



## **W111 RESEARCH REPORT**

# **Usability of Workplaces**

Phase 2



**CIB Report 316**

**ISBN 978-90-6363-057-7**



**CIB and EuroFM  
Joint Project**



**W111  
Research Report**

# **Usability of Workplaces**

**Phase 2**

**Editor:**

Professor Keith Alexander  
University of Salford  
Coordinator CIB W111

**Published by:**

International Council for Research and Innovation in Building and  
Construction  
CIB General Secretariat  
Post Box 1837, 3000 BV ROTTERDAM  
The Netherlands  
E-mail: [secretariat@cibworld.nl](mailto:secretariat@cibworld.nl)  
<http://www.cibworld.nl>

**June 2008**



**CIB and EuroFM  
Joint Project**



**USABILITY OF WORKPLACES**

**CONTENTS**

**Preface**  
**Foreword**  
**Introduction**

**Section One            Concepts, theory and methods**

**Usability: philosophy and concepts**

Keith Alexander

**Towards a theoretical framework for usability of buildings**

Michael Fenker

**Methods & tools for evaluation of usability in buildings**

Siri Blakstad, Geir Hansen and Wibeke Knudsen

**Section Two            Learning from the cases**

**Usability in the workplace – a case study of Pamela Youde Eastern Hospital**

Jan Ake Granath and John Gilleard

**Space for the digital age - a case study of a new media centre**

Per Anker Jensen

**Customer journey – a method to investigate user experience**

Suvi Nenonen, Heidi Rasila, Juha-Matti Junnonen and Sami Karna

**Section Three        Future directions**

**Usability of shopping centres – components of usability rating tool**

Johanna Alho, Suvi Nenonen and Kari Nissinen

**The circle of five: a magic recipe for optimizing locations**

Wout Ritzema

**Conclusions**



## **CIB and EuroFM Joint Project**

### **USABILITY OF WORKPLACES**



## **PREFACE**

This project has brought together two powerful and influential sources of change, CIB and EuroFM, to address issues that challenge some of the basic tenets of development in the built environment.

CIB is the international association providing a global network for international exchange and cooperation in research and innovation in building and construction. CIB supports improvements in building processes and in the performance of the built environment.

EuroFM's mission is the advancement of knowledge in Facility Management (FM) in Europe and its application in Practice, Education and Research. An understanding of the processes behind the activities of FM is crucial to develop the profession. With this publication EuroFM provides a basis for such an understanding

The project opens a new era in the relationship between CIB and EuroFM. CIB were one of the founding members of the EuroFM network. However, the project is the first joint project between CIB Working Commission W111 and the EuroFM Research Network Group.

Participants from both networks involved in the project and have developed a programme of collaborative research to promote, develop and share methods, processes and techniques for evaluating buildings-in-use from a user perspective.

Work in the project is now at the completion of its second phase, and has focused on the user experience of buildings and research in the workplace, rather than on laboratory or theoretical studies, and on applications of concepts of usability and manageability in practical situations.

The one day seminar, as part of the European Facility Management Conference (EFMC08) held in Manchester, is organised as three sessions, each of which will include short presentations of important aspects of the work by the main participants in the project. The seminar includes presentations of three case studies from Phase 2 of the work, and will discuss findings and conclusions from the project.

CIB

EuroFM



## **CIB and EuroFM Joint Project**

### **USABILITY OF WORKPLACES**



#### **FOREWORD**

A CIB working commission on Usability of Workplaces (CIB W111) has operated as an integrated network of researchers and practitioners since its inception in 2001. The network was originally formed as a task group (TG51) to investigate the application of an international standard on usability, previously applied in the evaluation of consumer products, to the built environment.

A first round of exploratory case studies (2002/05) sought to investigate the applicability of usability concepts and techniques, adapt them for use in the built environment and to identify methods and techniques that would enable a more positive user experience in organisational settings.

The work reported in this publication, is drawn from the second phase of the project (2006/08) which included a further three case studies, five workshops and will conclude with a one day research seminar. The work that comprised this phase of the project focused on contextual issues that were seen to define the difference in applying usability to the built environment as opposed to other consumer products.

Senior managers from leading organisations have participated in the network, coordinated by the research-based partners, and have been directly involved in the series of action learning workshops used the main vehicle for advancing the programme of work.

Participatory workshops provided the opportunity for sharing knowledge of user experience in the workplace, provided an independent review of practice and for sharing best practice. Host organisations received feedback from other leading-edge organisations involved in the project and recommendations for improvement, many of which have been implemented.

The network has provided new knowledge for action on themes including user experience, feed-forward processes, and has explored the links between the quality of the environment, health, well-being and productivity in the workplace. Each case has identified new appraisal methods and techniques. The network has also provided the opportunity for cross-cultural collaboration and information exchange.

Research-based partners also meet separately to reflect on the cases and workshops and to address philosophical, theoretical and methodological issues arising out of the work.

Professor Keith Alexander  
Convenor CIB W111  
Leader, EuroFM Usability Research Project  
May 2008

# **Usability: philosophy and concepts**

Keith Alexander

Centre for Facilities Management, University of Salford, UK

## **Abstract**

The purpose of this paper is introduce basic principles and to stimulate further discussion about the philosophical and conceptual underpinnings of usability, to enable the development of robust theory and to support practical applications in the built environment.

The paper introduces the background to an international action research project, now in its seventh year. Research organisations from nine countries, together with industrial partners from different sectors, are collaborating to understand the nature of usability and user experience, to identify develop practical methods for improvement and to promote an inclusive, participatory approach to adaptation of the built environment.

Early work in the project focused on the dimensions identified in international standards that apply to the usability of consumer products – efficiency, effectiveness and satisfaction. Later work has identified other key concepts – context, culture, situation and experience - that underlie efforts to understand and improve usability in the built environment.

The paper concludes that usability is a cultural phenomenon that can only be improved through a better understanding user experience, considered as situated action in a specific context. The paper discusses practical implications for built environment professions and for the development of design and management processes and raises specific issues for usability research in the built environment.

**Keywords:** Usability, context, situation, culture, experience

## **INTRODUCTION**

### **Background**

A CIB working commission on Usability of Workplaces (CIB W111) has operated as an integrated network of researchers and practitioners since its inception in 2001. The network was originally formed as a task group (TG51) to investigate the application of an international standard on usability, previously applied in the evaluation of consumer products, to the built environment. A first round of exploratory case studies (2002/05) sought to investigate the applicability of usability concepts and techniques, adapt them for use in the built environment and to identify methods and techniques that would enable a more positive user experience in organisational settings.

Senior managers from leading organisations participate in the network, coordinated by the research-based partners, and are directly involved in the series of action learning workshops used the main vehicle for advancing the programme of work. These workshops provide the opportunity for sharing knowledge of user experience in the workplace and an independent review of practice and for sharing best practice. Host organisations receive feedback from leading-edge organisations and recommendations for improvement, many of which have been implemented.

The network has provided new knowledge for action on themes including user experience, feed-forward processes, and has explored the links between the quality of the environment, health, well-being and productivity in the workplace. Each case has introduced new appraisal methods and techniques. The network has provided the opportunity for cross-cultural collaboration and information exchange.

Academic partners also meet separately to reflect on the cases and workshops and to address philosophical, theoretical and methodological issues arising out of the work. This paper focuses on some of the conceptual issues that have arisen from the project.

## **Basic principles**

The research network was created to understand and apply concepts of usability, and to provide a better understanding of the user experience of buildings and workplaces.

Usability, as generally defined, includes all aspects of the user's experience when interacting with the product, service, environment or facilities. The W111 network is particularly interested in 'user experience' in an organisational setting - encompassing all aspects of the end-user's interaction with an organisation and its facilities and with processes of design and management (of the built environment).

At the outset of the work, the definition from the international standard on usability was adopted '....effectiveness, efficiency and satisfaction with which a specified set of users can achieve a specified set of tasks in a particular environment' (ISO, 1998).

The definition suggests that a product's usability is determined by 3 key factors:  
Effectiveness – whether users can achieve what they want to do with the product  
Efficiency – how long it takes them to achieve it  
Satisfaction – their feelings and attitude towards the product

These three factors were incorporated in a framework which guided the first series of case studies. From this perspective, the term usability describes whether or not a **product** is fit for a specific purpose (Arge, 2004). Usability, or functionality in use, is concerned with a building's ability to support the user organisation's economic and professional objectives. However, an important conclusion from the first series of cases was the recognition that increased functionality does not necessarily mean improved usability.

Reflecting on the cases, Jenso et al (2004) have suggested that the concept of usability of buildings can be approached in four ways:

1. Criteria and parameters affecting usability
2. Usability from different stakeholder's point of view
3. The time perspective
4. Workplace and context

The particular interest of this group is the **user** point of view, as a key stakeholder perspective eg the patient focus in healthcare environments. From the user perspective, usability means that artefacts are easy and fast to learn, efficient to use, easy to remember, allow rapid recovery from errors and offer a high degree of user satisfaction. It also means bringing the user perspective into focus.

Broad conclusions about the nature of usability as a concept, applied to the study of the built environment, were drawn from the first phase of the work, conducted through a series of five case studies and associated workshops (2002/06). This confirmed that usability of the built environment focuses on user perceptions of the ease and efficiency with which they can use the facility – the workplace. It is a continuing process and not a (construction/workplace) project. There was agreement that usability is concerned with the effect rather than intentions or product - it is not Post Occupancy Evaluation (PoE) and is a time, place, context and situation bound concept.

Findings from the first phase of the project suggested that usability should therefore, be described as a phenomenon that is outlined by three characteristics:

The user and his or her knowledge, expectations and perceptions

The product, service, environment or facility, its characteristics and the functions it provides

The situation, tasks and goals in which the product is being used

The latter characteristic has received much less attention than considerations of the user and characteristics of the product and is particularly relevant in applying usability thinking, conventionally used to evaluate all kinds of consumer products, to the built environment.

These basic principles have continued to guide the work in the second phase of the project. A further series of cases studies and workshops has been conducted over the past two years, along with a series of research workshops to develop theoretical and methodological aspects of the work and to create a dialogue with a broader audience of researchers.

The second phase of the project has sought to address the need to consider usability and user experience of the built environment in the context of situation and culture. The second series of cases and workshops has been conducted in the past two years (2005-2008), is currently being analysed and will be reported and discussed at the research symposium, prior to confirming commitment to a third phase of the project.

## **PHILOSOPHICAL APPROACH**

### **Philosophy**

In a previous paper, Granath and Alexander (2006) laid the foundations for the development of usability theory, by highlighting the philosophical differences that underlie the usability perspective and differentiate it from the conventional position taken up by built environment disciplines.

The paper suggested that the reasons for discrepancies between the intentions of a built environment project and the outcomes, from a user perspective, can be found in underlying philosophical differences in approach. It was argued that the predominant, supply-led ways of thinking about, providing and managing facilities and delivering built environment solutions, fails to accord with the reality from a user's perspective.

The current philosophical paradigm of design, taken as a tool to arrive at outcomes in terms of usability, is not true for its purpose (Popper, 1963). Time after time, current thinking to help us in arriving at usable solutions has been falsified by user perceptions of the reality.



The paper elaborates this criticism and also investigates an alternative paradigm that might be more potent from a usability perspective. It suggests that current thinking in design, provision and management of workplaces is dominated by a predominantly rationalist way of thinking. The paper investigates whether pragmatism, offers an alternative way of reasoning.

Current design thinking is, naturally enough, strongly focused on the artefacts that we design. The functions of those artefacts and their overall functionality are what we are aiming at.

Granath uses an example from food production to provide further clarification. 'In Sweden, a cross- disciplinary research group was formed by the government to find out if organically produced food has a higher quality than normally produced food. Researchers cannot find any absolute evidence that it is so. In some cases it is, in some cases not. It is also questioned whether organically produced food is better for the environment and for animals in the production process. Also in this matter the results are ambiguous. In the Swedish context, the reason for this is that traditional food production has adopted many methods and philosophies from organic production that has resulted in high quality food to a normal price.

From a rationalist point of view, where we believe usability lies in the properties of the product, this would be a problem for those who produce organic food. But, those who buy organic food do not buy it only for its product properties and certainly not because of the price. For them the production process, the participation in something larger than buying food, their belief in doing something good for the future etc. is a part of it. From this point of view normally produced food can hardly be usable to these customers, despite price, taste or looks.'

### **Problem definition and evaluation**

The paper concludes that the predominant ways of thinking are not effective in arriving at usable solutions for work environments because the problem definition and evaluation of outcomes are not made from the perspective of users, but rather dictated by the structure and thinking of the professions that deliver the solutions.

Fragmentation of the professions presents obstacles to arriving at effective solutions, leading to definition of the problems by those that deliver the solutions. Facilities in use are not fragmented in the same way as in their creation. The solution lies within the domain of those that deliver the solutions. A usable building can be achieved, even if a building is not the most effective solution of the problem.

Efficiency is often well considered in most design situations, but an efficient solution is not usable if it is not the most effective solution.

Evaluation of effectiveness is strongly related to the ability of being usable, as it is interpreted in the vision of the project, rather than being tied to the actual user situation. A solution can be perfectly usable in a theoretical situation but that is not the situation of actual use.

Satisfaction is the most difficult aspect for traditional thinking to respond to. Satisfaction may be achieved, to a certain degree, by effective and efficient solutions. From a pragmatist perspective, a solution is however not usable, if it is not used. The

reason a solution is not used, although it has all the functional properties that could be imagined, might lie in the design process, in social and psychological relations, in cultural aspects or in the situation of problem definition, design, completion or use.

The paper suggests that a pragmatist approach is the appropriate point of departure for creating a usable solution. The pragmatist way of thinking means that usability is proved when, and only when, the solution contains artefacts that enables users and allows behaviour that is a desired change from an unacceptable situation.

In practice this means, defining the problem in the user context, defining the outcomes in terms of desired changes in behaviour, rather than through the use of artefacts. It means choosing strategies that support effectiveness and sustainability in use and defining the rules for the creation from a user satisfaction point of view, rather from the perspective of delivering efficient solutions.

This line of reasoning is however in its creation and will and should be questioned in all its parts. In that way we believe that something sustainable and useful will emerge. It is so far only an intellectual construct that has to be proven true in reality. However, if it in any way has an impact on our design behaviour, in such a way that we can change our design process, and hence have an impact on the design itself, it may promote the improved usability of workplaces in the future.

## **KEY CONCEPTS**

From this philosophical perspective and arising from the discussion and analysis of the first round of cases and workshops, it is clear that levels of user satisfaction will differ according to cultural differences, context, expectations and the actual situation of use.

Four concepts have been addressed in work in the second phase of the project. Usability should be considered in a specific context (Alexander, 2007), as situated action (Fenker, 2008), as a cultural phenomenon (Lindahl and Granath, 2006), and as user experience (Alexander, 2007).

Further analysis and discussion of the case material is needed to provide a better understanding of the impact of these issues, to identify implications for further usability research and for the development of appropriate, practical tools and to fully understand the

These key concepts are presented in outline to stimulate further discussion at the workshop.

### **Context specificity**

Buildings are typically considered independently from their organisational, urban, cultural context. A key finding from the case studies has been the need to consider buildings and workplaces in context in order to understand and improve usability.

Seen in an organisational context, buildings normally form part of a portfolio and are evaluated in terms of their asset value. The tools and metrics for considering the use value of buildings are less well understood and developed. However, the value added to the business, and the role of construction in this respect, has been the subject of considerable recent interest

in the United Kingdom (see for example, Evans et al, 2004, Hughes et al, 2004 and Ive, 2006).

In an urban context, buildings are part of the urban fabric and create the physical infrastructure for the development of communities. The need to consider cultural differences emerged from the cases and workshops, in terms of both region and ethnicity.

These inter-related issues are increasingly addressed in, for example regeneration literature which emphasises the need to build human and social capital and to develop inclusive approaches to development (Alexander and Brown, 2006).

### **Situated action**

Through the cases, and through his contributions to workshops, Michael Fenker (Fenker, 2008) has argued for recognition of 'situation' as a key parameter in usability. The literature on situated action provides an introduction to the issues that arise from consideration of situations.

The notion that people's behaviour is contextualised and the situation is a very important factor in determining what people will do. In the extreme view, this is the idea that you can't generalise and predict people's behaviour from one situation to the next. Thus, this suggests an approach to usability which requires an understanding of each user's or, more commonly, each organisation's specific and detailed needs in designing artefacts for them by carefully examining how they work and how situational and organisational factors fit into that process.

The concept of situated action, introduced by Lucy Suchman (Suchman, 1987), refers to how people act in a situation and emphasises the interrelationship between an action and its context of performance (Chen & Rada).

For some, situated activity is not a kind of action, but is the nature of human interaction at all times, in contrast with most machines we know. This is not merely a claim that context is important, but what constitutes the context, how you categorise the world, arises together with processes that are coordinating physical activity. To perceive the world is to be acting in it, not in a linear input-output relation, but dialectically, so that what I perceive and how I am act co-determine each other (Clancey, 1993).

People's actions are influenced by the context of their specific situation. The last view goes a bit further by drawing on how a users perceptions of the situation and specific actions are continually working together to determine the next step. Every course of action is highly dependent upon its material and social circumstances focusing on moment-by-moment interactions between actors, and between actors and the environments of their action.

It is therefore vital to understand the inter-active nature of actions, amongst the actors and between actors and their environment, to understand perceptions of usability.

### **Cultural sensitivity**

Lindahl and Granath (2008) have argued that the scope of an organisation's and user's activities are related to culture and context, and that usability is a cultural phenomenon. Thus there is a context and cultural aspect for built environment professionals to deal with. This is a challenge, as the current focus often is on cutting cost and making space use more efficient.

The usability work has sought to evaluate in an organisational context. Transformation of organisations, of which changes in the workplace are part, requires a better understanding of organisational culture.

Organisational culture, or corporate culture, comprises the attitudes, experiences, beliefs and values of an organisation. It has been defined as ‘the specific collection of values and norms that are shared by people and groups in an organisation and that control the way they interact with each other and with stakeholders outside the organisation.

Organisational values are beliefs and ideas about what kinds of goals members of an organisation should pursue and ideas about the appropriate kinds or standards of behavior organisational members should use to achieve these goals. From organisational values develop organisational norms, guidelines or expectations that prescribe appropriate kinds of behavior by employees in particular situations and control the behavior of organisational members towards one another’

### **Elements of user experience**

The term user experience is now widely used, especially by major players in the ICT industry including Apple, IBM and Microsoft. They suggest that ‘user experience’ goes beyond mere usability by including such attributes as usefulness, desirability, credibility and accessibility. Usability is often depicted as a much narrower concept focusing on systems being easy to use.

However, usability as defined in the ISO standard and as used in this project defines and describes usability in the broader sense of the overall user experience. A conclusion from the usability project is that the user’s experience encompasses all interactions, and experience of this interaction, with the facilities and resources at hand.

This implies that, to get closer to the user, we need to step further than the core activities and the functions used for that. The focus needs to be on effects and not intentions. The recurring discussion about competence and knowledge workers in workplaces might however shift the focus. If the ‘complete’ worker is needed the setting for work needs to be defined in the terms of the user.

Recent revision of the international standards for usability has sought to clarify some of these issues, for example the perceived differences in the use of the terms usability and user experience. Usability is a consequence of the presentation, functionality, system performance, interactive behaviour, and assistive capabilities of the interactive system. It includes all aspects of usability and desirability of a product, system or service from the user’s perspective.

Approaches to briefing, design methods, evaluation tools and management techniques have been developed to address the deficiencies of conventional approaches, in an attempt to address the need to put the user at the centre of the process.

For example, Hudson (forthcoming) argues that much of the existing work on briefing is based on premises that it can be reduced to a rational process, it is part of a finite project, that the final outcomes of this project are buildings or other physical facilities and that user requirements have an external objective existence that can be captured in the briefing process.

He goes on to suggest that work on usability suggests that these premises are limited and that a new approach to briefing may be necessary. This approach might be characterised by an emphasis of briefing as creative exploration of possibilities rather than requirements capture, a focus on the social construction of requirements and their evolution over time and a focus on human satisfaction rather than physical facilities.

Similarly, new design processes are emerging, such as user-centred design and experience design. User-centered design (UCD) is a design philosophy and a process in which the needs, wants, and limitations of the end user of an interface or document are given extensive attention at each stage of the design process. In the user-centered design paradigm, the product is designed with its intended users in mind at all times. In the user-driven or participatory design paradigm, some of the users become actual or de facto members of the design team.

Experience design is the practice of designing products, processes, services, events, and environments - each of which is a human experience - based on the consideration of an individual's or group's needs, desires, beliefs, knowledge, skills, experiences, and perceptions. An emerging discipline, experience design attempts to draw from many sources including cognitive psychology and perceptual psychology, linguistics, cognitive science, architecture and environmental design, haptics, product design, information design, information architecture, ethnography, brand management, interaction design, service design, storytelling, heuristics, and design thinking. Another term for experience design is experiential design.

Other important concepts, such as narrative environments are emerging in recognition of the need to address these issues. A narrative environment is a space, whether physical or virtual, in which stories can unfold (in other words, anyplace). A virtual narrative environment might be the narrative framework in which game play can proceed. A physical narrative environment might be an exhibition area within a museum, or a foyer of a retail space, or the public spaces around a building - anywhere in short where stories can be told in space.

## CONCLUSIONS

The purpose of this paper was to raise important philosophical and conceptual issues in the application of usability in the built environment in order to generate discussion in the usability research network and workshops.

Placing greater emphasis on user experience suggests a re-casting of the usability framework to efficiency, effectiveness and **experience**.

Considering these key concepts for usability has important implications for research:

The development and selection of appropriate methods for research into user experience eg social anthropology and ethnological studies.

Research strategies that respond to the nature of usability research with an emphasis on context specific, situated action

The work also raises important practical considerations for built environment professionals:

How to create and manage a destination/experience

How to design and manage to build human and social capital

The need for innovative processes to integrate situated activities

Development of the facilities value chain to include user experience

This places new demands on practitioners and requires better knowledge of behaviour and social processes. If built environment professionals are to address workplaces in terms of feelings about it - new methods and techniques need to develop, what is experienced as usable in a specific context will be sought after.

There is a need of development of knowledge regarding how to design and deliver environments and services in different cultural contexts. There is a need for more innovative processes that support the changing organisations they work with.

Future methods and research need also to focus on management of the complex issue of efficiency of facility use integrated with efficiency in staff use.

Taking the aforementioned into account one might consider if a new and extended role is beginning to emerge. Practitioners might turn into a facilitating manager rather than a facilities manager (Lindahl and Granath, 2006).

