USABILITY OF BUILDINGS, version 18.10.04
Theoretical framework for understanding and exploring usability of buildings

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Abstract

Usability, with focus on the user perspective, is one of the most important, but often most neglected, aspects of building performance. A new CIB Task Group (TG51) has been established 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*" (ISO9241, 1998).

The work of the Task Group proceeds through a programme of action research, comprising an intensive series of case studies and workshops, in association with occupying organizations, to produce research findings within a "business" timeframe, to satisfy a practice audience, and to identify the scope for further collaboration amongst research partners. The programme of work will centre on the user experience of buildings and research on buildings-in-use, and will focus on concepts of usability.

NTNU / SINTEF are partners in this Task Group, and we are going to do a research and case study together with our research partner The Norwegian Directorate of Public Construction and Property. In this paper we give a more detailed background for our focus on usability,and introduce a theoretical framework for understanding and exploring usability of buildings. The theoretical framework will be used for understanding the interaction between different parameters summing up to what we can measure or observe as the usability of a specific workplace or building. We are interested to see in what degree we can develop the term "usability" into operational methods and tools for planning, design and management of buildings and workplaces. Usability is therefore discussed in relation to our traditional approach to functionality in workplace planning and the user experience of effectiveness, efficiency and satisfaction from buildings-in-use. Our ongoing case study from a five year old university college building will be used to exemplify some of the issues concerning usability.

Keywords: Building performance; educational buildings; usability; workplace.

WHAT IS DEFINING USABILITY OF BUILDINGS?

Introduction
Usability, with focus on the user perspective, is often a neglected aspect of building performance. Seen from a North-European perspective this seems quite odd as most planners, architects and facilities managers will claim that they are strongly concerned about the user perspective and the usability of the workplaces and buildings. The planners and building owners will claim that functionality of the workplaces is one of the important success factors for creating a good building. The well-being and satisfaction from the building users are also seen to be very important for some companies and FM-departments, setting a high standard for the work environment and support services for users.

We have had a strong focus on functionality and a tradition for user involvement in planning and design of buildings since the 1960ies, and we see that different issues related to usability are:
- described in public legislation concerning health, environment and safety for workplaces in buildings (+ other workplaces)

- defined in building codes as minimum performance levels or specific technical requirements for buildings in use; example: minimum level of daylight in all permanent workplaces, minimum level of indoor air quality level
- defined in national and international standards for the building and construction sector setting both the rules of trade and describing approved measuring methods for quality levels
- reflected in common practice of user involvement in planning and design of new buildings in both the private and public sector

In spite of present legislation, standards and measuring methods, many buildings are still suffering from serious failures and weaknesses in performance and function, and there is a comprehensive potential for improvements. A better understanding of the user experience of the building is needed to get a better understanding of usability from both a planning and management perspective.

The organization
Different organizations, in public sector or private companies, are characterized by various types of work, objectives and organizational structures. Organizations have individual objectives and intentions for what they wish to achieve by a specific building. The development of a new building, rebuilding of an existing, modernization   or internal moves of workplaces are normally the result of an organization growing or shrinking, or organizational changes. In that respect the organizational characteristics are affecting the concept usability of buildings. A specific building can be usable for one organization, while another organization finds it unsuitable related to their needs.

During the programming phase the user requirements related to the new building is stated; *"Programming is the fundamental activity in planning of buildings. The objectives and desired qualities of using the building are expressed and stated during the programming"* (Statens byggeforskningsinstitut, 1981). The involvement of the users during this project phase will influence the usability we can observe in the finished building. The programming phase is a process of systematical collection, documentation and information of requirements affecting the expected performance of the building.

A major challenge in the programming phase is the translation of the user requirements into a programming document, and further into a design solution. This work is done by external advisors or architects, not directly part of the organization. For the planners the challenge is to develop a programming document and a design reflecting the requirements of the user organization as well as all other requirements set for the project. The user requirements are also dependent on the context and setting of the organizations work, complicating this translation.

