

Learning and living in the ‘New office’

Eva Bjerrum & Susanne Bødker

Centre for New Ways of Working, University of Aarhus, Denmark

(*ebjerrum, bodker*)@*daimi.au.dk*

Abstract. ‘Knowledge sharing’ and ‘learning’ are terms often connected with the ‘New office’, the “modern” open office space. Work in these settings becomes more and more distributed, mobile and characterised by temporary constellations of collaborators. The workers are mobile and work wherever they are. Based on nine case studies, this paper describes how the ‘New office,’ intended to support learning and peripheral participation often gets directly counterproductive to this purpose. It lacks places to dwell and return to, places to meet coincidentally, shared artefacts and possibilities of leaving traces of current and past activities. These problems are due to a combination of problematic architecture and insufficient technology, and not least to insufficient design processes, where the actual needs of the people in the organisation are rarely considered, and where people are rarely involved in the design and introduction processes. Through exploratory design we have pursued ways of improving legitimate peripheral participation, through architecture, physical artefacts and materials in the rooms as well as through virtual extensions of these artefacts, in order to explore alternatives and raise further research questions regarding ‘the new office’.

Introduction

Our starting point in this paper is that CSCW has analysed and conceptualised many cooperative artefacts, though never the “modern” open office space, that are dominating discussions of new ways of working, flexible offices and the learning organization. It is our basic suspicion that many organizations introduce open, flexible office solutions to support learning, yet it seems that they are often running the risk of throwing the baby out with the bath water - of neglecting some of the

mechanisms that make learning and peripheral participation happen. They implement office design in a way that is contradicting to how CSCW views cooperation as basis for learning and knowledge sharing, and hence the actual office design becomes counterproductive to the ideas as such.

'Knowledge sharing' and 'learning' are terms often connected with the 'New office', the "modern" open office space. At the same time as offices move from hallways to open spaces, work in these settings becomes more and more distributed and mobile. The workers are "always on" and able/demanded to work wherever they are. Work is increasingly characterised by temporary constellations of collaborators because people work in projects, and because people move about between employments much more than previously (Sennett 1998, Nardi et al. 2000). Traditionally, office workspace has been designed to fit with the organizational hierarchy, regarding location, size as well as furniture. Office design was mostly seen as a cost, a way to support quiet work and show people's status. This way of thinking lives on, and is in many ways conflicting with the demands from more recent ways of organizing work. Hence, there are many good reasons for rethinking the workplace design to support work as it actually takes place in the office.

The ideas and theories behind the '*New office*' are as follows: (Raymond & Cunliffe, 1997) describe the purposes of the new office as to attract and retain staff and to revolutionize corporate culture. Administrative work must take place in different work settings emphasizing learning and overhearing of the activities of others. Flexibility is essential for learning, and "*flexible working needs flexible settings, places that can change to accommodate whatever is happening now or tomorrow*" (p.2).

Worthington et al. (1998) focus on different activities and functions and divide the workplace into different types of rooms. Their typological model, called "The responsible workplace model", distinguishes four basic types of offices - hives, dens, cells and clubs - based on different levels of interaction and autonomy. The dens for group processes, the hives for individual process work, the club for transactional knowledge work and the cell for concentrated study. In their definition, the new workplace consists of shared open spaces for interaction and communication, shared offices for confidentiality and concentration, project rooms for teamwork, café areas for informal meetings, external and internal meeting rooms, mobile and modular furniture, as well as wireless LANs and a variety of mobile technologies. Myerson & Ross (1999) use four key themes to describe the new office: Team, Exchange, Community and Mobility; team offices which encourages team-building and group working; exchange offices which promote sharing and presentation of knowledge; community offices designed for greater social cohesion and mobility offices, designed for work everywhere. Many of the theories behind the new office are focussing on designing space and rooms to support particular activities and work processes.

We welcome these new initiatives: The idea that you can choose a setting depending on the task you're working on; the idea that a workplace is an important meeting place for flexible workers; and the idea that you can easily get in touch with your co-workers, cooperate and share knowledge.

Whereas, however, ideas and theories behind the 'New office' are challenging and exciting, everyday living and learning in the 'New office' is often much more problematic as we shall see in the following. And the appropriate technology is indeed lacking behind.

Empirical background

Centre for New Ways of Working does research on office workspace and technology from a perspective that emphasises the intertwined nature of organisation, physical space and technology. The research is action-oriented, interdisciplinary, and analytical as well as design-oriented.