## References

Alexander, K. (Ed.) (2006), **Usability of Workplaces**, CIB Report, Publication 306.

Alexander, K and Brown, M, (2006), **Community-based facilities management**, Facilities Vol 24 Issue 7/8 pp 250 – 268;

Alexander, K, (2007), **The application of usability concepts in the built environment**, Journal of Facilities Management, Vol. 4 No. 4, 2006, pp. 262-270

Arge, K., (2004), Forprosjekt. – effektiv bruk av arealer. Note, NBI.

Chen, C. & Rada, R. **Modelling Situated Actions in Collaborative Hypertext Databases**. Retrieved on November 7, 2003, from <http://www.ascusc.org/jcmc/vol2/issue3/chen.html>

Clancey, William J. (1993). **Situated action: A neuropsychological interpretation** (Response to Vera and Simon). Cognitive Science 17(1):87-107.  
<http://cogprints.ecs.soton.ac.uk/archive/00000459/00/128.htm>

CIB (2005) **Usability of workplaces, report on case studies**. Rotterdam, Netherlands, International Council for Research and Innovation in Building and Construction;

Evans, R, Haryott, R, Haste, N and Jones, A, (2004), **The long-term costs of owning and using buildings**, in Sebastian Macmillan: Designing Better Buildings: Quality and Value in the Built Environment. Taylor & Francis, 42–50;

Fenker, M. (2008) **Towards a theoretical framework for usability of buildings**. Unpublished paper. CIB W111.

Granath, J. Å. & Alexander, K., (2006), **A theoretical reflection on the practice of designing for usability**. Unpublished paper CIB W111.

Hansen, G. & Knudsen, W.(2003) **Usability – A matter of perspective**. Paper. Changing user demands on buildings. ISBN 82-7551-031-7. CiB W70 Trondheim International Symposium. Trondheim, Norway 12. – 14. June 2006

Hansen, G., Haugen, T. et. al.(2005) **Usability of workplaces**, Nord-Trøndelag University College Nylåna, Røstad. ISBN 82-14-03428-0. Trondheim, Norway. SINTEF Teknologi og samfunn and NTNU.

Hudson, J, (forthcoming), **Briefing for usability**.

Hughes, W, Ancell, D, Gruneberg, S and Hirst, L (2004). **Exposing the myth of the 1:5:200 ratio relating initial cost, maintenance and staffing costs of office buildings** in F. Khosrowshah, Proceedings 20th Annual ARCOM Conference, 1–3 September 2004, Edinburgh, UK, pp373–382;

International Standards Organisation, (1998), ISO 9241 – 11, **Ergonomics of human system interaction**.

Ive, G (2006), **Re-examining the costs and value ratios of owning and occupying buildings**, Building Research and Information, Vol 34 Issue 3 May 2006 pp 230-245;

Jensø, M., Hansen, G., Haugen, T., (2004), Usability of buildings. **Theoretical framework for understanding and exploring usability of buildings**. Paper, CIB W70 Hong Kong International Symposium, Facilities Management & Asset Maintenance, ‘The Human Element in Facility Management’, December 2004.

Lindahl, G., & Granath, J. Å. (2006) **Culture and Usability**. CiB W70 Trondheim International Symposium. Trondheim, Norway 12. – 14. June 2006

Popper, Karl, (1963) **Conjectures and Refutations**, Routledge, London;

Suchman, L.A. (1987). **Plans and Situated Actions: The Problem of Human-Machine Communication**, Cambridge: Cambridge Press.

# **Towards a theoretical framework for usability of buildings**

Michael Fenker

Laboratoire Espaces Travail, School of architecture Paris – La Villette

## **ABSTRACT**

The issue of the conditions governing the reuse of previously developed knowledge during design activities and its effects on the process assumes considerable importance in the built environment sector. We link this with another issue, being the effects of taking into consideration social practices and user experience on the relevance of built products. We believe that the joint consideration of the two problems provides a better understanding of the interleaving between the relevance of the products and the quality of their production and management processes. Thus, by exploring theoretical and empirical studies that feed this understanding, we want to contribute to the theoretical foundation of usability of buildings. We argue that usability is achieved by the interplay of user experience, design and management processes, and buildings.

## **BACKGROUND**

Like other activity sectors, the built environment sector is confronted by a growing number of uncertainties. These include, for example, technical uncertainties concerning the final use of built products and strategic uncertainties often generated by the divergent and differing final aims of the players involved in a building project. The difficulties resulting from these uncertainties increase the level of attention being paid to the operational, economic and social relevance of built products and raise questions concerning the capacity of organisational systems and players to handle new and more complex problems.

Over and above initiatives developed in individual project circumstances to meet these new requirements, players state the need to develop knowledge and ways in which to make it available. The difficulty of organising the reuse of knowledge developed in previous design and occupation processes during design activities is well known. This difficulty, on the one hand, makes reference to the connection between knowledge and specific building or urban project situations and, on the other hand, to the transmission and capitalisation of knowledge from one building project to another and between players.

Within this context, the issue of the conditions governing the reuse of previously developed knowledge during design activities and its effects on the process assumes considerable importance (Fenker, 2008; Evette et al., 2003; Spencer and Winch, 2002; Bonnet et al., 2001). We link this with another issue, being the effects of taking into consideration social practices and user experience on the relevance of built products (Alexander, 2006; Granath and Alexander, 2006; Fenker, 2004). We believe that the joint consideration of the two problems provides a better understanding of the interleaving between the relevance of the products and the quality of their production and management processes. In this understanding lies the theoretical foundation of usability of buildings.



## USABILITY STUDIES

A swing in favour of taking social practices into account during the design process began around 15 years ago in the industrial sector. In this meaning, the consideration of social practices pursues different aims and takes a different aspect than the approaches developed in the sixties and the seventies, i.e. *Advocacy planning* by Christopher Alexander, *Participation in the design of workspaces* by Colin Clipson or work carried out in France in research programs, like *Design and use in housing projects* funded by the ministry of construction and housing (PUCA). Using approaches grouped together under the generic term of *usability studies*, social practices, generally subject to analysis, either prior to or following the design process, have progressively entered the design process itself.

ISO 9241-11, 1998 defines usability as: ‘the extent to which a system can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use’. The taking into consideration of social practices is considered as a factor that can result in systems that are easy and fast to learn, efficient to use, easy to remember, that allow rapid recovery from errors and offer a high degree of satisfaction to users. Besides the usability of the system's operation, the point of view of the user in regards to usability is considered as being equally important. An attempt to study the experience of a user is made by approaches that link usability and human emotion. These include both the attitudes and perceptions of the user in terms of satisfaction and control.

Measures attempting to mobilise usability concepts in the field of building design and facilities management are rare and there is little knowledge available. In this field, players traditionally consider the building to be a project, a product, and consequently appreciate its performance through technical and functional aspects (Granath and Alexander, 2006). A greater recognition of the concept of usability demands that professionals not only see users in terms of physical and cognitive aptitudes, but also, to increase the acceptability of a technical system, take account of the relationship that the user has with the latter through the values it conveys. An approach focused on social practices demands that all human, social, economic and technical aspects of the user's effective activity be taken into consideration within the social context of use.

The widened perspectives we propose to investigate the concept of usability when compared with existing works concern two aspects: firstly, the object of our analysis specifically concerns the chain of actions and the knowledge that link the design and the uses of a location; secondly, the analysis needs to take into consideration all players included in the chain without developing an *a priori* ranking of the end-purposes they are seeking to achieve through the project. In particular, it is important to distinguish between contracting authorities and users and between a wide range of users, like top management, organisational units, end-users, etc. (Blakstad et al., 2008). Our proposal is built on previous work carried out by an international group of researchers and practitioners (CIB commission 111 Usability of workplaces), that has investigated the concepts and meaning of usability.

To this effect, as well as standing out from a certain amount of other research in the field of architectural and urban production, our analysis also widens the field of works trying to bring together the use of artefact and management practices. Nevertheless, some of these works, which have contributed to questioning management sciences, particularly in the field of “situated action”, distributed knowledge and resource management, will be analysed in the following part of the paper to provide a deeper understanding of the role of space in organised action, especially its appreciation as a symbolic and cognitive resource.

## **SOCIAL RELATIONS, SPACE AND COLLECTIVE ACTIONS**

### **Mediating artefacts**

For Vygotsky (1930), peoples relationship to the world, rather than being immediate is, on the contrary, mediated. In other words, we exist in the world, understand and intervene in it through the intervention of cultural tools (physical, e.g. a hammer, or psychological, e.g. language), that are available and passed on from one generation to another. These cultural tools are social pre-constructs defined as artefacts, in other words things resulting from human activity and which are susceptible to being incorporated into social practices.

Lautier (1999) positions the notions of space and physical settings in relationship with each other. “One can speak about space as a system of social relationships, mediated by a physical organisation.” Space therefore refers back to the diversity of positions in social relationships between occupants of a place. For Lautier (1999, p.214), “[space] is the representation which organises the perception of this setting for a (collective or individual) subject.”

In addition, given that they are designed for one or more activities, the artefacts are bearers of a set of possibilities and constraints as well as, most importantly, activity and social practices models. Characterising socio-technical systems as artefacts creates an inversion when compared with currently accepted definitions, with the technique defined in terms of activity rather than simply as a result of its intrinsic characteristics.

Human activity appears to be shaped by the use of mediating artefacts while also transforming them through use, thus contributing to the renewal of cultural acquisitions. This dual movement of people being transformed by the cultural tools represented by artefacts, and of culture being transformed by people through their social practices and appropriation of artefacts, operates on the productive aspects of the activity – achieving objectives in real situations – and in terms of the constructive nature of the activity – aiming to develop resources for the individual in the future. This definition of an activity in terms of “productive-constructive” links makes it possible to envisage relations being created between operating in concrete and day-to-day situations and development based on stabilities acquired in carrying out the activity while simultaneously giving up the latter to construct something new that meets changing requirements, whether they come from the individual, activity situations, socialisation settings or others.

*Social practices and meaning of artefacts*

The issue of social practices and the interpretations that the occupants have of artefacts introduces the concept of meaning. It also introduces important difficulties: not only are the relations between artefacts and meaning multiple and uncertain, but meaning also remains largely implicit in social practices.

Ledrut (1984) writes that having an object is not sufficient to understand the meaning of this object. A meaning is given arbitrarily to a form, even though we might feel that the relation is occasionally “natural”. The same meaning is given different forms, much in the same way that different meanings can be given to a same form. These relations are conventions based on a certain temporal stability of socio-cultural practices. Ledrut considers that “form takes precedence over meaning and in no way implicates it. This analysis underlines the fragile or unstable nature of the relation between form and meaning as socio-cultural practices vary from one moment to another, from one setting to another and from one social group to another. Form is not simply the materialisation of the project, it is also as a vehicle for the meaning developed in earlier situations. It is also reinterpreted according to the situation.

#### *Stability of social practices and collective memory*

The idea that a place can convey the stabilised and shared meaning of a group has been particularly developed by Halbwachs (1997) in his work on collective memory. The meaning that the group gives its activity is conserved in the objects surrounding it; collective practices subject objects to an encoding of meaning that simultaneously make them intelligible to the group members. For Halbwachs, one of the characteristics of places and objects is the fact that they provide group members with a way of being common to the entire group; the duration of the place creates the image of the continuity of their representations. Each aspect and each detail of this place has its own meaning which is only intelligible to the group members, because each part of the place occupied by the group corresponds to an equal number of aspects of the structure and the life of their society or at least to what is the most stable within that society.

The collective memory retained by the group by perpetuating practices allows the transmission of the meaning that they attribute to the relationship between their activity and the place. The stability of practices contributes to assuring the stability of meaning.

#### *Instability of social practices and adjustment processes*

Reynaud (1997) proposes a dynamic vision of the relations between players and the socio-technical systems surrounding them. His work on rules and adjustment processes reveals the instability of collective practices. Rules represent the organising principles for all social systems and cannot be subtracted from the tastes, preferences and interests of the involved participants. They impose an external constraint on individual decisions. Nevertheless, rules are not intangible; they often need to be reiterated, clarified and negotiated. Transgression is “normal”. Consequently, social reality is not the presence of rules, but rather the exercise of their constraints. Constraints are naturally drawn from standards in force and thus the systems they define, but they are also assumed by the players who test them, breath fresh life into them and occasionally create them through the social exchange process itself. It is this process of creation, application, transformation or elimination of rules that characterise the adjustment process.

Reynaud (1977) claims that adjustment processes are inseparably linked to an end-purpose, to an intention pursued within the collective action, to what the author calls a project. Adjustment processes do not simply constitute the forming of a group, they also govern the way the group operates and the relations between several collective players. There are as many adjustment processes as there are collective actions and participants. The relations between individual or collective players are governed by a complex decision-making process: adaptation or conflict, negotiation or arbitration, agreement or domination.

A large number of mechanisms, whether within or without the social system, contribute to adjustment processes. Reynaud (1997) is particularly interested in the adjustment processes applicable during action. For him, each player contributes to creating adjustment processes through his participation in the action. Naturally, this participation can take a number of different forms: formal or informal, explicit or implicit, through the design of the work or by the adaptation of the work to the given situation.

The collective player reaching agreement concerning a project by creating adjustment processes also reaches agreement concerning the meaning of the project. As expressed by Reynaud: “creating the rules for a system means creating a rationality shared by those inhabiting the system”. Similarly, the invocation of a rule determines the meaning of the considered events; it makes it possible to evaluate the meaning of an action. Operating adjustment processes means giving meaning to the collective action and, like the adjustment processes themselves, the meaning is questioned and transformed during the action.

### **Organisational learning and technical systems**

How can dispersed knowledge be interlinked during the action and used for structural cohesion? What place is occupied by technical systems, including buildings, technology, and other artefacts in the coordination processes taking place between players? An answer is to be found in the fact that knowledge incorporates a social and inter-individual dimension.

We support the idea that the link between individual learning processes and collective learning processes is based, on the one hand, on an interaction with the technical system and, on the other hand, on players working with one another. This type of relational configuration is made available with the aim of accumulating and transferring knowledge. Primarily, it is the organisations themselves that provide the foundations for the support using operational schemes, lists of procedures, technical systems, etc. that could also be defined as “collective cognitive systems”. However, each group appropriates these types of organisational artefacts for their day-to-day activities: depending on circumstances, individuals decide on the meaning to be attributed to the rules and the way in which they are used (or not used). We underline the dual nature of collective cognitive systems given that they are both supports and objects of coordination within and at the service of an interactive learning process.

The coherence of the reasoning goes hand in hand with the hypothesis concerning the heterogeneity of individual behaviour patterns which dispenses with the definition of representative agents. Crozier and Friedberg (1977) propose the idea of a dual organisation: all

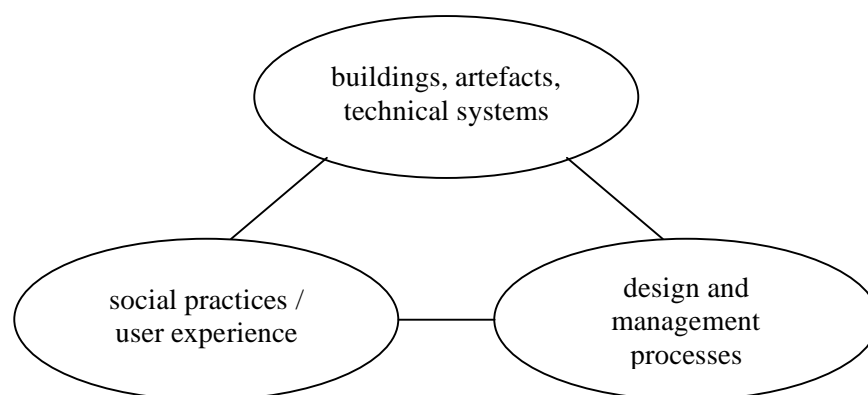
collective action structures – and, by extension, all organisational actions or decisions – are both restrictive because of the formal structure, rules, imposed referents, etc. that characterise them, and empowering due to the reinterpretative capacities of collective cognitive systems through players, the selective mobilisation of referents, etc.

The learning process for players is developed through daily practices and simultaneously contributes to the production (and reproduction) of social systems (A. Giddens, 1987). Within this framework, each player mobilises his particular reference points (words, gestures, artefacts, etc.). These types of supports are necessary inasmuch as they bear witness to a history of mutual commitments and can be subsequently mobilised again in different circumstances – “thus assuring the continuity of practices”. At the same time, a certain amount of ambiguity is inherent in these coordination objects as, by definition, they serve the local/global link: they are footholds, transitory social artefacts that have been selectively reappropriated by individuals through their relations to others and to the technical system.

Like E. Wenger (1998), we see this latter artefact as a vector for developing knowledge placed at the service of structuring cooperation and as an agent able to optimise its operation. This stands at the crossroads of practices, organisational identity, contextual experiences and structuring dynamics. At the same time, individuals mobilise technical systems, rules, procedures, etc. during their actions, actions that, in turn, will generate the design of their tools.

\* \*

We maintain that a technical system and its usefulness for collective action is neither the manifestation of timeless structures that are not subject to history and have a permanent and universal nature, nor the result of a historic succession of unforeseen events and disruptions. It is the product of a continuous process of construction whose course needs constant corrections. Following the theoretical development presented above, we argue that usability is achieved by the interplay of user experience, design and management processes, and buildings.



## LESSONS TO LEARN FROM A USABILITY PERSPECTIVE

The design and management of buildings is not simply a problem resulting from a strategic decision to adapt an organisation to external events or to create an event that might generate a

competitive advantage. The design and management of buildings is also confronted with the dynamic of the action and the deeply open nature of compromises between participants during the action. Consequently, adaptation is not simply the result of an intervention on the technical system or the management of an understanding of relations between the aims of the organisation and the buildings criteria. Adaptation also results from the construction of meaning and the compromises made by the participants during the action taking place on the location (concrete examples can be found in the appendix).

Usability has to deal with the fact that buildings and the workplaces they provide are at the crossroads of at least two different logics, or two different levels of considering their usefulness: local and global, working situation related and intra/ inter-organisation related.

The theoretical development presented in this paper underlines the situation and context related aspects of usability. Usability cannot be assessed without questioning for whom, for which purpose and in which action the usefulness is required. A (management) situation presents itself when participants are brought together and, within a given time frame, must carry out a collective action leading to a result submitted to external judgment. The notion of situation also implies the uncertainty of events which is not just maintained by the changing context but also by the very open nature of the compromises worked out between the players. These types of compromise take into consideration not just the appropriateness of the means used to achieve the result, but also their appropriateness given the various other objectives being pursued by the participants. And we understand now that buildings with their technical, cognitive and emotional aspects are part of these means.

The notion of context refers to the interpretation of the situation; it provides information as to *what is currently taking place?* The context is represented by all the knowledge, whether or not explicit, that the participants mobilise to interpret what is being said or what is taking place. Both, the situation and the context have an effect on the appropriateness of the available means.

Consequently, usability should be understood as a process, a process during which the players can learn from earlier situations and the range of experiences that they have insofar as the adaptation between action and space is concerned. The object of usability studies should incorporate an approach that aims to objectify the eminently tacit relations between technical system and users. This approach could have the effect of rendering “visible” contradictions that might exist between organisational and managerial objectives and the space-activity adaptations perceived as being relevant for users.

## **CONCLUSIONS: USABILITY STUDIES RAISE NEW ISSUES**

The incorporation of social practices in the design process in order to enhance usability is linked to a series of issues that extend far beyond the building sector. They result from the interleaving between the incorporation of these social practices and the mobilised knowledge of social groups during a design process or any other organised action bringing them together. Three fundamental issues concerning the incorporation of social practices bear mentioning:

The productive issue: the acceleration of the speed of innovations and the importance given to the quality of the design process refer back to the diversity of social practices and their development potential. The user's "information feedback" throughout the product's life cycle appears to be an essential factor for improving performance, both in terms of the process and the object to be produced (relevance, cost, quality, completion time). The incorporation of social practices is particularly translated in processes where players constantly evaluate the ease of use of future products and the development of interactions that will be based on these same products.

The information and learning issue: learning is a key aspect to question the effects of the design process experience on users. of this point. The types of appropriation and learning processes for new systems concerned by design can be decisive insofar as the quality of future social practices is concerned. Reducing divergences of understanding between future users or anticipating mediation between various modes of operation can become an important subject of social practices analysis during the design phase. To this end, the design process, given the objectives being sought, is occasionally considered as important as the production of a product itself.

The political issue: the occupant of a space, by shifting from his role as guinea pig or "simple" source of information, becomes user, client, patient, etc. His position as player also implies that his specific end purposes be recognised. Process management cannot simply be reduced to technical choices or unilateral strategic decisions. Unless discussions take place, there is no point in aiming to take social practices into account.

## REFERENCES

Alexander, K. (Ed.) (2006), *Usability of Workplaces*, CIB Report, Publication 306.

Bonnet, M., Claude, V. and Rubinstein, M. (Ed.) (2001), *La commande ...de l'architecture à la ville*, Paris: PUCA.

Blakstad, S., Hansen G. and Knudsen W. (2008), Methods and tools for evaluation of usability in buildings, unpublished paper presented at the CIB 111 workshop in Paris, 1-2 Feb. 2008.

Crozier, M. and Friedberg, E. (1977), *L'acteur et le système*, Paris: Seuil.

Evette, T., Lautier F., Macaire E. and Plais D. (2003), Expertises et savoirs dans la définition des édifices, in Prost, R. (Dir.), *Projets architecturaux et urbains : mutation des savoirs dans la phase amont*, Paris : PUCA, Coll. Recherche n° 143, pp. 79-134.

Fenker, M. (2008), Expérience et coopération au sein de la maîtrise d'ouvrage, in Biau, V., Bonnet, M., Tapie, G. (Ed.), *Aménagement urbain et architecture : dispositifs d'action et groupes professionnels*, Paris: ed. Parenthèse, Paris, (forthcoming Sept. 2008).

Fenker, M. (2004), Organisational change, representations and facilities", in Alexander, K., Atkin, B., Bröchner, J. and Haugen T., (Ed.), *Facilities Management – Innovation and Performance*, London : Spon Press, pp. 33-46.

