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# Management for Usability of the Built Environment

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## Abstract

The purpose of the paper is to identify the kind of management needed to create and maintain usability in the built environment. The study is part of the ongoing international research collaboration in CIB W111 and will include theoretical discussions based on the results from the first two phases of this work as well as literature studies.

Usability being dependent on context, culture and situation means that the possibility of dynamic changes in the built environment is central. One way of conceptualizing change in the built environment is the idea of learning buildings. However, what seems to be missing in the discussion on learning buildings is the role of management. Some kind of management is needed to make a number of individual people work as an organization with common objectives, and a specific kind of management is needed to create a learning organization. Similarly, management is needed to make buildings work as learning buildings. This is the role of Facilities Management (FM).

Evaluation is in general an important part of learning and evaluation of usability and performance of buildings is an important part of creating learning buildings. From a FM and corporate management point of view such evaluations should be part of a feed-forward from the corporate experience with existing buildings to make improvement in both existing and new buildings. This is in contrast to the traditional view on building evaluation carried out by POE (Post Occupancy Evaluations), where the main purpose is feed-back from finished buildings to the design team.

The focus on buildings in FM is concerned with how the corporate needs for facilities can be provided and optimized in both a short and long time perspective. Therefore every phase of the life cycle of buildings is of importance. This paper proposes continuous briefing and continuous commissioning as two interrelated concepts, which together with the concept of learning buildings can be used to integrate the management of buildings and usability.

**Keywords:** Management, Usability, Briefing, Commissioning, Learning Buildings

# 1. Introduction

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The paper starts in section 2 by a discussion of the concept of usability in relation to users and management based on previous research. This is followed by an introduction of the life cycle of buildings and organisations and the concepts of continuous briefing and continuous commissioning are explained and related to the life cycle perspective in section 3. One of the big challenges in relations to usability of buildings is to adapt to changing needs. The concept of learning building is in section 4 suggested as a possible way to meet this challenge, but the previous work on learning buildings seems to miss the management aspect, which is discussed by analogy with the concept of learning organisations. The paper is finished with conclusions in section 5.

# 2.  Management and Usability

## 2.1  Usability and users

The starting point for analysing usability of the built environment was originally the definition in ISO 9241-11 (ISO, 1998), where usability is measured in terms of efficiency, effectiveness and satisfaction. The basis for this definition was evaluations of consumer products and user interfaces of computers programs. The experiences from the research on usability of the built environment indicate that the user experience is equally important.

In the building industry there has traditionally been a strong focus on the functionality of the products based on technical rationalism, where the attributes of the products are described in objectively measurable terms. The introduction of the concept of usability challenges this approach of technical rationalism by introducing the subjective views of the users in the evaluation of the products. Granath & Alexander (Alexander, 2008a) propose that usability represents an approach of pragmatism, where the focus is on the effect of a product or an environment on the users and not merely on the physical attributes. Usability of the built environment cannot be evaluated without taken the specific situation, the context and the cultural aspects into consideration (Alexander, 2008a).

Research also shows that usability is evaluated differently by different groups of users. This was for instance clear in an evaluation of a university college in Norway, where the perception of the building's usability varied considerably between students and staff (Hansen and Knudsen, 2006). Therefore it is important to distinguish between different types of users. The students and staff of the university college can be seen as two groups of end users, which evaluate the facilities from their individual perspective. Visitors can be another group of end users. The staff can also represent the organisation, or at least staff at a management level will often represent the organisation as a specific type of user. A third and special type of user is the management and staff of the Facilities Management organisation in charge of operation and development of the facilities. They can be seen as professional users, who can play an important role as mediator both between top managers and end users and between the users and the building.

## 2.2  Management and research on usability

The previous empirical research on usability in the built environment has mostly been based on case studies and most of them are presented in two CIB report (Alexander, 2005 and 2008b). The role of top management as organisational user is mainly clear in the case studies which involve a completely new building layout that change the business processes in the organisation. This is particular clear in the case from the 2005 report concerning a new facility for product development in the car manufacturer Renault in France and in the case from the 2008 report concerning remodelling of an operation theatre in a hospital in HongKong.

The case from the 2005 report concerning a new discovery centre for NCR in the UK shows how the disappearance of a strong commitment by top management can cause a severe setback in the planning of a new facility, while the case from the same report concerning the new university college in Norway indicates that a lack of involvement at a strategic level in the project throughout the whole process means that concerns for a longer time perspective like future pedagogic principles, flexibility and adaptability was not taken into account. A case of a new Danish media centre shows that the managers generally were more positive in their evaluation of the usability of the facilities than the ordinary members of staff, but this was not necessarily a strong dividing line as the evaluation by the ordinary members of staff varied much more than the evaluations by the managers (Jensen, 2007 and 2008).

