difference in practice.

The purpose of this paper is to contribute to better knowledge of user experience-driven approaches to development and management of facilities. The paper presents 3 different building owners and facility managers in Norway who have been parties in developing methods and tools for evaluation of usability. By using the USEframe, developed in the Nordic project REBUS (Blakstad et al 2010b, Lindahl et al 2011), the actual implementation of the usability evaluation by the partners is studied. In addition to the 3 partner cases, an additional case study has been conducted within an organization which has first-hand experience with the tools. In all the cases, informants who have been involved in developing the methods, and later used different tools and methods for usability evaluations, have been interviewed in order to identify if the focus on usability and evaluations has led to new practices, new solutions, and consequently; new "contexts of use".

USABILITY EVALUATIONS AND CHANGES OF PRACTICE

Ideally, buildings are means or tools for the owners and users, which support the activities taking place within them. The physical surroundings contribute to efficiency, effectiveness and satisfaction in the user organization (Alexander et al. 2004, Alexander 2008). This is the usability of buildings. Usability is defined 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 9241-11). In reality, buildings both support and hinder their users' activities, and it is crucial to understand the underlying mechanisms that influence on the interactive play between different factors and aspects. A building's performance can hence never be seen or understood isolated from an

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organisational or technical perspective. However, owners and occupants seldom perform evaluations of how buildings perform in general, and particularly not when it comes to performance related to usability aspects. According to Granath and Gilliard (2008), “usability cannot be evaluated simply on the product alone but also with respect to how the product is perceived by and interacts with the user”. The complex nature of usability can be described as wicked problems (Blakstad et al. 2008), characterized by no definitive formulation of solutions, and hence open to multiple interpretations (Rittel and Webber 1973).

During the last 10 years, lots of effort has been put into developing the theoretical and methodological framework for evaluation of usability of buildings (Hansen et al. 2011b). Discourses about usability tend to be rather academical and theoretical. Thus, an important objective for the Norwegian research has been to make the concept of usability operational, in order to make it possible to use evaluations for improvements in practice. As a result, a common usability framework or methodology named USEtool was developed (Hansen et al. 2010b, Blakstad et al. 2010a). 3 business partners participated in the project. The partners are all cases in this study. While developing USEtool, the main objective was to create a framework for usability evaluation that was easy to use, and that would be possible for the companies to perform themselves. Our project partners wished to collect experiences from their user organizations, in cooperation with selected user representatives. The main purpose for evaluation was to allow building owners and Facilities Managers to gather user experiences from existing buildings as a basis for improving usability, input when planning new buildings and reference when choosing new premises (Blakstad et al. 2010a).

USEtool and the evaluation process are described in a handbook (Hansen et al. 2011a) which guides evaluators through the following stages: 1) Defining the evaluation, 2) Mapping usability, 3) Walkthrough, 4) Workshop with organization and 5) Action plan/report. Usability can be seen as a relationship between a user organization and a facility within a “context of use” (Fenker 2008, Blakstad et al. 2010b). In the REBUS project, a framework for mapping usability research, USEframe, was developed. USEframe position usability evaluations as knowledge development processes which provide new knowledge, which in turn may produce new guiding principles and governance, instigate action, and in turn lead to a new “contexts of use” (Blakstad et al. 2010b, Lindahl 2011).

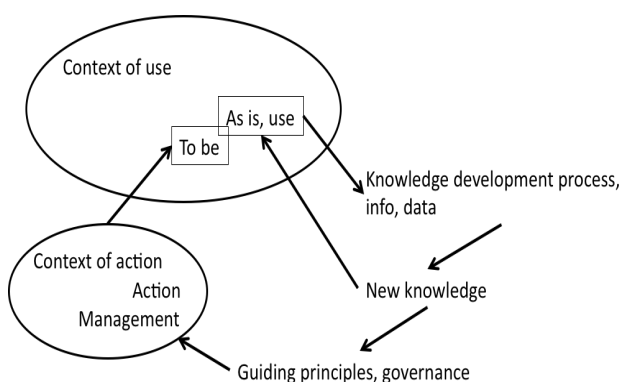


Figure 1. USEframe. Usability evaluation as part of an innovation cycle where evaluations lead to new knowledge and new governance and action (Blakstad et al., 2010b, Lindahl 2011)

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.