- Giddens, A. (1984), *The constitution of society*, Cambridge: Polity Press.
- Granath, J.A. and Alexander, K. (2006), A theoretical reflection on the practice of designing for usability, Frankfurt, proceedings of the European Facility Management Conference.
- Halbwachs, M. (1997), *La mémoire collective*, Paris: Albin Michel, (1<sup>st</sup> ed.: 1950, Paris: PUF).
- Lautier, F. (1999), *Ergotopiques. Sur les espaces des lieux de travail*, Toulouse: Octarès éditions.
- Ledrut, R. (1984), *La forme et le sens dans la société*, Paris: Librairie des Méridiens.
- Reynaud, J.-D. (1997), *Les règles du jeu. L'action collective et la régulation sociale*, Paris: Armand Colin.
- Spencer, N. and Winch, G. (2002), *How Buildings Add Value for Clients*, London: Construction Industry Council/Thomas Telford.
- Vygotsky, L.S. (1930) La méthode instrumentale en psychologie, in Schneuwly, B. and Bronckart, J.P. (Ed.) (1985), *Vygotski aujourd'hui*, Paris: Delachaux et Niestlé, pp.39-48.
- Wenger, E. (1998), *Communities of Practice. Learning, meaning, and identity*, Cambridge: Cambridge University Press.

## APPENDIX

Examples of situations where adaptation between players, built environment and collective action happens:

The first case refers to a standard situation to be found in companies. To take a break, employees stop work and gather around the table. Each person sits down on his chair in a different way, some even change place. The employees adjust the occupation of the room to meet the needs of the new action and the changing role that might be associated. The chief is no longer quite the chief, and the chief's chair is no longer exactly his chair. A few minutes later, the employees can return to the previous action and reassume their former role. The effect produced by the adaptation between players, technical system and situation is not necessarily great. It might even have led to the creation of inter-personal relations. The amount of accepted adaptation is minor.

A few years ago, we had access to a second, more far-reaching example of adaptation, by spending several days in the head office of a German bank. The office layout grouped together 30 individual partitioned work stations on each floor level. These were laid out around an open central area set out in a way that permitted different types of meetings to be held. The separations between the individual work stations and the central area were fully glazed. The occupant of each work station was able to see both the central area and the individual offices lying opposite. Contrary to the wishes of the management for frequent communications between several people



together at the same time, the area in the centre of the floor level remained largely unoccupied. Users revealed that the majority of meetings, be they for functional or relational communication, took place inside the individual offices and brought together two to three people.

Discussions with the occupants made clear that the logic having guided the layout did not correspond to real uses. The layout in the centre of the floor levels served *to assert* a type of communication that did not exist in the way that the management envisaged. Since the moving in, the management had continuously stated the existence of communication in the central area; this had been relayed by a certain number of department managers. For the personnel, the fact of designating the centre of the floor level at least partially replaced real communication. With this adjustment between players, technical systems and working situation, employees were free to determine whether or not they wanted to engage in this so-called communication:

Each employee had his own way of interpreting a non-existent communication; such as the person who told us: “I believe that exchanges linked to the activity take place in the central area, but I work on the principle that I will be kept informed if something important takes place” (Müller, whose colleagues stated that he always kept his door closed). Another person said: “I don’t go there, it’s a real chicken coop. To communicate, my door stays open 95% of the time so that I can stay in contact” While there is movement across the centre, it is to go from one office to another or to the printer, but nobody stops to talk. The irony was that a breakdown in the computer system was needed for the central area to be used by a large number of occupants in the way that the management had always wanted. A user explained to us: “While the computers were down, all the people on the floor came out of their offices to find out what was going on. For nearly half an hour we talked together, firstly about the breakdown, and then, as time went by, work problems in general and, finally, about life outside the workplace”.

The office door had a highly particular role in this environment broken up by glazed partitions. The role changed according to specific situations. Having previously worked in an open-plan layout, the occupants had to first learn how to use the doors. A person described the installation period to us: “For the first few weeks, we asked ourselves if we shouldn’t be making phone calls, drawing up lists to group questions together or invite colleagues to join us in the central space. Each person established his own particular way of meeting others and having exchanges”. Paradoxically, having previously worked in an open-plan office, everyone felt that they were being observed, and this represented a considerable problem. Called the aquarium effect during an interview, users felt “exposed” by the glazed walls. Time was needed to normalise the situation. However, the doors continued to represent an adjustment problem. Several interviews confirmed that a person telephoning from his office often needed to find an arrangement with a person looking at him from outside the work station if the closed door indicated an absolute refusal to be disturbed or simply a way to filter out persons who were not welcome.

A department manager had fewer doubts as to the significance of his behaviour insofar as co-workers were concerned. He stated: “My colleagues have learnt what it means if my door opens after a phone conversation. It means that I am – once again – available to them. They even understand that after a very long phone call, the open door means that I’m available for a chat”.

# Methods and tools for evaluation of usability in buildings

Siri H. Blakstad, Geir K. Hansen, Wibeke Knudsen  
SINTEF / NTNU, Norway

## Abstract

*From our perspective, buildings are means of production, and should be evaluated based on their potential to support organizational performance and achievement of goals. This paper presents examples of methods and tools for assessing usability of buildings used in different research projects at SINTEF and NTNU during the last 5 years. The purpose of this overview is to describe and discuss the different methods and reflect on their relevance for different aspects of usability. The paper will discuss different aspects which are important for usability evaluation, such as purpose of evaluation, user perspectives, parameters for evaluation, methods as participatory instruments, scales and measurement, as well as levels of evaluation. The paper will present and discuss examples of methods used for research and development purposes from the projects “Usability, case Nylåna, Norway”, “The Knowledge Workplace”, and “Children and their use of spaces”.*

*This paper’s objective is to contribute to further development of theories and methods for evaluating Usability, developed within the CIB workgroup 111, Usability of workplaces.*

**Key-words:** Usability, Buildings in use, Evaluation methods

## INTRODUCTION

Buildings are built for a purpose: for education, for work, to live in, etc. Depending on how well they serve their purpose, buildings contribute to efficiency, effectiveness, and satisfaction for their occupants. Even so, most occupants, owners, designers, and constructors never perform evaluations of how well their buildings perform. According to CIB (2005) conventional approaches to building performance have focused on technical, functional, and operational aspects of their use. Only recently, building performance of buildings in use has been studied. For organizations, a large proportion of cost is related to facilities. Thus, the cost/benefit ratio of facilities should be of great importance to companies. Any potential benefit for enhanced performance due to more efficient and effective buildings, which enhances different user groups’ satisfaction, will improve the cost/benefit ratio.

The concept of usability was first developed in the 1950s, for ICT and software development (Leaman, 2000). Usability means the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency, and satisfaction in a specified context of use (ISO 9241-11). Usability of buildings is a much younger subject, as the work of applying the Usability concepts to buildings has only been going on for under a decade. This means that both the theoretical and the methodological aspects of studying buildings in use with usability in mind are still developing. Theories, concepts, and methods are tested and discussed, and relations to other building research subjects, such as design theory and Post Occupancy Evaluation, are analyzed. This paper is one input to that debate, as we aim at reflection on different existing methods, and discussion of further development of methods that can give better understanding and knowledge about usability.

When evaluating the usability of buildings, we aim to evaluate the relation between building and people/organization. The users' actions are unpredictable, and there is a long list of user types and groups. Users interpret and interact with the building with all their senses, their cultural and social baggage, and often (at least in parts) unconsciously. Buildings last for a long time, and will have interactions with many user groups at different moments in time (Blakstad, 2001). This means that evaluation of the relation between people and building is challenging. Working with usability, we should not only focus on the individual level, but also look at the impact of the building in the organizational context. How does the building support the work that is performed in the workplace? Will it enhance learning? Or, do buildings have an impact on organizational goals at all?

The definition of usability stresses that usability depends on how a product can be used by specified users to achieve specified goals. According to ongoing discussions in W111, usability can be seen as a process; it is contextual and is developed within the relationship between an organization and its building(s). In his progress report on the work of W111 in Paris February 2008, Keith Alexander states that while functionality can be evaluated on the product (building), usability can not be evaluated on the product - only in the situation of use of the product that depends on users' values in culture, context, time, and situation. He states that usability has partly to do with the properties of the product, but even more with the process of design and use. This is in line with recent theoretical works on Usability, e.g. Fenker (2008) who argues that usability is a process that can only be understood as a social construction. Granath and Alexander (2008) propose to replace the rationalist perspective that argues that usability lies in the properties of the product, with the pragmatic view that usability is connected to user *experience* of buildings.

In our work at SINTEF and NTNU we have focused on buildings as means of production, and their potential to support organizational performance and achievement of goals. A traditional view of production is that the main resources are capital, labour, and production technology. Entering the "knowledge society", information was added to the list of resources for production. In a series of CRE reports Joroff et al (1993) proposed that real estate is the fifth resource for production. In line with this we developed a KUNNE Knowledgeworkplace-model, where workplace performance is related to people (labour), ICT, and space (Gjersvik & Blakstad, 2004). The perspective of workplace, facilities, building, and real estate as means of production also underlies this paper. Usability is, as stressed in the definition, related to achieving organizational goals. In line with this, the effect of the building (effectiveness) is related to productivity and achievement of goals. In kindergartens, good care, learning, and social experience are important goals. In an office building, related to offshore production, a cost effective, safe, and secure production of oil and gas is the goal. Our main perspective is on Usability's relation to organizational goals and output.

This means that methods for evaluation of usability will have to explore the user experience of buildings, the relationship between buildings and multiple users, the process and time, as well as the culture, work style, and goals of the organization. This also means that the concept of usability is both individual and subjective, as well as organizational and collective.

Our discussion will be based on 3 Norwegian research projects undertaken by NTNU and SINTEF. The first case is Nylåna, University College Campus in Levanger, Norway, being one of the first cases developed by CIB Task Group 51, Usability of Workplaces. The second case is the Knowledge Workplace, KWP, a research and development project financed by the Norwegian research council and several large building users and owners. The third case is "Children and their use of spaces" ("Barn og rom").

## EVALUATION OF USABILITY

In this part of the paper we will discuss some factors important for evaluation of usability. This will later be discussed in relation to actual experiences with different methods and tools.

### Purpose of evaluation

In our work with these cases, we have identified at least three purposes for evaluation of usability. First as feedback to planners, owners, users, and Facilities Managers in order to improve usability, both within the given context and as learning for future projects. Second, we have aimed at evaluating usability in order to contribute to general knowledge and research. And third, an understanding of user needs and usability is developed as input to a briefing or design process.

In Building Evaluation Techniques, Baird et al. (1996) presents a framework for understanding the motive for Building evaluation and the evaluation practical or theoretical nature. We have developed this in two dimensions:

- Motive for evaluation internal vs. external
  - *Internal*, attention to decision making and place learning
  - *External*, the motive is outside the user organization, the goal is knowledge
- Nature of study, practice vs. theory
  - *Focused on practice*, empirical, experiential knowledge, close to practice
  - *Theoretical and scientific*, based on theories and empirical testing, traditional scientific lines, rigorous methods, systematic research, test reliability and validity.

Baird also points at the importance of a dialogical process of moving back and forth between theory and practice.

Both nature and motive of study will be important for which methods and criteria one chooses to focus on in any particular study. Methods and criteria are thus both depending on the nature of study and the context, as well as on objectives and actors' points of view.

### Subject of evaluation

As discussed in the introduction, evaluation of usability is related to the user experience and organizational goals. From the definition of Usability, effectiveness, efficiency, and satisfaction are the main factors. According to our perspective on buildings as means to achieve organizational goals, effectiveness is the main purpose. Efficiency and user satisfaction can be seen as tools to enhance effectiveness.

### Level of evaluation

One explanation on the lack of evaluations of building in use can be the fact that evaluations can be quite time and cost expensive to carry out. In Preiser et al (1988) and Preiser (2003), three levels of investigation are described for Post Occupancy evaluation:

- Indicative: Provides an indication of failures and successes of a building. Requires a limited amount of resources
- Investigative: Based on indications from level 1. More topics, detail, and reliability. More time consuming, and requires more competence and more sophisticated methods. Evaluation criteria more objectively and explicitly stated. Benchmarks with state of the art literature and facilities.

- **Diagnostic:** Comprehensive and in-depth investigation. Multi-method strategy. Research approach. Large scale projects, many variables.

In the case of Nylåna, Adrian Leaman states that good usability in buildings depends on robust performance on basic factors like comfort and space provision. If the basics are in place, then other factors tend to follow (Hansen et al, 2005). Follow this perspective; it will be important to define indicators that will give the basic information on usability to improve the building's ability to meet the user's needs.

### **The user perspective**

Most buildings have multiple user groups and different user roles, e.g. pupils/ teachers, staff / customers, patients / medical professionals. In any study of usability, a documentation of the different users and their goals and practice will be essential. In studies of usability it is important to differentiate between users, actors and stakeholders such as end users (individuals, teams, departments, etc), Facility Managers, building owners, visitors, and the society at large.

Different stakeholders and organizational levels have different perspectives considering usability of buildings (Fenker, 2004). In the Nylåna case (Hansen, 2006), the study shows that there are different opinions on the usability issues reflecting different views of the students, teachers, administration, and FM staff. What appears as usable and efficient from a student's point of view does not necessarily mean the same for the staff. The study also concludes that cultural aspects and background play an important role in the different users' evaluation of usability in that case. Any evaluation of usability will have to discuss which user groups are targeted, and output must be related to the perspective of the actual user groups and their contribution to achievement of organizational goals.

### **Methods as boundary objects**

In several of our cases, we have used participatory methods. This means that the users are engaged in a development process, constructing understanding and reflection on their own work practice and their relation to the building. Using such participatory methods and processes, the process and its working documents may act as boundary objects. According to Kjølle et al. (2005), many of the processes and documents used in briefing are really boundary objects, used to construct a common foundation and understanding onto which different stakeholders with different languages, expertise and knowledge can actively explore the user's experiences and needs. From the participatory methods used in our work, we have learned that it is very useful to engage different user groups collectively in order to construct a better understanding of their experience with usability within the actual context.

### **Scales and measurement**

The question of what usability means and how we can understand the concept is essential in the design for exploring usability. This is directly related to the question of indicators and how we can measure usability in a certain building, for a particular organization, at a specific time. As discussed above, evaluation of Usability involves many factors, and many of them are difficult to quantify. So far in our research, most of the research has been explorative, using qualitative methods, often case studies, as research strategies. For more descriptive and causal studies we will need to develop methods that give us quantitative data and defined indicators that may allow us to benchmark between multiple cases. So far, only the surveys have produced this kind of data. At this stage in our research, most emphasis has been on exploring usability factors and testing methods. This is an important first step into developing more robust research designs. It might however be that we discover that the nature of our

research problem, to discover how buildings support organizational objectives, is hard to explore with descriptive and casual studies due to the dependency on the different contexts and many interdependent variables.

Ongoing discussions in our research projects suggest that there are both context dependent and generic parameters and factors in evaluation of Usability. To our knowledge, there has been no research to determine the relation between context dependent and generic factors. Further research will have to investigate this, both on the organizational and the individual level. For now, these issues should be discussed for each case.

## **METHODS AND TOOLS – EXPERIENCES FROM 3 RESEARCH PROJECTS**

In this part of the paper we will describe and discuss some of the methods and tools used in the three cases.

### **Document analysis**

In order to establish context and situation of the cases, all three projects started out with document analysis. Such analysis includes briefs and architectural descriptions and project presentations, minutes, drawings, articles, annual reviews and company presentations, other case-studies within same context, reports on work environment and operation, etc. From our cases, we have seen that this is a relatively fast and efficient way to familiarize us with the case and to understand the background and premises for original project and the present situation.

In the case of Nylåna, the document analysis gave an important input to the comparative analysis of the program requirements, the changes during the project development and the use of the building after completion. Together with interviews, the analysis identified imbalance between physical concepts and pedagogic principles (Hansen et al., 2006).

### **Interviews**

Interviews were used in all three projects. Together with document analysis, interviews with key informants have been used to create the initial understanding of context and situation in both Nylåna and Barn og rom. Interviews are also used in all three cases to explore users' experiences with the building in use and with working in the organization. In the Nylåna case, individual interviews focused on user experiences with the relationship between users' needs and what the building actually offered. Group interviews (semi-structured) have been an important method in the KWP project where they have been used for several purposes:

- To learn to know new companies and departments and to understand their use of space and existing work practice, often prior to major workplace changes
- To understand the use of new offices (½– 1½ years since moving in), use of space and new work practice
- To evaluate processes (moving into new workplaces, user involvement, and design process)
- As preparation for user surveys

In the Barn og rom case, parents, employees, and building owners were interviewed. In addition to this, we used group interviews with children. The children were taken on a “walk-through” and videotaped. During the interview, they spoke of their impressions and experiences, and acted out many of the different possibilities of use in the building.

Interviews have been a powerful and important method in all three projects. In these cases interviews have proved to be well suited for exploring complex situations and relations, such as usability. With group interviews we have also seen that the effect of talking together, focusing on usability and the organisation and its relation to the building, is important as a participatory tool as well as for evaluation.

Another important lesson from all three projects is that semi-structured and open interviews on a complex issue like usability requires a skilled and reflective interviewer. This is especially the case with children, where this is a special skill. Another important aspect is that we have seen that we are much better equipped to analyse and extract meaning for the interviews within a multi-professional team. In the case of Barn og Rom, this was essential to be able to analyse the data from the interviews.

Obviously, the findings from interviews will depend on the selection of interviewees and which questions are being asked. This highlights the importance of a more standardized framework and a vocabulary that support evaluation on usability.

### **Walk-through**

In the different case study reports in CIB W111, walk-throughs are the most commonly used methods for evaluation of usability. Walk-through is a qualitative, but systematic, way of assessing different aspects of building by using different stakeholders as informants. The Walk-through is not really one method, but a common term for several different techniques, in which informants are taken on a “tour” of the building, assessing different qualities and shortcomings of different parts of the building.

In the Barn og rom case, the walk-through worked as a method to gain fast input on three aspects: Positive/negative impressions and experiences, and suggestions for improvement of different parts of the buildings. The results were analyzed by looking at input from three different user groups: employees, parents, and researchers. The findings from the walk-through were later used as a starting point for interviews, observations, and analysis of video material. As mentioned before, the children were also taken on a walk-through and interviewed. The session was videotaped, and served as important material as documentation of in-situ interviews with children.

In the Nylåna case, we had representatives from teachers, administration staff, students, and FM staff. Together, their knowledge covered a wide range from technical aspects to accessibility, functionality, and user satisfaction. The participants’ definitions of key-factors essential for the building’s suitability reflected their work tasks and experiences with the building.

In both projects, we have seen that the walk-through is a simple and rapid way of getting the first overview and indications of the usability of the building. The results from the walk-through and the quality of the evaluation will depend on who is participating, the preparations, the route for the walk-through, and the focus of the evaluation. One example of this is that in the Nylåna case, one of the participants had a physical handicap that helped us understand aspects of accessibility. Similarly, greater detail came from the staff from the music and nursing departments in the group.

### **Surveys, questionnaires**

In the Nylåna case, we attempted to use a well-tested and developed Post Occupancy Evaluation, Building use studies (Leaman & Bordass, 2001). The Nylåna case came out very high on the benchmarks with other UK buildings, but the survey failed to detect the lack of special types of space in the building, as well as the gap between organizational objectives and new ways of teaching, and the building. These aspects were uncovered using other methods (interviews and walk-through).

In the Nylåna case, we found that the survey gave some hints about the effectiveness of the building, but it is not specific enough to give detailed information on efficiency. This may reflect the difference in culture and focus on different aspect of usability between the Scandinavian countries and the UK.

The question of what usability means, and how we can understand the concept, is essential in the design of a questionnaire exploring usability. This is directly related to the question of indicators and how we can measure usability in a certain building, for a particular organisation, at a specific time. From this case study, we see a need for developing the questionnaire to give more answers regarding the efficiency and effectiveness of the building. Topics like way of working, need for space need for technology, flexibility, and adaptability would be more central in this survey.

Buildings in Use focuses on indoor climate and comfort, but not on issues related to usability as such. In the KWP case, the survey focused on a wider range of criteria. A web-based end-user survey based on 5 standard modules was developed, each with several questions (Hatling & Molberg, 2007):

- Needs, demand. How well the workplace satisfies end-users, when it comes to individual and collective work, knowledge production and sharing, concentration
- Satisfaction and work environment
- Use of space and place
- Physical work environment, air, temperature, noise, space for storage, furniture and equipment aesthetic
- The process, moving in and out of new offices, participation, adaption to workers' needs and preferences, information, etc.

In addition to the standard questions, each company is given the possibility to add other questions that are relevant to their situation. 1100 respondents have answered the questionnaire so far, and the response rate is between 50-80 %. The survey has been used in approx. 20 different offices (departments) in 6 different companies, and it is thus possible to benchmark results between both departments within one company and between different companies.

The experience from KWP is that if the right criteria are developed, user surveys may be a beneficial tool for evaluation of certain aspects of usability. User surveys will also give possibilities for standardized questions and scales, which can be applied for benchmarks. The experiences from both Nylåna and KWP suggest that surveys should be a part of a multi-method strategy in order to uncover issues not detected in the survey.

### **Participatory methods, workshops, narratives and pictures**

As mentioned earlier, Usability methods can be used both in order to analyse and evaluate existing building – user relationships, as well as for design and development of new projects. In the KWP project, the main focus has been on the latter, and since our objective has been related to organizational learning and development, several participatory methods and tools



have been developed and tested. Among the methods are workshops with users and managers, describing business aims and objectives as well as discussing future work and facilities. In the KWP project, we have focused on participatory processes, in order to articulate and develop aims and objectives and to make them operational for use in design. Tools in such workshops can be metaphors, pictures, etc. Evaluation of usability must be related to organizational objectives. Thus, reflection on objectives and relationship between work practice, use, and building, is important also for evaluation. Workshops, as well as other participatory methods, can be used as boundary objects in order to define and develop understanding of objectives and work practice, and as facilitators for the users' reflections over their use of space and place. Other participatory methods used in the KWP project are narratives (learning stories), and pictures taken by the users to illustrate their relation to space.

### **Documentation of use of space: observation, videotape, and photographs**

Both in KWP and in Barn og rom, we used observation, and researchers' documented actual use, activities, and movement in the building. In the Barn og rom case, the observation was supported by videotape and pictures of the children using the space for different activities. The recordings focused on documenting children's use of space, interaction between children, and interaction between children and adults. The observations were analyzed by a multidisciplinary research group. Analyzing video observations, was a necessity in ways of analysing informants which to a scant degree were able to express their needs, and describe their preferences in words. Photos of children's activities and use of space were taken by one of the researchers. Matched with a description of the situation in which they were taken, the photos were a powerful tool for the research team in analyzing children's preferences in their use of space.

### **Analyses of space and movements in space**

In the KWP project, analysis of space and spatial relations has been developed in relation to planning and design of new facilities. The same methods have not so far been used to evaluate workplaces in use. Some of the knowledge from the development projects should, however, be useful also for evaluation:

- Identification of functions with different characteristics, e.g. activity, noise, concentration, movement, etc.
- Analyses of the relations between such functions: zoning, etc.
- A layered design approach to floor-plan layouts in order to improve flexibility, where the main structures, the "footprint", represent structures and functions that are not expected to change as rapidly as other functions, such as the workdesks, etc.

