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Rosander, Charlotte

Published in:
Proceedings IRIS 27

2004

Link to publication

Citation for published version (APA):
Rosander, C. (2004). Images of Reality - Interacton space analysis and large-scale design in open office landscape environments. In *Proceedings IRIS 27*

Total number of authors:
1

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PO Box 117
221 00 Lund
+46 46-222 00 00

Images of Reality - Interaction space analysis and large-scale design in open office landscape environments

© Charlotte Rosander
Department of Informatics, Lund University
Ole Romers vag 6
SE-223 63 LUND, Sweden
Phone: +46 46 222 80 29
Fax: +46 46 222 45 28
charlotte.rosander@ics.lu.se

ABSTRACT
This chapter explores communication patterns and media choices among employees, as well as their connection with the ongoing changes in workplace design. It presents a multiple case study of communication and co-ordination in open landscape office environments. The study was carried out in three different organisations; an advertising firm, a manufacturing business, and an IT development office. In the organisations the work practice was to some degree dependent on possibilities to communicate from various locations among co-workers, both within and outside the office. This paper suggests that utilising more personalised and effective communication media could provide necessary means for more efficient support of co-operative work. The issues of interaction space analysis and large-scale design, i.e. integration with the existing installed base of services and infrastructures, both technical and social, were here put into focus as influencing factors. To Trevino et al's (1990) three factors I have added a forth factor, namely company culture that I believe has a great influence on employee's media choices. The conclusions were that the organisational culture had deep impact on how the technology features were accepted and incorporated in the work practice for communication purposes.

Keywords
Communication, media choice, open landscape office environment, company culture, multiple case study.

Introduction

Culnan and Markus's (1987) critique against previous research is that the findings occurred in field settings where participants with equal status and similar tasks are geographically remote from each other, and so have few opportunities to meet, and few alternative communication media. They further argue that in the vast majority of organisations, co-workers are co-located, know each other, and have the option of face-to-face communication. This suggests a need for extended field studies, where the underlying assumptions for media choices are highlighted. Their findings suggested that there were different causes for choosing a particular media at a certain occasion, as will be discussed in the remainder.

Previous research has focused principally on management's media choices and organisational communication (Krone, Jablin & Putnam, 1987; Lengel & Daft, 1988; Trevino et al, 1990). In my study the interest is oriented towards employees at different levels of the hierarchy. The overall purpose of this paper is to improve the understanding of communication between co-workers in a modern organisational context. The paper will focus on approaches as well as practices, and also on organisational conditions in relation to communication. The empirical part is based on a qualitative investigation within three companies. The main focus is on use of communication media in a workplace context. The assumption was that different media result in different patterns of communication, which implies that the media choice affects the choice of communication style.

Research area

A number of researchers (e.g. Mumby, 1998; Orlikowski, 1995; Schein, 1992; Schmidt & Bannon, 1992) have studied communication and organisation in depth. Suchman (1987) argues that communication between individuals is affected by introducing new technologies and should therefore be in focus. Suchman's conclusion is that since an action or event always is dependent on a certain social and physical environment the understanding for and the attention to this environment is important when that action is to be interpreted and understood. The use of IT in organisations is oriented towards increased communication possibilities.

Workers are to a higher extent bound together by being linked through communication networks. Work today is frequently a mobile activity realised through applications like email, chat or SMS, which enable new ways of acting and co-operating. Portable computers, and technologies like WAP and Bluetooth, also work to enable these new phenomena. New standards, like UMTS and TCP/IP (v6), will provide the means for fast widespread interactions through geographically dispersed computers.

Dahlbom (1998) describes a trend towards a higher degree of nomadicity; by using new information technology people will be able to move around and work wherever they are independent of time and space. According to Lyytinen and Yoo (2001) a nomadic information environment is a heterogeneous assemblage of interconnected technological and organisational elements, which enables physical and social mobility of computing and communication services between organisational actors both within and across organisational borders. These systems could provide the means for having access to distributed colleagues, in a shared environment, as well as enabling the ability to share and exchange documents and information, thus enhancing an individual flexibility. Heath and Luff (1998) claim that the ways in which mobility features in collaborative work have largely been overlooked within the field of CSCW, accordingly in their study they examine the emergent issue of requirements to support mobility within collaborative activities.

In mobile systems, as in other areas of human-computer interaction, it is not sufficient to merely focus on the specific interface of a device. This is because it operates within a broader context, which includes the network and computational infrastructure, the broader computational system, the application domain, and the physical environment (Dix et al, 2000). The authors further suggest that one aim of the growing focus on context is to allow the highly situated nature of interaction devices to be reflected in the design of such systems (ibid). New computing platforms will, among other things, result in a ubiquity of services, i.e. services will be available at any time and at any place (Lyytinen et al, 1998). In this way they could provide a basis for more flexible and mobile co-operational patterns. The design challenge within social innovation is to understand user needs in a new information rich nomadic environment, enabled and supported by multiple technologies, services and pervasive infrastructure (Lyytinen & Yoo, 2001).