The role of the facilities managers is not very much in focus in the empirical studies, but it is discussed in some of the theoretical contributions. Alexander (2008a) concludes that a new extended role is beginning to emerge, where practitioner instead of becoming a facilities manager might turn into a facilitating manager. Similar thoughts are expressed by Fenker (2008), who argues that usability is achieved by the interplay of user experience, design and management processes and buildings as shown in figure 1. These are also the three main elements that are investigated in this paper with particular focus on how management of the relationship between user experiences can lead to usability in the life cycle of buildings.
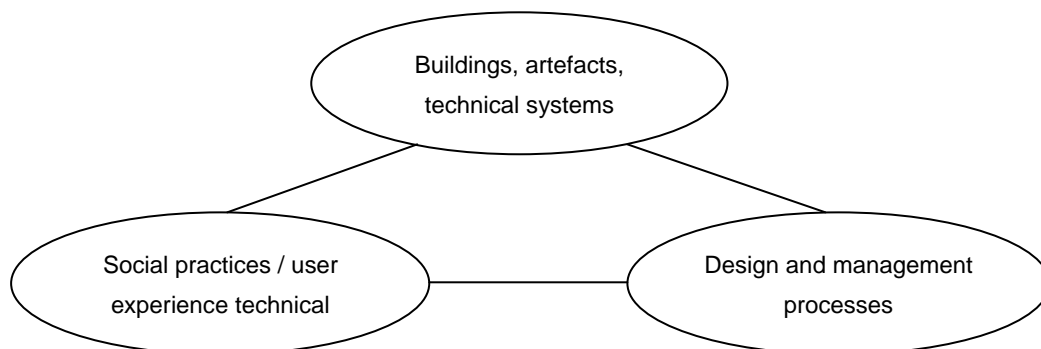


*Figure 1: Elements involved in achieving usability (Fenker, 2008)*

# 3. Management and the life cycle of buildings

## 3.1 The life cycle of buildings and organisations

It is common to divide the life cycle of buildings in a number of phases. One such division is represented in the ISO-standard on service life planning and whole life costing according to which the life cycle of assets or projects consist of four distinct phases: Acquisition, Use and maintenance, Renewal and adaptation, and Disposal. The first phase of acquisition is sub-divided in 7 individual activities: Definition of need, Conceptual design, Preliminary design, Detailed design, Construction, Commissioning, and Occupation (ISO, 2007).

However, when we look at an organisation's need for space, it is important to combine this with the corporate life cycle. The international literature gives a lot of different models for corporate life cycles. Adizes (2004) have written several books on managing corporate life cycles, and he divides the corporate life cycle in 10 stages. The need for additional space for a corporation is obviously related to stages with growth and expansion. However, for most large organisations the situation will at any time be characterized by on-going use and adaptation. There will always be smaller or bigger building projects going on to adapt the facilities to changing needs. For the purpose of this paper it is only necessary to distinguish between phases with new building projects and phases before and after with on-going use and adaptation as shown on the horizontal axis of figure 2.

## 3.2 Continuous briefing and continuous commissioning

The activity "Definition of need" in the ISO standard mentioned above is usually called "briefing" in the UK and "(architectural) programming" in the US. An obvious way to achieve usability is to involve the users in the briefing process. Briefing has traditionally as expressed in the ISO standard been seen as an activity in a distinct phase at the beginning of a building project leading to a brief document with a specification of the client requirements. It has often been a very expert based activity, where the users at the most have been used as information sources.

However, we have in the last decades seen a trend towards other forms of briefing processes. In Jensen (2006) this development is described by the term "continuous briefing" based on a case study of a huge media building project in Copenhagen. Recently the term "inclusive briefing" was also introduced for this development (Jensen and Pedersen, 2009). The differences between traditional briefing and continuous or inclusive briefing are shown in table 1.

*Table 1: Comparison of traditional and continuous briefing (Jensen, 2006)*

| *Traditional briefing* | *Continuous briefing* |
|---|---|
| *Concerns new building/construction* | *Concerns all client/user needs in developing facilities* |
| *A definite phase at an initial stage* | *A continuous process with changing focus in different phases* |
| *An expert based information collection* | *A guided learning and dialogue process* |
| *Users mainly involved as data sources* | *Users actively involved as part of a corporate change process* |
| *The result is a brief, i.e. a requirement specification* | *The result is acceptance of solutions based on a brief* |

A main reason for involving the users in the briefing and design process is the fact, that the users are the experts in relation to their work. However, users are not necessarily particularly competent when it comes to the relation between the design of buildings and workplaces on one side and how they best support their work activities on the other side. Designers may have such competences, but often they may be more concerned with architectural expressions and details or technical novelties. The use of visualisation tools is very important in the dialogue between designers and users and the use of concrete tests of design solutions in one-to-one mock-ups can be very helpful in achieving usability.

