Office Environments for CSCW in Design and Architecture

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ABSTRACT

In this paper, we propose a novel paradigm for office environments with the focus on the rapidly changing work processes in the fields of design and architecture. The proposed environment supports the dynamic modification of teams, the mobility of the whole system, and the interaction possibilities with others with the aid of new technological developments and the segmentation of a projected desktop. We suggest additional workflow components (with appropriate visualization techniques), which support the user in the processes of design and communication.

Keywords
Human-Computer Interaction, Office Environments, Industrial Design, Interaction Design, CSCW, Desktop Metaphor.

INTRODUCTION

Office work is currently changing everywhere to satisfy national structures and international cooperation. Future companies will consist of small operational units with an increasing number of highly specialized freelancers providing the specific know-how needed for a project [1]. This development will very likely lead to interdisciplinary virtual teams cooperating via worldwide information networks, and even to virtual companies. Developing transmission standards and better communication and information techniques will support interactive and personal communication and the transmission of data simultaneously in the coming years. In this context, the communication of abstract and associate elements will lead to a creative process.

An office environment in the field of design and architecture was drafted in an interdisciplinary design project. The demands of work on the proposed group do not allow for mobile offices alone, but require a dynamic combination supporting both the present users in the office and outdoor satellites.

Furthermore, we have planned a concrete office installation and an input device for stationary and mobile applications. For this environment, we have developed a user interface, supporting both a suitable presentation of data and the visualization of the corresponding team partners in CSCW applications (see figure 1).

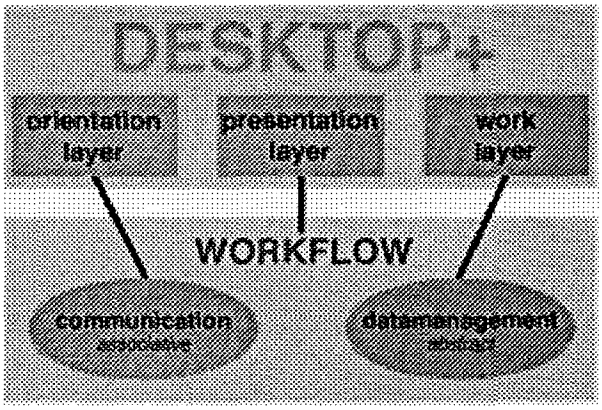

Figure 1: Structure of the **desktop+**
The workflow components conjoin the associative and abstract elements to support creative collaboration in scalable team sizes.

STATE OF THE ART

A number of projects have addressed the changing needs and the new requirements in office environments in the context of new work paradigms. One of the main tendencies observed at the workplace today is the integration of larger display areas and interaction devices in the office environment.

An example of this is i-Land [2], which integrates large projection areas and projection tables into office walls and tables; similarly, projection systems and various displays are applied in the "Office of the Future" [3] and "Augmented Surfaces" projects [4].

The additional need for a specially designed user interface for such environments has been discussed in the "Office 2005" and "OfficePlus" projects [5], which focus on the individual workspace. (Here, the display area is not only increased, but a specifically designed user interface making use of the increased presentation area is provided. In addition, a user interface agent as a central interface to various software agents is included.)

While all these project examples address and enhance important aspects of daily office work, they fall short in supporting interdisciplinary teamwork in creative work areas such as industrial design and architecture. None of the mentioned approaches is really scalable and supports teamwork with varying group sizes. Moreover, these office solutions are either designed for teamwork scenarios or for individual work only. None of them is flexible enough to support both scenarios, a requirement that is important especially in creative and interdisciplinary projects and the sophisticated work

scenarios of virtual teams. This is especially significant for CSCW solutions.

SCALABLE OFFICE ENVIRONMENTS

Based on the introduced requirements, we propose an office environment design for interdisciplinary cooperation with the aim of retaining the dynamic of communication and collaboration. We attained this goal by designing an extended **desktop+** consisting of 3 layers (see figure 2):

- a common **presentation layer**,
- an **orientation layer**, and
- a **work layer**.