A previous paper, "Web-based Information Systems - Infrastructures and Co-operational patterns in a Networked Organisation", focused on portraying the different competencies and roles in a full-service Internet consulting company in Denmark (Hoffmann & Rosander, 2001). The analysis included an investigation of how the use of Web-based

Information applications supports the co-operational patterns and exchange of information between actors, who are interdependent in their work and co-operate in distributed national and cultural work settings. In exploring work and communication in this type of environment, considerations were further made about how individuals are dependent on mobility in their co-operational activities (Rosander & Hoffmann, 2001).

These previous studies led to a new comparative multiple case study, which provided the basis for writing this paper. As a result of the findings in the earlier studies I have chosen to view communication as a phenomenon embedded in the organisational culture that through large-scale design is integrated in the existing installed base of services and infrastructures, both technical and social (concept borrowed from Lyytinen & Yoo, 2001). Media choices may also create a particular kind of corporate culture, i.e. seniors can be contributing to the creation of an organisational culture that values informality, teamwork, participation, trust, goodwill, and caring (Trevino et al, 1990).

Communication media

Research on communication media have among others been carried out by Connell et al 2001, Herbsleb et al 2002, Muller et al 2003, and Nardi et al 2000. The definition used here for electronic media follows Culnan and Markus (1987): i.e. interactive, computer-mediated technologies that facilitate two-way interpersonal communication between both individuals and groups. The interaction could occur either at the same time as in a phone call, or at different times as in mail. The information present in face-to-face communication differs from that present in other media. This information falls into three categories based upon the communicative functions they serve: regulation of interaction, perception of communication partners, and awareness of the social context (Culnan & Markus, 1987). Non-verbal cues not only serve the function of regulating social interaction, but also provide valuable information about the communication partner. This information is useful in forming impressions, in evaluating how partners understand and respond to messages, determining the truthfulness of the partners' communication, and so forth (ibid).

The use of communication media is influenced by the social context in which it is embedded in the daily communications. Naturally its history will influence the use of computer-mediated communication (CMC). Underlying causes affect recent behaviour, and personal interaction patterns are an essential aspect of the individual's historical context. Values

are entwined in the fabric of the history of interaction, the historical context shapes what is possible and ‘what is done around here’ (Fulk et al, 1992). “*Context is not simply a stable factor that conditions communication behaviour; instead, it is dynamic in both its nature and the character of its relationship with behaviour*” (ibid, p 7).

Communication is central to employees; they spend a great deal of their time communicating. Today there are more communication options than ever before due to new technologies available. Media choice is not simple and obvious; to make appropriate media choices can be difficult sometimes. A single medium is not suitable for all cases. Mail can be a quick and efficient way to transmit routine messages, however for other purposes there is a need for a richer medium like telephone or face-to-face communication. In order to make appropriate media choices, employees need to understand the underlying processes. Communication media can be characterised as rich or lean based upon their capacity to facilitate shared meaning, this is called information richness theory (Lengel & Daft, 1988; Trevino et al, 1990). Media typically available can be organised into a richness hierarchy depending on feedback possibilities, multiple cues such as body language, use of natural language, and personal focus of the medium (ibid).

Method

Current research has emphasised the need for establishing a deeper understanding of actual work practice when designing new systems. Using different techniques in the design process compared to traditional software engineering approaches, and conducting ethnographic studies enable obtaining a rich picture of the work practices for the purpose of informing design (Blomberg et al, 1991; Greenbaum & Kyng, 1991; Simonsen & Kensing, 1998; Suchman et al, 1999). Therefore, the ethnographic approach is becoming widely used in connection with workplace studies with the objective of informing ICT-designers (information and communication technology). The artefacts are set in different social contexts and in making sense of the patterns it is necessary to include this context when studying technology-in-use. Relationships between technology and work practice have consequences for how organisations design and use information technologies to support their work. In order to understand technologies ethnographically it is required to locate artefacts within a site and their relations in everyday use (Suchman et al, 1999).

In understanding complex social phenomena, a case study allows an investigation to retain the holistic and meaningful characteristics of real-

life events (Yin, 1994). The research method used here was case study as it also enables data collection from a variety of sources in order to get a rich empirical base (ibid). Through the use of a selection of qualitative research techniques and sources of data-collection the study took an ethnographic approach in order to develop an understanding of everyday activities of particular communities of people (Blomberg et al, 1991). The techniques employed were observation, qualitative interviews, descriptive field notes, and document analysis. The study featured 20 semi-structured interviews, a questionnaire answered in all by 230 employees, as well as ten days of observations. The comparative case study investigated following research questions: how and why do the employees make specific media choices when they want to communicate with each other in open office environments?