Standards and legislation
The major purpose of legislation concerning buildings is to secure the health and safety issues for users are taking care of during planning and management of buildings. In addition the legal framework for controlling the building process focus on specific areas that have general public interest, like design of public areas, access for disabled and safety for workers. For workplace design and management we have two major laws in Norway, the Planning and Building Act (latest major revision 1997) and the The Working Environment Act (The Ministry of Labour and Government Administration, 1977) setting specific requirements concerning usability and user welfare.

National and international standards are part of the legislation, and developed to structure and control the different activities and trade between all the different actors in a sector. For the building sector we have a large number of different standards related to planning, design and construction and we are in the process of developing standards for Facilities Management. In September 2003 CEN Technical Committee 348 "Facility Management" was established with the aim to develop common European standards for FM terms and definitions as well as guidelines for FM agreements.

One important trend in a number of new standards is the shift from specified technical requirements for buildings and technical installations to performance-based standards based on functional demands and requirements. Usually functional requirements will be expressed in the programme document as a statement of the objectives, purposes, activities and functions of the proprietor or users. Current framework and conditions that must be present in the building project is also stated in the programme.

The Norwegian standardization system consists of different standards affecting usability of buildings in different ways, and one of the most important ones are mentioned here. Usability of buildings, emphasizing functionality of buildings, is influenced by the "Table for building functions" (Standards Norway, 1993). This standard has a structure and framework that can be used for developing a complete description of a building based on the functional characteristics. The standard might be used in programming of functional demands, control of functional aspects in design, planning of maintenance, life cycle analysis and independent evaluations and testing of functional characteristics of a building.

The ISO 9000's are a series of international standards dealing with the quality perspective in organizations activities and processes. Quality is defined as *"the ability to satisfy the customer demands and needs."* According to this definition experienced quality will depend on the end product being in accordance with the customer expectations and needs. The customer in this respect will be the one ordering the service or product, normally the building owner or project manager acting on behalf of the owner. Whether the customer, according to the ISO definition, acts on behalf of the users, will depend on the degree user experiences and requirements are taken into account.

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*" (ISO9241, 1998).

Measuring methods – Different approaches to the concept of usability
Until lately it is written and done little research on usability in buildings. The terms are vague and little tangible. The concept of "usability" is widely known in relation to applications within product design, information technology and web-design, related to user friendliness and user interface of the system.

Different companies are measuring conditions related to usability and building performance in different ways. In accordance with The Working Environment Act the largest companies are performing regular internal examinations or investigations related to health, working environment, safety, user satisfaction and well-being. These investigations can merely occasionally be directly related to physical surroundings and building conditions. It is therefore a necessity to do a further development of measuring methods for this use.

Several terms are used related to different measuring methods for buildings. The terms building-in-use-studies, building diagnostics, building pathology and building evaluation are all used in this sense. The problem with these terms is that they are focusing on the building as a product, and do not include the process-oriented evaluation of the building process as a totality. It is essential to develop a measuring method including the time perspective in the building process and the relationship between the organization and the physical surroundings serving the organization.

Post Occupancy Evaluation (POE) was introduced as a measuring method in the 1960ies, as a response to considerable problems related to buildings functionality, especially from the user's point of view. *"Evaluation of buildings-in-use"* is another name for POE, and it is a method identifying and evaluating several aspects of building performance from the user perspective. The method is assessing the match between building performance and user needs, and identifies ways to improve building design, performance and fitness for purpose. The POE method is representing the reverse process to programming, as it is comparing actual performance with expected requirements and user demands. The programming phase comprises a translation of the user's objectives and purposes into a programming document. This is done by systematically collecting documentation and information of criterions due to expected building performance.

According to Granath (2004), Wolfgang Preiser (1988), who is the pioneer in developing Post Occupancy Evaluation techniques, is an important contributor to this field. Granath says in his note that POE is a technique strongly tied to performance, and is traditionally a technique that is used after a building is taken in use.