A limitation of involving the users in the briefing and design process is that their perspective is their work as it is in a specific situation and perhaps with the foreseeable changes which can be predicted from implementation of new technology, products and/or organisation. However, the life time of buildings is often 50-100 years, and it is impossible for anybody to predict the changing need for facilities over such a long period. As shown in the case of the university college in Norway, it is necessary with involvement at a strategic level to take the longer time perspective into account, for instance in relation to flexibility and adaptability. The concept of learning buildings can be used to accommodate this as explained later in this paper.

Another activity in the acquisition stages is "Commissioning". Just like briefing, commissioning is also changing from being limited to a distinct phase towards becoming a more widespread activity in the building life cycle. In the ISO standard mentioned above, commissioning represents the handover phase from construction to occupation. Recently the term "continuous commissioning" has been introduced, for instance in an official American guide book on commissioning (US Dep. of Energy, 2002). The International Energy Agency, Annex 40 on Commissioning (Visier, 2004) gives this definition of commissioning:

*"Commissioning is a documented way to diagnose and verify building systems performance, and to propose ways to improve the performance in compliance with owner's or occupant's requests. Commissioning is performed in order to keep the system in optimal condition through the life of the building from viewpoints of environment, energy and facility usage.*

*The commissioning begins with pre-design phase and can be applied through life of building including all phases, which are pre-design, design, elaboration, construction and operation and occupancy phases."*

Commissioning thus focus on validation of the performance with main focus on the technical installations and the interplay between the different technical systems in a building through-out the whole life cycle. Commissioning can be seen as an approach of technical rationalism like functionalism as described earlier, but evaluation of usability can complement commissioning activities in a combined validation of both the technical and the user oriented performance of buildings.

The parallel development in the introduction of continuous briefing and continuous commissioning in relation to the buildings' and organisations' life cycles is illustrated in figure 2.
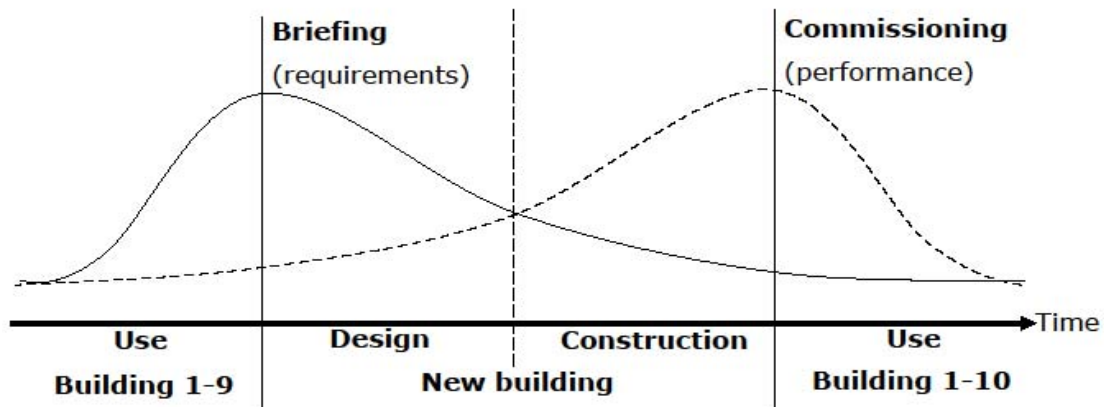


***Figure 2****: Continuous briefing and continuous commissioning (Jensen et al., 2009)*

The briefing process takes place during the use of existing buildings as an ongoing capturing of requirements based on experience and changing needs. When the need for a new building evolves, the briefing activity intensifies and has a peak around the start of the design phase, but continues as a dialogue with designers during the design phase and to a certain degree with designers and contractors during construction. When the new building is occupied briefing continues as an ongoing capturing of requirements in the extended portfolio.

The commissioning process has a similar development but with an opposite intensity. During the use of existing buildings it takes place as an ongoing optimization of building performance and when a new building project starts, the commissioning process of ensuring and verifying the performance of the new building begins and intensifies during design and construction with a peak, when the new building is occupied. When the initial building performance is verified, the commissioning continues as an ongoing optimisation of the extended portfolio.