Multiple case study

In the remainder some of the findings from the empirical study of communication and co-ordination in the office environments are presented. Following a short presentation of the project with the main focus points the author took interest in within the study. Then the results of the questionnaire, including a comparison between the companies, will be presented. Further, an account of the interviews and observations including an exposition of the qualities and shortages of the work environment with an interaction space analysis, and finally how the experiences can lead to further workplace developments in terms of large scale design, will be discussed.

The office project

In a three-year project, on communication patterns in office work, the author has been working together with three architects from the research community at Lund University. Our co-operation initially started in 1998 with the exploration of workspaces and possibilities for co-operative design, and now the researchers wanted to take a further step. In the project, two basic infrastructures for interaction and communication among individuals were addressed; buildings and ICT (Wikstrom et al, 2000). It focused upon ICT and architecture and how they were employed in contexts of office communication and co-operation.

The investigations were conducted in different new open landscape office environments in south Sweden. The studies were carried out in three selected organisations; an IT development office (called X, with about 340

employees in several landscapes, of which 90 in the most studied landscape), an advertising firm (called Y, with about 30 employees in the studied landscape), and finally a manufacturing company (called Z, with about 50 employees). In the organisations the work practice was to some degree dependent on the co-workers ability to communicate from various locations, both within as well as outside the office. It is well known that the spatial organisation of a building affects the ways people communicate and interact with each other (Wikstrom et al, 2000). The researchers primarily wanted to study how the employees made their media choices and carried out their communication in these open environments.

Findings of the questionnaire

In the questionnaire the use of several communication media were explored, including how the employees made their deliberate media choices. Among fifteen questions the following two multiple choice questions were put to the respondents. The findings in percentages are presented in the diagrams 2 and 3 shown down below.

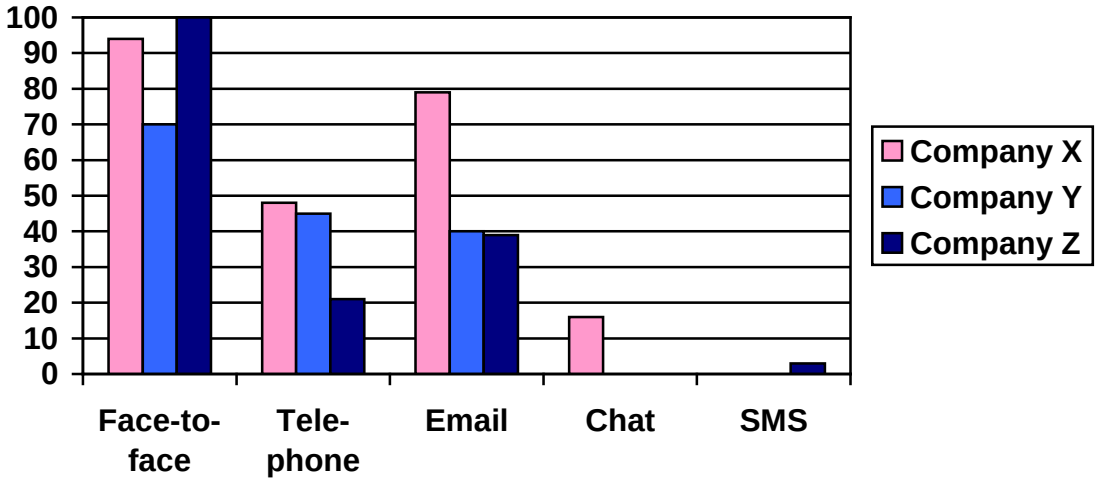

Figure 2: Question "If you have to ask somebody WITHIN the office something work related, how do you prefer to make contact?"

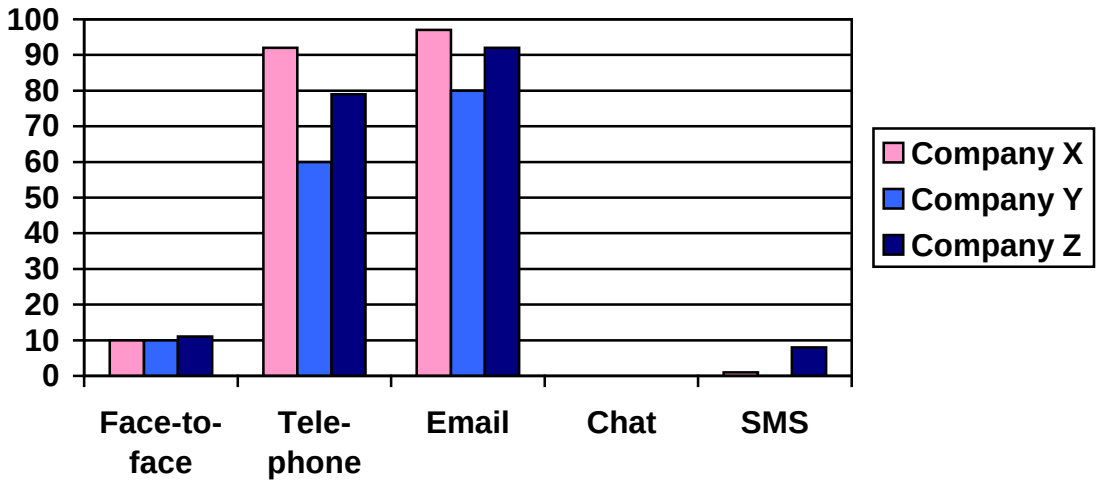

Figure 3: Question "If you have to ask somebody OUTSIDE the office something work related, how do you prefer to make contact?"