Title	Resources/duration	Purpose	Methods
C1. Engineering company	3 months	Exploratory design of CSCW	Observations, interviews, workshops, video prototypes
C2. Design firm	3 months	Exploratory design of AR technology	Observations, interviews, workshops, video prototypes
C3. Telecom industry	1 year, 55 subjects	Analysis of work patterns	Registration of work patterns Interviews
C4. County office	6 months 26 subjects	Analysis of work patterns Mobile work and technology	Observations, Registration of work patterns Interviews Workshops
C5. The State Agency	Several visits	Example material for book	Interviews
C6. Research organization	Long-term study	Analysis of work patterns Design of new building	Registration of work patterns Interviews Workshops
C7. Dot.com	Long term study 1 month per year	Knowledge management	Observation interviews workshops
C8. Advertisement bureau	Visit	Example material for book	Interviews
C9. Professional organization	Several visits	Example material for book	Interviews

Figure 1. Case studies – work setting of each case described in figure 2

The paper is based on several empirical studies of modern office space and office buildings, in particular such that are claimed to be “new” or even “innovative”, and it will draw on examples from these studies when necessary. These studies are of a varying nature – from yearlong empirical investigations combined with participatory redesign of technologies and spaces, to one-day site visits and accompany-

ing interviews with key persons (see figure 1 for overview of cases). Common to the studies, however, is the overlaps in methods that make it possible for us to compare across studies, qualitatively and to some extent quantitatively. It is these comparisons that form the basis for the examples used in the paper. Hence our references to the cases must be seen as examples of more general findings, rather than as solitary empirical findings.

Furthermore, the paper will draw on our past studies of more traditional office settings (see e.g. Trigg & Bødker 1994) and our own exploration of ways of working and IT-support in an open flexible office, that was set up for exploration in our own physical and organisational environment. This open, flexible office constitutes a microcosm (Engeström 1987) in which we

- gain our own experiences with working in a flexible environment,
- draw on experiences from the case studies to explore the relevance of the experiences gained in the flexible office,
- in particular we explore various CSCW technologies to understand the possibilities of supporting awareness and cooperation in the office,
- and we use those experiences to raise further questions to the case studies (bringing experiences from the microcosm to more general real-world settings).

The use of the flexible office is developed through a participatory process including regular office meetings where problems are dealt with and discussed and prototyping experiments to explore cooperation possibilities in the office.

CSCW and the office

In a certain way, the interest in offices among CSCW researchers started before CSCW, not least with the studies of Suchman & Wynn (1984) of procedures and problems in the office. In these studies, they pointed out how much work in, what at first glance seemed to be highly routinised office settings, is based on joint problem solving, based on the peripheral overseeing and overhearing of the work of co-workers in the office. Since then, surreptitious monitoring has been found in many settings to be the basis for learning and knowledge sharing. In these processes it is equally well demonstrated that it is through the joint access to materials and artefacts that these processes take place as much as it is through conversation (Wagner et al. 1999, Robinson 1993). Teasley et al. (2000) in particular point out how ‘at a glance’ visibility of a permanent record of group activity and decisions is essential for teams working in shared large workspace.

In her book about the development of office technology, Yates (1989) points out how such technologies, by structuring and enabling communication have made distributed organisations possible.

In some ways, the “new” office technologies are a continuation of these developments. Shared electronic document repositories are a continuation of the advan-

ced, yet individual and paper-based, desks that Yates describes, and wireless laptops and mobile telephones an extension of the communication technologies that made distributed organisations possible.

Title	
C1. Engineering company	The Engineering Company is located in a new building with a perfect view from most windows. The public areas of the building consist of a reception, stairways, café areas, and cafeteria area with meeting rooms. The office space consists of two floors of open-space office with flexible quiet/meeting rooms to one side. For the majority of people they have their own desk somewhere in the open space, together with other people from their group or project. Desks are moved when necessary. Managers have desks in the open space as well. People have regular PCs. Some people use CAD stations with larger computer screens and a small number of laptops are available. The network and the telephones are stationary. Materials are kept on shelves. There are hardly any pin boards anywhere, and there are whiteboards only in the meeting rooms. The company is continuously experimenting with the use of their office space, hence they experimented with open offices before they moved into this building, and they are continuing to experiment.
C2. Design firm	The office is the home of three independent industrial designers and a similar number of hired staff. The office space is open, and filled with models, mock-ups and materials. People move about, and change the location of their work, partly as a result of the task they are doing and the tools they need, and partly when they change between the projects that they are working on. The CAD workstations used are not movable, and hence are in some ways determining where certain tasks take place. People cooperate around projects, and move between places as they move in and out of discussions or situations of practical cooperation. The designers use the stuff left in the office space to seek inspiration from past projects, and visitors are left in no doubt what the firm is doing and which projects they are proud of.
C3. Telecom industry	A department with 55 people is placed in 6 different locations. The company wanted to make a new office design to obtain increased knowledge sharing and cooperation and they wanted to implement a strategy for flexible working arrangements. In all 6 places the employees were placed in a traditional office environment with hallways and offices. Most of the technical solutions were stationary although most of the employees were flexible workers.
C4. County office	The Office is currently located in two different locations, each with traditional hallways and individual offices. People work on a variety of matters regarding the relationship between the county and local business: tourism and EU lobbyism are two such instances. The County office has flexible working hours and some people travel extensively and work from a distance (Figure 6). At the same time all employees use the same PC platform. This causes problem to e.g. the EU lobbyists who need to exchange electronic documents with numerous agencies, which typically use Microsoft products. It is typical to the Office, that while each employee cooperates with many people outside the office, there is little cooperation between employees in the office (Bjerrum & Brinckman, 2001).
C5. The State Agency	In the State Agency's new building there are 450 employees The Agency moved into a new building a year ahead of our studies. This building was planned with new office design. The main idea was to gain increased knowledge sharing, increased efficiency and more flexibility. The office is dominated by big open spaces. Most of the employees own their desks, 30 work at different places in a hotelling concept. In the building there are 36 meeting and project rooms. Some people use laptops and some stationary PCs. There are project rooms, hives or offices and café areas spread all over the building. There are no colours (except for the clothes the employees are wearing) and there is nothing on the walls – no paintings or whiteboards - because the house rules prevent that.
C6. Research organization	The research organization is now placed in a traditional office environment with hallways and offices. The organization manages research cooperation between universities and industry. The plans for the new building are to make a range of different solutions for different people and work processes. There will be room for group work, individual work, formal and informal meetings. Everybody will have his or her own desks. There will be no rules except that people can fill the walls and desks with projects and paintings - both professional and personal stuff. Rooms will be equipped with whiteboards and pin boards. Wireless networks will be in place, and telephone arrangements are currently investigated.

