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Published in:
Proceedings of i3 Annual conference 2000

2000

Link to publication

Citation for published version (APA):
Rosander, C. (2000). Interactivity and Spatiality - Experiences of Modelling Real Work Places as Virtual Places in a VR Collabortive Environment. In *Proceedings of i3 Annual conference 2000*

Total number of authors:
1

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Interactivity and Spatiality – Experiences of Modelling Real Work Places as Virtual Places in a VR Collaborative Environment

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ABSTRACT
In this paper I will discuss interactivity and spatiality, including the relationships between virtual places and work places. The paper reports some initial experiences of using a virtual reality (VR) tool for collaborative modelling. The aim was to investigate how well this technology could support participatory design of work environments. In a pilot study a group of researchers carried out an experiment of long distance collaborative design in a virtual environment.

Interactivity and spatiality are important aspects that need to be considered in connection with emerging new technologies. In the experimental study the virtual environment represented a real work place quite satisfactory. The participants apprehended the virtual place as an interaction space for designing and communicating ideas in a smooth and unconstrained way. This initial work lays the basis for further research about future work places and use of new information technology, in a context of distributed work and various work environments including virtual places.

KEYWORDS
Interactivity, spatiality, work place, virtual place, interaction technology, communication, co-ordination, human-computer interaction.

INTRODUCTION

Today work conditions are going through substantial changes, not least in questions regarding work organisation and localisation. Distributed work is a term that describes work life that is less dependent on concrete places. Enhanced boundlessness in work could have several advantages but also some drawbacks. This development brings new challenges to designers of work places and information technology systems. There is a need for widened knowledge where experiences and research in a better way can be integrated in a holistic view on work place design.

The area of human-computer interaction (HCI) has contributed to design of better interfaces, even so some systems have an inability to support people in work practices where workers in a team need to share and jointly manipulate information. There has been an increasing need for communication between people in different locations. The use of new technologies enables new possibilities for long distance communication and co-ordination through creation of virtual places for co-operation and mutual activities. It is therefore important to study the implications of new interaction technologies in work place settings.

The use of new communication media is changing the work patterns, and thereby put new demands on the work place. These circumstances caused by information technology come to expression in all kinds of work environments. This has been given widespread attention, both in media and within research about work life (Greenbaum 1995). Earlier research has investigated interaction in different work places (Alexanderson & Rosander 2000).

INTERACTIVITY AND SPATIALITY

In our everyday lives we play roles before new audiences that are not physically present and in new arenas that do not exist in time and space. Individuals and groups have to change their behaviours to match these new situations. Electronic media affect social behaviour by reorganising the social settings in which people interact and by weakening the once strong relationship between physical place and social place. As we lose our old sense of place, we gain new notions of appropriate social behaviour and identity. (Meyrowitz 1985)

Information technology's connection to social communication is an important aspect to study in relation to the conditions that the surroundings of the work environment imply. Communication between individuals is affected by introducing new technologies and should therefore be in focus (Suchman 1987). Suchman's conclusion is that because an action or event always is dependent of a certain social and physical environment the understanding for and the attention on this environment is important when that action is to be interpreted and understood.

Virtual places and work places

According to Casey's reflections (1997) our use of technology brings with it an unexpected return to place. A new sense of place emerges from communicating through electronic media, a kind of virtual place. By inhabiting this place people can present themselves to each other in a quasi face-to-face interaction. They become accessible and seem to share the same space independent of location.

The development of electronic media has decreased the significance of physical presence in the interaction between people. Now people can be part of a communication without being physically present, that is, they can communicate with others without staying in the same place. The spatial settings for interaction have a quite different role in human communication today. Physically bounded spaces are less significant as information is available and easy accessible from outside the own environment. Hence, electronic media have altered the significance of place for human interaction. Media can create a sense of sharing and belonging or on the other hand a feeling of exclusion and isolation (Meyrowitz 1985). It is therefore important to consider the aspects involved in communication with regard to media's influence on the interaction patterns.

Wikstrom (1998) calls attention to the fact that the development is headed towards creating virtual places where distributed work can take place. These places are often constructed with spatial characteristics that in the users create a sense of spatial presence. This distributed manner of work makes us more independent of real places, and makes us move quickly in the cyberspace between many different contexts and virtual places. Our environment has great influence on how we can shape and carry out our work to achieve certain predetermined intentions and aims. Wikstrom further states that never before have we physically transported ourselves to such an extent as today, which indicates that we still have a need to be physically present on certain circumstances. Even though communication media's development has changed people's relation to places, the physical room will not lose its importance. This just means that we generate a widened view on the notion of place and learn to handle the concept of changeable spatiality, with several dimensions.

