TELEWORKING ENVIRONMENTS

Proceedings of the

Third International Workshop on Telework

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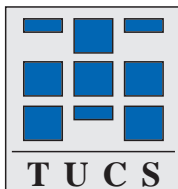Paul Jackson
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Preface

When the International Workshops on Telework started back in 1996 one key aim was to improve the dialogue among scientific researchers at the cutting edge of telework-related issues. The ´96 event in London, together with the ´97 Amsterdam workshop, brought together nearly 150 people in the field, from over 20 countries world-wide, with close to a hundred papers being presented and discussed.

With this year's event in Turku, that process has continued, enabling closer links to be fostered especially with parties in northern Europe. Also this year, the workshop has succeeded in attracting a great variety of participants from different disciplines and countries. Satisfied we note that many of the participants visit the workshop series for the first time in Turku. We believe that we proceed nicely in the process of establishing this workshop series as one key source of valuable and up-to-date academic information about telework and related disciplines.

As with the Amsterdam event, Turku ´98 will also include a final day management conference, this year entitled ´Building for a New Millennium´. Practitioner workshops have been added to the total program, making the bridge between research and practice even stronger. Both the academic and practitioner papers in the proceedings have passed a blind review process.

Since 1998 a body has also been created to give ongoing support and focus to the discussion and relationship-building that the International Workshops have encouraged. The International Telework Foundation will seek to make the contacts made and lessons learned more than a once-a-year exercise but an opportunity for open-ended discussion and collaboration.

The papers included in these proceedings remain the cornerstone of the Telework Workshops. The experiences and research findings they discuss provide a range of insights into teleworking at both practical and theoretical levels. We trust you'll find them useful and inspiring and hope to hear more from you about the messages they contain.

We wish to thank The International Telework Foundation for their co-operation and European Commission DGXIII for their co-operation and financial support for the conference. We also wish to thank our co-operative partners Helsinki Telephone Corporation, Miratel Oy and Telia for their co-operation and financial support, and the seminar supporters Sampo-Varma Group, Finnair, Turku Telephone Ltd., The Finnish Work Environment Fund and City of Turku for their financial support.

Reima Suomi   Paul Jackson

Introduction

It was noted many times at the first two International Workshops on Telework that teleworking phenomena are both complex and elusive. They can be examined from many angles, levels of analysis and disciplinary perspectives. Many overlapping concepts are used to describe them. And in the world of practice, teleworking issues and problems (whether or not they are explicitly labelled as such) intersect and criss-cross in intricate ways.

The debate on telework can be framed in many ways, of course. In our ongoing attempt to provide a platform for the latest scientific work on telework, and to raise new questions and find new vantage-points, the Turku ´98 workshop has been entitled ´Teleworking Environments´. The organizations and individuals implementing telework-related activities do not work in a vacuum. The theme of this year's event reminds us that the environment in which we operate is important to the success of telework.

In the call for papers, we identified four environments:

- the decision making environment
- the workplace environment
- the management environment
- the societal environment

Now, after having all the contributions on our desk, we are satisfied to see that the environment theme has actually been richer than what we originally expected. In our program construction, we have ended up to the following taxonomy:

1. The work group Environment
Featuring session: *Understanding work groups and places*

This will include two sets of papers, looking at various aspects of dispersed team-working and remote collaboration.

2. The learning and development environment
Featuring sessions: *Teleworking and organizational environments*
                         Educational environments

Papers here will look, first, at the role of teleworking in organizational development, and secondly, at experiences of tele-education.

3. The social and societal environments
Featuring sessions: *Home, work and gender*
                         Transport and ecological impacts of telework

The papers presented here go beyond the work place to look at more far-reaching telework implications. This involves, first, the relationship between home, work and gender in telework, and, secondly, the transport and ecological impacts of telework

4. The representational and discursive environments
Featuring session: *Metaphors and narratives*

In this environment papers look at the sort of metaphors and narratives associated with virtual work developments, and the models of organisational processes they imply.

5. The communication technologies environment
Featuring sessions: *Information and information technologies in telework*
                        Software solutions for telework 1 & 2
                        Integration and communication

Three sets of papers will be dedicated to drawing out the information hardware and software issues raised by teleworking. First, papers look at the matter of integration and communication in telework. Next, the importance of information is linked directly to the role of information technologies. Thirdly, the software solutions available for telework support are discussed.

6. The regulatory and legal environment
Featuring sessions: *Regulation and national policies*
                        National policies 1 & 2

Three sets of papers will be dedicated to the importance of national policies in telework, in both legal and regulatory terms, and the consequences they have for organisations and individuals.

7. The management and control environment
Featuring sessions: *Resistance and acceptance of telework*
                        Managing and commitment
                        Issues of control and autonomy

The final three sets of papers look, first, at forces of resistance and acceptance of telework in organisations. This is followed by a discussion on management and commitment issues involved, and concluded with papers that concentrate on matters of control and autonomy.