C7. Dot.com	The Company is an internet start-up that has emerged out of a more traditional IT-firm. It is placed in an old building with a large staircase in the middle. There are 25 employees placed in open spaces all the way through. They all have their own desk and most have laptops and cellular phones. There are no white boards or pin boards except in the meeting room. The company builds knowledge management software and is concerned with the knowledge sharing in the company itself.
C8. Advertisement bureau	This bureau has created a workplace like a home from the seventies in an apartment with children's room, kitchen, and living room – even a cocktail cabinet. All the employees have laptops and cellular phones. The price for a worked through concept is a lack of white board and pin boards and personal stuff.
C9. Professional organization	The professional organization with 100 employees moved into a new building in 1999. The employees are all placed in open spaces all the way through - except for the management who launched the idea. The idea was to mix different cultures and increase knowledge sharing but also with a focus on interior design. There was an enormous resistance towards the ideas in the new building especially from the development department. The Development Departments answer to the New Office was to create "offices" with a lot of walls in the open space. The professional organisation is now in the middle of a reorganization of the workplace. They are prepared to start all over again and this time they involve all the employees in the process.

Figure 2. Case work settings. Most cases are documented further in Bjerrum & Nielsen (in press)

When it comes to learning in this perspective we find Lave & Wenger's (1991) definition of learning as legitimate peripheral participation useful, because it emphasizes what the main argument for the 'new office' is about: learning and peripheral participation in activities of other people in the room. The concept of legitimate peripheral participation emphasizes the social nature of learning, and the potentiality as well as actuality of being located in a physical and organizational space. In continuation of the same line of thought we see knowledge not as a commodity, or object that can be placed in the common space to be shared, but as deeply process-oriented and interpersonal (Nonaka & Takeuchi, 1995). Activity theory and distributed cognition are other relevant theories that we find of greater importance if we move on to an analysis of shared artefacts and representations in the office (see e.g. Bertelsen & Bødker, 2001, Bødker et al. 2001 or Olson et al. 1998).

Nardi et al. (2000) point out that knowledge workers are becoming increasingly dependent on personal knowledge networks across organisational boundaries and physical locations. In the current societal condition workers are furthermore expected to move between places and locations of work, rather than to spend their lives as a "company man" (or woman) (Sennett, 1998). Because of the ongoing moving about, the responsibility of learning is increasingly put in the hands of individual participants (Nardi et al. 2000) and their personal networks whereas the role and mechanisms of the organization of supporting collective learning, to knowledge maintenance and innovation are losing out.

Bødker & Christiansen (2002) develop the connection between place, identity, materials and learning, what they call dwelling, by pointing out that it is important to dwell in order to develop routines and to learn. Dwelling means that one is able to move and come back, to repeat what one is doing. Such dwelling is the starting point of imagining something different. In other words to have an environment that

is recognizable is an element of developing routines, and routines, even in the flexible work setting is a precondition for legitimate participation. Routines are preconditions for innovation, for creating something new (Engeström 1987).

Harrison & Dourish (1996) talk about the importance of place as well as space. Suchman (1993, 1996) describes how airport workers create such places, as centres of coordination to orient in a large, unstructured physical space. Bertelsen & Bødker (2001) discuss a case where learning and knowledge sharing is connected to movement in a large but well-defined physical space (a waste water plant).

These perspectives will be applied in the following to analyse findings from our studies of the 'New office' design.

Findings from the field

Our studies of office space and interviews with decision makers show that the *main reason* for implementing new office design is the wish for increased learning and collaboration among managers and employees. As we shall see from the following, we find in our cases different solutions, which do not support:

- Rendering work and activities visible.
- Learning through other means than hearing.
- Participation while away.
- Mobility.
- Transition between locations and cooperative situations.

In the following we will describe these findings through different examples from our different cases (Figure 1) and a more detailed presentation in Figure 2. For pedagogical reasons and to allow us to go into some level of detail, we shall use some of the cases as more dominating examples than others. This is not because they are particularly better or worse than others.