Granath also says that "The Serviceability Tool", developed by Gerald Davis et al. (1993), is one of the most spread practical and theoretical tools or methods to evaluate building performance. Davis distinguishes between performance and serviceability. He argues that "*Serviceability is about whether a building or facility is capable of performing as required. (...) Performance means actual behaviour in service at a given moment."* Granath says that Davis defines serviceability as a broader term than

performance. This indicates that his interpretation of satisfaction has a general meaning, and is not connected to individual values dependant on situation, context and time.

In accordance with this Granath expresses that POE and Davis's Serviceability Tool are competitive methods of evaluating buildings in relation to intended use. Both of the methods are emphasizing observation and measurement of certain physical aspects of the building or the facility, and evaluate this according to intended or actual use.

Ongoing research related to measuring of usability
Several research projects are working with measuring related to physical surroundings and buildings-in-use. We are mentioning some ongoing projects with relevance for the theme, involving interesting approaches to usability of buildings and measuring of building performance. The projects are discussing different building categories, but the challenges concerning the relationship between users and physical surroundings are mainly the same.

"The Knowledge Workplace" (Blakstad and Gjersvik, 2004), accomplished by SINTEF Technology and Society is studying the relationship between physical surroundings, organizational aspects and information and communication technology (ICT). The project is working with developing methods for measuring how surroundings are affecting organizations effectiveness, efficiency and user satisfaction.

In a another ongoing project, "The Nordic Knowledge Workplace" (Bjerrum et al., 2002), the projects superior objective is how to use workplace design as a strategic mean to promote innovation, knowledge sharing and cooperation in Nordic organizations. This project is, among other things, studying measurable relationships between design of workplaces and performance.

Various research projects have been evaluating building performance related to health buildings. SINTEF has in a number of occasions been evaluating the relationship between new physical surroundings, efficiency and cost in use, and well-being and satisfaction among inhabitants (Høyland, 2001).

In addition to this SINTEF has been accomplishing several projects (Hansen et al., 2002, 2003) studying the relationship between organization, operation and building in the planning and building process for the new University Hospital in Trondheim. These projects have mainly been focusing how the new hospital should be designed to satisfy the user organization.

Another project studying physical surroundings and measuring methods is the project "Kontorbyggets arkitektur. Opplevelse og betydning"(Hauge, 2003), accomplished within the area of environmental psychology. The project is studying the physical surroundings of workplaces as one of many elements affecting well-being and growth in an organization, and includes a methodology using a questionnaire based on semantic differential. The most important finding of the project is that the importance of physical surroundings can be described at three different fields; functional, esthetical and symbolic.

CIB Task Group 51 "Usability of buildings"
According to the above mentioned national and international standardization and legislation, and the ongoing research at the area, it is a necessity to provide a better understanding of the concept of usability in relation to buildings and users of the buildings.

The CIB Task Group 51 "Usability of buildings" is established to apply concepts of usability, to provide a better understanding of user experiences of buildings. The objectives of the Task Group 51 are to carry out a series of case studies and associated workshops in a program of action research, to develop concepts of usability for application in practice, and to promote, develop and share methods, processes and techniques for the evaluation of buildings-in-use.

The case studies are carried through in co-operation with industrial partners, financing the research and participating in the case studies and the international workshops. The aim of the case evaluation and the workshops are to explore aspects of the usability concept. As every case is different and belonging to different contexts, new aspects of the concept is highlighted in every national study. A preliminary understanding of the concept is developing and become more and more elaborate with every workshop.

According to the paper "Usable workplaces" (Alexander et al., 2004), the UK case study (Alexander et al., 2003) focuses on the development of R&D facilities for NCR in Dundee, Scotland. The UK contribution to the Task Group is demonstrated through the use of a novel planning process. The case study is focusing user participation in the planning process, a feature still quite unusual in UK building projects.