In the Barn og rom project, both functional analysis of the floor-plan and Space syntax analysis (Hillier et al., 1976) were conducted. The Space syntax studies analysed integration, control, and depth of the special structures in different kindergartens. The Space syntax analysis was compared with the observation of movements of children and adults in space. Movements were registered continuously and drawn into floor-plans to create a "map of movement" through the building. The analysis of movement compared with the Space syntax analysis, showed which part of the kindergarten that was the most central and actively used. Compared with findings from observations, the analysis of the floor plan gave interesting findings. The kindergarten where the most integrated room coincided with their natural meeting place functioned a lot better than the kindergarten where the most integrated room was a narrow, non-furnished room.

Mapping movement, combined with Space analysis, is a powerful tool to identify actual use over time. However, there is a need to develop a useful and efficient tool for systematic gathering and analyzing mapping of movements, as observation requires much time and resources.

### **User patterns, Time/activity/space studies**

In the KWP project, two different systems for analysis of use of space and time have been developed.

- Self-reported use of time. Selected users are given the task of reporting the start and end of every activity (for typically 1 week). They will record the actual time (hh:mm), if they are alone or together with another person, and a short description of the activity. The results are later punched into a worksheet, and activities registered as standardized activities, such as: formal meetings with colleagues, social meetings with colleagues, individual work in front of computer, etc (Paulsen & Hatling, 2008).
- Registration of presence in facilities. The number of people presents in cellular offices, office landscapes, and different meeting rooms, were registered into handheld PDAs every half hour during 2 weeks. Each room was given a code, and the different departments were analysed and compared based on their actual presence within the facilities.

Both registrations gave valuable data about present use of the buildings, and were used as input to design of new facilities. Their value for Usability as such seemed to be limited, as effectiveness and user experience were not assessed.

### **Work pattern, culture analysis and work styles**

In relation to the KWP project, two short surveys have been developed in order to access the nature of work and the work culture in the company (or individual departments). In the method which is used to place the user organisation in relation to its work culture, a survey with 20 questions is developed (Paulsen & Hatling, 2007). Another method used in the KWP project, is the use of semantic differentials in order to rate qualities and challenges in the present workplace.

Both methods have proven to be valuable as boundary objects in discussions about present and future use of workspace. It has not so far been used as a tool for evaluation, but it might be used as such in a participatory process.

### **Combination of methods**

Usability is in many ways a “wicked problem” (Granath & Alexander, 2008). Wicked problems have no definitive formulation of solutions, and they are open to multiple interpretations (Rittel & Webber, 1973). Exploring “wicked problems” will usually require multi-method strategies. In all three cases we have used different methods – and the results from each method are discussed in relation to each other. In Barn og rom, we used the research group as a panel in order to discuss results and interpret video and pictures. The research group consisted of different professionals, and the different viewpoints and competences were vital for developing the final results. In the KWP project, user groups are used to discuss relevance, interpretation, and meaning of findings, in much the same way.

## **CONCLUSIONS**

The purpose of this paper is to discuss important aspects of evaluation of usability, and to present experiences from some of the methods and tools we have used during the last years. Our most important finding is that though we have documented a wide variety of methods, very few of them aim directly at evaluation of usability, related to organizational objectives and effectiveness. In most cases, the assessments from users are more based on their personal experience than on the fulfillment of organizational objectives. We find a number of different methods for evaluation of efficiency both related to buildings and to organizations. We have quite a few methods for evaluation of effectiveness and satisfaction, but effectiveness is more difficult to assess. Related to our perspective on buildings as means of production, effectiveness will be the most important. This means that we still need to develop criteria, measurement scales and methods to deal with effectiveness. Of the methods we have used so far, interviews, participatory methods, and walk-throughs are methods that will be well suited for further development in order to evaluate effectiveness, but we will also need to develop criteria that can be used in quantitative studies such as questionnaires.

Usability is complex, but in studies of usability we will have to narrow down the number of parameters and criteria. In our 3 case projects we have seen that the complex nature of Usability highlights the importance of triangulation of methods (multi-method strategies) and research teams with different backgrounds and skills. We have described usability as context dependent, and related to user experiences and social relations between users and facilities. This means that we so far have not been able to pinpoint any generally accepted key performance indicators, or even commonly accepted criteria and benchmarks for Usability. This will be addressed in forthcoming projects at NTNU / SINTEF, where we are looking for methods to define usability of several objects within a portfolio in more resource-efficient ways.

In our studies, we have studied the relation between organizations and physical environment. We have seen that other parameters than physical environment are as important for Usability as buildings and space. We have also seen that physical environments may be important in order to fulfill organizational goals. In all three case-projects we have seen that the key to good usability is related to good relations between the people and the building and clear organizational strategies for work and use of buildings. This supports the proposition that usability cannot be evaluated by assessing only physical parameters, and will be important when we continue development of methods for evaluation.

In further research, we aim to explore how buildings support organizational goals using output from descriptive methods as input to participatory processes. Developing tools and instruments for the continuous dialogue between the building supply side and the organizational demand side, we aim to meet the need for tools to enhance long time effective facilities.

## **References**

Alexander, K., & Granath, J. Å. (2008) **A theoretical reflection on the practice of designing for usability**. Unpublished paper CIB W111.

Amundsen, H. et. al. (2007) **Barn og rom, refleksjoner over barns opplevelse av rom**. Trondheim Norway. SINTEF Byggforsk.

Baird et al. (1996) **Building Evaluation Techniques**. McGraw-Hill.

Blakstad, S. H. (2001) **A Strategic Approach to Adaptability in Office Buildings**. PhD thesis, Norwegian University of Science and Technology.

CIB (2005) **Usability of workplaces, report on case studies**. Rotterdam, Netherlands, International Council for Research and Innovation in Building and Construction.

Fenker, M. (2008) **Towards a theoretical framework for usability of buildings**. Unpublished paper. CIB W111.

Gjersvik, R., & Blakstad, S. H. (2004) Designing Knowledge Workspace. Archetypes of Professional service Work as a Tool for change. In: Carlsen, A., Klev, R., & von Krogh, G. **Living Knowledge**. New York, Palgrave Macmillan, pages 140 – 163.

Gjersvik, R., & Blakstad, S. H. (2004) Towards Typologies of Knowledge Work and Workplaces. In **Facilities Management. Innovation and performance**, red. Alexander et al. , London, SPON press.

Hansen, G. & Knudsen, W.(2003) **Usability – A matter of perspective**. Paper. Changing user demands on buildings. ISBN 82-7551-031-7. CiB W70 Trondheim International Symposium. Trondheim, Norway 12. – 14. June 2006

Hansen, G., Haugen, T. et. al.(2005) **Usability of workplaces, Nord-Trøndelag University College Nylåna, Røstad**. ISBN 82-14-03428-0. Trondheim, Norway. SINTEF Teknologi og samfunn and NTNU.

Hatling, M., & Molberg, M. (2007) **KUNNE funn om åpne arbeidsplassløsninger**. Unpublished article.

Joroff, M., Louargand, M., & Lambert, S. (1993) **Strategic Management of the Fifth Resource**. Corporate Real Estate. IDRC.

Kjølle, K. H., Blakstad, S. H., & Haugen, T. (2005) Boundary objects for design of knowledge workplaces. In: **Proceedings of the CIB W096 Architectural Management**. Denmark 2005.

Leaman, A. (2000) Usability of buildings: the Cinderella subject. In **Building Research and Information**, Vol. 28 (4), pages 296-300.

Leaman, A. & Bordass, B. (2001) Assessing building performance in use: the Probe occupant surveys and their implications. In **Building Research & Information**, Volume 29, Issue 2 March 2001 , pages 129 – 143.

Lindahl, G., & Granath, J. Å. (2008) **Culture and Usability**. Unpublished paper. CIB W111.

Molberg, M. (2007) **KUNNE Karakter. KUNNE metodebatteri**. Trondheim, Norway, SINTEF Teknologi og samfunn. Available at <[www.kunne.no](http://www.kunne.no)>.

Hatling, M., & Molberg, M. (2007) **KUNNE funn om åpne arbeidsplassløsninger**. SINTEF Teknologi og samfunn. Unpublished article.

Hillier, B., Leaman, A., Stansall, P. & Bedford, M. (1976) Space syntax. In **Environment and Planning**, B 3(2), pages 147 – 185.

Paulsen, T. (2007) **KUNNE Praksis. KUNNE metodebatteri**. SINTEF Teknologi og samfunn. Available at <[www.kunne.no](http://www.kunne.no)>.

Paulsen, T. & Hatling, M. (2007) **KUNNE Kultur – de konkurrerende verdier. KUNNE metodebatteri**. SINTEF Teknologi og samfunn. Available at <[www.kunne.no](http://www.kunne.no)>.

Preiser, W. F. E., Rabinowitz, H. Z. & White, E. T. (1987) **Post Occupancy Evaluation**, Van Nostrand Reinhold company.

Preiser, W.F.E. (2003) **Improving Building Performance**. Washington DC  
US, NCARB Monograph Series.

# **Usability in the Workplace: Case study of Pamela Youde Eastern Hospital Hong Kong**

**Jan Ake Granath  
John Gilleard**

## **Abstract**

The paper firstly introduces the concept of usability in the workplace as an extension of the more commonly applied post-occupancy evaluation.

Continuing the paper describes background information on CIB Working Commission W111 Usability in the Workplace before describing a recent case study based on the remodelling of an OR hospital theatre. Finally, reflections on the case study are highlighted, emphasizing the importance of effectiveness, efficiency and satisfaction when evaluating usability.

**Keywords:** Usability, Workplace, Health Care, Design, Participation

## **BACKGROUND**

Over the past three years an international group of researchers and practitioners have conducted a series of six case studies to investigate the concepts and meaning of usability.<sup>1</sup> The common point of departure of the participants has been that, as a mixed group of practitioners and academics, all have been working with users of workplaces and work environments.

The work focuses on the outcomes of design and seeks to understand why despite the involvement of experienced managers and skilled designers of workplaces, and extensive research in design and briefing methods, post-occupancy studies and evaluation methods too often show that the resulting buildings cannot be used efficiently or effectively by the users / occupants. Previous studies have shown that these design outcome inadequacies have been reported by Gutman (1988, 89), Preiser (1995) and more recently by Hinnersson (2005).

## **RESEARCH PROBLEM**

Building performance appraisal has typically focused on issues such as functionality, serviceability and accessibility. Building performance appraisal may also be extended to the design intentions through post-occupancy evaluation, (POE). In this way POE ideally identifies ways to improve building design 'fitness for purpose' by attempting to assess how well buildings match user' needs. POE generally uses direct user feedback as the basis for

---

<sup>1</sup> Laboratoire Espace de Travail, La Villette, Paris, France, Norwegian University of Science and Technology (NTNU), Trondheim, Norway, Chalmers University of Technology, Gothenburg, Sweden, University of Salford, Greater Manchester, UK, VTT, Transport and Buildings, Helsinki, Finland and Hong Kong Polytechnic University, Hong Kong.

evaluating how buildings work. POE is typically used to fine tune a new building, manage 'problem' buildings and assist with the remodelling / refurbishment of existing buildings.

However, both the assessment of building performance and POE tends to be post-design / construct activities with little or no input during the design phase. In addition, building performance measures and POE tend to treat buildings statically, ignoring the dynamic nature of businesses and organizations that inhabit the building's space. This is in contrast to the occupying organizations who consider buildings as workplace settings that are required to mirror the evolving nature of the organization's activities. Hence, to better understand workplace settings, the International Council for Research and Innovation in Building & Construction (CIB) recently established Working Commission W111 "Usability in the Workplace".

## Research methodology

The project adapts and develops a methodology previously used in an EU research project entitled Workspace (EuroFM, 2000), by working through a series of interactive 'best practice' workshops to consider the results of case studies of buildings-in-use. The workshops involve the participation of organisations, organised as clusters of 'stakeholders' to represent the interests of owners, occupiers and operators of buildings. The clusters are organised as action learning sets, providing the opportunity to share learning and experience in the business context of the case study organisations.

The overall project uses a multiple case study approach. An initial set of five case studies<sup>2</sup> have been carried out to test the adequacy of the framework, survey methods and to identify the overriding issues, which are of concern to different stakeholders. These five cases have been reported in separate case reports. The data was assessed at the level of holistic cases (projects), embedded cases (incidents within projects) and through cross-case comparisons at both of these levels (Alexander et al 2004). The sixth case study at the Pamela Youde Nethersole Eastern Hospital (PYNEH) in Hong Kong is reported in this paper and will be further described in a forthcoming case report.

## Theory

Usability means making products and systems easier to use, and matching them more closely to user needs and requirements. Wikipedia describes usability in terms of "*denoting the ease with which people can employ a particular tool or other human-made object in order to achieve a particular goal. Usability can also refer to the methods of measuring usability and the study of the principles behind an object's perceived efficiency or elegance.*"

Usability research is typically associated with web design and 'Human-Computer Interaction', although it has more general applications related to making products more efficient to use. For example, it takes less time to accomplish a particular task. It is easier to learn – often by simple observation and, in terms of human psychology, imparting greater satisfaction in use. International standard, ISO 9241-11 also provides guidance on usability and defines it as "*the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use*".

---

<sup>2</sup> NCR, Discovery Centre, Dundee, UK, Örebro University Hospital, Örebro, Sweden, Old Mill Business Centre, Turku, Finland, Nord-Trøndelag University College, Røstad, Norway and Technocentre Renault, Guyancourt, Paris, France.

Usability is about:

- Effectiveness - can users complete tasks, achieve goals with the product, i.e. do what they want to do? Effectiveness has to do with the effect of something. Often we interpret effectiveness as the ability to reach target we have set up; to get the desired effects of something.
- Efficiency - how much effort do users require to do this? Efficiency is a term used in many contexts. Common to most meanings is that it, in some way, has to do with the ratio of a system's work output to its work input.
- Satisfaction – what do users think about the product? Satisfaction in common language has to do with being content, the fulfilments of a desire or a need.

Unlike POE or other existing methods to measure performance, 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. In turn the user also influences the product's effectiveness, efficiency and satisfaction. For example, are the users highly trained and experienced, or are they novices? What are the users trying to do with the product and does the product support what they want to do with it? Finally, the usage situation (or 'context of use') and how the product is being used is also important. This implicates that usability is dependant on culture, context and situation and changes with time (Granath and Alexander, 2006).

## THE PYNEH CASE STUDY



Recently the W111: Usability in the Workplace group completed a usability study in Hong Kong. The project related to an operating room (OR) remodelling project undertaken at the Pamela Youde Nethersol Eastern Hospital (PYNEH) in Hong Kong. The W111 team based their investigation on interviews with PYNEH management and staff in the specialist medical department, including those who participated in the remodelling exercise and users who did not. The team had previously noted that strategic organizational change frequently requires the need to reconfigure space and the concept of usability has been shown to be a useful adjunct to traditional methods for determining success.

Hong Kong's health services now face increasing demands for greater efficiency, higher resource utilization and innovation. PYNEH opened in 1993 under the management of the Hong Kong Hospital Authority. The hospital is located on the East Side of Hong Kong Island. It serves a population of approximately 600,000. The hospital has more than 1,800 beds, 3000 plus staff members and a total floor area of approximately 150,000 square meters on a



land site of ten hectares. The mission of the hospital is, “*to excel in the provision of holistic, patient-centred, quality health care through loving, dedicated and cohesive team effort*”. PYNEH acts as a role model in the health care arena following best practices, introducing new technologies and innovative projects in public hospitals of Hong Kong.



PYNEH recently pioneered a new operating theatre concept, the Minimal Access Surgery (MAS)<sup>3</sup> unit by creating the first integrated OR for both endoscope<sup>4</sup> and laparoscopic<sup>5</sup> surgery in Asia. The earlier technology made it sometimes necessary to conduct the endoscope diagnostic in a separate space and close the patient to have to reopen the patient at a later time in OR. Attendant with the increase in laparoscopic surgery procedures a whole array of equipment previously absent from the OR has emerged resulting in an uncontrolled proliferation of monitors, cables, tubing, and other equipment. These have typically been housed on large wheeled carts frequently overwhelming small operating suites that were not designed to accommodate this new technology. This can result in operative inefficiencies and safety problems for patients and staff.

For example, the inability to place video monitors in the direct sight line of surgeons and OR staff may increase fatigue and potentially increase surgical errors. In case of emergencies, access to the patient by the anaesthetist and OR staff may also be suboptimal. Patient safety may also be compromised since equipment controls are frequently near the sterile field, making it difficult for nursing staff to access control in a timely and sterile manner. Finally the time spent in setting up for routine video procedures may affect the flow of OR schedules and decrease OR efficiency.

It was with this background that the PYNEH decided to reconfigure one of four OR. However, the new OR faced a number of critical challenges. For example, during the remodelling period – 5 months – the other three OR were required to function normally. In addition, the OR would be a unique facility in Asia with no known precedent. Hence the team had to adopt an “*invent it as you go along*” design methodology. Fortunately the champion behind the work, Surgeon Li, was able to bring together a strong team representing the

---

<sup>3</sup> Also called MIS – Minimal Invasive Surgery

<sup>4</sup> Endoscopy is a minimally invasive diagnostic medical procedure used to evaluate the interior surfaces of an organ by inserting a small tube into the body, often, but not necessarily, through a natural body opening. Through the scope one is able to see lesions and other surface conditions (Wikipedia).

<sup>5</sup> Laparoscopic surgery, also called keyhole surgery (when natural body openings are not used), band aid surgery, or minimally invasive surgery (MIS), is a surgical technique (Wikipedia).

clinical staff, the facility management group as well as, critically, the medical equipment supply company. The facility manager acted as the day-to-day project leader. Her task was made easier by the unique culture of cooperation that developed between the surgical team and those charged in doing the work. Fortunately the latter group was a relatively small team of individuals who had long experience of working together. Their relationship was based on mutual professional respect, shared trust expressed through patience, politeness and a willingness to ask opinions of one another. The final outcome of the project has been a resounding success. This is evidenced by the staff nurses commenting that the OR reconfiguration had significantly reduced their physical stress when handling equipment, had increased the OR equipment flexibility and most tellingly improved “quality patient-central care through teamwork”.

## REFLECTIONS ON USABILITY

All too often users have to adapt their working practice and operations to suit constraints imposed by the facility rather than the facility adding value to their business. In the case of the PYNEH OR project the remodelling work was designed to meet the users’ objectives i.e. providing surgeons and nurses a meaningful, valuable and manageable workplace over which they have control, permitting them to operate at lower level of stress, with increased efficiency of working and hence improved productivity. Designed from the inside the project may be said to be a first for Hong Kong, a uniquely ‘usable’ space.

Looking at earlier experiences from the five European case studies there are parallels with the PYNEH design case. Part of the success in the PYNEH case was the close co-operation between core business and the team that designed and provided the new space. In the NCR case a method called Community Based Planning were used to involve the users of core business in the process. In the Örebro case, which also included design of a number of operating theatres, the user participated very explicit in the design of the units. Another parallel to the Swedish case is the close co-operation and the sense of shared commitment between all participants in the project. This is somewhat atypical for the Hong Kong hospital sector. On the other hand, the Örebro project followed long term official policy created through negotiation and legislation between the participants

The strong leading role the core business had in both the Swedish and the Hong Kong cases was important for the *effectiveness* of the new operating theatre. The hands on involvement of the surgical staff in the design was important to the *efficiency* of the OR. Finally the close co-operation and shared commitment between the teams vouched for a *satisfactory* solution that supports usability both for core business and for the FM team that maintain the OR.

## REFERENCES

Alexander, K et al (2004) Usable workplaces, proceedings of CIB World Congress, 2004, Toronto, Canada.

EuroFM (2000) Workspace: improving production quality via workspace design, Final Report.

Granath, J.Å. and Alexander, K (2006) A theoretical reflection on the practice of designing for usability, proceedings of The European Facilities Management Conference – EFMC 2006, Frankfurt, Germany.

Gutman, R. (1988) Architectural Practice: A Critical View Princeton, N J Princeton Architectural Press.

Gutman, R. (1989) Human Nature in Architectural Theory: The Example of Louis Kahn, Architects People. ed. Russel Ellis and Dana Cuff, 105-129. New York, NY: Oxford University Press, Inc.

Hinnerson, J. (2005) Måluppfyllelse i lokalförsörjningsprocessen – En studie av vårdsektorns byggande. Lic.avh. Göteborg, Sverige: Arkitektur, Chalmers tekniska högskola.

ISO 9241-11 Usability Net (2006) [http://www.usabilitynet.org/management/b\\_what.htm](http://www.usabilitynet.org/management/b_what.htm)

Preiser, W.F.E. (1995) Post-occupancy evaluation: how to make buildings work better, *Facilities*, Vol. 13, Number 11, pp 19-28.

# **Space for the digital age – a usability study**

Per Anker Jensen  
Technical University of Denmark

## **Abstract:**

**Purpose:** The paper presents an evaluation of a new broadcasting facility with focus on the usability of the new workplaces and working environments and the satisfaction both with the user involvement and the finished buildings.

**Methodology/approach:** The evaluation is mostly based on post occupancy evaluation including an interview survey among managers and staff in DR. The results of the survey are analyzed in relation to the intentions for the new facility and the concept of usability.

**Findings:** The research indicates that the involvement of the users in briefing and design has a clear positive effect on the finished buildings and the user satisfaction. Besides measuring satisfaction, the study also indicates a number of ways that the facility supports and improves the efficiency and effectiveness of the working environment and the organisation.

**Research limitations:** The survey covers 18 respondents at an early stage after occupation and the results are qualitative. The intention is to follow up with further evaluations of both quantitative and qualitative nature.

**Practical implications:** The study can help the user organisation to improve the facility and other organisations to learn from this case.

**Originality/value of paper:** The paper provides a case study with presentation and evaluation of a new architecturally and technologically advanced media centre and contributes to the understanding and methodology to investigate the usability of workplaces

## **Keywords:**

Usability, workplaces, user involvement, post occupancy evaluation.

## **INTRODUCTION**

This paper presents an evaluation of the usability of a new media centre (DR Byen) for Danish Broadcasting Corporation (DR) in Copenhagen, Denmark. The paper is based on the author's experience as deputy project manager in the client organisation for the building project during briefing and design as well as research as a university researcher, which includes a post occupancy evaluation based on an interview survey among DR's staff after their move to the finished building complex.