Rendering work and activities visible

New office buildings, such as the State Agency (C5) or the Engineering Company (C1), are often very anonymous. They all look the same and they all look very nice. The office building and the office design rarely show the company story, they do not show to customers whether they have entered an auditing firm or an engineering company.

There are exceptions to this, e.g. the Advertisement Bureau (C8). It is awful but has been useful in many ways because it shows identity and a certain style for customers and employees to identify with. However, this is primarily a matter of branding and not of asking whether employees feel comfortable working in the kitchen or the children's room (Figure 3).

One matter, however, is a building not showing the history or company vision or product to outsiders, another is people in the building and their professional and personal identity.



Figure 3. Showing corporate identity

The new office buildings are often characterized by very restrictive “exhibition” rules (E.g. C5). People are not allowed to show their sketches or pictures at the walls. The architects or the management are afraid that people will put up stuff that will remove a nice general impression. That it will be pure disorder and anarchy, as one manager said (C1, similar statements from C7).

We recently visited a company where they had the following rules for *good* conduct in an open space (figure 4).

A common rule is a “clean desk policy” that requires from workers, whether they have a permanent desk or not, to clean up their desk every day. Hence, they are prevented from leaving “stuff” around that reminds others or themselves of what they do, here and now, or over time. This type of clean desk policy is in harsh contrast to the piles of material found in creative offices of designers (Wagner 1999, and C2), but also to what we find by a simple at a glance inspection of a random office section in a university department or a research organization such as C6.

- Abandoned cellular phones will be removed.
- You’ll have to clear your desk even if you come back the next day.
- Common areas and quiet places must be cleared after use. Take care to make them presentable. Remove paper, binders and other unnecessary materials.
- Don’t place things on the top of the bookcases.

Figure 4. House rules - good conduct

Even if there is no strict clean desk policy, the open space impression is very important and our cases show that whiteboards and pin boards are rare (see e.g. the Engineering Company, C1). And the house rules further reinforce our impression that the buildings look the same. The office design looks the same. The furniture looks the same. The empty walls look the same. There are very few, stable “landmarks” in the office landscape. It is difficult to know where one has to locate oneself to casually meet somebody, and even more importantly, creating what Such-

man (1993, 1996) calls “centres of coordination” – places to coordinate with other people, e.g. in an open landscape such as, in the case of Suchman (1993, 1996) an airport tarmac.

The empty desks and walls make it virtually impossible to share “stuff” while working in the office. The moving about, the clean desks and lack of information on the walls are counterproductive to sheer coordination: When walking through the office landscape it is difficult to sample impressions of who is doing what, and hence be a legitimate peripheral participant in projects and topic areas other than your own. This means that unless a person happens to be located in hearing distance, it is necessary to turn to the company intranet to identify a person working on a particular topic. We conclude that there is a tendency that new office designs are driven by architects’ focus on a particular kind of anonymous aesthetics more than by people’s need for dwelling, i.e. occupying a space, individually or together, and for showing their work and personality.

Learning through other means than hearing

As described above, the open office is one where whiteboards and pin boards are rare, and where there are few other places for projects or teams to post material for mutual monitoring of a process or for mutual creation of a product. In our perspective on learning, the open office has on the one hand a lot of potential for being the centre of a lot of legitimate peripheral participation. This is by virtue of being open and flexible so as to allow for moving nearer to where things happen and to allow for overhearing and over-seeing. Yet, conversation requires co-locatedness in time. In particular, the lack of shared artefacts, such as sketches and drawings makes legitimate peripheral participation difficult. Accordingly it appears to be an assumption behind the new office design that learning is entirely an effect of talking and listening, which we propose that it is not (see Bødker & Graves Petersen 2000).

Furthermore, the functional spaces are equally separated by house rules - you may start a conversation in the common quiet area, but in order to continue, the co-operation needs to move elsewhere. A discussion may start in the café area, but due to the lack of shared artefacts there (whiteboards or computers) a focussed discussion need to move to a meeting room. Teasley et al. (2000) mention nine kinds of work taking place in a software design team and focus, similar to us, on the transitions that happen between those.

Trailing after the open office design, the newest trend is the establishment of a new type of rooms, called “innovation rooms” or “experimental rooms”. In such rooms, you get all the gadgets and offbeat objects that lack in the rest of the anonymous offices (Figures 5 and 6). You can walk into a specific room to be creative, to brainstorm, to play or to write on the ceiling.



Figure 5. Brainstorm room

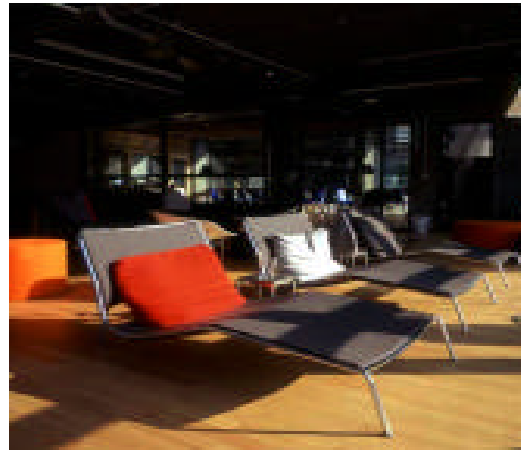


Figure 6. Working/meeting

We suspect that the need for such add-ons is symptoms of the lack of learning, creativity and knowledge sharing in the open office. And we worry that these rooms are exaggerations that add yet another place with artificial rules where one needs to behave in certain ways - creative ideas don't always show up because you make an untraditional design of a room. Rather, in our cases we find that people use posters and materials from past projects, etc. (e.g. the Design Firm, C2). These innovation rooms are different from the "war rooms" described by Teasley et al. (2000), because the war rooms are not 'add-ons' but part of an integrated strategy where people are continuously located in the room, with a documented effect on productivity, learning and cooperation.