There was a clear tendency towards preferring face-to-face communication when communicating within the office. In company X a stronger email culture however asserts itself when it came to work related internal communication, which could depend on the greater size of this particular landscape. Outside communication was mostly made with telephone or email. The telephone is considered an important communication tool. Most employees have portable ones that works within the offices, allowing them to move freely in the environment when communicating. It also makes it possible choosing to have your telephone call in a silent room. Many complained about ringing cell phones as a great disturbance. One interviewee claimed that cell phones are more disturbing than regular ones, both depending on that the signal is more annoying and because people tend to speak louder in cell phones. But, he preferred phoning to email due to the risk of misinterpretations depending on different values and meanings.

In the study the employees where asked to explain why they make specific media choices. Three important factors that influenced managers media choices where presented in the study by Trevino, Daft and Lengel (1990), the reasons offered fell into three classes; *message content*, *contextual determinants* and *symbolic meaning*. In my study I took a starting-point in these but also discovered one more factor, namely company culture, as will be discussed in the remainder. The reasons the interviewees offered for using a specific communication mode included; if the message was complicated (message content), where the person is located (contextual

determinant), ability to discuss problems with instant feedback (contextual determinant), and possibilities to express caring feelings (symbolic meaning). The media choice could also be depending on cultural habits, for example promoting of technology as with the chat system in company X (company culture).

Another question addressed what media was preferred when the communication regarded an *urgent or more personal matter*. Here the findings were more varying. As for ICT it seemed that more direct communication media, as SMS, was preferred to traditional email in two of the companies when the nature of the communication was more urgent. Even chat was more preferred to email in one of the companies; in urgent cases they preferred SMS and chat over email, even though there too were strong preferences for face-to-face communication altogether. In company Y there was a stronger preference for email in urgent matters compared to the other two companies. This was later explained in the interviews as a wish for having written "proofs" in urgent matters, and that might mirror a more stringent company culture. The interchange of text is seen as a confirmation that the information has come through, but written text can also make room for more misinterpretations than the direct, verbal communication. In investigating the hypothesis that electronic media could have capabilities not found in face-to-face communication, the findings suggested that one characteristic found in email was the ability to use it as written proofs of a conversation.

The natural language and rapid feedback associated with face-to-face communication and telephones makes these richer media, and thereby they could more efficiently create shared understandings. The employees argued that in order to establish a new relationship with for example a customer they preferred face-to-face communication or possibly telephone conversation. Face-to-face meetings are less necessary when you know somebody and already have established mutual understandings. Lean media such as mail were preferred when they for example sent a reminder of a pre-established meeting. When necessary they choose media with the capacity to handle complex messages in order to have more efficient communication that is they matched the richness of the media to the message content. In line with Trevino et al´s (1990) findings I found that effective communication involves selecting a medium with the capacity to create mutual understanding of the message, i. e. effective communicators use mail for routine messages and choose face-to-face or telephone for more complex issues.

In company X there is a central organisation that handles policies and standards together with stipulating the guiding principles regarding ICT development. They decide on which partners to co-operate with and which standards to follow. They observe the market and their ambition is to lie one step ahead. Purchase of computer equipment is co-ordinated to facilitate exchanges, repairs and installations. Questions were also posed that explored if the employees worked at home, if they had access to portable computers, and finally if they have had any experiences of video conferencing. The findings in percentages are shown in diagram 4 down below.