Örebro University Hospital was chosen as the Swedish case study (Lindahl et al., 2003), and the group is studying the user's experience due to functionality and usability of the surgery centre, built in 1997. Their contribution to the Task Group is demonstrated through the analysis of the planning process, the effects of incorporating new technology and new work processes, as well analysis of the building configuration and layout.

The case study from Turku (Nenonen et al., 2004) is studying "The Old Mill" in Turku Science Park. The Old Mill is an old factory building, now offering office facilities to several IT-companies. The purpose of the case study is to understand the elements of usability in refurbished environments, and secondly to produce elements of use in the planning process of Old Mill 2, which is representing an enlargement of the building.

The French case study (Fenker et al., 2004) is studying the vehicle design and development centre of Renault outside of Paris, limited to the occupation of The Ruche Building. The management of the company considered the implementation and use of this project to be an essential part of its change strategy in vehicle design and development. This led to a very ambitious approach, both in the architectural and landscape treatment of the building site, and in the way the building has to support ongoing change and improvement of the organizations processes.

The Norwegian case study is under work, and will be completed within February 2005. As part of our participation in the CIB Task Group we are doing a case study of the Nord-Trøndelag University College at Levanger.

THEORETICAL FRAMEWORK

Based on the background described in the paper and the four case studies already carried out by the CIB Task Group, we have seen the need to for a stronger theoretical framework for understanding and exploring the concept usability of buildings. This will be the basis for our planned case study, as well as being a possible platform for developing a method or an applied guideline for evaluating usability of buildings.

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*" (ISO9241, 1998).

According to this ISO-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

In accordance with Jensen (2001) the English language in a better way than many others distinguishes between nuances within the usability term. In this way *efficiency* means "to do things better", while *effectivity* means "to do better things". The Norwegian vocabulary does not permit describing the difference in these terms, and the word "effektivitet" is a common denominator for both. Due to this, the above described differentiation is lost, and it is an extensive need to define and describe the different terms and the connection between them, to gain a better understanding of the meaning and significance of the terms.

Usability means 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 concept usability of buildings can be approached in four ways;
   1.   Criterions and parameters affecting usability

2. Usability from different stakeholder's point of view
3. The time perspective
4. Workplace and context

Criterions and parameters affecting usability

Several aspects influence a building's usability and whether a building is fit for a specific purpose. At an internal workshop at NTNU (Hansen, 2004), researchers and academics tried to develop a common understanding of the term "usability", to define the content and different aspects of the term, and to discuss the most important criterions for usability and methods and tools relevant for measuring this aspect of a building. As a common understanding, the term usability describes whether or not a product is fit for a specific purpose (Arge, 2004). Usability, or functionality in use, is concerning the buildings ability of supporting the user organizations economical and professional objectives. The quality of use for a building means that it is efficient in use (use of resources, productivity, effectiveness, rationality), offer the desired effect in use (increasing the value), and to offer the desired quality in use (user satisfaction).