Participation while away

In three case studies (the Telecom Industry, C3 the Research Organisation, C6 and the County Office, C4) we have looked at workplace and location of activities. The participants registered their working patterns and locations for a period of 7 weeks; the study involved 55, 24 and 17 participants respectively. In all cases there was a span of working patterns, from very few people spending all their working hours at the workplace (typical secretaries) to mobile people spending most of their time outside the workplace working through a combination of mobile work, external meetings and working from home (Example working patterns in figures 7 and 8). Our studies show that people in general only are in their office half their working time. In different national institutions the utilization of a workplace was measured four times a day (within normal working hours). The conclusion of the Building Management of the Danish State was that the workplace in general is used less than 50% of the time (Mosbech, 2001). Observations of hundreds of cases show that office workplaces are rarely occupied for more than one third of the time that they are available even during the core eight-hour working day (Duffy 2000).

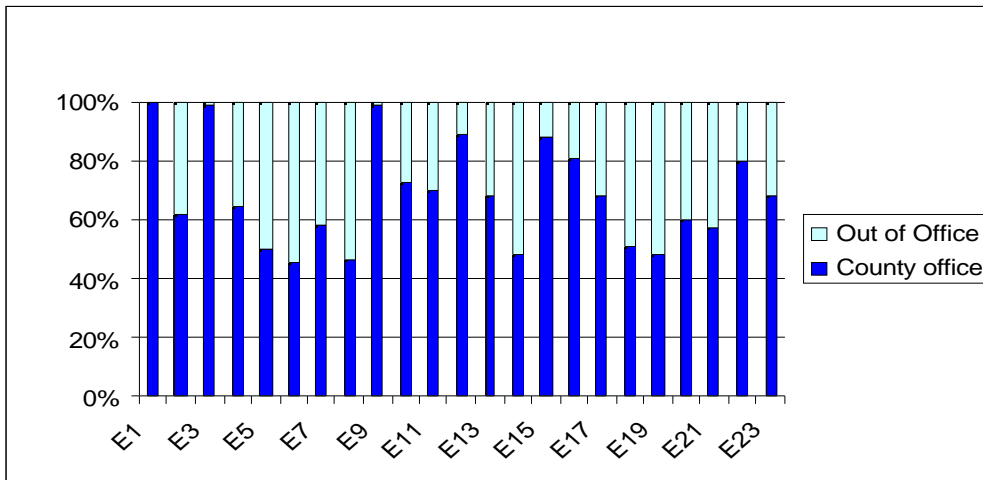


Figure 7. Working patterns – C4. The X-axis represents 23 employees. The Y-axis represents 100 pct. working time accumulated over 8 weeks

The differences in working patterns show the need for rethinking the workplace. It is obvious that mobile and non-mobile workers don't need the same office solutions, roomwise, or with respect to furniture and technology. They need different choices, e.g. with respect to "owning a desk", with respect to mobile, wireless or traditional telephones, and with respect to computers. In C4, where the highly mobile EU lobbyist may desire an advanced mobile telephone and a laptop with wire-

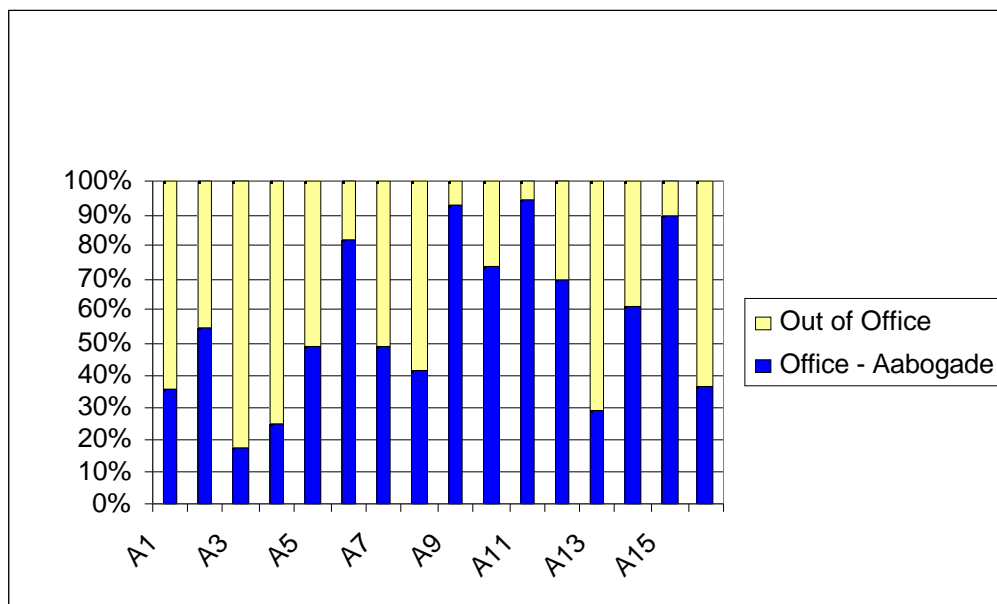


Figure 8. Working patterns - C6. The X-axis represents 23 employees. The Y-axis represents 100 pct. working time accumulated over 5 weeks