USABILITY OF EVALUATION TOOLS

Parallel to the development of theory, we have carried out several case studies to explore usability, and to test and develop the applicability of the methods. This has been an iterative learning process, where experiences and learning from one case have been discussed, developed and implemented into the following case studies, in order to support continuous improvements.

The USEtool methodology is mainly based on a qualitative approach where different users and stakeholders contribute to the evaluation of usability. As described, usability is a matter of perspective, and different stakeholders and organisational levels will have different opinions regarding the usability of the facilities (Fenker, 2004). The selection of participants will hence be of great importance, as this may influence the findings.

Several studies on usability evaluations (Hansen et al., 2005; Bias 1994) show that the quality of the evaluation will depend on who is participating, reflecting their focus and experiences with the building. 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 (Duffy 1990, Kernohan et al. 1992, Horgen et al. 1999, Blyth and Worthington 2011, Gjersvik and Blakstad

2004a&b, Våland 2010). In USEtool, this perspective has been essential when developing the methods, by bringing together different actors to discuss and learn from each other. It is more important to obtain the variations in interests, opinions and proposals, rather than focusing on consensus or one “correct” solution.

This co-learning and knowledge exchange has been a new experience and an eye-opener for participants in this research, both from a user perspective and from an owner’s and Facilities Management point of view. One of the partners in the usability project has used the methodology to enable a systematic dialogue between owners, occupants and Facilities Management staff in order to improve briefing for new buildings (Hansen et al. 2011b). Blakstad and Torsvoll (2010) have explored the possible uses and benefits of implementing usability evaluations in different phases of the workplace management processes in another of the partner organisations. They found that the methods generated useful knowledge, and are especially relevant prior to large-scale construction or renovation projects, to discuss new ways of working, new technology and new types of workplaces. They also underline the importance of continuous learning by evaluating innovative concepts for further development and adaptation. Blakstad and Torsvoll also discuss the potential of usability evaluations to assess workplaces with undiagnosed problems.

One of the important discussions related to usability evaluations has been the external validity of the methods used (Hansen et al. 2010a). The methods have been developed to produce or obtain relevant information and experience relating to the defined topics for evaluation. The focus has been on understanding the situation and context and obtaining differences in interests and opinions, rather than focusing on consensus (meaning average, middle way, sufficient). The key advantage of qualitative research is its ability to give insight into local practices, and it is important for the development of a nuanced view of reality (Flyvbjerg, 2006). According to Halvorsen (2008), the main question is not if results may be generalized, but rather if knowledge can be transferred to other settings and contexts. This view is supported by Kroll (2005), who states that even findings can be valid for other projects, it “means not using a cookbook approach to building design”, but more intelligently adopting or adapting the research and applying it to new projects, rather than copy-and-paste. The value of usability evaluations for feeding forward to new projects mainly lies in the ability to understand the user experiences and to translate those into adequate products and solutions.

CHANGES IN PRACTICE – THE INNOVATIVE USER?

This brings us to the issue of transforming knowledge gained from evaluation into changes in practice. In his studies of user innovation, von Hippel (2005) defines users as firms or individual consumers that expect to benefit from using a product or a service. He refers to these as “innovation users”. He contrasts this with manufacturers who expect to benefit from selling a product or a service (“innovation manufacturer”). He claims that users are unique in that they benefit directly from innovations. The innovation manufacturer must make a profit from selling innovation-related products or services to users. Viewing the usability of a building, the direct benefit is mostly related to the users (employees and students, e.g.) occupying the building, and the user organization whose “production” takes place inside the building. The Facility Management staff who are expected to conduct the usability evaluations, are therefore “innovation manufacturers”. Their benefit from innovation is indirect, and if they can profit from their product (facilities) without improving it, there are no incentives to innovate and change. The lack of financial incentives may be substituted with other incentives, and other possible drivers for change might be related to the relationship between FM and the user organization. An FM unit may be linked to the user organization by common interests and objectives, or by a client–supplier business relationship (client–supplier model). This means that the incentives and direct benefits of improving user effectiveness, efficiency and satisfaction will vary, depending on the nature of the relationship between the users and the suppliers (FM), and on the existence of strategic alignment and common rewards. In order to make this a real driver for improvements in usability, some kind of measurement systems and recognition of achievements must be established. Lack of such KPIs and reward systems for improved usability may inhibit realizing benefits from usability evaluations.