The Ishikawa-diagram (Hansen, 2004) in figure 1, a result from the workshop, is visualizing a simplified picture of this reality.
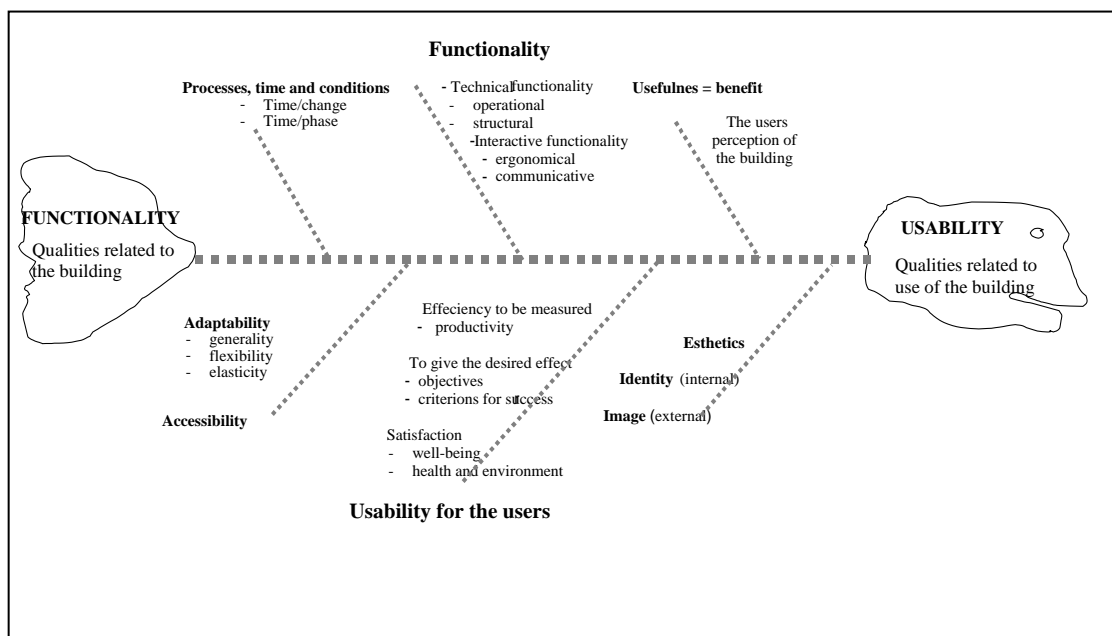

Figure 1. Ishikawa diagram. Criterions and parameters affecting usability of buildings.

The four international case studies accomplished as a part of the work in CIB TG 51 have given various contributions to the theoretical framework and the discussion related to terms and definitions.

The British case study (Alexander et al., 2003) is investigating the concept of usability by discussing the terms usefulness, adaptability, flexibility, functionality that is used, accessibility and ease of use, and their contribution to achieving usability, in terms of efficiency, effectiveness and satisfaction. The workplace needs is defined by studying culture, organization, communication, collaboration, work processes, innovation, learning, attract and retain, technology, change management and trust.

Serviceability – the supply perspective of the building
Usability focuses on user perceptions of the ease and efficiency with which they can use the building. Serviceability, on the other hand, describes the capability of a building to provide a range of performances for which it is designed, used or required to be used, over time. While usability states a demand perspective, serviceability states a supply perspective (Alexander et al., 2004).

In accordance with Davis and Ventre (1990) the term *performance* describes the performed service in a particular situation, context and time, while serviceability means whether the building is capable of offering satisfying functionality for the users. According to Granath (2004), Davis defines serviceability as a broader term than performance, which indicates that his interpretation of satisfaction has a general meaning, and is not connected to individual values dependent on situation, context and time.

Granath also says "*The characteristics of the concept serviceability, as it is defined by Davis et al., (...) is that serviceability and hence performance is causally tied to functionality. In Davis' reasoning serviceability is synonymous to usability in the meaning it has in ISO 9241 – 11.*"

Serviceable buildings are buildings of a long lasting technical, functional and economical life time. Buildings functional and economical life time is usually shorter than their technical life time. High adaptability (generality, flexibility and elasticity) contributes, according to Arge and Landstad (2002), to prolong buildings functional and economical lifetime, and hence buildings *serviceability*.

This shows that a buildings performance means the service offered in a specific situation, context and time. A building's serviceability describes whether the building is capable of functioning as necessary, and is reflecting the user satisfaction.

Functionality – might result in usability?
In the Swedish case, functionality is discussed as a category beneath usability. According to Warell (2001) the term functionality can be described as *technical functionality* and *interactive functionality*.
Technical functionality:
- *Operational functionality*; characteristics or qualities of an object causing that a specific action or work can be done
- *Structural functionality*; characteristics of an object causing that the object is functioning as a part of the whole

Interactive functionality defines characteristics of an artifact that interacts with the users of the artifact:
- *Ergonomic functionality*; characteristics of an object functioning together with the users of the object
- *Communicative functionality*; characteristics of an object dealing with how shape and design expresses value and identification.