less Internet connection, the secretary may have greater need for a desk with a stationary PC and a large computer screen. And while the secretary may be content with sharing document formats inside the walls of the County, this is highly insufficient for the EU lobbyist.

Our studies further show that the more people are away, the more important their workplace is. They enjoy the qualities of place when they are there, and they need a workplace where it is possible to get both a professional and social contact to colleagues. This is in essence what Bødker & Christiansen (2002) call dwelling. They point out how too much movement and too much change in the surroundings prevent routines in developing, be they routines by which work can be left for later, similar matters dealt with at a later instance, or conversations to be left for later. In many ways, the familiarity of the surroundings is a precondition of learning.

Transition between locations and situations

Through the emphasis on functional space (e.g. dens, hives, club, cell) (Worthington et al. 1998) the new offices at a first glance seem to support casual encounters as well as focused ones. However, if we look at the Engineering Company (C1), the café, intended for casual encounters, has neither whiteboards nor tabletop space. Accordingly, people may start a casual conversation in the café, but there are no means there for changing this into more focused work. Hence, people need to move to a meeting room to continue such focused affairs. This is indeed a transition in type of work (Teasley et al. 2002) or mode of cooperation (Simone & Schmidt, 1996) that leads to a transition in location. Similarly, in the open office, people may pass by somebody's desk and ask a question, e.g. regarding a CAD drawing on the person's screen. However, a more detailed conversation cannot continue there without disturbing the rest of the office. And materials are not easily moved away from the CAD screen and into the meeting room. The only thing that can be moved is the entire desk with its telephone, PC and everything else.

While the different modes of cooperation may be supported in various physical locations, the transitions between casual and focussed suffer from the physical separation of places, and the artefacts available for cooperation in those places. We are not arguing that e.g. cafés should be jammed with boards and computers. We are considering how transitions can be supported, and e.g. how electronic documents may be carried from one location to another, and from one type of computer screen to another (e.g. PC and wall-mounted screen), through lightweight technologies. There are many proposals for such technologies in the CSCW literature, and we are continuously exploring the usability of such proposals in our actual settings (Bødker et al 2000, in preparation, Bødker & Christiansen, in preparation).

Processes, processes and processes

Our case studies point out that the processes of designing and introducing new office design are highly important for the success of the project. As is fairly well known from computer technology there is a harsh difference between designing for idealized work processes and for how work actually takes place (Suchman 1987). And, as is equally well documented, the processes through which people get to experience their future technologies; work processes etc. are very essential (see e.g. Ehn 1988, Bødker 1999). The lack of process is typical in many 'New office' implementations. And we often meet the following problems:

Not to investigate. There are many examples where companies implement new office design as a "general solution" without investigating the work processes, the tasks, meetings, etc. in the workplace. Our Dot.com (C7) is a modest example of this, primarily driven out of sheer lack of appropriate space. The Professional Organization (C9) shows many of the problems that occur when people are forced to work in open spaces: complaints about noise, building fences and walls of bookshelves, or working from home to get things done.

Not to participate. The management initiates and sells the idea of efficient learning and cooperation in open spaces. But the managers stay in their own big private offices. In a Danish County they made the following principles for what they called "The New Office". Top and middle management were to have individual offices - 4 modules for top management and 3 for middle management. Ordinary employees, on the other hand, were to have group offices with varied space. This particular top management claimed that the new group office space would support knowledge sharing, cooperation, openness and flexibility. However, the principles for assigning spaces still show a deep connection between status and office size.

Not to continue. The process stops when people have moved in, before the actual experiences begin. A typical mistake is to close down all the groups, meetings and activities related to new office design once people have moved into the new building. Experiences from our own experimental office show, however, that improvements can be made, and are necessary based on the actual experiences. It is an ongoing process where work, its technologies and surroundings are under continuous development.

Preventing or supporting learning in the 'New office'?

There should be no doubt that we see many of the new office design as refreshing alternatives to classical office hallways or cubicles. However, it is necessary to understand the workplace both in terms of actual and desirable contact between people and new rooms and facilities, in order to support cooperation and learning. We see a number of ways where the new office design seems to go too far, risking of preventing rather than supporting learning:

- The focus on anonymous aesthetics
- The lacks of corporate and personal identity in the new office buildings
- Open spaces all the way through
- The house rules
- Lack of concern for actual work and different needs
- Lack of mobile (or movable) technology
- Lack of concern for processes of design and implementation

There is a tendency that new office designs are driven by architects' more than by people's need for dwelling and for showing their work and personality.