The evaluation concerns the buildings as work environment, the involvement of users in the planning process as well as the fulfilment of the vision for the new media centre. The

investigation aims at gathering the experiences from the building project, and the research has been carried out in collaboration between Danish Technical University (DTU) and DR's client organization. The evaluation is also part of the international research project "Usability of Workplaces" carried out in collaboration between CIB W111 and EuroFM's Research Network Group. As part of this project a workshop took place at DR Byen in April 2007 to present and discuss preliminary results from the evaluation with representatives from the client organisation, the Danish research team and the international research group.

## **DR and DR Byen**

DR is a national public service broadcaster of television and radio financed by license fees. Until the relocation DR had 12 different addresses and two main centres in Copenhagen – Radio House from around World War II and placed close to the city centre of Copenhagen and the Television Centre from the 1960's and 1970's placed 10 km north of Copenhagen. With the new development DR has relocated all functions in the Copenhagen area to the new media centre called DR Byen (DR Town) and placed in a new part of Copenhagen on former military land close to the city centre and serviced by a new Metro line.

During the planning process DR formulated a vision for DR Byen shown in Figure 1.

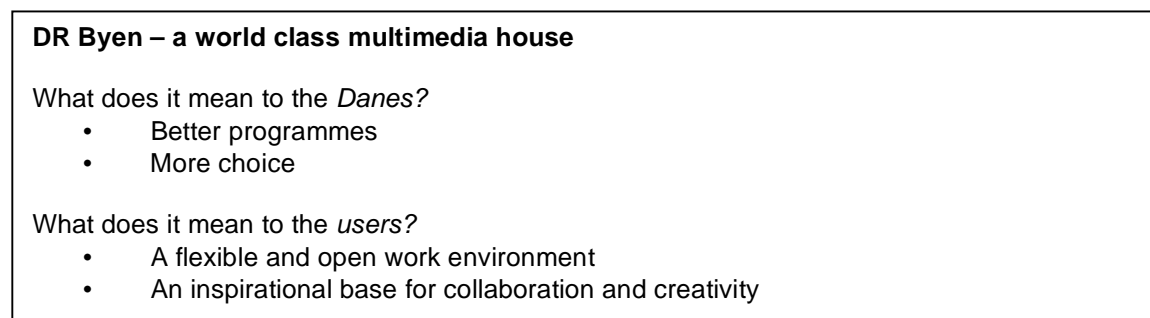


Figure 1. DR's vision for DR Byen (DR, 2003)

The main reason for the relocation was the revolutionary changes in the electronic media from analogue to digital technology. This change involves a convergence of information and communication technologies and has been the basis for the introduction of new ways of producing radio and television. Today editing of video and sound is done on computer based technology like text editing and the possibility of content sharing has increased tremendously. This means that journalists and other program staff can do many tasks in the production of electronic media, which earlier were specialist tasks carried out by technical staff – very similar to the changes in the division of labour between journalists and typists in the printed media during the 1970's. In DR, these changes were followed up by the formation of a new multi-media organisation, where the earlier strong division between departments producing radio in Radio House and departments producing television in the Television Centre has been replaced by departments, which both produce radio and television as well as diverse on-line products. Besides these technological based reasons, an overall purpose with the relocation was to change

DR's image and corporate culture from the monopoly era to become a modern, open and dynamic organisation.

The new media centre is a huge building complex with 130.000 m<sup>2</sup> including full basement. The decision to start the project was taken in 1999. Based on a master competition in 2000 the complex was divided in four rectangular buildings designed by different design teams. The four buildings are placed in one big rectangle which is separate by an artificial canal in north-south direction and joined together with a connecting "Internal street" in east-west direction, which cross the canal on the second floor as a four storey high glass covered bridge building, see Figure 2.

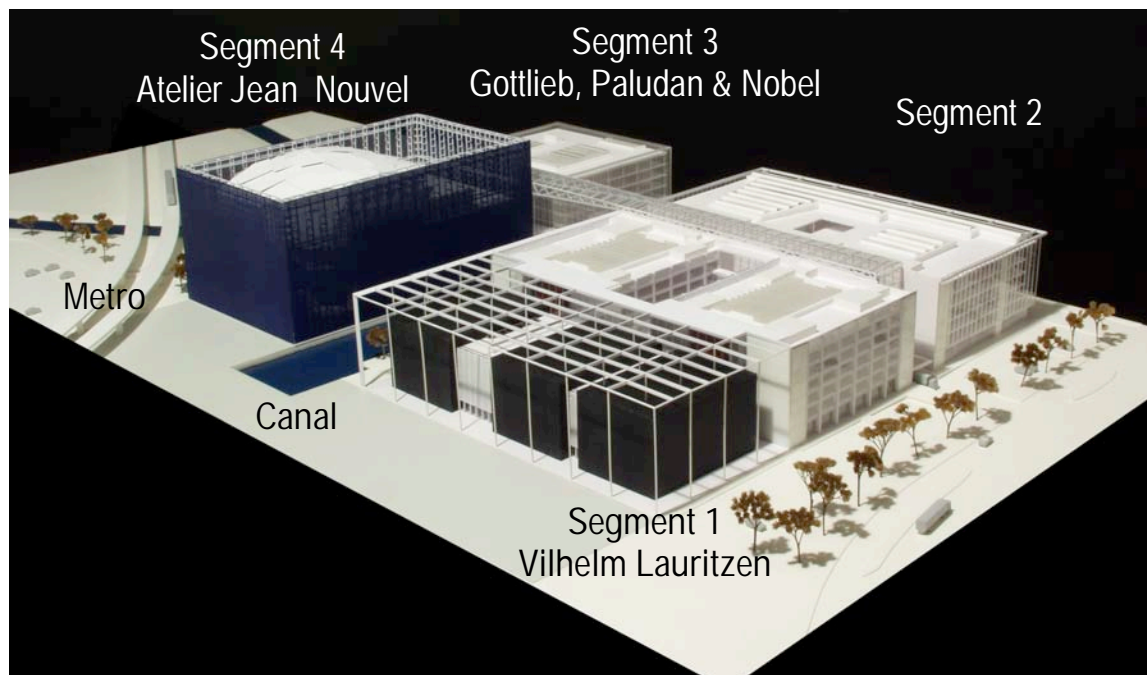


Figure 2. Model photo of the final design – seen from south-east

The complex is in general 6 storey's tall except for one part (segment 4) that includes the concert hall and has a total height of 45 m above ground. The building with the concert hall is designed by the French architects Atelier Jean Nouvel. The Danish architects Vilhelm Lauritzen AS won the master plan competition and has designed the largest building (segment 1) and the Internal Street. The other buildings are designed by Danish architects Dissing + Weitling AS (segment 2) and Gottlieb, Paludan & Nobel. (segment 3).

Segment 1, 2 and 3 were occupied gradually during 2006. Only these parts of the complex are covered by this evaluation. Segment 4 has been severely delayed and the office part was occupied in June 2007, while the concert hall will be open to the public early 2009.

## **THE EVALUATION**

One of the objectives of the evaluation is to clarify to what extent the intentions, requirements and expectations to the use value of the buildings have been fulfilled. Another objective is to identify what could have been done to increase the use value, and what possible adjustments can be made to improve the buildings. In a wider sense the purpose is to contribute to the development of methods to evaluate the usability of buildings and workplaces and to utilize the experiences from DR Byen in improving future building projects.

The planning of the building project took place with a very extensive involvement of the users in the process. This included the briefing, the building design and the interior planning process. The user involvement and the briefing process are dealt with in more details in Jensen (2006). During briefing and building design about 20 user groups were actively involved and in the interior planning as many as 50 groups with approx. 300 users - 10% of all staff – were actively involved. One of the objectives of the investigation has been to evaluate, what the effect has been of the user involvement and the staff satisfaction with the involvement process and the finished buildings.

The evaluation concerns the generally usable spaces in DR Byen with main focus on the workplaces in open environments and the common areas like cafés, atria, the Internal Street, staff restaurant, meeting areas and service facilities. Special rooms like studios and editing suites are not evaluated as such, but the relationships between the open environments and the special rooms was also part of the evaluation.

The evaluation puts particular emphasis on the fulfilment of the requirements and intentions in relation to obtaining buildings with attractive and creative working environments, a pleasant indoor climate, the possibilities to easily adapt the layout to changing organizational needs and good opportunities for informal contacts across physical and organizational divides. Attempts were made to clarify what impact the new physical surroundings have on the way DR's organization functions and performs and its possibility to develop over time. The satisfaction among staff with the buildings was also investigated.

The results presented here are based on a first and early qualitative evaluation in spring. Further studies including a quantitative questionnaire survey and more in-depth qualitative methods like walk-throughs and workshops are planned. The evaluation is documented in full in a research report in Danish (Jensen, 2007a) and various aspects of the building project has been described and analyzed in a research report in English (Jensen, 2007b).

### **Method**

The interview survey included a total of 18 interviews with people employed by DR. The interviewees were evenly distributed among managers, who all had been involved in the planning of DR Byen, and other members of staff – out of which 6 had been involved in user groups during the planning of DR Byen and 3 had not been involved.

The interviews were carried out as semi-structured qualitative interviews using an interview guideline with about 60 questions divided in four themes:

- Evaluation of the new surroundings
- User involvement
- The overall process
- The Vision for DR Byen

Questions were as far as possible formulated openly. As a main principle all interviewees were asked the same questions, but questions about the overall process were mostly asked to those who had been involved. In some cases additional questions were asked dependent on the interviewee. Each interview lasted about 1 hour. The interviews were recorded and written minutes were sent to the interviewees for comments and acceptance.

Before the survey, the managers among the interviewees were contacted by mail by DR's client organization with information about the investigation. Afterwards they were contacted by DTU, and arrangements for the interviews were made. The managers were asked to appoint the members of staff to be interviewed. None of the people contacted refused to participate in the survey.

The 18 interviews took place from 19. March to 16. May 2007, and at the time of the survey people had worked between 4 and 12 month in DR Byen. There was still a huge building site around the occupied buildings, and the Internal Street was not finished, but had just been opened between segment 1 and 2 without any service facilities in operation. In the occupied segments there was still trouble shooting going on both in relation to the building and the technology. Major changes in DR's organization also took place during the period.

However, most importantly, DR went through an economical crisis at the time with severe cuts being announced shortly before the survey, and as a consequence about 10% of the staff were going to be made redundant. The cuts were partly due to budget overruns on the building project – mostly related to the concert hall in segment 4. At some points during the period of the survey strikes occurred among DR's staff as protests against the redundancies.

This situation in the survey period could influence the results negatively. The economical situation has clearly had an impact on the replies to some of the questions, and particularly on those related to the vision for DR Byen concerning the possible effect on DR's broadcasting output. Besides these questions it is the impression that the interviewees mostly have been capable to separate DR's economical conditions from their evaluation of the physical environment in DR Byen and the previous planning process.

The report with the results of the evaluation was sent to DR's client organisation and to each of the respondents and only positive feed-back has been received.



## **RESULTS**

The results of the interview survey are presented anonymously. The presentation follows the division in the four themes in the interview questions.

### **Evaluation of the new surroundings**

The overall impression of DR Byen is generally positive. The diversity due to the involvement of four different architects and the transparency and the light in the buildings are emphasized as positive aspects. It is appreciated that everything is new and also that DR has become more united than before. The architecture is also mostly evaluated positive. The newsroom atrium with open and curved balconies is regarded as exceptional, but also other atria and high rooms are valued.

The workplaces and furniture in general function very well but the working environment is anonymous and impersonal, and some find that there is too little space. The views are very much divided in relation to the open environment. The managers are generally positive, even though they get more disturbed than before, but they are also more accessible for the staff. One of the staff representatives does not thrive at all in the open environment and prefers to work at home as much as possible. The views are also divided whether there has been an increase in knowledge sharing or not, but it is seen as an advantage that people sit closer to each other, and it is easier to see who are present. Another advantage is that more groups and departments have been placed more together than earlier. In spite of problems with trouble shooting for instance in relation to ventilation, light control and sun shades, the indoor climate is mostly evaluated positively. Some mention that the acoustics in the open environment work surprisingly well.

Most respondents find that there is more contact across the organization in DR Byen than before. Cafés and informal meeting places are used very differently. Some of the cafés are used as meeting places, while others are used only as kitchens. Those of the common areas that have been taken into use are generally evaluated positive. The atria are used in varying degrees. The staff restaurant is regarded as boring and has problems with logistics and capacity. The meeting centre functions well, but the architectural quality of a great meeting hall does not live up to some managers' expectations.

It is in general difficult to evaluate the impact of the new surroundings at the moment. It has become easier to change the layout of workplaces. There are some indications, that efficiency has increased, and there is a great potential for increase in productivity, but problems with technology has limited the benefits for those involved in production of radio and TV. The relocation has created a stronger coherence in the organization, and a more united culture has evolved.

The things that people miss in DR Byen are mostly of intangible character like ambience and atmosphere – particularly some of those who used to work in the old Radio House. The smoking policy with a total ban on smoking indoor is evaluated as positive and is accepted and followed, but the conditions in the outdoor smoking area are not satisfactory.

## **User involvement**

The group based approach has worked well and was in accordance with the culture in DR. The sizes of the groups – maximum 10 during briefing and design and 8 during interior planning - were appropriate. Information exchange with the interior architects has been satisfactory and improved through the process, and the staff was well informed. The inputs from the users were implemented in various degrees. The process was mostly characterized by consensus with few conflicts, and differences in views have been handled well. The managers find that they had strong influence, but several members of staff find that the managers were equal partners in the involvement process.

The amount of staff resources used in the process has in general been on a reasonable level in relation to the outcome of the process. However, some managers feel that too many resources were used in the involvement process, while some members of staff find that the users' possibilities to influence the result were too limited.

The most important outcome is that the staff has been mentally prepared to move and feels ownership to the final result. Contrarily, a process without user involvement is regarded to have created dissatisfaction, more complaints and greater resistance to changes. Most find that the user involvement has led to buildings that suit the needs of the users better. The user involvement led to a higher degree of motivation among staff during the process, but after the relocation one does not notice any difference in motivation between those who were involved in the process and those not involved.

In general, there is satisfaction with DR Byen, even though there are differences in the level of satisfaction. Among the interviewees most managers find that there is great satisfaction while some of the members of staff are more uncertain.

## **The overall process**

In general there has been a good coherence between the main processes in the planning of DR Byen, although there were some problems with the timing, particularly for the technology. The client organization has been sensitive to the needs of DR's organization, but there have in varying degree been problems in the communication between the different architects and the users. The management of the planning process should have been stricter.

### *The vision for DR Byen*

The views are divided whether a world class multimedia house has been or will be created. Many believe and hope that DR Byen will become a world class multimedia house.

A flexible and open work environment has been created for the users, but the flexibility has not yet been utilized very much. Most of the interviewees also find, that DR Byen provides an inspirational base for collaboration and creativity, or that this will be achieved when the Internal Street is completely finished.

The views are very divided – both among managers and staff – about DR Byen’s impact in relation to DR’s broadcasting output to the Danish people, and the economical situation influences the evaluation considerably. Several expect that DR Byen over time will lead to better programmes, and some also think that DR Byen will provide more choice.

## **DISCUSSION**

The concept of usability is defined in ISO 9241-11 as: “The extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use” (ISO 1998). In relation to usability of workplaces a Norwegian project has developed a framework for usability criteria, where efficiency is sub-divided in efficiency related to organisation and efficiency related to building, effectiveness concerns added value understood as increased potential for cooperation, learning, innovation, adaptability etc., and satisfaction is sub-divided in satisfaction for employees and satisfaction for customers (Hansen & Knudsen, 2006).

This evaluation has not concerned efficiency related to building and satisfaction in relation to customers. The focus has mostly been on satisfaction for employees (including managers), but there have also been attempts to uncover the efficiency related to the organisation and the effectiveness in terms of added value. The following is an attempt to characterize the usability of DR Byen by summarizing the evaluation in relation to these 3 criteria and the effects of the user involvement.

### **Efficiency**

Relocation of the organisation from 12 addresses into one facility have clear organisational benefits with directorates and departments being placed together without having to spend transport time to meet and with general easier internal communication. Besides that, the increase in efficiency is mostly related to the open workspaces, which means that it is easier to move around and adapt the configuration of the work environment to the changing needs of the organisation. The potential for increased productivity is high due to a more functional layout, for instance short distances between workstations and studios, but problems with technology were impediments at the time of the evaluation.

### **Effectiveness**

It is difficult at this early stage to evaluate the buildings’ possible impact on the effectiveness in terms of added value for the organisation, but there are some indications of actual and potential impacts. It takes time to learn to know and fully use and utilize the new environment. However, it is an advantage for the internal collaboration that people are placed close together and can see who are present. There is also more contact across department and the common areas are used for informal information and inspiration, but still not to their full potential. Several respondents expect that DR Byen over time will lead to better programmes. There are signs of a change towards a stronger coherence in the organisation and a more united corporate culture.

## **Satisfaction**

The satisfaction with the new working environment is generally high. Managers are mostly very satisfaction while the degree of satisfaction is more varied among other members of staff. The disagreement mostly concerns the open workspaces, which some of the staff are opposed to. The furniture works well, but the working environment is impersonal. Several respondents find that it is a pleasure to move into a place with architectural diversity and where everything is new, but some finds that the new buildings lacks atmosphere and spirit. The transparency of the buildings dominated by glass walls is mostly regarded as positive, but it has created some problems with privacy.

### *User involvement*

The satisfaction with the user involvement is also generally high – both among managers and staff – even though some managers feel that too much time was spent on the involvement and some members of staff would have liked more influence. The user involvement has resulted in buildings that better suit the needs of the user. The staff has been mentally prepared to move in and to the general change process that has been part of the relocation. The effect has also been an increased motivation for the work in DR for many of those who have been involved directly in the planning process, but this effect has only lasted for a limited period.

## **CONCLUSION AND RECOMMENDATIONS**

In spite of the economical crisis in DR during the survey period with announcement of cuts and redundancies, and in spite of the trouble shooting going on in relation to both buildings and technology the interview survey shows an overall positive evaluation of DR Byen after occupation by the 9 managers and 9 staff representatives involved in the investigation. The managers are - not surprisingly – the most positive, while the views from staff are more mixed. However, most of the staff representatives are positive and only a few are very critical. The involvement of the users in the planning has been important for the usability of the buildings.

### **Recommendation for DR's organization**

DR Byen was defined to be the physical environment for a new way to produce electronic media with focus on creativity and cross organizational collaboration, with possibilities to dynamically change the organization and creation of a new corporate culture as well as a new image based on openness to the surroundings and the public. Before the move great efforts were made to prepare DR's organization to the new conditions – for instance by user involvement – and it is important to continue this development of the organization to realize the potential, which DR Byen represents. The investigation indicates that the effect on staff motivation from the user involvement is no longer working.

It is recommended that DR consciously continues to disseminate the ideas behind DR Byen and create events, activities and learning processes in the organization to enable the staff to become informed about and experience the opportunities in the buildings, including possibilities to meet across the organization and use the common areas. The managers in DR have a crucial position

in this respect, and it is important that all managers have the necessary knowledge, commitment and ability to take the lead in the process.

### **Recommendation for further evaluations**

This interview survey is a preliminary qualitative evaluation of DR Byen carried out at an early stage when the building project is not completely finished, and the staff has only worked fairly short time in the buildings. Therefore, it is recommended to follow-up with further evaluation of both quantitative and qualitative nature.

The crisis in DR during the survey period of this evaluation makes it even more interesting to see how the results are in a follow-up evaluation at a later stage, when DR's economy and organization is less turbulent, and the buildings are in a more finished condition. More specifically it is recommended, that DR carries out a questionnaire survey among all staff to provide a complete quantitative evaluation of the staff's experience and satisfaction with DR Byen. Such a survey could be part of a general survey on staff satisfaction in DR's organization, where the normal questions are supplemented by a number of questions related to DR Byen.

Furthermore, it is suggested to make a more in depth qualitative study implementing a method based on walk-throughs, which was introduced by Kernohan et al (1992) and has been developed in the international research project "Usability of workplaces" and tested in case studies of buildings, for instance in Norway (Hansen & Knudsen, 2006) and Finland (Rothe, Gersberg & Nenonen). When using this method, the researchers take a tour around the buildings together with a group of users, and based on the concrete physical aspects they meet on their way, comments and evaluations from the users are collected in relation to a number of focus points, which are discussed at a workshop after the tour. Based on this the researchers can make an overall evaluation of the buildings in relation to the selected focus points.

### **REFERENCES**

- DR (2003): *Indretning af DR Byen.(The interior planning of DR Byen)*. Policy statement from DR's director to the staff, 10. March 2003.
- Hansen, G.K. & Knudsen, W. (2006): *Usability – A Matter of Perspective? The Case of Nord Trøndelag University College*. Proceedings of CIB W070 Facilities Management and Maintenance. NTNU, Trondheim.
- ISO (1998): *Guidance on Usability*. ISO 9241-11.
- Jensen, P.A. (2006): *Continuous Briefing and User Participation in Building Projects*. In *Proceedings of the joint CIB, Tensinet, IASS International Conference on Adaptability in Design and Construction*. Eindhoven University of Technology, Netherlands, 3.- 7. July 2006, vol. 3.
- Jensen, P.A. (2007a): *Evaluering af DR Byen efter indflytning (Evaluation of DR Byen after occupation)*. Research report R-173, BYG-DTU.
- Jensen, P.A. (2007c): *Space for the Digital Age – Defining, designing and evaluating a new world class media centre*. Research report R-175, BYG-DTU.
- Kernohan, D., Gray J., Daish, J. with Joiner, D. (1992): *User Participation in Building Design and Management*. Butterworth Architecture, London.
- Rothe, P., Gersberg, N. & Nenonen, S. (2007): *Usability Attributes of Business Parks*. Proceedings from 6th EuroFM Research Symposium. EFMC 26.-27. June 2007. Zürich.

# **Customer Journey – a method to investigate user experience**

Suvi Nenonen, Helsinki University of Technology  
Heidi Rasila, Helsinki University of Technology  
Juha-Matti Junnonen, Helsinki University of Technology  
Sami Kärnä, Helsinki University of Technology

## **ABSTRACT**

Workplaces are stages for work experiences. There is a need to understand the experience as a definitive factor in workplace management. However the ways to investigate the experience are many and there are many perspectives to approach the methods. This paper aims to answer the question how to assess the work environments from the user perspective, as part of user experience?

The methods for user orientated workplace management are presented. The conclusions indicate the different objects of different methods, which all together provide rich data for workplace management, user organisation and other stakeholders – for the ones creating user experiences.