It is essential to examine the interdependence and connection between the terms usability and functionality. Will functional buildings automatically be usable buildings, or can a building be usable without being functional? In the theoretical framework for the Örebro case study it is said: "*We all know that functionality alone does not make a certain artifact usable. The technical and physical properties of the artifact and its theoretical potential to deliver a certain effect do not automatically make it usable in the real world. As a result of the definition of usability it also depends on the context the artifact is designed and used in and the values of the designers and users. Both context and values change with time and place.*" The Swedish case study concludes that "*We can define functionality as a property given to an artifact in order to create a practical effect. An important effect can be described as usability.*" (Lindahl et al., 2003).

In accordance to Warell (2001), functionality defines whether the product offers functions and features that users need to complete tasks. Usability, on the other hand describes whether these features will be used easily and efficiently during task completion.

Usability, branding and image
The Finnish case study is concerned with "the Old Mill"-building in the context of creating a brand. The brand concept includes usability, and it offers a way to describe the quality of the building; "*The intangible nature of brand includes the usability. (...) The brand can also be used as a framework for classifying the usability – the brand is a concept, a mindset, which have tangible artifacts like logo, slogans, buildings etc.*" (Nenonen, 2004).

Four elements are introduced as the basics of a real estate brand;
- location
- functionality (includes usability)
- services

- associations and image

The perspective of change
The French case study is studying the Ruche building as a mean to support organizational change, product development and improvement of the organizations processes. The project is also discussing the necessity of parallel management of the company's human and spatial resources (Fenker et al., 2004).

Some branches of the Ishikawa diagram are more comprehensively discussed than others. It is necessary to bring this discussions further forward, especially related to the branches "processes, time and conditions" and "adaptability". The different terms and interdependence between them will be further investigated during a PhD-study at the university.

Usability from different stakeholder's point of view

Different stakeholders and organizational levels have different perspectives considering usability of buildings. The terms usability, effectiveness, efficiency and satisfaction is interpreted and understood in different ways. Productivity and effectiveness are generally emphasized as a strategic management issue, while individual workers are engaged with user satisfaction and practical aspects in their daily working situation. There are several ways to divide an organization into levels. We are proposing a classification in five levels, ranging from the company in total to the individual workstation;
- The company
- The Facilities Management (FM)/ property
- The project / department / division
- The team
- The individual workstation

The four international case studies have made use of different approaches to the stakeholder perspective, and have been limited to different stakeholder's point of view. While the British case study is focusing usability related to teams and individual workstations, the Finnish case study is studying the main areas in the building and the usability perspective from the FM / property and project point of view. The French case study is discussing usability according to the company in total, FM / property and project / division.

The time perspective

The third approach to the concept of usability is discussing the time perspective in a building process. It is useful considering the different phases of the building process, and to discuss how the usability perspective is changing during these phases.

Development of concepts   **Production**

objectives / framework → concept, design → detailed project → building, production → Facilities Management
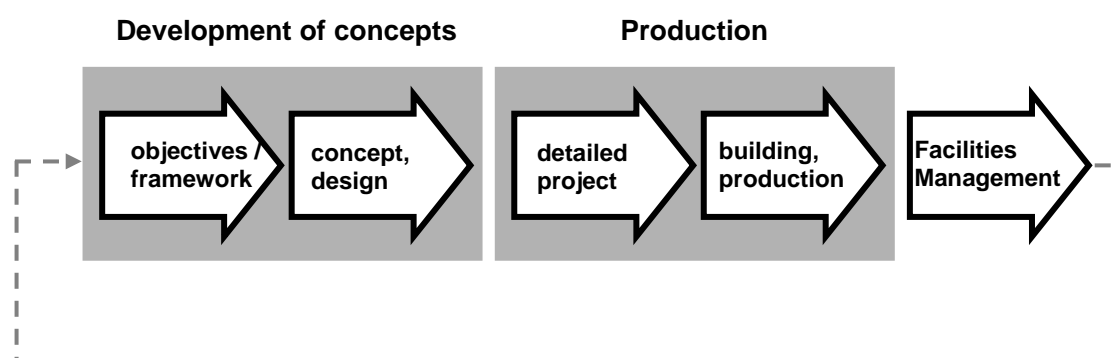
Figure 2. The building process (simplified) (Haugen, 2000)