The work place has become a less bounded environment because of employees' access to other places through communication media. To understand physically defined settings in a given work place we need to embrace the interactional environment created by communication media. Electronic media affect to a larger and larger extent the work situation in these physically defined settings, and it is also creating new situations. The relationships between virtual places and work places are dependent on how the real world is represented in the virtual space, including what means there are for a rich and unconstrained communication between the participants.

METHOD

Ethnography is a valid approach for developing understanding of everyday activities of particular communities of people. This approach, with its emphasis on employees' point-of-view, holism and natural settings, provides a unique perspective for understanding users' work activities. In my fieldwork I have involved some combinations of observation, informal interviewing and participation in the ongoing events of the community. Through this extensive contact I expected to develop a descriptive understanding of the observed behaviours. (Blomberg et al 1991)

AN EXPERIMENTAL PILOT STUDY

Many studies in HCI focus on the individual user working on a computer system. However, this view neglects the importance of co-ordination and co-operation (Bannon 1991). The co-ordinating aspect of work activities has to be supported when designing the system. In my work I am taking part in a group of multidisciplinary researchers which are performing studies with the purpose of gaining some experiences about collaborative design (e.g. Hornyánszky Dalholm 1998; Davies 1999). The context of the experiment was the Envisionment Workshop, in which groups of workers use different envisionment techniques in designing work places, including full-scale modelling, pedagogical drama, democratic meetings and VR technology. The Envisionment Workshop is a design methodology based around participatory design through visualisation and user involvement (Ehn et al 1996). It is a collection of techniques aimed at assisting in participatory design in connection to changes of work places and it covers aspects from the physical to the organisational level. The techniques are combined in order to visualise and discuss ideas. To enable creative work place changes these techniques are used as means to establish a common language and communicate design ideas among the participants. The goal is to enhance the possibilities for design, visualisation and communication within a group.

This experiment was part of the efforts to investigate whether VR technology could complement the other envisionment techniques as a useful tool. Several case studies have earlier been carried out to investigate if a simple and intuitive VR based tool could be built to support participatory design (Davies 1999). In the fall of 1999 our group of multidisciplinary researchers carried out the experiment using a virtual reality tool for collaborative modelling in order to investigate how well this technology could support participatory design of work environments. The aim of this particular experiment was to investigate the possibilities of long distance collaborative design in a virtual environment. The technical equipment included three Silicon Graphics Octane MXE with

the VR program dVise (from division Inc.), with a spaceball, a mouse and 3D crystal-eyes. The computers were located in different institutions in southern Sweden. The researchers communicated through voice via an Internet conference system (SGIinperson) and through a 'chat' whiteboard program (SGImeeting). There was one group of researchers in front of each computer at the three different locations. In the virtual environment the groups could see each other as so-called avatars. The task was to collaboratively design a virtual work place in the shared virtual space on the screen.

In the site where I was located the group consisted of five people in front of the 24 inches computer widescreen who took turns operating the spaceball. At the other sites there were three respectively one person participating in the experiment. We were continually communicating with each other as well as with the other two groups. The members communicated foremost with voice but also through 'chatting' on the whiteboard. On the screen there was an open space where we started to build up walls in order to create a room. We could move our position with the spaceball to get a suitable view of the space. There were pre-developed elements ready for use that could be moved with help of the mouse. These elements representing walls and furniture were easily put into position after a few minutes of getting used to handle the spaceball. There were ongoing intensive discussions about how to furniture the room, and where to place the doors and windows. When discussing details of how to arrange the furniture as a suitable work place we tended though to foremost turn to the participants in the physical room. It seemed that when the discussion became more complex and involved deliberations there was a need for communication with body language and gestures as well.

The chat was of rather limited use, the type of contributions made in this channel were mainly short messages. It functioned as a kind of tool for brainstorming, e g suggesting ideas that needed reflection. It was not apprehended as direct as talking via the audio link. On the other hand, the audio channel provided a quick and easy way of communicating. It became natural for the participants to think aloud in an effortless manner. However, it was easier to relate to people in the same location even though the other participants were on a direct audio link. Visual confirmation like nodding and smiling seemed to be vital for creating a sense of closeness. The virtual environment was experienced to be well suited to represent a real work place. The participants apprehended it as an interaction space for trying out ideas and as a base for discussing different suggestions in an unconstrained manner. The difficulties laid in handling the technology in a smooth way and also in relating closely to those located at the long distance sites.