**KEYWORDS:** Customer Journey, Work Environment, Usability, Method

## **INTRODUCTION**

We are entering – or have already entered – the experience economy (Pine and Gilmore 1997; LaSalle and Britton 2003). For the building owners and facility managers it is a challenge to understand how they, from their part, could create environments that enhance user experience. Although the term "user experience" has been used extensively in recent years, it has been associated with a wide range of meanings (Forlizzy and Battarbee 2004). Unlike usability, user experience tends to include wider human experience dimensions (such as pleasure, fun, and other emotions) and also may have a temporal or longitudinal component. The customer experience is a blend of company's physical performance and the emotional evoked, intuitively measured against customer expectations across all the moments of contact (Shaw and Ivens 2002)

While usability tends to be focused on task efficiency and effectiveness measures, user experience includes emotional and perceptual components across time. The user experience consists of perceptions that shape emotions, thoughts, and attitudes. User experience involves a constant feedback loop repeated throughout the usage lifecycle including from initial discovery through purchase, out-of-box, usage, maintenance, upgrades, and disposal. (Beauregard *et al.* 2007) The concept of customer satisfaction is outcome-oriented focusing mainly on functionality of the service/product. Experience in contrast, is process-oriented including all the moment of contacts and emotions during the experience (Schmitt 1999).

If user experience is the significant factor in designing, constructing, maintaining and developing e.g. work environments, one has to understand how to increase knowledge about

user experiences in work environments. It is essential to shift the focus from working processes towards employee experiences. The question arises: How to assess the work environments from the user experience perspective?

To answer this question this paper proposes a methodology for assessing the experience as customer journey. The methodology is built in a gross-disciplinary manner: the post occupancy evaluations (Barrett and Baltry 2003), usability walk-through audits (e.g. Nenonen and Nissinen 2005; Riihiahho 2002) and service process evaluations (Gummesson and Kingman-Brundage 1992) are combined with insight from customer journey (Christopher, Payne and Ballantyne 1991). It is suggested that these analysis could enable to understand user's experiences, activities and factors, which are significant for the usability.

## **POST OCCUPANCY EVALUATION, USABILITY WALKTHROUGH, CRITICAL INCIDENT TECHNIQUE AND CUSTOMER JOURNEY**

### **Facility oriented approach – Post Occupancy evaluation**

Post-Occupancy Evaluation - POE (Preiser *et al.* 1988) is the process of systematic collection of data on occupied built environments, analysis of these data and comparison with performance criteria. POE's are particularly aggravated to the users' needs, preferences and experiences. It assesses how well buildings match users' needs, and identifies ways to improve building design, performance and fitness for purpose. Building users are all people with an interest in a building - including staff, managers, customers or clients, visitors, owners, design and maintenance teams, and particular interest groups such as the disabled. It uses the direct, unmediated experiences of building users as the basis for evaluating how a building works for its intended use.

POE is also a formal way of determining whether a recently occupied or remodeled building is performing as was intended in its programming and design (Horgen and Sheridan 1996). Post Occupancy Evaluation can be used for many purposes, including fine tuning new buildings, developing new facilities and managing problem buildings. Organisations also find it valuable when establishing maintenance, replacement, purchasing or supply policies; preparing for refurbishment; or selecting accommodation for purchase or rent. (Preiser 1989.)

Indicators for success of the building are for instance a high occupancy level, a positive appraisal by occupants and visitors, and easy to let (low vacancy rate, small number of movements). Indicators for failure are for instance complaints of users, negative comments of experts, high running costs or a burglary rate above average. Over the years there is a growing awareness of the importance of Total Building Performance Evaluation, also including technical aspects, building physics and costs (Preiser and Schramm 1998).

There are numerous methods of data-collection such as questionnaires, individual and group interviews, behavioural mapping, technical assessment tools and mathematical models, each with its own pros and cons. World-wide sound instruments such as the Real Estate Norm, Serviceability Tools and Methods and other scaling techniques are used in order to measure functional aspects such as usefulness, accessibility, health, safety, and flexibility. (Voordt 1999)

Some critics claim that such assessments concentrate too much on technical aspects of the buildings. It is focusing on building, giving feedback instead of feed-forward and needs additional methods to achieve the user. (Alexander *et al.* 2005; Voordt 1999)

### **Usability oriented approach – Usability walkthrough**

A CIB Task Group 51 “Usability of buildings” has been created to apply concepts of usability, to provide a better understanding of the user experience of buildings and workplaces. Usability is defined as the “...effectiveness, efficiency and satisfaction with which a specified set of users can achieve a specified set of tasks in a particular environment” According to this definition, a product’s usability is determined by 3 key factors:

- Effectiveness – whether users can achieve what they want to do with the product
- Efficiency – how long it takes them to achieve it
- Satisfaction – their feelings and attitude towards the product

The first level of the usability decomposition is what is called usability attributes. Usability attributes are precise and measurable components of the abstract concept that is usability. Usability attributes include e.g. that systems are easy and fast to learn, efficient to use, easy to remember, allow rapid recovery from errors and offer a high degree of user satisfaction.

It also means bringing the user perspective into focus. The term usability describes whether or not a product is fit for a specific purpose. Usability, or functionality in use, is concerning the buildings ability of supporting the user organizations economical and professional objectives. (Jensø *et al.* 2004)

The methods to assess usability are developed mostly in information and communication technology. However they can be applied to physical built interfaces and infrastructure as well as to virtual interface and infrastructure. Heuristic Evaluation (Nielsen and Mack 1994) identifies usability problems early in the design phase. One can provide mock-ups, in order to avoid usability problems. Formal Usability Inspection can be additional for mock up assessment. Riihiaho (2000) describes the usability walkthrough as the method, which guides the analysts to consider users’ mental processes in detail instead of evaluating the characteristics of the actual interface. The method can be used also in very early phase in the design process to evaluate designers’ preliminary design ideas. On the other hand the context of the tasks and the users’ characteristics must be well specified so that the users’ mental processes will be articulated. Cognitive Walkthrough (Rowley and Rhoades 1992); (Wharton *et. al.* 1994) is a task oriented usability inspection method. Its focus is on ease of learning. Cognitive walkthrough is based on a theory of learning by exploration according to which users try to infer what to do next using cues that the system provides.

Pluralistic Walkthrough (Bias 1991) looks into how users react in different situations. The pluralistic usability walk-through session include participants from several groups: the users (present or potential) of the workplace, system developers like architects, designers and constructors and usability experts. It is best used in the early stages of development, as the feedback garnered from pluralistic walkthrough sessions is often in the form of user preferences and opinions. Together the participants gather information about the usability by



inspecting the workplace. In the end of the session the whole group discusses the findings they have made.

Feature Inspection (Nielsen and Mack 1994) aims to find out if the feature of a product (e.g. meeting rooms) meets the users need and demanding. This method is used at its best in the middle stages of development. At this point, the functions of the product and the features that the users will use to produce their desired output are known. This can be enriched with consistency inspections, which look for consistency across multiple products from the same development effort. Guidelines and checklists help ensure that usability will be considered in a design. Usually, checklists are used in conjunction with a usability inspection method. (Nielsen 1993).

Usability assessing methods are interested in understanding the development of interface from the user perspective. It is widening the perspective from functionality to functionality in use. However the logic for usability walkthrough has to be approached more specific way.

### **Process and experience oriented approach – Critical Incident Technique and Customer Journey**

Walk-through audits have been used also in service industries, mostly in hospitality industry (see Fitzsimmons and Fitzsimmons 2004; Fitzsimmons and Maurer 1991). The service process audits have some insight that lack from e.g. post occupancy evaluation. This insight is related to the fact that service process audit literature notices the process nature of services and starts analysis by defining the processes that are carried out in certain premises. As Koljonen and Reid (2000) put it:

*An understanding of any professional service creation and delivery system begins with a comprehensive description of the client service process.*

A basic method to understand and to describe service processes is service blueprinting. The method was introduced by Shostack already in 1984. In service blueprint the service processes and interactions are visualized as a flowchart (see for example Koljonen and Reid 2000). This approach has some disadvantages; first, it typically looks at the processes rather from company than customer perspective. Second, the blueprint illustrates only the observable actions or events (Kingman-Brundage 1989).

Other methods for analyzing service processes are service mapping (Kingman-Brundage 1989; Gummesson 1993; Gummesson and Kingman-Brundage 1992) and sequential incident technique (SIT) (Stauss 1993; Stauss and Weinlich 1995). The first is, as service blueprinting, more company focus whereas SIT is more customer focused.

Sequential incident technique draws from critical incident technique (CIT) in which the customer is asked to describe those moments in service process that were in some respect exceptional – either in good or in bad. Then the data is classified into different types of experiences with content analysis. (Bitner *et al.* 1990) For our purposes the approach has two limitations; first the process dimension is not clear and second the normal incidents are excluded from the analysis. Sequential incident technique bypasses these problems. It looks at entire processes and includes also those incidents that are not exceptional. As Stauss and Weinlich (1995) state: “The fundamental purpose of the method is to record all incidents customers perceive in a specific service transaction sequentially in the course of the

consumption process.” The first step is to construct a “customer path diagram” (compare with blueprinting). This diagram shows the typical path customer follow when involved in some service process. Suggested methods for data gathering are single interviews, group interviews, surveys and observation. The aim is to understand what customers typically do during the service process (Stauss and Weinlich 1995). This is called customer journey.

The customer journey is the cycle of the relationship/buying interaction between the customer and the organisation (“what we put our customers through if they wish to, and do, do business with us”). It is a visual, process-oriented method for conceptualising and structuring people’s experiences. Customer-journey means the customer’s transition from never-a-customer to always-a-customer. This has been described by others (Christopher, Payne and Ballantyne 1991) as a customer staircase or ladder. On this journey the value of customers will change. These maps take into account people’s mental models (how things should behave), the flow of interactions and possible touch points. They may combine user profiles, scenarios and user flows and reflect the thought patterns, processes, considerations, paths and experiences that people go through in their daily lives.

The customer life cycle usually starts when the customer wants or needs a product or service and will continue to the point where the product is reclaimed, redeemed or renewed. The organisation’s aim is to manage this journey in such a manner that maximises value both for the customer and for the organisation. Different authors use different amount of phases in customer journey. They are summarised in Table 1.

Table 1. Phases in customer journey

Phases from customer to commitment perspective	Phases from customer experience perspective	Phases from process perspective
Suspect - could the customer fit to company’s target market profile	Need - I’m considering a purchase – who should I approach?	Orientation
Prospect - customer fits the profile and is being approached for the first time	Enquire - I make general enquiries to possible suppliers.	Approach
First-time customer - customer makes first purchase	Approach - I decide to make more specific enquiries to a selected few	Action
Repeat customer - customer makes more purchases	Recommendation - They make recommendations and/or send proposals	Depart
Majority customer - customer selects your product/company as supplier of choice	Purchase - I decide to purchase and place my order with one supplier	Evaluation
Loyal customer - customer is resistant to switching suppliers; strong attitude	Experience - They supply and I use the product or service.	
Advocate - customer generates additional	Problem - I have a problem that is	

Phases from customer to commitment perspective	Phases from customer experience perspective	Phases from process perspective
referral currency	reported to and handled by the supplier.	
	Reconsider - I'm considering purchasing something else – should I go back?	

The Customer Journey is a systematic approach designed to help organisations understand how prospective and current customers use the various channels and touch points, how they perceive the organisation at each touch point and how they would like the customer experience to be. This knowledge can be used to design an optimal experience that meets the expectations of major customer groups, achieves competitive advantage and supports attainment of desired customer experience objectives.

When the customer path or user journey is understood, the SIT moves on to second phase – namely assessing the customer experience during this path. This is done with interviews or surveys. After the entire data has been collected, it may be then analyzed. If they survey is conducted, then statistical methods are applicable. If the customer experience is studied by interviews more qualitative methods are applicable. (Stauss and Weinlich 1995)

## METHODS IN INVESTIGATION OF USABILITY OF BUSINESS PARKS

The usability of business parks can be approached by methods presented above. One way to define Business Park itself can be defined either in a product orientated way “*A landscaped area containing high tech, other amenities for business purposes, as distinct from high-tech park or a science park. Building density is lower than would be usual in a traditional industrial estate. Business Parks are preferentially located where motorway, rail and airport communications are within a short distance.*” Narains (2006) or in a process orientated way as: “*Collection of companies of more or less related activities, in close proximity, exploiting the benefits of synergy*” (Promitheas 2006)

Business park consist on several buildings, which of course provides possibilities to use post occupancy evaluation in a relevant way, because the quantitative data is easy to collect. Post occupancy evaluation provides also comparative data if the surveys are conducted before and after the change, e.g. removal.

Usability walkthrough method in business parks rises up a question, who is the user. There is need to define different user groups. The tenant organizations in the business parks form one user group. Their customers are important users too. Thirdly the service providers in the business park are one user group. The usability is different for different user groups.

Critical incident technique concentrates in service processes in the business park – this method is relevant when understanding business park in process orientated way. The method allows information especially about the service processes within a business park and indicates the service blueprints in the service environment.

Customer journey in Business Park allows researcher to investigate the user experience as a part of the customer journey process. This differs from usability walkthrough method in a way that in customer journey one defines the moments of relationships during the customer journey. Usability walkthrough concentrates on usability of the functions of the environment.

Table 2 summaries the characteristics of different methods. Together they provide a complete illustration of the phenomena as well as rich data.

Table 2. Summary of different methods

Method	Research Object	Research Techniques	Presentation of results
Post occupancy evaluation	Building	Survey - quantitative	Diagrams
Usability walkthrough	Attributes, usability of functions of the buildings	Participative interviews during the walkthrough (discussion during walkthrough) or after the walkthrough (silent walkthrough)	User paths and maps
			Qualitative descriptions
		Observations	Classifications
			Recommendations
Critical incident technique	Service process	Interviews – qualitative	Descriptions of transactions – process descriptions, service paths
		Observations	
Customer journey	Process	Interviews – qualitative	Customer journey map illustrations
		Surveys - quantitative	Process descriptions
			Diagrams

## CONCLUSIONS

This paper described the methods to assess usability of work places. The Post Occupancy Evaluation (POE) method is focusing on building as object instead of process. Usability walkthrough is focusing on qualities of different functions within a building, its attributes. Customer journey provides data about the processes and user experiences in the work environment. These different orientations provide a possibility to gather rich data from the work environment and weight the customer experience from different angels.

The tangible and intangible elements of user experience are both measurable. The advantage of the methods presented in this article is that they can uncover those small details that affect the workplace experience – sometimes to a really great extent. Still they also allow increasing understanding in more general level. Nevertheless, the usage of different methods demands more investigations in order to provide sufficient new data for evaluating and developing user experiences in the workplaces.

## REFERENCES

- Alexander, K., Fenker, M., Granath, J.Å., Haugen, T., Nissinen, K. (2005) *Usable workplaces: action research*. Proceedings. CIB 2005, Combining Forces – Advancing Facilities Management & Construction through Innovation Series, pp. 389-399. 13-16.6.2005, Helsinki, Finland.
- Barrett, P., Baldry, D. (2003) *Facilities Management – Towards Best Practice*, 2<sup>nd</sup> edition. Blackwell Science Ltd. Oxford, 2003. ISBN-0-632-06445-5.
- Beauregard, R., Younkin, A., Corriveau, P., Doherty, R., Salskov, E. (2007) Assessing the Quality of User Experience. *Intel Technology Journal*.  
<http://www.intel.com/technology/itj/2007/v11i1/8-quality/>
- Bias, R. (1991) *Walkthroughs: Efficient collaborative testing*. IEEE Software 8(5), pp. 94–95.
- Bitner, M.J.; Booms, B. H., Stanfield Tetreault, M. (1990) The Service Encounter: Diagnosing Favorable and Unfavorable Incidents, in: *Journal of Marketing*, Vol. 54, No. 1 (, pp. 71-84.
- Fitzsimmons, J. A. and Fitzsimmons M. J. (2004) *Service. management: Operations, Strategy and Information Technology*, McGraw-Hill: London.
- Fitzsimmons, J. and Maurer, G.B (1991) A walk-through audit to improve restaurant performance. *The Cornell HRA Quarterly*, Vol. 31 No.4, pp.95-99.
- Forlizzi, J. and Battarbee, K. (2004) Understanding Experience in Interactive Systems, in Proceedings of the 2004 Conference on Designing Interactive Systems: Processes Practices, Methods, and Techniques, pp. 261–268.
- Gummesson, E. and Kingman- Brundage, J. (1992) Service Design and Quality: Applying Service Blueprinting and Service Mapping to Railroad Services, in: *Quality Management in Services*, P. Kunst and J. Lemmink, eds., Van Gorcum, Maastricht, pp. 101-114.
- Gummesson, E. (1993) *Quality Management in Service Organizations*. International Service Quality Association, ISQA, St. John's University, New York, NY.
- Jensø, M., Hansen, G.K. and Haugen, T.I. (2004) Usability of buildings: Theoretical framework for understanding and exploring usability of buildings. 18.10.2004.
- Horgen, T. and Sheridan, S. (1996) Post-occupancy evaluation of facilities: a participatory approach to programming and design *Facilities* Vol. 14 No. 7/8 pp.16 – 25.

Kingman-Brundage, J. (1989) 'The ABC's of service system blueprinting', in M.J. Bitner and L.A. Crosby (Eds.) *Designing a Winning Service Strategy*, Chicago: American Marketing Association.

Koljonen E.L.-P.L. and Reid R.A. (2000) Walk-through audit provides focus for service improvements for Hong Kong Law Firm. *Managing Service Quality*. Vol. 10 No. 1, pp. 32-46.

LaSalle, Diana and Terry A. Britton (2003) *Priceless. Turning Ordinary Products into Extraordinary Experiences*. Boston: Harvard Business School Press.

Narains (2006) <http://narains.com/glossary.htm>. assessed: 16.8.2006.

Nenonen, S. and Nissinen, K. (2005) Usability walkthrough Usability Walkthrough in Workplaces – What, how, why and when. *Proceedings. CIB 2005, Combining Forces – Advancing Facilities Management & Construction through Innovation Series*, Vol IV, pp. 413-422. 13-16.6.2005, Helsinki, Finland.

Nielsen, J. (1993) *Usability Engineering*. Academic Press, San Diego.

Nielsen J. and Mack R.L. (ed) (1994) *Usability inspection methods*. Wiley, New York, USA.

Christopher, M, A Payne and Ballantyne, D. (1991) *Relationship Marketing*, Oxford, Butterworth-Heinemann.

Pine J. and Gilmore J. (1999) *The experience economy: Work is theatre every business is a stage*. Harvard business press. Boston. USA.

Preiser, W.F.E. (Ed.) (1989). *Building Evaluation*. New York, NY: Plenum.

Preiser, W. F.E and Schramm U. (1998). Building Performance Evaluation. *Time-Saver Standards for Architectural Data*, 233-238.

Preiser, W.F.E., H.Z. Rabonowitz, E.T. White (1988), *Post-occupancy Evaluation*. New York; Van Nostrand Reinhold Company.

Promitheas (2006) <http://www.promitheas.com/glossary.php>. assessed: 16.8.2006.

Riihiäho, S. (2002) The Pluralistic Usability Walk-Through Method, in: *Ergonomics in design*, Vol. 10, No. 3, pp. 23–27.

Rowley, D.E and Rhoades, D.G. (1992) The Cognitive Jog through: A Fast-Paced User Interface Evaluation Procedure., *Proceedings of the Proceedings of the SIGCHI conference on Human factors in computing systems*, ACM Press, Monterey, California, United States, pp. 389-395.

Schmitt, B. (1999) "Experiential Marketing" *Journal of Marketing Management*, 15(13), pp. 53–67.

Shaw, C. and Ivens, J. (2002), *Building Great Customer Experiences*, Palgrave Macmillan.

Shostack, G.L. (1984). Designing services that deliver. *Harvard Business Review* 62, pp. 133-140. 61.

Stauss, B. (1993) "Using the critical incident technique in measuring and managing service quality", in Scheuing EE, Christopher WF (eds) *The service quality handbook*, American Management Association, New York.

Stauss, B. and Weinlich, B. (1995) Process-oriented measurement of service quality by applying the sequential incident method", Tilburg, The Netherlands.

Voordt, D.J.M. van der (1999) "Objectives and methods of POE". Paper presented at FAU, Sao Paulo, Brasil, August 1999.

Wharton, C., Rieman, J., Lewis, C., and Polson, P. (1994) The cognitive walkthrough method: A practitioner's guide. In Nielsen, J., and Mack, R. L. (Eds.) *Usability inspection methods*, pp. 105-140. New York, NY: John Wiley & Sons.

# **USABILITY OF SHOPPING CENTRES: Components of Usability Rating Tool**

Johanna Alho, Helsinki University of Technology  
Suvi Nenonen, Helsinki University of Technology  
Kari Nissinen, Technical Research Center of Finland

## **ABSTRACT**

Usability of workplaces is a research theme in an international CIB 111 series of case studies. Usability of shopping centres is part of this theme and at the same time a research project conducted in Finland as a joint effort with shopping centre managers, designers and construction companies. The theoretical framework for exploring usability has been developed in the previous studies (Rothe 2006). Usability of shopping centres research has two perspectives: how do consumers experience the usability of shopping centres and how do customer organisations, tenants experience the efficiency, effectiveness and satisfaction of using the shopping centre. This paper describes the components which are important in a usability assessment of shopping centres. The structure of a derived usability rating tool is illustrated and methods to use the tool are presented. The paper will also give an overview how the tool is used in the Finnish shopping centre context. The results of the study are significant for both design and maintaining phase of shopping centres and contribute to the continuing process of assessing and developing usability of workplaces.

## **KEYWORDS**

Usability, Shopping Centre, Rating Tool, Finland

## **INTRODUCTION**

The shopping centre industry is an increasingly competitive and complex marketplace. In literature, a shopping centre has been defined e.g. as a “concentration of shops and other commercial establishments which are in individual ownership” (McGoldrick and Thompson 1992). New shopping centre formats and a changing consumer environment are challenges for shopping centre management. Shopping centres provides a physical, social, and virtual interface for different actors. It should be usable for consumers as well as for tenant organisations. A shopping centre is a workplace for tenant organisations and for consumers it is a consumption and entertainment environment. As part of the research project on the usability of shopping centre this study concentrates on both user groups. Its intention is to find a way to assess usability and create usability profiles of shopping centres.

The purpose of the Usability Rating Tool is to provide a method for managers, owners and designers to assess and develop the usability of different places. It can provide information, which can be used in different phases of the building lifecycle: design and planning, construction and finally operation, using and developing. The tool analyses relevant usability attributes. The attributes are specified with different parameters identified during the research. These parameters create profiles of usability from user-perspectives.