# 4. Management and learning buildings

## 4.1 The concept of learning buildings

One way of conceptualizing change in the built environment is the concept of learning buildings, which was introduced by Brand (1997). Adaptivity is according to Brand the main characteristic of a learning building, which is a building that learns from its occupants, and they learn from it. He recommends use of scenario methodology to plan new buildings for future needs. Brand use the illustration shown in figure 3 as a representation of the learning building with six layers – or the 6 S's as the names of all layers begins with "S".
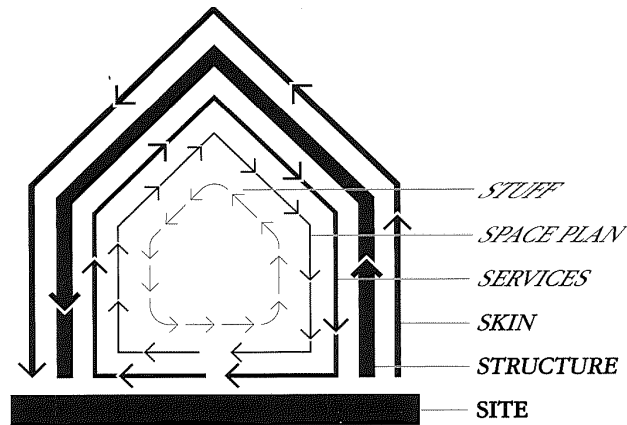
**Figure 3: Shearing layers of change in buildings (Brand, 1996)**

The concept of learning buildings was elaborated further by the "Learning Building Group" in the UK as documented by McGregor & Then (2001). They defined the following five key characteristics that a learning building must possess: Adaptability, Capability, Compatability, Controllability, and Sustainability. The first three of these characteristics can be regarded as technical characteristics of buildings in line with functionality, but the last two characteristics are like usability more related to the effects of the building design. Controllability is defined as "Providing users with the means to maximize their use and operation of the building, its services and facilities, while minimizing the conflicts between corporate values and individual values" and sustainability is defined as "To ensure that the building and its 'assets' are operated and maintained to enhance individual and corporate productivity, their health and well being at all times, and environmental responsibility throughout the entire life of the building".

Recently the concept of learning buildings has been investigated further in a Norwegian PhD-study (Bye, 2008), who by inspiration from actor-network theory (Latour, 2005) introduces the idea, that buildings not only is provided with technical characteristics and properties from the design, but also possess abilities like skills and dexterities. One of the conclusions from this research is that building operators play a crucial role as mediators between users and buildings (Aune et al., 2009).

## 4.2 Management of learning building

What seems to be missing in the previous research on learning buildings is the role of management. Learning in not something that can be implemented in buildings like human intelligence can be implemented in intelligent buildings by installation of building automation systems etc. as shown by Himanen (2003). It is more relevant to compare with the concept of learning organisations. Senge (1990) defines learning organisations as "Organisations where people continually expand their capacity to create results they truly desire, where new and expansive patterns of thinking are nurtured, where collective aspiration is set free, and where

people are continually learning to learn together". Management is needed in general to make a number of individual people work as an organisation with common objectives. A specific kind of management is needed to create a learning organization, where traditional hierarchical structures are removed and a shared vision has been defined and accepted.

Similarly, a specific kind of management is needed to make buildings work as learning buildings. This involves identification of visions, strategies and requirements for the long term development of buildings in the planning phase and on-going monitoring of performance and usability to capture new needs and requirements for changes during the use phase of buildings. Facilities managers should be the obvious profession to take on this important management role in close collaboration with the top managers and users in the organisation.

Evaluation is in general an important part of learning and evaluation of usability and performance of buildings is an important part of creating learning buildings. By implementation of continuous briefing and continuous commissioning such evaluations can be part of a feed-forward from existing buildings to make improvement in both existing and new buildings. This is in contrast to the traditional view on building evaluation carried out by POE (Post Occupancy Evaluations), where the main purpose is feed-back from finished buildings to the design team.


# 5. Conclusions

The focus on buildings in FM is concerned with how the corporate needs for facilities can be provided and optimized in both a short and long time perspective. Therefore every phase of the life cycle of buildings is of importance. This paper has proposed continuous briefing and continuous commissioning as two interrelated concepts, which together with the concept of learning buildings can be used to integrate the management of buildings and usability. Just like the development of learning organisations needs a specific form of management, where traditional hierarchical structures are removed and a shared vision is defined and accepted, so does the development of learning buildings need a similar specific form of management.

The management tasks to obtain usability include formulation of visions, strategies and requirements for the long term development of buildings in the planning phase, involvement of users in defining needs and requirements and deciding on design solutions in continuous briefing and on-going monitoring of performance and usability to capture new needs and requirements for changes during the use phase of buildings. Facilities managers should be the obvious profession to take on this important management role in close collaboration with the top managers and users in the organisation

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