In addition to these academically–oriented papers, we have a few practically-oriented papers, which, we believe, further strenghten the link between the practitioner and academic worlds.

Eclectic though these environments and papers are, together they illuminate key issues involved in contemporary teleworking. They have been carefully selected to allow for a wide-ranging set of debates at Turku ´98.

We thank all those who have contributed and look forward to building on the outcomes. We feel that even this proceedings witnesses the fact that telework is a phenomenon on the rise and that we should give even more attention to understanding and developing it further.

Reima Suomi   Paul Jackson

Table of Contents

Academic papers

Present or tele present: The difference that makes the difference

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Abstract

Working despite distance has become a critical skill in organisations as a result of corporate globalisation. As a result of the development in information technology (IT) tele working has become an attractive new way for organising work. When the object of work is considered in terms of presence, we notice that the materials or utensils are seldom distant; they are present. Data can often be distant or tele present. However, co-workers can be either present or tele present and this is the nucleus of the concept of tele work. In this paper we discuss the effects of distance on context, collaboration and communication and conceptualise the problem area using the theory of the formation of social institutions.

Keywords: tele, work, group, distance, communication, coordination, context, institution

1. Introduction

Working despite distance has become a critical skill in organisations as a result of corporate globalisation. As a result of the development in information technology (IT), which has provided us with tools to automate routine work and enhance communication, tele working has become an attractive new way for organising work. What exactly is tele-work? Tele work has been defined as work performed off the premises of a company's main office (Hesse, 1996, Duxbury and Corbett, 1996). To our minds this is not a proper definition. We call this tele presence. Work is inherently local by definition; work is where the worker is. Therefore, we need to ask: "what aspects of work are distant?" When the object of work is considered in terms of presence, we notice that the materials or utensils are seldom distant; they are present. Data can often be distant or tele present. However, co-workers can be either present or tele present and this is the nucleus of the concept of tele work.

Tele work is in our understanding a matter of collaboration, cooperation, and coordination of people over distance and therefore much more a social concept than a technological artefact. In this paper we sketch a conceptual framework for tele work. This framework is based on two basic elements, which need to be managed in order to manage tele work. These are: (i) transportation with reference to material, other objects of work, coordination of information, knowledge, and results, and (ii) a human need for meeting face-to-face, because it is during these meetings that the foundations for trust, creation of shared values and expectations and articulation is laid. Information technology appears to have provided the means to manage the transportation element fairly well. However, we

1

question the possibilities of current IT to provide a functional solution to the need of meeting face-to-face. Technologically this issue can be solved, but is it a successful substitute?

Referring to Hall (1966), Schein (1992) has brought back to our attention an old 'silent' rule within human resource management (see also, Lipnack and Stamps, 1997) and presented the classification of "normal distances", i.e. the shared, biologically rooted, interpretation people give to distance (Fig. 1). From the point of view of communication in the work life the most important "distances" are personal distance and social distance. Personal distance (18" - 30", about 0.5 m - 1 m) is the range for personal conversations with intense eye contact. Social distance (4' - 7', about 3 m - 5 m) defines how we talk to several people at once, as at a meeting. It is interesting to note that these ideas of distance are so well perceived within the United States work culture that within these categories of normal distances there is a high consensus of what is regarded as 'very near' and 'very distant'. Furthermore, there is an understanding of what is 'intrusion distance', i.e. how far away we have to stay in order not to intrude (e.g. eavesdropping).