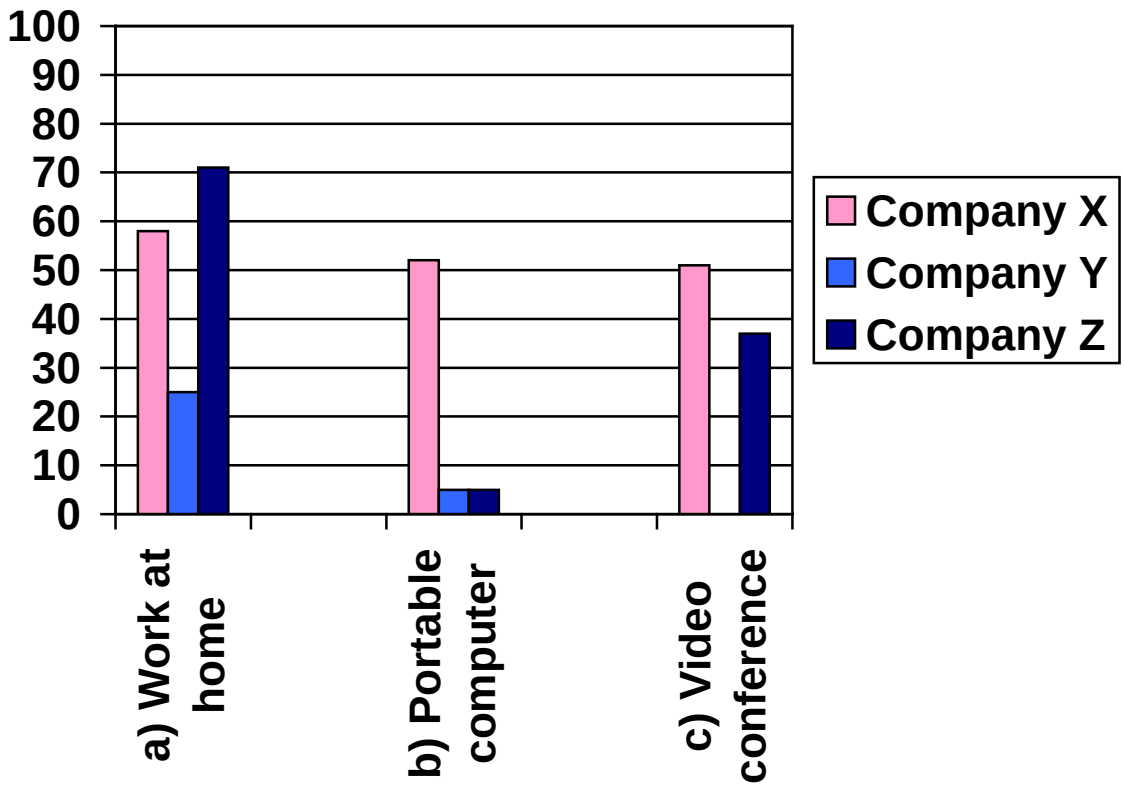

Figure 4: Questions:
a) Do you sometimes work at home instead of at the office?
b) Do you have access to a portable computer?
c) Have you sometime participated in a videoconference at work?

The findings suggest that a great deal of the employees worked at home regularly, which implies a need for different communication options. Regarding videoconference two of the companies do use it on a regular basis which has opened up new possibilities for communication.

Interviews and observations

In later years there has been an increased concentration on open landscape configurations that are viewed as giving a higher degree of flexibility. Regularly placed connections to the network from the ceiling give a flexible usage of the work environment. Wireless networks are still considered as more open to intruders and therefore viewed as a security risk. None of the companies had wireless solutions so far. In today's organisations re-organisation occurs often, which creates a need for offices to be easily remade into new constellations. The employees in company Z were viewed as a resource, which were deeply involved in creating their own environment. The goal was to build an office that is adapted to the enterprise and holds new opportunities through internal communication. It should also help to form a comprehensive picture of the organisation among the employees.

The office of the future was introduced as a concept for a work manner that was expected to be more efficient through work in project teams. The office was seen as a tool for creating a better enterprise, which does not require everybody to be physically present even though accessibility was an important conception. Information should be distributed quicker and more easily through hearing and seeing each other. The employees should be prepared to share information. But, the flow of information has increased too much, the interviewees emphasised that it was difficult to receive and sort out all the information.

According to the interviewees the choice of communication media seems to depend on both whom they are contacting as well as on the type of business. Within the own landscape direct contact was mostly preferred. Email is used when they need confirmation or when the receiver is absent. The media choice for outside communication is usually email or telephone. Some of the employees thought that email has replaced telephone contact, but others believe that telephone is more efficient than mailing backwards and forwards. There were not all-positive experiences of using email, one interviewee thought mail was an unpersonal way of communicating. They all believed that it is still important with personal contact, because people prefer to hear a human voice to establish a more personal relationship. Also, personal contact is considered superior for communicating compared to just reading a message.

Communication with colleagues and customers both within and outside the office is affected by the tools available, but also by the employees' type of work tasks. Some of the interviewees spent a great deal of their working time attending meetings and having direct contact with clients outside the office. Since they have portable computers, working from home was a possibility well taken advantage of. Working at one's home was often done

with work tasks that demand reflection and therefore are harder to perform in the open office environment. In the interviews it was evident that those who did not have portable computers much wished that they had. Recently the objective has been to replace some of the staff's travelling using videoconferences. One reflection the interviewees pointed out was that it is still hard to replace the direct customer contact.