Functional separation means difficult transitions between locations and between modes of cooperation. This is partly because cooperation is seen as carried out entirely by conversation and not through shared artefacts as well. Our own flexible office has been set up partly to explore for ourselves some of the potentials and problems of the open, flexible office, and partly because we want to do action-oriented research, exploring physical space, furniture, technologies etc. In our own office, we can work with design alternatives before or alongside our cooperation with larger empirical settings (e.g. County Office, C4). Obviously, we do this type of research because we are interested in CSCW technologies at large, and not because we believe that there are any "quick technological fixes" to the problems described above. Accordingly, we turn to our own flexible office, in order to explore the questions raised in this microcosm and to discuss the possibilities of using CSCW technologies to augment new offices and hence re-enforce possibilities and counteract some of the here-mentioned problems.

Our microcosm

Our experimental office is the setting for our design ideas. In this office, four-six researchers are working in an open space with four desks. They have an additional informal meeting room (with a couch) for small meetings, extensive telephone calls, and quiet reading. From the beginning they decided not to own their desk, but make use of whatever desk was available. They have laptops with wireless network connections working in the entire building. The researchers all do field work where they are away from the office for shorter or longer periods, and several of them live at a distance and work at home some days. As a main rule the researchers do not work on the same project. They have been cooperating on many smaller assignments across and between various constellations of people and they have all participated in the development of the experimental office itself.

Overall, this flexible office experiment is meant to raise and explore further research questions as well as to inform the building of our own new office building. The use of the flexible office setting has been monitored through participant observation and regular office meetings where problems are dealt with and discussed. Furthermore, we are doing prototyping experiments to explore cooperation possi-

bilities in the office. In particular we have experimented with shared itineraries and awareness support, as well as with physical and virtual means of creating “a place of your own” and of various projects in the room (see further in Bødker & Christiansen, 2002).

Our experiment has been one where we have provided means that looked very much like what we see in many open office spaces: activity-based spaces (meeting room vs. office), movable furniture and laptop computers, and some amount of change in whom and how many use the office. Indeed the office is much smaller than what we find many places, and as such not all aspects are comparable to a large flexible office space.

In the beginning the office was dedicated to six (mobile) researchers sharing four desks so it did make sense not to “own” a specific desk. After a while, there were only four researchers left and it began to feel awkward to change table all the time and to clear the desk when they knew that there were plenty of room for the four of them. So the researchers agreed to change the concept and got a desk for each person. And indeed this decision changed how people used their desks, and how people, who came to see them, oriented themselves in the office - aspects that we shall return to.

By drawing on the findings from our case studies we initiated the exploration of the flexible office at a different technological state than many other organisations:

- Wireless LANs, laptops and mobile phones were deployed to support easy transition between different rooms at the workplace while travelling and while at home.
- The office had ample supply of whiteboards and pin boards and there were no rules for what could be posted or left in the room.
- We have been working in close cooperation with projects where electronic whiteboards were already being explored. The workers in the flexible office have had access to the use of these throughout the project in one adjacent meeting room (Bücher et al. 2001, Bødker et al. 2001).

Starting from there, the following experiences of relevance here, were accumulated in our discussions:

We lack multi-level access to people’s itineraries. One type of information is needed for people who come to seek somebody working in the office. Another type may be needed for the office community to answer urgent phone calls and to get a sense of who to expect on a given day. Surely it is even better if this information can be accessed remotely, so that an absent co-worker may contact a person who is actually in on a given day, and so that the information may be updated e.g. from home or from a train if plans are changed.

We lack personal space in the shared office. It was important for the researchers to make the office “their own”, both as a group and as individuals. Though they all had a cart each for their “stuff” it was at times important to leave material out. To

place sticky notes somewhere to remind oneself of the coming day, and even to put up pictures of children, etc.

We lack project space in the shared office. Similar to the private space, it is important for projects to have a place of their own, and to remind the project group itself as well as others of what the project is about and what it has achieved (similar to Teasley 2000).

We lack support for directly moving documents between electronic boards in various locations, and between PCs and electronic boards.

If we return to our studies of other organizations we see striking similarities in the two sets of experiences: the anonymity is a problem in this office at several levels: for visitors, among co-workers and for the individual researcher. The anonymity is a problem regarding coordination, knowledge sharing and dwelling.

The original decision - a new desk every day - was abandoned as soon as there were only four users of the office. And soon, artefacts and documents were left on the desk, personal space created, etc.

Exploration through mock-ups and prototyping

Our experiences in the flexible office formed the basis of several design explorations (Further in Bødker & Christiansen, in preparation). The purpose of these explorations is double: to create visions and challenges to be pursued in technological design (as opposed to designing technological gadgets with no anchoring in use) and to help the inhabitants of the office shape their requirements for a future office building.