A common presentation layer provides the required quality of illustration; an orientation layer integrates workflow techniques in CSCW and serves for dynamic forms of communication.

We have borrowed from current tendencies to use multiple displays and larger display areas and made use of PDAs and modified interaction techniques for local and global input. In our case, these ideas are combined with CSCW techniques, allowing for distributed teams and scalable team sizes in the work process. One of the main ideas is the simultaneous visualization of users and actual documents. A segmentation, as well as scalability, of the display surfaces creates centers of interest and is suited for variable team sizes.

In structured office work processes, more and more workflow techniques are applied to optimize standard work procedures and to enhance the QoS. However, up to now, workflow aspects were not relevant for heterogeneous design processes. In our work, the goal is an integration of workflow components with the aim of visualizing the project history, to provide better orientation in projects with large and distributed teams, and to enhance project documentation. Furthermore, the workflow metaphor is used to structure CSCW communication.

REALIZATION

The **desktop+** environment is differentiated into a common representation layer, an orientation layer, and a work layer for sorting information. The common representation layer is intended for present contents and the representation of the external participants in its actual size. The separate treatment of a common layer, which is a projection on several, staggered displays, has the advantage of presenting maximum density of information without interfering with other functions. For this, we want to use the technology of laser projection, which enables a precise quality of representation on spatially installed surfaces and 180° round projections with just one device.

Projections of external users consent to speak with the user like on a picture phone. The intention is to project alternately only two active users on the two assigned display segments, since two users at maximum can interact at the same time on a common layer. The mobile pen-based input device integrates an orientation layer and a personal work layer (a conventional desktop). The orientation layer serves for the interaction of the common layer and for the regulation of the communication between users. It provides the opportunity to view other layers and to interact with them. On this layer, workflow, information space and electronic business cards are visualized. (Intended) actions of the users are shown by the position of their electronic business cards.

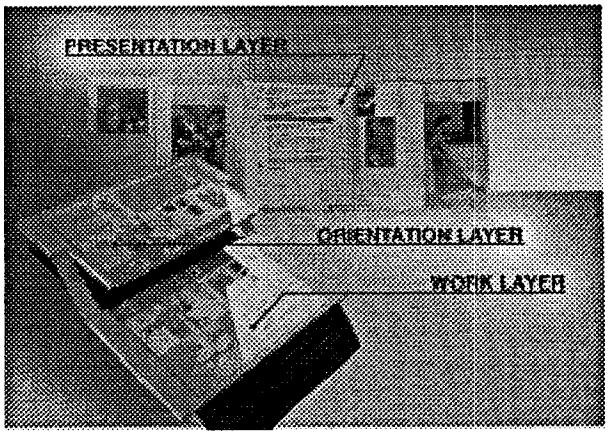

Figure 2: Prototype design for a projection wall and a split-screen PDA to support the **desktop+** paradigm.

The mobile input device in front integrates the orientation layer and the work layer; the common presentation layer in back is projected on staggered display walls.

Active fields, which serve for protocolling, are situated at the points of intersection of workflow and information space elements; relevant contributions can be collected at this place. A multimedia protocol, providing a history of conversations and decisions in the shape of a graph, develops from these fields. Based on the turn-taking of conversations, the protocol workframe serves for basic functions, such as concerning or summoning prior activities.

Pen computing makes dynamic interactions (as in fast scribbling or handwritten notes) possible, just as they are practiced in real meetings. Actions can be triggered by "drawing" certain symbols which originate from the real way of working; this means that a kind of code optimized by usage can be agreed on at the user's personal workstation. These two high-resolution displays of the input device can be arranged differently and thus be tailored to the referring application. Interaction options with a tracked, transparent, and sensitive tablet extend the functionality and also support the natural usage with data.

CONCLUSION

The design of scalable workplaces supporting interdisciplinary cooperation, as well as natural and spontaneous interaction, will be the major challenge in the coming years. A critical review and redesign of the desktop and the user interaction will be one of the central tasks.

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