This paper first sets out to describe the components which are important in usability assessments. Initially usability is described both in on general level and in the context of shopping centres. Then it is presented how the structure of usability rating tool has been derived from the usability framework. In the following, the empirical part describes how the tool has been applied. Conclusions provide an overview on the tool and its opportunities.

## USABILITY FRAMEWORK

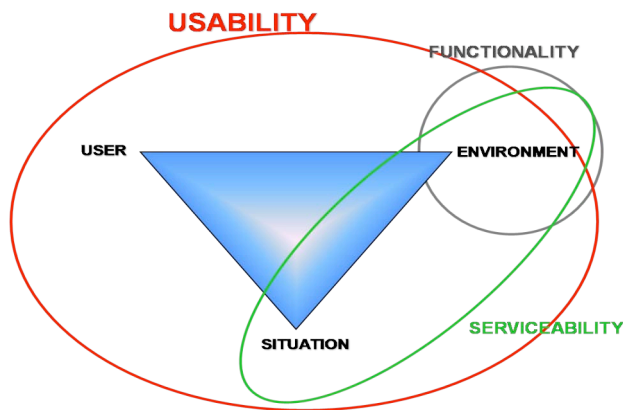
The usability of the workplaces has been identified to influence the work performance, thus impacting on the overall organizational success (Alexander *et al.* 2005). However, usability is much easier to notice in its absence and it is not at all easy to investigate. According to the ISO 9241-11:1998 standard usability is: “[...] *the effectiveness, efficiency and satisfaction with which a specified set of users can achieve a specified set of tasks in a particular environment.*” Standard indicates that there is a general level of usability, which has been often captured by analysing different kind of usability attributes. The application of attributes from product usability is developed further for workplace usability.

Even though, usability is affected by different attributes in the environment, these attributes alone do not create usability, as it is then mainly a matter of functionality. Secondly, usability is a matter of situation and context. Lindahl and Granath (2006) argue that usability depends on the situation in which the artefact is used as well as the context the artefact is designed. Nevertheless, the capability of a facility to provide a range of performances for which it is designed does not guarantee usability either and, as Granath and Alexander (2006) argue, might indeed never be able to achieve it.

Usability is also a matter of the user perspective; the overall usability of a workplace is by definition depended on the user. Additionally, all users are different; they have a different background, different knowledge and know how, different culture and habits (Sinkkonen *et al.* 2002). Mäntylä (2001) describes usability as a phenomenon that has three characteristics: A) the user and his or her knowledge; B) the product, its characteristics and the functions it provides; C) the situation, the tasks and the goals in which the product is used.

Rothe (2006) suggests a usability framework for work environments that integrates Mäntylä’s (2001) views. Based on her framework it is suggested that in order to assess the usability of a certain entity, one must know from which user’s point of view usability is assessed and what kind of goals the user holds. The different aspects of usability are illustrated in the Figure 1.

Figure 1. The Usability Triangle (Rothe 2006)



The different factors affect the way the user experiences the usability of the work environment – shopping centre is work environment but also an entertainment and consuming environment. The basic groups in the shopping centre include tenant organisation and consumers. Latter include a variety of customer segments, which is challenging for usability studies. The challenge is that different users, who are completing similar tasks, might consider the usability of the environment significantly different. Therefore, cultural differences for example are seen to effect on the usability experience (Lindahl and Granath 2006). Hence, the investigation of usability attributes of a shopping centre should be done from a specific user's point of view while also taking the context into account.

As describe in the framework (Figure 1), functionality does not take the user and the situation for which the shopping centre is being used into consideration. Serviceability on the other hand has been described to focus on the capability of a facility to provide a range of performances for which it is designed (Alexander *et al.* 2005), so it covers the object and the context, tasks and goals in which the object is being used, but it does not take the user in to account. Since the overall usability is influenced by the environment and the user as well as the context, all three components need to be considered. This way usability can be improved not only by making changes in built setting, but also in the context and user settings. (Rothe 2006.)

## USABILITY RATING TOOL

### Components of usability rating tool

The usability rating tool is generated from the usability framework taking all three aspects, user, environment and the situation into account. The rating tool includes following three components *Environment Profile*, *User Profile* and *Weighted Usability Attributes*.

The first component, *Shopping Centre Profile*, is about indentifying the place, build environment, interface, which provides a platform for activities. It is defined as physical, social and virtual places. Physical places are tangible, built environments. Social place is an environment for interactions and virtual environment supported by information and communication technology.

The aim of the component is to profile the environment in focus. This means classifying all significant variables of the environment effecting on the usability experience of the users. The variables within this component are both building and concept related. Typical variables are size, occupancy rate, location, layout etc.

The second component is *User Profile*. Understanding the users' is essential in usability rating. User characteristics, knowledge, personality, age and surrounding culture etc. have an impact on the usability experience. In addition to demographical and psychographical data, the user groups should be created in order to understand the context, the situation, why and how the place is used by the users. The recent study by Giuseppe Riva (2005) has highlighted the impact of context in the usability experience. According to him, the focus should be on the context rather than on the environment. As a result of the component, clear profile of the user groups and the situations they are using the environment should be determined.

The third and final component is *Weighted Usability Attributes*. Firstly, the aim of the component is to select accurate group of usability attributes for the rating tool. Depending on the objectives of the rating, users and environment in focus, relevance of the usability attributes will vary. Completion of components 1 and 2 are strongly supporting this selection process. Also lists of various usability attributes already identified in the previous studies are useful in the selection process (Hansen 2004, Nielsen 1993 etc.).

Once the set of relevant usability attributes have been determined, measurable parameters for each of these attributes will be defined. As the attributes are usually very complex, each of the attributes consists of multiple parameters. To measure accessibility, number of entrances, number of available transportation systems, and availability of website for further information for example could be used as parameters.

Some attributes are valued more than others by the users. Therefore, interrelations of the attributes must be explored and weightings for each attribute based on the users preferences identified. To complete the third component, a list of the weighted usability attributes including related parameters is established.

### **Methodology used in usability rating**

The usability rating tool is in the format of a survey and checklist. After broad literature review, components 1 and 2 will be carried out by undertaking customised user surveys and through interviews. Once the first two phases are completed, the rating itself is conducted by using standardized usability checklist based on the usability attributes determined in component 3. Each usability attribute includes a variety of measurable parameters, which are evaluated by using the set criteria.

Usability appears in a different way in different phases during the users' journey in environment. Therefore, the rating checklist including all the identified measurable parameters should be structured to follow the logic of the real journey of the user. User Journey thinking is based on the customer experience approach. Instead of focusing only on the outputs of the customer experience, all the touch points between the customer and the environment during the whole customer experience are in the focal point (Smith, 2003). Users' journey is divided into phases. For example following five general phases, Orientation, Approach, Action, Depart and Evaluation, could be used to structure the rating

process. Phases are adopted from the Customer Journey model introduced by Alexander and Kaya (2003).

Relevant usability parameters are listed under each of these phases. For example parameters related to accessibility will effect on the user when approaching the built environment, whereas functionality effects mainly in Action phase, when the user is already using the environment.

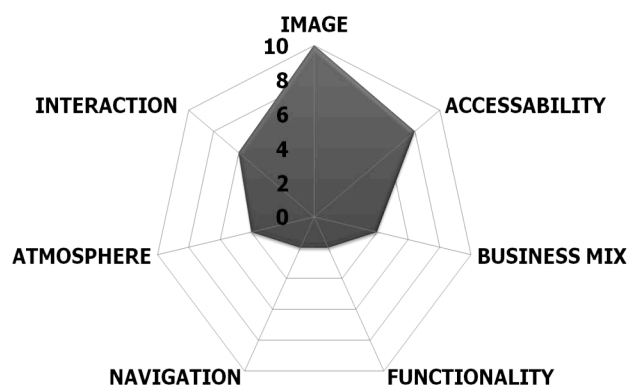
As the usability rating checklist is standardised including set evaluation criteria, the rating exercise could be undertaken by one auditor or the group of auditors. The suggested way to conduct the rating is to use usability walkthrough method, as an adapted form of the generic evaluation process described by Kernohan et al. (1992). The walkthrough is a way to gather data about the use of an environment while physically being in the environment in question. Beside the proximity to the physical object of the investigation, a walkthrough is a social activity. (Nenonen and Nissinen 2005; Riihiaho 2002.) Walkthroughs involve representatives from user organisations and other stakeholders like facility management, property developer and usability research etc, thus enabling an understanding of the usability for a multitude of users. Within the auditing group results can be discussed and verified.

Whether undertaking the rating exercise by the single auditor or a group, not only undertaking the user journey and filling in the usability rating checklist is important, but also observations are significant to add richness to the assessment. Therefore using a recorder and/or taking notes are highly recommended.

### **Result: Usability Profile**

By processing the data collected during the rating process, a usability profile of the shopping centre is created. The results of the assessed usability parameters are first fed into an automated template, calculating firstly the final result of related usability attributes and secondly drawing the usability profile of the environment in focus. Once the ratings have been calculated the tool will give a usability profile similar to the one shown in Figure 3.

Figure 3. Example of Usability Profile



In addition to the general overall usability profile, the tool will also provide more extend information on the usability. The tool will give the usability profile for each of the customer journey phases or each individual usability attribute including all parameters if required. As the results are visually presented, it is easy to indicate recommendations for improvements. Furthermore, the results can be used for comparative studies and benchmarking.

## **APPLICATION OF USABILITY RATING TOOL IN SHOPPING CENTRES**

### **Identification of Environment**

Firstly in component one, shopping centres were studied to understand a shopping centre as a platform effecting usability experiences of the user. The definition of shopping centres by Finnish Council of Shopping Centre was used in the research project to identify and select appropriate centres. According to the Council, a shopping centre consists of a commercial building in which retail outlets and services open inwards onto a walkway or concourse. The gross leasable area (GLA) is generally at least 5.000 sqm. Shopping centres have at least ten retail outlets. A shopping centre has one or more anchor tenants and a number of key traders as well as other retailers and services. The services may be either commercial or public. A single trader may not exceed 50% of the total commercial space. Shopping centres have also joint management and marketing.” (KKY 2006).

Nine centres out of 50 Finnish Shopping Centres were selected for the study through the business partners funding the research project. Four of the centres are located in the capital region, two in Western- Finland, two in Central Finland and one in Eastern Finland. Only North Finland is not represented. The nine centres area comprehensive sample, representing well Finnish shopping centres in concept and location. The sample included local and regional centres and likewise centres located in downtowns. Also in geographically centres covered well all the main areas in Finland geographically.

An extended literature review was undertaken to understand the nature of the shopping centres as a physical, social and virtual platforms. According to previous studies, the number of characteristics, location, size, shape, and layout for example were identified to be vital for the success of shopping centres (Carter and Vandel 2005; Howard 2001).

The shopping centres selected to participate in the project were ask to provide secondary data on the centre including these key characteristics. Also layout and floor plan of each centre was explored. In order to complete the particular component, profile of the selected shopping centres were created by using following parameters: micro location, macro location, size (sqm), number of visitors, number of tenants and occupancy rate (% or sqm).

### **Identification of user groups and context**

Two different methods were used to complete the second component, profiling the users. Firstly, former shopping centre related consumer researches were analyzed to understand consumers visiting shopping centres. (Kim 2006; Pitkaaho *et al.* 2005; Ruiz *et al.* 2004 etc.) It was found that various customer characteristics, lifestyles, values, demographics etc. had been used to describe different customer types. Also tenant related literature was reviewed. (Skogster 2007, Fenker 1996, Kautto, 2007.)

Through the literature review process, user surveys for both user groups, consumers and tenants, were provided. Consumer survey was undertaken between mid October 2007 and January 2008. The tenant survey was conducted as online survey in the same shopping centres in the first quarter of 2008.

The consumers were randomly intercepted while they were inside the shopping centre and invited to participate in the survey either by filling a paper questionnaire or online-survey through laptops. To insure that the survey results are not concentrated on specific group of shoppers based on the timing of their visit, the questionnaire was spread out over different times of the day. The business partners of the project were asked to point the survey date, therefore surveys have also been undertaken different days of the week.

The study involves over 2000 shopping centres' consumers and 300 managers of tenant organisations. Data is not analyzed yet, but the consumer segmentation will be derived using factor analysis. As we are exploring the usability experiences and preferences, consumer groups will be identified on the basis of the situation. The questions, why customers are visiting the shopping centre, will be critical for segmentation. Other behavioural (visiting frequency etc.) and demographic (age, sex etc.) measures will deepen the picture of these segments. Once the data of consumer survey is analyzed, similar process will be followed to profile tenant organizations.

### **Identification of Weighted Usability Attributes**

While completing components 1 and 2, marketing, consumer and shopping centre literature was reviewed. The same material was also used to identify relevant usability attributes effecting on shopping centre users' usability experience. At first, the main focus was to identify key attributes correlating with positive shopping experience and achievement of customer satisfaction. Various attributes were found and some important findings were made: Image of the shopping centre for example was considered as one of the key factors. On the other hand, some of the usability attributes identified in the earlier studies, did not seem to be relevant in the shopping centre context.

In the end of the identification process, seven relevant shopping centre related usability attributes were determined. The attributes were verified by the group of business partners, including shopping centre manager, developers, architects etc. with a strong experience in shopping centre markets in Finland.

The definitions of these attributes are:

1. **Image** is a mental picture or impression of something as well as mental conception held in common by members of a user group and symbolic of a basic attitude and orientation.
2. **Accessibility** includes micro and macro location and availability of transportation and parking. Also paths, outdoor signage and visibility are important. The aim is to achieve user experience where one can easily access the shopping centre and find way out.
3. **Business Mix** the combination of businesses represented in the shopping centres. The right mix might increase the synergies between the different companies. For customers the right business mix is playing important role to attract people to visit the shopping centre.
4. **Functionality** the variety of functions offered by the environment. This includes for example building systems affecting the working conditions and customer satisfaction.

The shopping centre layout, lifts, stairs, building materials are examples of features of functionality.

5. **Atmosphere** is created by shapes, materials, sounds etc. that have an impact on the atmosphere and ambience of the space.
6. **Navigation** signing and clues offered by the environments with regards to how to move around indoors. From a consumer perspective it will include experiences like easily finding your way around.
7. **Interaction** includes all actions that occur as two or more objects have an effect on another. Typically it is regarded as oral or written communication between people or systems. In the shopping centre context interaction includes customer service, communication between shopping centre management and tenants etc.

Weightings for each usability attribute will be determined by analyzing the survey responses. Because consumers and tenants were asked to rate defined seven usability attributes, weightings are correlating to consumers' usability preferences. Weightings can be identified in four different ways. As the sample is fairly sizeable, firstly we can get general weightings by using all collected data. These weightings will represent all shopping centre users in generally. Secondly weightings can be determined according to a specific shopping centre profile. By using these weightings, shopping centres with similar profile can be compared more easily. The third way is to determine weightings for each of the identified user segments. On the other hand, each shopping centre can also be provided with centre specific weightings.

In order to evaluate each of these complex attributes in shopping centres, measurable parameters were identified for the usability rating checklist by the researchers. Nearly 200 different parameters were identified for customer's usability checklist. Even though, usability attributes itself will be the same for consumers and tenants, parameters will vary.

Usability ratings will be carried out by using the usability walkthrough method in all shopping centres participating in the project in May 2008. By the end of June the collected data will be analysed and final usability profile for each shopping centre determined including recommendation for improvements. These ratings could be used for benchmarking purposes to find best practices in shopping centre settings.

## CONCLUSION

The aim of this study was to create usability rating tool to address the potential and need to improve usability in shopping centres. At the same time the objective was to increase general knowledge of usability, generate understanding in usability preferences of the users' and explore how the situation and the objectives of the users' will affect on their usability experiences.

Usability was approached from the users' perspective and attributes enable to rate shopping centres regarding efficiency, effectiveness and satisfaction were identified. The usability rating tool was built by undertaking three components to identify shopping centre profile, user profile and weight identified usability attributes. The tool itself was based on the usability framework introduced by Rothe (2006). By undertaking all these three components, the usability profile will be provided and vital information regarding customers and tenants and their usability preferences is generated.

There are alternative uses for the rating tool. It can provide general information which enables benchmarking, but it can also be used as customized tool to provide shopping centre specific information. The tool can be used by shopping centre managers and owners to evaluate and improve usability of the shopping centre already in use. On the other hand, the tool can be used as guidance for designers and construction companies.

The tool has not been fully implemented yet, so the final rating results, user preferences and segmentations are not yet completely defined. Based on quantitative approach, extensive surveys for instance, the results will be significant and increase validity of usability research from the users' perspective. The usability rating tool and the software application will be developed further. It is also possible that the tool is used in other environments than in shopping centres. As the consumer behaviour, shopping centre expectations are changing all the time, it is also essential that the tool, including surveys, checklists and parameters is reviewed regularly.

## REFERENCES

- Alexander, K., Fenker, M., Granath, J.Å., Haugen, T. and Nissinen, K. (2005), *Usable workplaces: action research*. Proceedings. CIB 2005, Combining Forces – Advancing Facilities Management & Construction through Innovation Series, pp. 389-399. 13-16.6.2005, Helsinki, Finland.
- Carter, C.C. and Vandell, K. (2005), Store Location in Shopping Centres: Theory and Estimates. *The Journal of Real Estate Research*. Vol. 27, ISS .
- Fenker, R. (1996), *The site book; A Field Guide to Commercial Real Estate Evaluation*. Mesa House Publishing, Texas.
- Granath, J. Å. and Alexander, K. (2006) *A theoretical reflection on the practice of designing for usability*. Proceedings European Facility Management Conference 2006, Frankfurt, pp. 379-387.
- Hansen, G. (2004), *Usability of Workplaces*. Workshop 18.5, 2004. NTNU, Trondheim
- ISO 9241-11 (1998), *Ergonomic requirements for office work with visual display terminals*, Guidance on usability.
- Kautto, M., Lindblom, A. and Mitronen, L. (2007) *Kauppa liiketoimintaosaaminen*. Helsingin kaupunkorakentamisen julkaisu B-77, Helsinki.
- Kernohan, D., Gray, J. and Daish, J. (1992) *User participation in Building Design and Management*. Butterworth Architecture, Oxford.
- Kim, H. (2006), Using hedonic and utilitarian shopping motivations to profile inner city consumers. *Journal of International Shopping Center Research*. Vol. 3. No. 1, pp. 57-79.
- KKY (2006), Suomen Kauppakeskushdistys. (Finnish Council of Shopping Centers) Kauppakeskukset 2006. <http://www.rakli.fi/attachements/2006-03-31T15-10-1848.pdf>.
- Lindahl, G. and Granath, J. Å. (2006), *Culture and Usability*. Proceedings, Trondheim International Symposium, 12-14.6.2006. ISBN 82-7551-031-7.
- McGoldrick, P.J. and Thompson M.G. (1992). The Role of Image in the Attraction of the Out-of Town Centre. *The International Review of Retail, Distribution and Consumer Research*, Vol.2, No.1, pp. 81-98.
- Mäntylä, M. (2001), Käytettävyys ja kognitiotiede. In Saariluoma, P., Kampainen, M., Hautamäki, A.(toim.) *Moderni kognitiotiede*, pp. 128-151. Gaudeamus Kirja, Helsinki.



Nenonen, S., Nissinen, K. (2005), *Usability walkthrough Usability Walkthrough in Workplaces – What, how, why and when*. Proceedings. CIB 2005, Combining Forces – Advancing Facilities Management & Construction through Innovation Series, Vol IV, pp. 413-422. 13-16.6.2005, Helsinki, Finland.

Nielsen, J. (1993), *Usability Engineering*. Academic Press, San Diego.

Pitkääho, M., Uusitalo, J. and Marjanen, H. (2005), Suorittajia vai shoppailijoita? Ostopaikan valintaorientaatioon perustuvat kuluttajatyypit Turun seudulla 2003. *Turun kauppakorkeakoulun julkaisuja*, Sarja Keskustelua ja raportteja 6:2005.

Riihiäho, S. (2002), The Pluralistic Usability Walk-Through Method. *Ergonomics in design*, Vol. 10, No. 3, pp. 23–27.

Riva, G. (2005). The psychology of ambient intelligence: Activity, situation and presence. In Riva, G., Vatalaro, F., Davide, F. and Alcaniz, M. (eds.), *Ambient Intelligence*. IOS Press.

Rothe, P. (2006), *Yrityspuistojen käytettävyyden arvioiminen käyttäjäorganisaatioiden näkökulmasta*, Espoo.

Ruiz, J.P., Chebat, J.C. and Hansen, P. (2004), “Another Trip to the Mall: A Segmentation Study of Customers Based on their Activities”, *Journal of Retailing and Consumer Services* Vol 11 pp. 333–350

Sinkkonen, I., Kuoppala, H., and Parkkinen, J. (2002), *Käytettävyyden psykologia*. Edita Oyj, Helsinki.

Skogster, P. (2007), *About location planning within Finnish shopping Centre context*. Lisensiaattitutkimus, Helsinki University of Technology, Espoo.

Smith, B. (2003), *Customer experience management: A revolutionary approach to connecting with your customer*. John Wiley & Sons. Inc., Hoboken, New Jersey, Canada

# **The Circle of Five<sup>®</sup>: A Magic Recipe for Optimizing Locations**

Wout Ritzema  
NPC (The Netherlands)

## **Abstract**

The Circle of Five<sup>®</sup> is an experience based model that represents NPC's vision on location development. The model is founded on the central belief that location development issues should be approached integrally by combining various disciplines. It takes a close look at the compulsory, necessary and underestimated ingredients for successful locations, not just at one or two aspects which is fairly common. It looks at 75 underlying prerequisites of five aspects that make locations healthy: Asset Management, Mobility & Logistics, Safety & Security, Design, and Exploitation. A small team of experts analyses the five vital aspects that make locations work. After that, the team weighs and scores the 75 underlying predictors of success after an intake, desk research, thorough analysis of the location, and interviews with owners, facility managers and user groups. The team then analyses the outcome during an intensive expert meeting, and presents the outcome with a clear Performance Projection, combined with short, medium and long term organizational and physical recommendations. Among other things, the Circle of Five<sup>®</sup> can be used to develop a vision and strategy for a new location, to determine costs and benefits of possible improvements, and/or to benchmark the outcome of the location scan with other (reference) locations.

## **Keywords**

Location development, location scan

## **INTRODUCTION**

Developing complex locations that attract large amounts of people and where public and private parties meet, ask for an integral approach. Ideally, such a location optimizes its value and market possibilities, is highly accessible for people and goods, provides an environment that is safe, both objectively and subjectively, is designed outstandingly and experienced by passengers accordingly, need low maintenance efforts, and gain high commercial revenues due to a strong image. The question is how to reach such a 'healthy' location.