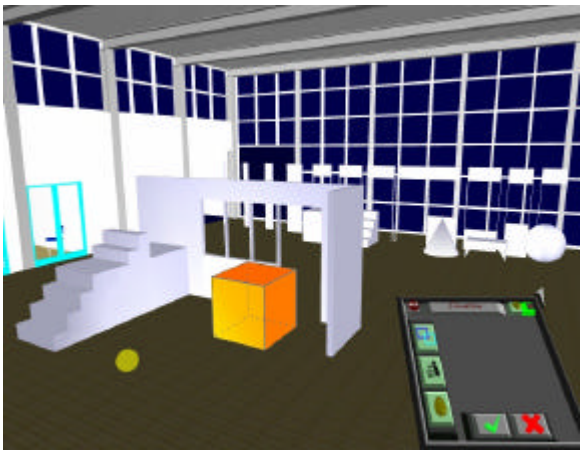

Fig 1 The VR environment

DISCUSSION

When individuals are confronted with a new technology they try to understand it in terms of their existing mental models (Norman & Draper 1986). If the technology is substantially different, these models may be inappropriate, and the individuals will need to significantly modify their models in order to understand and interact with the new technology, as argued by Orlikowski (1992). She also stresses that when individuals learn a shared technology in isolation, they may form their own assumptions and routines. These interaction patterns may considerably differ from those of the people they will interact with through the technology.

New conditions due to technical advances have come that from a placial point of view have engendered major changes in a diversity of work practices today. Now we are connected with places far away and everywhere, this implies a whole new range of possibilities but also changed attitudes in questions about the apprehension of presence. A widespread interaction and co-operation have been made possible by electronic media and former limitations are exceeded with the help of technology, but instead new questions have emerged. The spatial conditions that the new information technology gives rise to have implications for how we perceive our position in relation to others with whom we interact. Technology helps us creating places, both real and virtual in which we can perform. These phenomena have significance for how we can use place as a point of view for understanding and reasoning about human activity.

Spatiality provides a space for action where events can take place. It affects how we form our interaction patterns and how we claim the physical room. This leads towards a requirement for a wider consciousness about how we use electronic media and what effects different tools for communication bring with them. It is also important to enable making conscious choices of different tools for different purposes, depending on the situation and what we want to achieve for the moment being. The notion of place also includes social dimensions; it is

the arena for communication and collaboration. Electronic media has affected our social behaviour in the new forms of social spaces that it has created. The social place is no longer tied to the physical place, but can instead emerge in completely new patterns of interaction through electronic media. Our sense of place has become fundamentally changed as we remodel our conceptual view on spatiality. Social interaction is no longer dependent on physical location, even in the sense of concrete presence, evidently mediated presence could provoke a similar experience. New technologies will affect communication in different ways and as a result we adapt our exchange with each other by the possibilities and limitations of the technology.

Recent development of interactive environments makes people's relations to rooms an important aspect to consider in designing these environments. With interactive media new rooms are created, that in a sense have spatial characteristics that give a feeling of presence. In certain aspects these rooms can be seen both as tools and contexts for people's interaction. These rooms can be used in varying ways for different purposes, both as a physical interface and as an interface towards other, virtual places. At the same time they are the environments at present from which the communication gains its coherence and meaning. Technologies like VR and ubiquitous computing (Weiser 1991) can contribute to create enhanced environments where work can be performed in a more effortless way. This possibility may also help us with the important matter of information overload, to overcome this problem it is crucial that the technological environment is able to provide these relieving qualities.

CONCLUSIONS

In our experiment the virtual environment could represent a real place quite satisfactory. The participants apprehended the virtual place as an interaction space for designing and communicating ideas in a smooth and unconstrained way. The gained experiences of the pilot study indicate that it is possible to collaboratively design a work place over long distance in a beneficial way with the support of a VR tool. The relationships between physical places and virtual places are blurred when we are networking between several places and realities simultaneously. The significance of place has been altered by new possibilities and we need to adapt our behaviour to match these changed conditions. I believe that interactivity and spatiality are important aspects that should be considered in connection with emerging new technologies. This initial work lays the basis for further research about future work places and use of new information technology, in a context of distributed work and various work environments.

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