The perspective on usability changes during the building process due to the character of the tasks and work performed by the different actors (figure 2). The functional qualities of a building are emphasized in the early planning phase, and there is a general focus of technical structures and functionality. In later phases, when the building is almost completed, usability and the user perspective come into focus. This is also visualized in the Ishikawa diagram above (figure 1), where the tail of the "fish" is

emphasizing the qualities related to the building, while the head of the "fish" is visualizing qualities related to use of the building.

Neither of the international case studies have so far offered much attention to the time perspective due to usability, nor have they discussed how the concept of usability is changing during the different phases of the building process.

Another aspect not offered much attention is the perspective of change over a time period, and adaptability and functionality according to this. The term adaptability means functionality of buildings in a life time perspective. Functionality over a time period is assuming buildings being adaptable towards continual changes in user demands and needs, and new ways of using the building.

In accordance with Blakstad (2001) adaptability is described as "*the ability to change as a result of internal or external influence, and is regarded as a strategic "from the top" approach"*. The term *physical adaptability* is used concerning the structure and technical system of the building. Adaptability is a generic term for the aspects flexibility, generality and elasticity (Arge and Landstad, 2002).

Workspace and context
The traditional CIB approach has been focusing architecture and buildings according to technical and structural aspects. The usability initiative has however shifted the emphasis to aspects concerning the organization and user.

"The Knowledge Workplace" project is studying the relationship between physical surroundings, organizational aspects and information and communication technology (ICT) at the workplace. In her book "Workspace", Mosbech (2004) similarly describes *"the four elements of balance"*; organization, workplace, IT and knowledge, and how these elements must be in balance for an office environment to function optimally.

The triangular figure (figure 3), developed as part of "The Knowledge Workplace" project, is here supplemented by adding context as an aspect in the figure. This is done to discuss the three aspects architecture, organization and ICT in a contextual situation, to include the setting of a building and to encompass cultural differences in different countries.
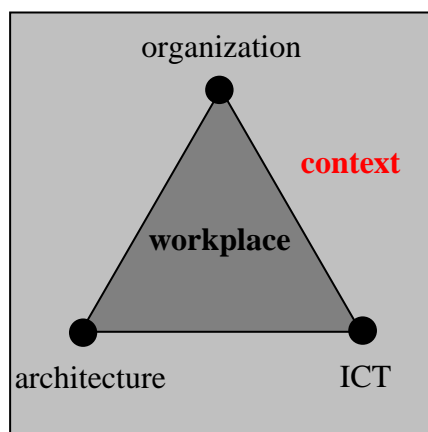

Figure 3. The balancing elements of a workplace in a contextual situation.

FURTHER STEPS - CASE STUDY: NORD-TRØNDELAG UNIVERSITY COLLEGE, LEVANGER

Introduction to the case study object
The University College at Levanger was founded in its current state in 1994, and the main areas of study at the university college are health care, teacher training and engineering. The school is situated at an area called Røstad, close to the north of the town centre of Levanger, in the middle of Norway.

The Campus has an area of 500 decare (a quarter of an acre) cultivated land, and consists of a composed and complex group of buildings, totally 28 000 sqm, of varying age and use. Owner of the campus buildings is The Norwegian Directorate of Public Construction and Property, and the user is The University College at Levanger and The National Support System for Special Education. Today totally 2 500 students and employees have their daily work at the campus.