Development is the process of creating a significant change, while innovation is a change that creates a new dimension of performance (defined by Peter Drucker for his Drucker Award for Innovation). Schumpeter (2000) distinguished between “invention” (the discovery of new technical knowledge and its practical application to industry) and “innovation” (the introduction of new technical methods, products, sources of supply, and forms of industrial organization).

One of the aims for Action research is to increase the awareness and competence in the company (Greenwood and Levin 1998). But for development and innovation to happen, practice has to change as well. In order to get the FM staff to start using the newly developed usability evaluation toolbox, they need to change their practice. Brown and Duguid (1991) describe how working and learning occurs in communities. They differentiated between actual practice (non-canonical practice) and formal descriptions and procedures (canonical practice). Changes and innovations depend on changes in non-canonical communities of practice, not only in formal procedures. They claim that “canonical accounts of work are not only hard to apply and hard to learn. They are also hard to

change” (p.50). Implementing usability evaluations only through development of formal procedures is demanding. In order to benefit from the evaluations it is the actual practice that needs to change.

CASE STUDIES: IMPLEMENTATION OF USETOOL

The USetool was developed and tested in close cooperation with the research partners in co-learning processes, and can therefore be labelled action research. Greenwood and Levin (1998) highlights the importance of learning and reflection both for ‘insiders’ and ‘outsiders’ in action research. The actual development process of USetool is described in the USetool Handbook (Hansen et al. 2011a). One year after publishing the handbook and giving all partners opportunities for training, we decided to launch an investigation into the actual use of the tools we had developed.

Representatives from all three research partners were interviewed, using a semi-structured approach. Due to geographical distances, the actual interviews were conducted by telephone. The respondents received the questions one day in advance, in order to prepare for the interview. The research partners were one public property development and management entity (case B), one corporate real estate function within an oil company (case A), and the property development unit of a local authority (case C). One additional case (case D) was investigated. This was in a corporate real estate unit within a telecom company. USetool has been used in relation to a large development process of workplaces within this corporation, and for this study, it was interesting to see if there are factors that lead to implementation which differ from the original partners’. One of the researchers developing the USetool was involved in the implementation in case D, as well as in the research described here. The main findings from the interviews are summarized in Table 1.

We are aware that the data for this paper are qualitative and context-dependent, and that there is a close relation between the researchers and the practitioners, as they have been developing the tools together, and even been taking positions as both respondents and researchers. In “real world research” (Robson 1993), this is often the case. This makes the knowledge we can bring forward contextual.

Table 1: Findings, case studies

A CORPORATE REAL ESTATE. ENERGY	B PUBLIC PROPERTY	C LOCAL AUTHORITY PROPERTY	D CORPORATE REAL ESTATE. TELECOM
Focus on and use of usability evaluations before USetool			
Not on usability, but used questionnaires to evaluate workplaces. Survey was developed in earlier research projects, and much used to develop and confirm workplace solutions for the company.	Not specific on usability. Evaluations in development projects only on request from clients.	Mostly on functionality from a traditional perspective (briefing) and on technical conditions/ indoor climate Tradition for strong user involvement.	Commissioned major evaluation of functionality and use of new HQ some years ago. Annual customer and user satisfaction surveys and HSSE reviews – some questions on usability issues.
Reasons for engaging in usability work. Expectations			
Increased focus on functions and use created demand for methods to evaluate usability.	Improve the role of FM. Better understanding of client/users and buildings functionality Was established as an R&D project.	Improve the role of FM. Knowledge transfer to new projects. Coming projects on upgrading and development of existing buildings.	Developing new general briefs and ambitions for continuous development of work practice, ICT, workplace.
For partners: Pilot projects. Benefits during project.			
Good discussions and common understanding of expectations. Very satisfied with both process and result (USetool). Pilot successful, showed relevance.	Increased competence. Learning processes with workshops and pilots. Learning from the other partners and their pilots. Pilot and first evaluations in cooperation with researchers – important for implementation and use of the tool.	Interesting workshops and discussions with other partners. Gave more understanding of own organization and the usability of their existing facilities. Improved their role in briefing for new facilities.	