In order to find out the kind of information about co-workers needed by other co-workers and by visitors to the flexible office, a two-level whiteboard with shared itineraries was set up: in the hallway the inhabitants posted one level of information for visitors, and visitors could place notes for the inhabitants. Inside the office, a more detailed calendar was set up to give an overview of where all inhabitants were for all days of the coming week/month. Experiments with information contents inside and outside the office were carried out for a month, and documented in daily pictures of the two boards. We further explored the physical placing of boards in the room (both inside the room and in hallway) in a workshop of all inhabitants and a couple of additional researchers.

The findings from this experiment are that it is important to be able to up-date shared itineraries information once, and that it is far from trivial to filter this information so that the right level of information reaches the people who pass by the door, and the right level reaches people in the office.

The second kind of exploration took place mainly in a workshop and aimed at exploring the possibilities of providing electronic panels with personal stuff – from post-it notes to pictures of one's family. The overall idea was to provide some kind of electronic panel at each desk where this personal stuff would pop up in a non-intrusive way, whenever somebody occupied the desk (e.g. placed the personal

computer there). We explored with three different solutions: panel, desktop or wall that turned out to have different potentials and problems vis-à-vis personal and shared access. The wall turned out to be the more communal, but the least supportive of the attention of the individual user, e.g. the least suited for placing sticky notes. The wall worked well for shared project spaces as well as individual use. The screen embedded in the desktop was good for personal use, but more difficult as support for awareness by people passing by. The panel rising from the desktop had qualities somewhere between the two. However, such panels certainly do not replace piles and artefacts of the physical desktop.

The third kind of exploration was focussing on the right kind of display for the right job – electronic boards for meeting rooms, boards for shared information in offices, other representations on the PC or on small palm tops. Not least we have explored possibilities of smooth transitions, of using small devices to move documents from one location to another, instead of logging on and off servers to retrieve documents. The topic of collaborating on shared documents in front of large interactive boards and similar support for direct cooperation has been dealt with in our cooperation with the WorkSPACE project (Bücher et al. 2001). The work on easy ways of moving documents between display screens was started some years ago and discussed in (Bødker et al 2001). We have added a small experiment that made it possible to use a PDA to pick-and-drop (Rekimoto 1997) documents from a board or PC onto the PDA and vice versa.

From microcosm back to the real world

This section connects our experiences and technological explorations from the flexible office back to the real world cases that we started out with. We formulate questions or challenges rather than answers.

CSCW technology

We have found that in most organizations there is a large diversity in how much time people spend at their desk, at home, and in various other locations. In a case such as the County Office (C6) these other locations include for some people mainly other parts of a large administration building, for others locations within the boundaries of the county and for still others, a hotel room in Brussels. This means that while there is a need in the organization to support transition between different rooms at the workplace while travelling and while at home, the challenge is to provide a variety of solutions, and a flexible infrastructure to support this.

We have explored the possibility of substituting whiteboards and pin boards with lightweight electronic solutions. In the Engineering Company, C1 we explored mock-up information kiosks to be placed in the open café areas, hallways and other “in-between” places. The question is how far such solutions may help people learn

about each other and about projects? To what extent will they help provide project space in the shared physical and virtual space? And to what extent may these same types of solutions help people create personal space?

We have seen no uses of electronic whiteboards in any of our case studies. We have discussed the use of such in several cases, e.g. Engineering Company, C1. Provided that meetings are about electronic materials such as e.g. CAD drawings, or that electronic materials can be made useful for people when returning to their own offices, the question is how far we can go in employing electronic boards or electronic pens on regular whiteboards in organisations such as our cases? And how may transitions be supported?

Multi-level itineraries we see as a supplement to shared electronic calendars. Electronic calendars are useful for planning joint meetings or for finding very specific details about a particular person. In larger organisations, however, we hear many complaints that it is difficult to locate each other. The question is how useful electronic calendars are for this purpose? If an organisation chooses another form of shared itineraries, what form should they take, and how do they get updated together with the calendars?

Process experiences

Through the process we have gained experiences with participatory activities to involve office inhabitants in design and tailoring of their own office environment and technology. In accordance with the findings, it is important to continue participatory activities when people have moved into new buildings, and not just during the design process. We continue to do real life projects in which the next step is to develop a toolbox of methods helping these design and monitoring processes, emphasizing *design in use*.

Our studies have pointed to a need to extend participatory design concerns in the direction of the combined office design and technology. One aspect is to work with the actual users and their actual needs, the other to expand on ways of doing cooperative tailoring (Trigg & Bødker 1994) and cooperative reflection based on experiences with actual use. These elements we will continue to develop.

Conclusion

In the current situation, an optimal design of the 'New office' must include design of information technology. The large open-plan offices in many organisations are the architects' version of "anything, anywhere." And, as discussed e.g. by Bertelsen & Bødker (2001) information technological "anything anywhere" often becomes "nothing, nowhere." We have demonstrated that the architectural version is nowhere different. New computer artefacts, and new buildings do not as such make knowledge sharing and learning happen. We see a danger in the recent development

that learning and communication is prevented, and that the 'New office' leads to conformity and anonymity rather than cooperation and creativity.

Through our exploratory prototypes we have pursued ways of improving legitimate peripheral participation, through architecture, physical artefacts and materials in the rooms as well as through virtual extensions of these artefacts.

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