Is there a need for more natural meeting spaces in the office environment? The observations and space analysis showed that main footpaths should be made more distinctly visible to enhance the physical communication and then hopefully also encourage spontaneous meetings. The observations also showed that a factor of significant importance for transfers on the premises, and for spontaneous meetings, was the placement of peripheral equipment as printers, copiers, scanners, as well as analogue information storage in archives of various kinds. Of course also the coffee room was a valuable meeting space. The size of the open office landscape was significant for communication and exchange of information between the employees. The open landscape had spatial demands that still were not completely solved in the companies studied, both in terms of the closed silent room concept and in dealing with the openness that follows an open landscape configuration. Still, they tried to optimise the space and there was strive for flexibility and accessibility.

How big a problem are disturbances? The investigation included exploring if there are limits for a feeling of presence, that is how far from the own work place is the territory where one perceives disturbances in terms of sound and movements. The interviewees emphasised that they needed quite a space around their desk in order to concentrate on their work, if others were passing right behind their back they experienced that as disturbing. There seemed to be a common view on what constitutes a good, efficient, creative, modern work environment, even though there has developed a more balanced view on openness than before. For example, there is a stronger focus on silent rooms and special meeting rooms now. The spatial organisation was of great importance because it determined how apparent the disturbance became, depending on screenings, background sounds, and absorbing elements in the work environment.

The overall impression among the employees was that there are several benefits from working in an open office landscape. One benefit was the possibility for contact and overhearing, the employees experienced that they asked each other more questions and solved problems quicker now. They knew each others work tasks better and felt better informed. The contact ways were short and the environment was functioning well from a social perspective. The open landscape concept is less pretentious and it is easier to establish contact with co-workers compared to when sitting in cell

offices. The disadvantage with open offices was that it is harder to concentrate on demanding work tasks.

The benefit with open landscape is that you are constantly kept informed, because the landscape involves closer dialogue than before partly depending on passing each other regularly. Direct questions and quick answers with different types of efforts make the work more easy and effective. Problems are discovered quickly through colleagues' behaviour. The possibility to overhear information was experienced as a great asset. The observations revealed a relatively high degree of mobility among the employees, both in their workspace and closest environment. They were sitting at their desk, standing at higher tables and cabinets, and moving through the office landscape. Despite this, there was a quite calm and relaxed atmosphere. The employees also talked unconstrainedly in portable telephones while shutting off the world around them meanwhile. Direct contacts that are taken incidentally are important to the general communication, it is like oil in the machinery, as one employee expressed. She had developed a habit of passing certain persons when moving for other reasons, for example fetching printouts. In these environments lots of spontaneous information is spread by overhearing, you get informed of things that nobody would have told you otherwise. The information can be of public relevance, you know what is going on, information could be adjusted quickly, and you could intervene and help out.

Large scale design

The development has gone from computer screens to interactive spaces, the current status presents new challenges both to computer science and architecture. These challenges need cross-disciplinary explorations, in order to be successfully handled. Space, technology, and individuals are all-important factors in the process of communicating, and accordingly, need to be considered. Space interaction analysis should as discussed move beyond the computer screen and take place in the physical space as well, enabling the perception of spaces as the interface for digital resources. Interactions in these environments require a deeper understanding of the relation between space and technology. Large-scale design should also contain considerations on the whole work environment in terms of physical and social aspects. Hence, the material infrastructure should support existing social systems.

How can the employees work further with improvements and developments of the open landscape office concept? In one company there have been continuous improvements and a positive attitude towards ongoing changes. They had already made an evaluation and made certain improvements. In that company it seemed that the organisation encourages a continuous discussion, which is necessary with growth and reorganisation

in mind. The new work environments with open landscapes have affected both the employees work manners as well as their behavioural culture. Even though most of the interviewees emphasised the positive aspects of working in landscapes they also suggest that there were periods when they were disturbed. They have developed different strategies for handling this, for example performing some work tasks at home, screen off noise by wearing headsets with music, or just to some extent learning to disconnect the surrounding world.

Development of new technology should reflect the spatial aspects of the work environment. Then other questions become important as how does the desk placement in relation to the open landscape's main street matter, and how does the technology affect the work and concentration ability. Interaction design must consider these new possibilities of integration of workspaces to enable that the spatial surroundings in the work place could consist of both digital information and physical space in dynamic coexistence. Some employees some times experienced stress. The cause for evoking a feeling of stress could be disturbances making them unable to finish their work tasks, telephones ringing when having a visitor, or not being able to plan your own work. The technology seemed to be both a help and a reason in relation to stress. It seemed important that you have a choice when it comes to interacting with ICT.

There also seemed to be a need for rules on how to act and move within the environment. Not to disturb the co-workers the employees moved in certain passages and if possible used the silent rooms when communicating. This raises some questions about how we can make the technology support the interaction patterns. Could the technology to some degree have similar qualities as the spatial environment? Is it possible to design for more public respectively private spaces? Could there be more open passages that are more publicly available with less disturbances for the near sited? Could we design an environment with adapted technology for possibilities to easily choosing and moving between public and private spheres? There was not a pronounced strategy for making oneself less available but it seemed that most people respected when someone looked busy. Here appeared to be need for some technology that could support this in a simple and smooth way (see for example Xerox Parc and IBM, who have experimented with different awareness technologies for promoting conditions of availability).