Has the project changed practice? Is USEtool used in practice? If yes: How and for what?

Formal link to USEtool in process and procedures established. In the process "Change workplace/allocate area" there is a formal reference to USEtool.	More focus on functionality. Greater awareness at the real estate/FM department. Clients have requested USEtool approach.	No. One of the key persons and initiators has left. Think existing processes and ways of working function well.	Yes. In relation to pilot projects (4) for new workplace model. Evaluations (survey, interviews and walkthrough) both before and after renovation of pilot work-zones. A formal link to USEtool and evaluation is made in the CREM toolbox.
In practice, not used in other projects than the pilot.	Used in 4 different real estate projects. Mapping existing facilities for identify critical issues and a better contextual understanding of user organization.		

Experiences from using USEtool?

No experience after the pilot. But the understanding of Usability developed through the project is important for present practice.	Works well when starting up a process and to improve dialogue with users.	No experiences after the project was completed.	Walkthrough works very well as a tool to understand work practice and use of space before renovation. After renovation more focus on users' experiences with new workplace. Web-based survey is replacing the group interview in stage 2.
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What are the success criteria, and what are pitfalls and hindrances for implementation?

Hindrances: Competence and the understanding of roles FM/ customer (need a proactive, consultative role in FM)	Evaluation is anchored in the organization. Hindrances: Lack of capacity, competence and experience doing evaluations.	Head of department does not regard the USEtool as relevant for new projects. Partly because of time and costs. Partly because evaluating existing buildings is looking backwards and seen as less innovative.	Competence to use the tools is main success factor. Incentives to change – are there any benefits from improving? Engaging users takes up a lot of their time – so the user organization (customer) needs to see benefits.
Lack of "demand" from customer (user organization).	Creating expectations among the users that can be difficult to meet.		

Have the evaluations contributed to development and / or innovation in your firm?

Not yet. But web surveys developed previous in R&D projects are used to develop workplace concepts.	Yes. Improved dialog with users. More focused discussions on development and effect	No. No persons to follow up after the initiator left.	Yes. Used to develop knowledge of existing situation, evaluate pilots/tests and new models. Results used for developing new routines and practices
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Suggestions for improvements regarding implementation & use or changing practice & innovation in your business?

Will make this a "service" that is visible to the customers.	Wants a more flexible use of the framework. The whole 5 step process can be too much. Develop and adapt to our business and projects.	Must be far more relevant and efficient in briefing and design process. Look at new and other innovative projects. Challenge the users to think differently. Good experience using the design process, drawings and models to discuss new solutions. The architects as an important driving force in innovation.	Develop more automatic systems for reports and benchmarking between projects.
Will start training of dedicated staff to support local delivery roles.			Make part of continuous development circle.

DISCUSSION

The discussion is focused on three main objectives: has the work with usability evaluations lead to new practice, new solutions, or new “contexts of use” as shown in the USEframe model?

NEW PRACTICE?

It is interesting to see that the companies have different results when it comes to implementation in practice. If we distinguish between canonical practice (formal descriptions and procedures), non-canonical practice (actual practice), and usability awareness / competence, the companies report the following:

Table 2: Changes in usability-related competence and practice in the cases

	Case A	Case B	Case C	Case D
Changes in canonical practice:	yes	yes	no	yes
Changes in non-canonical practice:	no	yes	no	yes
Changes in awareness / competence:	yes	yes	no	yes

These findings suggest that changes in awareness and competence and the understanding of usability is a precondition to develop changes in practice. In the company where the main participant left after the project, there has been no implementation at all. Based on the interviews, it also seems that there is a need to feel confident that you have the competence and skill to perform the evaluation. This is a skill in which the researchers are trained in. In case D, the evaluations were performed by one of the trained researchers. In case B, one of the researchers participated in the first project using the USEtool. During the project, a couple of dedicated staff developed these skills together with the researcher. In both case B and D, there are some special members of staff who are trained in using the methodology. In case A, the main idea has been that the local representatives can use the tool as described in the process map. The company discovered that this is difficult. Skills are needed to perform the evaluation, but also competence and understanding of usability as such: “You need to understand what you are doing, to understand usability. If not, you might just stir things up and create worries among the users” (CREM, case A).