Our case study is limited to a building completed in 1999, called "The New Pile" ("Nylåna" in Norwegian). This building contains offices for administration and teaching facilities, and the area is totally 10 800 sqm. The planning process was initiated in 1992 by an open architectural competition. The winning project was "ABC", developed by HUS Architects from Trondheim. A long lasting and difficult planning process arose, because of a lack of funds granted via the National Budget. Not until 1997 the project received the necessary funding, and the planning could proceed.

During the planning and building period of "The New Pile" there was an increase in the number of students and employees at 50% (600 students and 60 employees), and before completion of the building there was a need for further expansion, in shape of a new building, for the purpose of teaching and administrative offices.

The New Pile project is chosen as the case study object because the building has been in use for some years, and the user organization has made several experiences related to the building performance and usability.

Research topics and focus area – our contribution to TG 51
As part of our contribution to the work in TG 51 we want to do a further development of the theoretical framework of usability of buildings. Our case study will be discussing usability, and the different perspectives considering usability, during the different phases of the building process, in a lifetime perspective. The case study object will be used to explore challenges and interfaces between different parameters in the framework, due to these approaches. Evaluations of buildings-in-use and feedback loops are important to improve the programming phase based on knowledge and experience gained during the evaluation process.

In our case study we will be discussing different stakeholder's perspective concerning usability, with a special emphasis on the user perspective. Evaluations and measurements of the consistence of the planned and completed building, and the consistence of the completed building and the building as it is today, five years after completing time, will be accomplished as a part of the case study. This will be to study the validity of the planned building related to the situation today, and to discuss the perspective of change. How to handle the perspective of change will be a challenge in the case study.

The case study is a combination of a descriptive and a normative research approach. The descriptive approach will be carried through as an examination of how the process and the different procedures are accomplished. We will be combining several methods, like studies of project documents, a walk-through in the building, and interviews with central actors in the process. The normative approach will be carried out by organizing a workshop with different users, where the users themselves are invited into the work of evaluating criterions of usability of buildings. Criterions of usability, developed and discussed in earlier international Task Group Workshops will be discussed and taken further, in light of validity in the Levanger case study. Do the users recognize the situation? What criterions are most important to choose? How can this be evaluated related to their situation?

SUMMING UP

In this paper we give a background for our focus on usability and introduce a theoretical framework for understanding and exploring usability of buildings. We are demonstrating that the usability concept can be approached in four ways;

1. Criterions and parameters affecting usability.
Several aspects influence a building's usability and whether a building is fit for a specific purpose. By using a Ishikawa-diagram we are trying to discuss the term "usability", to define the content and different aspects of the term and to discuss the most important criterions for usability and methods and tools relevant for measuring this aspect of a building.

2. Usability from different stakeholder's point of view.
Different stakeholders have different perspectives considering usability of buildings. The term usability is interpreted and comprehended in different ways. Organizational productivity and effectiveness are generally emphasized as a strategic management issue, while individual workers are engaged with user satisfaction and practical aspects in their daily working situation.

3) The time perspective.
The usability perspective is changing during the phases of the building process, due to the character of the tasks and work performed by the different actors. Functional qualities are emphasized in the early planning phase, while in the later phases usability and the user perspective come into focus.

4) Workplace and context.
The traditional CIB approach has been focusing architecture and buildings according to technical and structural aspects. The usability initiative has shifted the emphasis to aspects concerning organization and user. It is also important to involve context in this discussion, to include the setting of a building and to encompass cultural differences.

This theoretical framework will be used as a basis for understanding the interaction between different parameters concerning usability of buildings in our additional work, where we will see in what degree we can do a further development of the term "usability" into operational methods and tools for planning, design and management of buildings. Our ongoing case study will be used to exemplify some of the issues concerning usability.

The research area outlined in this paper is part of a current doctoral research at the university.

ACKNOWLEDGEMENT

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