Discussion

In the following the case study findings and communication in general are related to and discussed in connection with different theoretical perspectives, including discussing the implications of the observations for facilitate communication in co-operative work.

In a project about a Danish company, Oticon, Mette Morsing describes their organisational change and how they moved into a new open office environment. The study shows several similarities with my studies. The new office was built from the principle that effective and creative co-operation will result from personal communication, so it was “designed for dialogue” (Morsing, 1995). It was thought that designing open offices would make the employees talking to each other more. The main office’s design was also based on the idea about the mobile office. The employees was temporarily placed nearby the others which whom they were working with at the time. With the new physical limits the old routines and norms became impossible to hold on to. The new building communicated a strong message of a new identity; the communicative power that lies in architecture came clearly to expression in Oticon´s office environment (Morsing, 1995). The physical environment contributed both functionally and symbolically in creating a new and common identity. As in my studies, here too were spontaneous meetings in the premises a ground for exchange of insights in organisational activities, and so meant a great deal for information sharing.

Different systems will be combined during the work, for example desktop computers, portable computers and mobile phones, which are personalised to the specific needs at the time and of the task in question. As pointed out by Lyytinen and Yoo (2001), both the development and use of nomadic computing are socially constructed and embedded, and therefore analyses of its use and design must be placed in a social context. The meaning ascribed to networked technologies by actors is highly context-specific, and also affected by the local organisational culture and supporting infrastructure. Hence, these new technological infrastructures mean an increased openness and exchange between actors in different locations and communities. In understanding the connections between all the complex infrastructures in an organisation, by enlightening that growing co-operational patterns are firmly linked to the social infrastructures, the necessary awareness about the dependencies can be created (Rosander & Hoffmann 2001). With new open landscape offices follow new needs of

communication in respond to changing communication patterns and new possibilities of media choices.

The actions taken so far have mostly been of a technical character, such as introducing email, chat and video conferencing. Communication seems thus primarily to be defined in structural and technical terms, and not as a cultural or attitude-based phenomena. The focus on technology and structure points at some kind of transmission view of communication, where it is mostly about transfer of information. The interviewees emphasise the difficulties of sending and receiving accurate information, which also supports the above mentioned transmission view. They amplified the importance of clarity when distributing information. Several experienced an overflow of information, which implies an increased need for guidance to support the construction of proper interpretations of messages. The assumption that communication is connected to transmission and spreading of information rather than to interpretation and meaning creation implies reduced possibilities for development of common perspectives within the company.

As ICT has made it possible to distribute vast amounts of information to a number of employees, their task has become more and more complex when sorting, translating, and interpreting all that information. The increased use of electronic communication has often been related to a pull strategy, which implies that the employees should seek and assimilate information. But, some of the employees viewed the increased access to information as a stress rather than an asset. Another view was that it is hard to convey values and attitudes with electronic media. That draws the attention to the benefits of face-to-face communication with gestures and verbal cues. Still, even if modern ICT offers a line of benefits it cannot supply as multifaceted and nuanced communication as face-to-face conversation. This media richness is hard to imitate. Accordingly, when designing new communication technology and developing workspaces, using large-scale design can help us see the bigger picture and the whole complexity, allowing more innovative solutions to arise.

Conclusions

In the paper the author has tried to connect contemporary theories about communication with the empirical findings from the multiple case study at the three companies. The conclusions are that communication is a fast-changing phenomenon, which will considerably affect the terms and developments in co-operative work. To Trevino et al’s (1990) three factors I have added a forth factor, namely company culture that I believe has a

great influence on employee's media choices. Further also that the organisational culture had deep impact on how the technology features were accepted and incorporated in the communication patterns and work practice. The author therefore suggests that designers develop an enhanced knowledge about the implications of new interaction technologies in workplace settings when designing both ICT and office environments.

Acknowledgement

I would like to thank the three case organisations for their benevolent and valuable co-operation, and also my dear colleauges in the office project, Elisabeth Hornyánszky Dalholm, Birgitta Rydberg Mitchell and Tomas Wikstrom, for fruitful discussions and comments on this paper.

References

Blomberg, J, Giacomi, J, Mosher, A & Swenton-Wall, P (1991): Ethnographic field methods and their relation to design. In Schuler, D & Namioka, A (eds): *Participatory Design: Perspectives on Systems Design*, pp 123-155. Lawrence Erlbaum, New Jersey.

Connell, J, Mendelsohn, G, Robins, R & Canny, J (2001): *Effects of Communication Medium on Interpersonal Perceptions: Don´t Hang Up on the Telephone Yet!* GROUP' 01, Colorado, USA.