Both competence and awareness, and the actual skill to perform the evaluation, were learned in the research project. Successful implementation seems to rely on training of dedicated staff. This suggests that successful implementation of USEtool requires more training and specialization than we initially hoped for.

Several of the companies mention the need for clear and direct benefits from development. If there is no “demand” for more knowledge, or if there are no direct incentives for the “innovation manufacturers” (all participants and partners in the project provide facilities to users), there is no reason to change existing practices and develop anything for the “innovation user”. In two of the cases (case A and D), the “manufacturers” and “users” are linked, as the studied organizations are Corporate Real Estate Units that are measured on their performance and the satisfaction of the internal client. The same is in a way the case for case B, where the manufacturer is the public entity which handles real estate for the Norwegian State. In all three cases, the “manufacturer” (FM / CREM) is responsible not only for design and construction of real estate, but also for operation and management in use. In case C, there is much more focus on design and construction of new projects (FM vs. project focus).

NEW SOLUTIONS?

In case B, evaluations of a university campus have been used to develop new concepts for future campuses. In the same case, knowledge from the evaluations is fed forward to briefs for new projects. In case D, the evaluations were used for both developing and evaluating the actual workplace (evaluations before and after renovation), but also for understanding the underlying relations between use, facility, technology, and organization, in order to develop corporate concepts and generic briefs. In both cases, the evaluations have lead directly or indirectly to new solutions. From the two cases, it seems that it is important to look at not only the physical solution, but also the other elements, such as the organizational issues.

In case C, evaluations are described as “looking backwards”, and something that would drain the new projects for time and resources, and produce less innovative solutions. In many construction projects, much time is spent visiting new exciting buildings for inspiration. During the development of the evaluation tools, the walkthrough was seen as a efficient method to extract experiences from such visits. Often, innovative solutions are copied, based on how they appear at first sight. The intention in case C, was to use the walkthrough to understand the solutions better, in order to continue to develop and adapt the good solutions even further into

the next project. In USEtool, much focus is on understanding WHY a solution performs well. This understanding can later be used in other contexts, and actually produce new solutions, based on evaluation of existing buildings.

NEW "CONTEXTS OF USE"

USEframe illustrates a development and learning loop which, from evaluations and new knowledge, through governance and action, leads to new contexts of use. Only two of the cases have reached this stage. In case B, the evaluations are fed into new briefs for similar facilities. The impact on context of use is indirect and works through guiding principles (the briefing system). This has a potential to change a large number of facilities, as it represents a feedback loop from use to briefing. In the other case (D), knowledge from the evaluations are used for several purposes: to develop and test pilots, to give input to governing documents and systems (policies and toolboxes), to develop new solutions, to produce "general briefs" (corporate concepts), and to develop knowledge among users and CREM about the users experiences. In both cases, the implementation of usability evaluation tools has contributed to development and new contexts of use. But is this innovation, a change that creates a new dimension of performance? This is probably only the case in D, and even there most of the result is invention, not innovation. But some new solutions and concepts are developed and implemented which may qualify as innovations. In case D, the implementation has been part of an extensive effort to develop workplace strategies and concepts in the corporation. This gave justification to use the needed amount of resources, time, competence and effort, needed to go through the whole process as it is described in USEframe.

CONCLUSIONS

The objective of this research have been to revisit the companies that have been part of developing usability evaluation methods, in order to see if they have used the new tools and if this has lead to new practices, new solutions and new contexts of use. 2 of 4 companies had started using the tools. These were the companies that had used the most resources on implementation, and continued the action research relationship with the researchers to develop own staff with competence to carry out the evaluations.

In the 2 cases that had implemented the USEtool, this had directly or indirectly lead to new solutions and given the companies an instrument to analyze what works well and why in order to feed this knowledge into new projects. In the same 2 companies most of the developments should be labeled invention, not innovation. Some innovations were however identified in one of the cases. This was as part of a larger effort of changing practises, solutions and contexts of use.

Can usability evaluations drive innovation? This study has showed that this is possible, but that it requires that the usability evaluations are part of a larger development project. Usability evaluations can only be drivers for innovation in cases where key players have awareness and competence, and where the need for change is seen as urgent enough to justify the amount of resources needed to both analyze the situation and implement the change. To develop new practice there is a need for sufficient resources, awareness, competence and incentives.

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