NPC, a full subsidiary of NS (Dutch Railways), has developed a vision on healthy locations that resulted in the Circle of Five<sup>®</sup>. The European and Benelux registration procedures for the Circle of Five<sup>®</sup> have been initiated on behalf of NPC. The experience based model is founded on the central belief that location development issues should be approached integrally by combining various disciplines. Recently, the Circle has been transformed into several tools of which the Circle of Five<sup>®</sup> Location Scan is the most striking example. A scan that shows its best performance for locations that attract a large number of people every day: stations, airports, hospitals, shopping centers, and schools.

## THE CIRCLE OF FIVE® LOCATION SCAN

There are several reasons why the Circle of Five® Location Scan is interesting for locations that need to be optimized. It looks at 75 underlying prerequisites of five aspects that make locations healthy: Asset Management, Mobility & Logistics, Safety & Security, Design and Exploitation (

Figure 1). It takes a close look at the compulsory, necessary and underestimated ingredients for successful locations, not just at one or two aspects which is fairly common. It analyses these ingredients both solitary and in relation to each other (where relations are present). Related predictors are then correlated, providing insight into the character of the relation (strong or weak, positive or negative). This gives the opportunity to determine what improvement is likely to have the biggest effect on the location.

The Circle of Five® also combines shared public and private sector views, in order to come to solutions with high commitment for both private and public parties involved. Moreover, it combines the technical orientation with a behavioral approach, connecting two different worlds in location development and location management. And last but not least: it combines the vision and strategic level with tactical and operational solutions.



Figure 1: The Circle of Five®.

One of the reasons for the rapid success of the Circle of Five® methodology is that it is an experienced based model, developed by consultants and project managers working in the field of station development, and station management. In addition, they are well-skilled and experienced in optimizing other locations too, like airport terminals and hospitals. The experience is gained by working for different clients in The Netherlands, Belgium, the United Kingdom, South Africa, Germany and Sri Lanka. Location Scans have already been held successfully for stations, hospitals and schools.

### How does it work?

A small team of experts analyzes the five vital aspects that make locations work. After an intake, desk research, thorough analysis of the location, and interviews with owners, facility managers and user groups, the team rates the 75 underlying predictors of success (5 aspects

each of which has 15 predictors) on a scale from 1 to 5. The character of the chosen method is generic ordinal. Subsequently, the importance of the 75 predictors for that specific location is determined, based on the ambition of the location owner (0=not important, 1=important, 2=very important). The Circle of Five<sup>®</sup> software program will combine the rating and importance into weighted and unweighted final scores. The outcome is then analyzed during an intensive expert meeting, with cross explanations of the 75 predictors, in order to divide cause and effect, and to identify the possible improvements and recommendations to optimize the location from different perspectives. Finally, the team presents the outcome with a clear Performance Projection, combined with short, medium and long term organizational and physical recommendations. The process is illustrated in Figure 2.

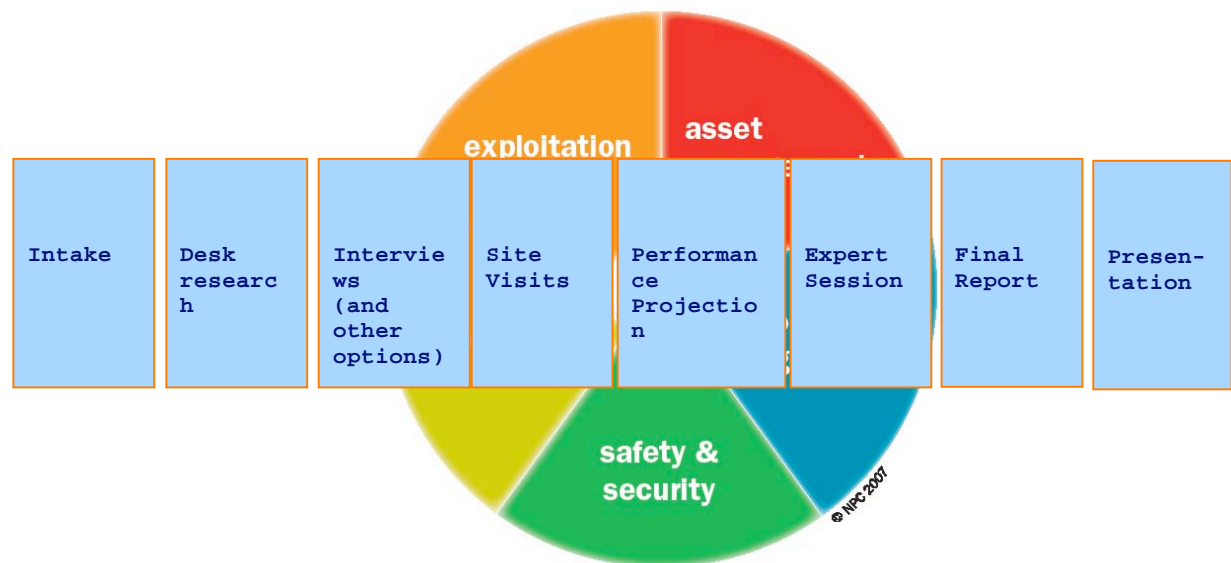


Figure 2: The Circle of Five<sup>®</sup> Location Scan process.

### Performance Projections

NPC has developed a software program for the location data, which produces Performance Projections easily. The projection shows the performance of the location as a whole and for the underlying five aspects in particular. Moreover, it produces weighted and unweighted final scores per aspect on a scale from 1 to 10. Figure 2 depicts the Performance Projection and singles out the division of one aspect into 15 predictors.

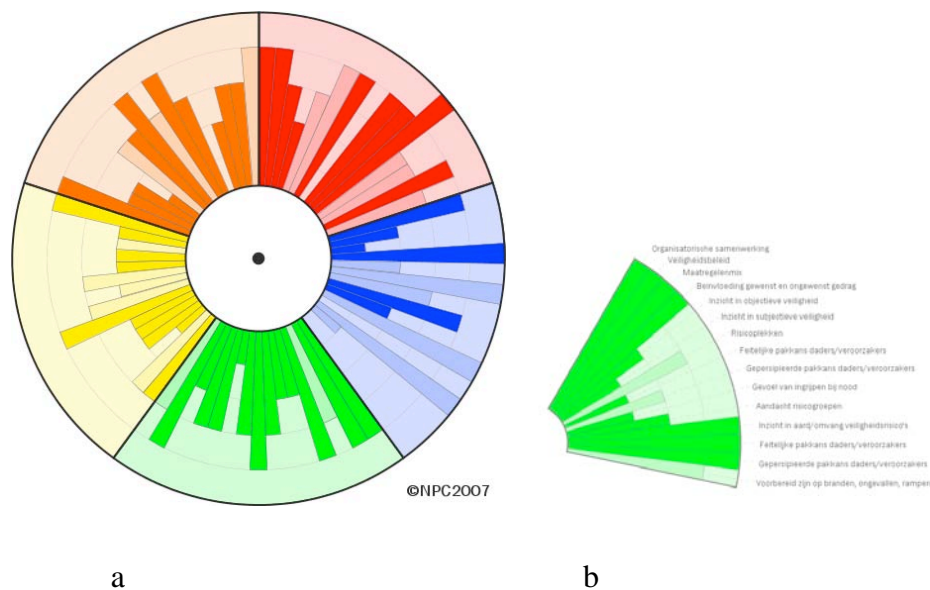


Figure 2: (a) Performance Projection and (b) the division of one aspect into 15 predictors.

## A RANGE OF APPLICATIONS

This paper has briefly described the vision behind the Circle of Five<sup>®</sup> and the Location Scan as one of its tools. But the concept can be applied for many related issues. Other possible applications are:

- to develop a vision and strategy for a new location;
- to develop a program of requirements for a new location;
- to apply the scan in several phases of the location life cycle: from the masterplan and definition phase to the drawing table and the realization phase;
- to analyze and compare one or more geographical scales: facility, building, location, area;
- to assess the perception of several user groups by panel or internet assessment;
- to determine costs and benefits of possible improvements;
- to benchmark the outcome of the location scan with other (reference) locations;
- to compare different locations and pinpoint the best location for your purposes;
- to develop different scenarios to make the most out of the location.

## CONNECTING EUROPEAN UNIVERSITIES

Although the model is based on a wide range of experience and has proven itself to be applicable in a practical sense, NPC strives to strengthen the methodology scientifically in order to make it even more reliable and applicable in more cases. Therefore, the University of Salford (Manchester, UK) is connected from a Facility Management point of view and the Technical University of Helsinki (Finland) from a usability perspective. Further, the University of Twente (Netherlands) is expanding the model with a psychological basis. Currently there are talks with students of the Technical University of Delft (Netherlands) to design 'dream locations' based on the Circle of Five<sup>®</sup> principle. And finally, a graduate

student of The University of Eindhoven (Netherlands) is currently studying the cost effectiveness of measures to increase ‘the experience’ of locations.

The Circle of Five<sup>®</sup>: optimize your location.

## CONCLUSIONS

Evaluation and reflection on the second round of cases and workshops in the project has begun and will be the subject of an open, one-day seminar and research workshop. Some of the conclusions from the work have been drawn from the papers to stimulate discussion at these events.

### **Philosophical, theoretical and methodological issues**

It has been generally agreed in the network that usability in the built environment is context dependent, related to user experience, to social relations amongst users and the interaction between users and facilities. Usability is strongly related to relationships between the people and physical settings and to clear strategies for the organisation of work and the use of buildings.

Occupants of spaces become users/clients/patients rather than sources of information. For improvement of usability, users must be recognised as actors, and design and management processes are needed that enable a continuing dialogue.

The position of users as players in the action also implies that their specific end purposes be recognised. The management of processes cannot be reduced to technical choices or unilateral strategic decisions - unless real dialogue takes place, there is no point in taking their social practices into account.

Placing more emphasis on user experience suggests a re-casting of the usability framework to efficiency, effectiveness and experience.

Each of these general issues has implications for further research. Research strategies are needed that respond to the nature of usability with the emphasis on context and situated action. Conventional evaluation methods eg Post Occupancy Evaluation, focus on building as an object rather than a process. Approaches and methods appropriate to research into user experience eg social anthropology and ethnological studies, must be developed.

Tangible and intangible elements of user experience are both measurable. Some of the qualitative, participatory methods identified in the cases are capable of development into effective tools for usability research and practice.

Further development of usability walkthrough has been suggested, focusing on qualities of different activities and events within a building, their attributes and effects. Tracing the user journey provides data about both the processes and user experience in the work environment and allows rich data to be collated from the work environment and enables user experience to be assessed from different angles.

The advantage of these methods is that they can uncover those small details that affect the workplace experience – sometimes to a really great extent. They also allow improved understanding at a more general level.

The complexity of usability assessment highlights the importance of involving research teams with different backgrounds and skills, multi-method strategies and the

triangulation. Qualitative techniques should be blended with the development of criteria that can be used in quantitative studies.

Further research is needed to explore how buildings support organisational goals using output from descriptive methods as input into participatory processes. A perspective on buildings as means of production, effectiveness will be the most important dimension.

However, very few of the methods analysed in the cases deal directly with the evaluation of usability in the context of the organization, with achievement of 'business' objectives and effectiveness. Generally, user assessments are more based on their personal experience than on the fulfillment of organizational objectives.

### **Learning from the cases**

The three cases in this set generally emphasise collaborative working between core business and the team that design, provide and manage a new space and the sense of shared commitment amongst all participants in the project.

Each of the cases has provided examples of settings designed to meet the users' objectives, to provide users with a meaningful, valuable and manageable workplace over which they have control, permitting them to operate at lower level of stress, with increased efficiency of working and hence improved productivity.

Future usability methods and research must also to focus on the management of the complex issues of efficiency of facility use integrated with efficiency in staff use. All too often users have to adapt their working practice and operations to suit constraints imposed by the facility rather than the facilities adding value to their business.

There is a need of development of knowledge regarding how to design and deliver environments and services in different cultural contexts. There is a need for more innovative processes that support the changing organisations they work with.

The cases suggest a strong leading role of senior management as important for the *effectiveness* of facilities. Hands on involvement of those directly involved in operations in the design is important to the *efficiency*. Finally the close co-operation and shared commitment between managers, user groups and service partners is necessary for a *satisfactory* solution that supports usability both for core business and for the FM team that maintain facilities.

### **Future directions**

Future work is being planned in the network, to increase general awareness and appreciation of usability, to generate a better understanding of the preferences of users and explore how user needs, the situation and organisational objectives impacts on experience.

Practical usability models and assessment tools have been created and evaluated as a part of the project. Project partners have offered further cases in different public settings, including shopping centres and railway stations, to evaluate these in a further



round of cases and workshops. The continuing work provides the opportunity to strengthen the methodologies scientifically in order to improve their reliability and applicability to a broader range of cases.

A new Nordic study will address two perspectives where end-user orientation is in major role in developing evaluation and feedback system about real estate. The purpose of the proposed research project is to develop and suggest methods that will enable innovative and effective project management in the provision of real estate.

The study has a dual focus on project management processes in construction and on benchmarking the usability and functionality of buildings in use. The first will focus on defining and setting the criteria and values to guide the construction process from the end-user perspective.

Information and data will be gathered for use in benchmarking a building's usability and functionality from the end user perspective. This perspective is needed in order to develop the systematic and continuous feedback system based on end user expertise and to influence the value chain from design to construction and maintenance of real estate.



# INTERNATIONAL COUNCIL FOR RESEARCH AND INNOVATION IN BUILDING AND CONSTRUCTION

CIB's mission is to serve its members through encouraging and facilitating international cooperation and information exchange in building and construction research and innovation. CIB is engaged in the scientific, technical, economic and social domains related to building and construction, supporting improvements in the building process and the performance of the built environment.

## **CIB Membership offers:**

- international networking between academia, R&D organisations and industry
- participation in local and international CIB conferences, symposia and seminars
- CIB special publications and conference proceedings
- R&D collaboration

**Membership:** CIB currently numbers over 400 members originating in some 70 countries, with very different backgrounds: major public or semi-public organisations, research institutes, universities and technical schools, documentation centres, firms, contractors, etc. CIB members include most of the major national laboratories and leading universities around the world in building and construction.

**Working Commissions and Task Groups:** CIB Members participate in over 50 Working Commissions and Task Groups, undertaking collaborative R&D activities organised around:

- construction materials and technologies
- indoor environment
- design of buildings and of the built environment
- organisation, management and economics
- legal and procurement practices

**Networking:** The CIB provides a platform for academia, R&D organisations and industry to network together, as well as a network to decision makers, government institution and other building and construction institutions and organisations. The CIB network is respected for its thought-leadership, information and knowledge.

The CIB has formal and informal relationships with, amongst others: the United Nations Environmental Programme (UNEP); the European Commission; the European Network of Building Research Institutes (ENBRI); the International Initiative for Sustainable Built Environment (iiSBE), the International Organization for Standardization (ISO); the International Labour Organization (ILO), International Energy Agency (IEA); International Associations of Civil Engineering, including ECCS, fib, IABSE, IASS and RILEM.

**Conferences, Symposia and Seminars:** CIB conferences and co-sponsored conferences cover a wide range of areas of interest to its Members, and attract more than 5000 participants worldwide per year.

## **Leading conference series include:**

- International Symposium on Water Supply and Drainage for Buildings (W062)
- Organisation and Management of Construction (W065)
- Durability of Building Materials and Components (W080, RILEM & ISO)
- Quality and Safety on Construction Sites (W099)
- Construction in Developing Countries (W107)
- Sustainable Buildings regional and global triennial conference series (CIB, iiSBE & UNEP)
- Revaluing Construction
- International Construction Client's Forum

## **CIB Commissions (March 2007)**

- TG33 Collaborative Engineering
- TG43 Megacities
- TG49 Architectural Engineering
- TG50 Tall Buildings
- TG53 Postgraduate Research Training in Building and Construction
- TG55 Smart and Sustainable Built Environments
- TG56 Macroeconomics for Construction
- TG57 Industrialisation in Construction
- TG58 Clients and Construction Innovation
- TG59 People in Construction
- TG61 Benchmarking Construction Performance Data
- TG62 Built Environment Complexity
- TG63 Disasters and the Built Environment
- TG64 Leadership in Construction
- TG65 Small Firms in Construction
- TG66 Energy and the Built Environment
- W014 Fire
- W018 Timber Structures
- W023 Wall Structures
- W040 Heat and Moisture Transfer in Buildings
- W051 Acoustics
- W055 Building Economics
- W056 Sandwich Panels
- W060 Performance Concept in Building
- W062 Water Supply and Drainage
- W065 Organisation and Management of Construction
- W069 Housing Sociology
- W070 Facilities Management and Maintenance
- W077 Indoor Climate
- W078 Information Technology for Construction
- W080 Prediction of Service Life of Building Materials and Components
- W083 Roofing Materials and Systems
- W084 Building Comfortable Environments for All
- W086 Building Pathology
- W089 Building Research and Education
- W092 Procurement Systems
- W096 Architectural Management
- W098 Intelligent & Responsive Buildings
- W099 Safety and Health on Construction Sites
- W101 Spatial Planning and Infrastructure Development
- W102 Information and Knowledge Management in Building
- W104 Open Building Implementation
- W106 Geographical Information Systems
- W107 Construction in Developing Countries
- W108 Climate Change and the Built Environment
- W110 Informal Settlements and Affordable Housing
- W111 Usability of Workplaces
- W112 Culture in Construction
- W113 Law and Dispute Resolution
- W114 Earthquake Engineering and Buildings
- W115 Construction Materials Stewardship





# INTERNATIONAL COUNCIL FOR RESEARCH AND INNOVATION IN BUILDING AND CONSTRUCTION

**Publications:** The CIB produces a wide range of special publications, conference proceedings, etc., most of which are available to CIB Members via the CIB home pages. The CIB network also provides access to the publications of its more than 400 Members.



A recent major CIB collaborative activity was the Thematic Network PeBBu Performance Based Building: a four-year programme that included 50 member organisations, that was coordinated by CIB and that was funded through the European Commission Fifth Framework Programme.

**Themes:** The main thrust of CIB activities takes place through a network of around 50 Working Commissions and Task Groups, organised around three CIB Priority Themes:

- Sustainable Construction
- Performance Based Building
- Revaluing Construction

A fourth priority Theme, Integrated Design Solutions is currently being developed within CIB.

## Recent CIB publications include:

- Guide and Bibliography to Service Life and Durability Research for Buildings and Components (CIB 295)
- Performance Based Methods for Service Life Prediction (CIB 294)
- Performance Criteria of Buildings for Health and Comfort (CIB 292)
- Performance Based Building 1st International State-of-the-Art Report (CIB 291)
- Proceedings of the CIB-CTBUH Conference on Tall Buildings: Strategies for Performance in the Aftermath of the World Trade Centre (CIB 290)
- Condition Assessment of Roofs (CIB 289)
- Proceedings from the 3rd International Postgraduate Research Conference in the Built and Human Environment
- Proceedings of the 5th International Conference on Performance-Based Codes and Fire Safety Design Methods
- Proceedings of the 29th International Symposium on Water Supply and Drainage for Buildings
- Agenda 21 for Sustainable Development in Developing Countries

**R&D Collaboration:** The CIB provides an active platform for international collaborative R&D between academia, R&D organisations and industry.

## Publications arising from recent collaborative R&D activities include:

- Agenda 21 for Sustainable Construction
- Agenda 21 for Sustainable Construction in Developing Countries
- The Construction Sector System Approach: An International Framework (CIB 293)
- Red Man, Green Man: A Review of the Use of Performance Indicators for Urban Sustainability (CIB 286a)
- Benchmarking of Labour-Intensive Construction Activities: Lean Construction and Fundamental Principles of Working Management (CIB 276)
- Guide and Bibliography to Service Life and Durability Research for Buildings and Components (CIB 295)
- Performance-Based Building Regulatory Systems (CIB 299)
- Design for Deconstruction and Materials Reuse (CIB 272)
- Value Through Design (CIB 280)

## CIB Annual Membership Fee 2005/07

### Membership Fee (Euro)

Category	2005	2006	2007
FM1	10.019	10.270	10.526
FM2	6.680	6.847	7.018
FM3	2.297	2.354	2.413
AM1	1.154	1.183	1.213
AM2	703	773	851
IM	229	235	241

The lowest Fee Category an organisation can be in depends on the organisation's profile:

- FM1** Full Member Multi disciplinary building research institutes of national standing having a broad field of research
- FM2** Full Member Medium size research Institutes; Public agencies with major research interest; Companies with major research interest
- FM3** Full Member Information centres of national standing; Organisations normally in Category AM1 or AM2 which prefer to be a Full Member
- AM1** Associate Member Sectoral research & documentation institutes; Institutes for standardisation; Companies, consultants, contractors etc.; Professional associations
- AM2** Associate Member Departments, faculties, schools or colleges of universities or technical Institutes of higher education (Universities only)
- IM** Individual Member Individuals having an interest in the activities of CIB (not representing an organisation)

**Fee Reduction:** A reduction is offered to all fee levels in the magnitude of 50% for Members in countries with a GNIpc less than USD 1000 and a reduction to all fee levels in the magnitude of 25% for Members in countries with a GNIpc between USD 1000 to 7000, as defined by the Worldbank.

**For more information contact** CIB General Secretariat:  
e-mail: [secretariat@cibworld.nl](mailto:secretariat@cibworld.nl)



PO Box 1837, 3000 BV Rotterdam,  
The Netherlands  
Phone +31-10-4110240;  
Fax +31-10-4334372  
[Http://www.cibworld.nl](http://www.cibworld.nl)

## DISCLAIMER

All rights reserved. No part of this book may be reprinted or reproduced or utilized in any form or by any electronic, mechanical, or other means, now known or hereafter invented, including photocopying and recording, or in any information storage or retrieval system without permission in writing from the publishers.

The publisher makes no representation, express or implied, with regard to the accuracy of the information contained in this book and cannot accept any legal responsibility or liability in whole or in part for any errors or omissions that may be made.

The reader should verify the applicability of the information to particular situations and check the references prior to any reliance thereupon. Since the information contained in the book is multidisciplinary, international and professional in nature, the reader is urged to consult with an appropriate licensed professional prior to taking any action or making any interpretation that is within the realm of a licensed professional practice.

## **CIB General Secretariat**

post box 1837  
3000 BV Rotterdam  
The Netherlands  
E-mail: [secretariat@cibworld.nl](mailto:secretariat@cibworld.nl)  
[www.cibworld.nl](http://www.cibworld.nl)

## **CIB Publication**