Culnan, M & Markus, M L (1987): Information technologies. In Jablin, F, Putnam, L, Roberts, F, & Porters, L (eds): *Handbook of Organizational Communication*. Sage Publications, California.

Dahlbom, B (1998): *From Infrastructure to Networking*. Proceedings of IRIS 21, Aalborg, Denmark.

Dix, A, Rodden, T, Davies, N, Trevor, J, Friday, A & Palfreyman, K (2000): Exploiting Space and Location as a Design Framework for Interactive Mobile Systems. *ACM Transactions on Computer-Human Interaction*, vol 7, no 3, pp 285-321.

Fulk, J, Schmitz, J A & Schwarz, D (1992): The dynamics of context-behaviour interactions in computer-mediated communication. In Lea, M (ed): *Contexts of Computer-Mediated Communication*. Harveaster Wheatsheaf, London.

Greenbaum, J & Kyng, M (eds, 1991): *Design at Work – Cooperative Design of Computer Systems*. Lawrence Erlbaum, New Jersey.

Heath, C & Luff, P (1998): *Mobility in Collaboration*. Proceedings of CSCW '98, Seattle, ACM Press.

Herbsleb, J, Atkins, D, Boyer, D, Handel, M & Finholt, T (2002): *Introducing Instant Messaging and Chat in the Workplace*. CHI 2002, Minnesota, USA.

Hoffmann, L & Rosander, C (2001): *Web-based Information Systems - Infrastructures and Co-operational patterns in a Networked Organisation*. Proceedings of IRIS 24, Ulvik in Hardanger, Norway.

Holtham, C, Ward, V & Rosander, C (2001): *Designing spaces for knowledge work – can the use of fiction help construct new realities?* In proceedings of Managing Knowledge: Conversations and Critiques Conference, Leicester, UK, 10-11 April 2001.

Krone, Jablin & Putnam (1987): Communication Theory and Organizational Communication: Multiple Perspectives. In Jablin, F, Putnam, L, Roberts, F, & Porters, L (eds): *Handbook of Organizational Communication*. Sage Publications, California.

Lyytinen, K & Yoo, Y (2001): *A Research Agenda for Nomadic Knowledge Environments*. Working paper.

Lyytinen, K , Rose, G & Welke, R (1998): The Brave New World of development in the internetwork computing architecture (InterNCA): or how distributed computing platforms will change systems development. *Information Systems Journal*, no 8, pp 241-253.

Morsing, M (1995): *Omstigning til paradis? Oticon i processen fra hierarki til spaghetti*. Handelshojskolens Forlag, Denmark (in Danish).

Muller, M, Raven, M E, Kogan, S, Millen, D & Carey, K (2003): *Introducing Chat into Business Organisations: Toward an Instant Messaging Maturity Model*. GROUP'03, Florida, USA.

Mumby, D K (1988): *Communication and Power in Organizations - Discourse, Ideology and Domination*. Ablex. Norwood, New Jersey.

Nardi, B, Whittaker, S & Bradner, E (2000): *Interaction and Outeraction: Instant Messaging in Action.* CSCW'00, Philadelphia, PA.

Orlikowski, W J (1995): *Evolving with Notes: Organizational Change around Groupware Technology.* Massachusetts Institute of Technology, USA.

Rosander, C & Hoffmann, L (2001): *Enhanced Mobility - Augmented Possibility ? - Developments in Co-operative Work.* In proceedings of IRIS 25, Bautahoj, Denmark, 10-13 Aug 2002.

Schein, E (1992): *Organizational Culture and Leadership*. Jossey-Bass, San Fransisco.

Schmidt, K & Bannon, L J (1992): Taking CSCW Seriously: Supporting Articulation Work. *Computer Supported Cooperative Work (CSCW): An International Journal*, vol 1, no 1-2, pp 7-40.

Simonsen, J & Kensing, F (1998): Make Room for Ethnography in Design. *The Journal of Computer Documentation*, ACM-SIGDOC, vol 22, no 1, pp 20-30.

Suchman, L A (1987): *Plans and situated actions - The problem of human-machine communication*. Cambridge University Press, USA.

Suchman, L, Blomberg, J, Orr, J E, & Trigg, R (1999): Reconstructing Technologies as Social Practice. *American Behavioral Scientist*, vol 43, no 3, pp 392-408.

Trevino, L, Daft, R, & Lengel, R (1990): Understanding managers´ media choices: a symbolic interactionist perspective. In Fulk, J & Steinfield, C (eds): *Organizations and communication technology*. Sage Publications, California.

Wikstrom, T, Hornyánszky Dalholm, E, Rydberg Mitchell, B, & Rosander, C (2000): Research proposal granted by FORMAS. Departement of Architecture, Lund University.

Yin, R K (1994): *Case Study Research. Design and Methods*. Second Edition. Sage Publications, California.