The distances shown in Figure 1 have within management been well established and have had impacts on, for example, the design of office buildings by not making too long corridors or too many angles. Even the famous comic strip Dilbert plays on this perception; as one step towards tearing down these boundaries have been to implement cubicle offices. However, the globalisation of businesses has forced management into a situation where they have to learn how to manage beyond fifty feet whether it is recommendable by earlier management heuristics or not. The business realities for many companies today are that there are branches in multiple cities and multiple countries around the globe. Information technology provides us with the technological means, but as found in literature and as we point out in this paper, it is not a sufficient solution. We have to redefine and reassess our basic assumptions regarding work and work performed from a distance. This forces us to accept a discontinuity as continuity, i.e. presence becomes tele-presence.
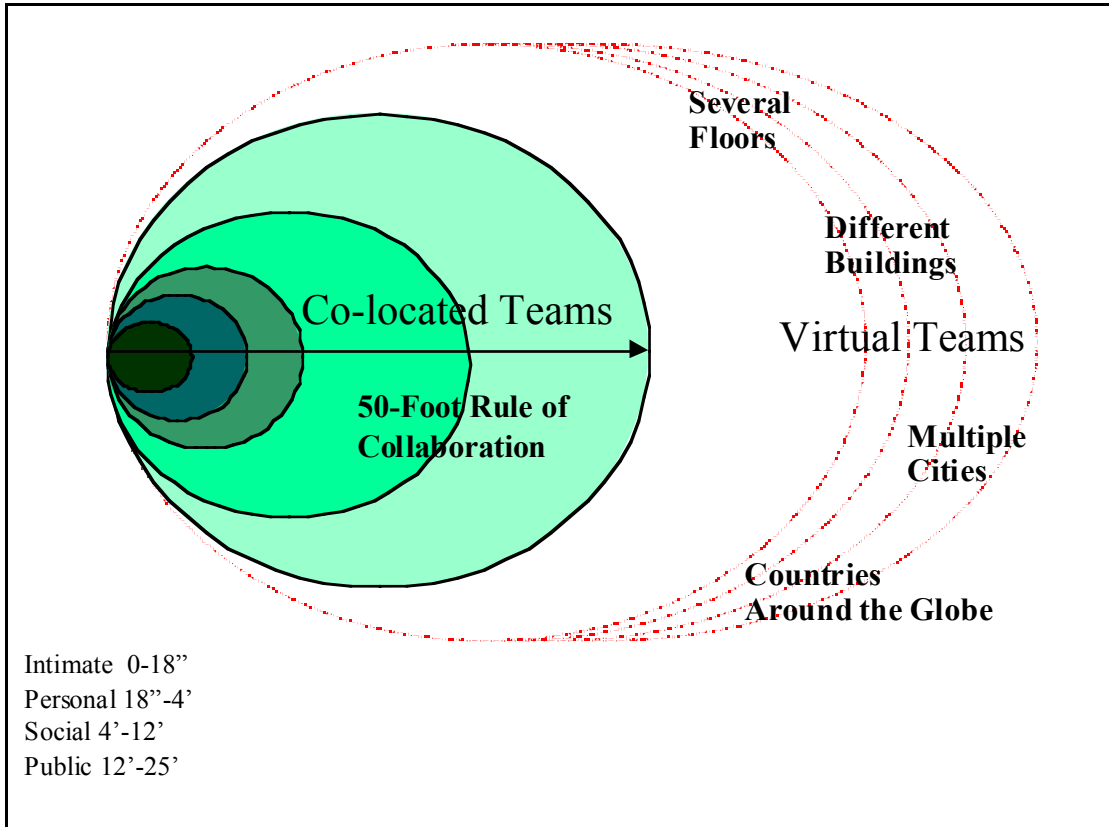
Figure 1. The 50-foot rule of distance (Schein, 1992, Lipnack and Stamps, 1997)

When the distance between collaborating actors is increased some kind of transmitting technology is needed (Fig. 2). The properties of the technology applied in turn dictate the type of information, which is possible to transmit. The present technology (and maybe also the forthcoming!) limits radically the richness of information and information sources we are accustomed to in usual face-to-face communication. In this paper we discuss some of the possible short-term and long-term effects the reduction of "information space" through a transmitting technology has and might have when applied in organisations.
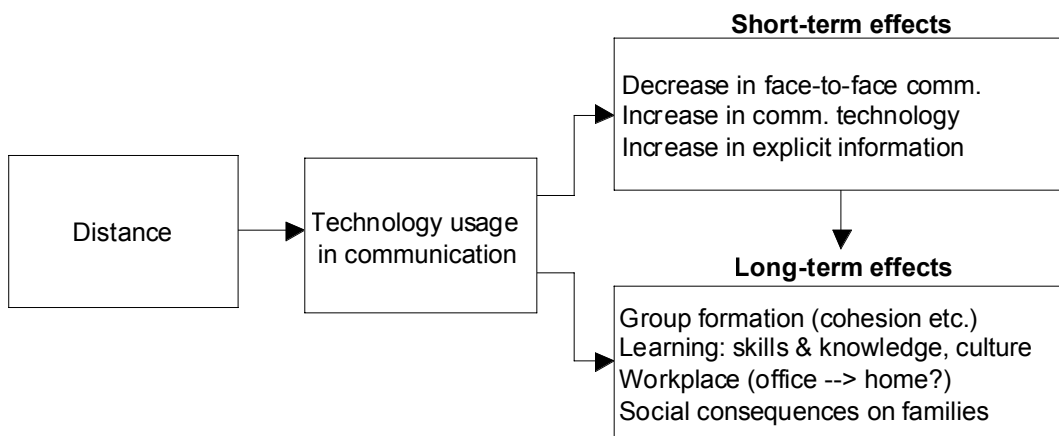
Figure 2. Some obvious short-term and long-term effects of the increase in the distance between co-operating actors.

The existence of the effects is obvious, but the mechanisms which cause such effects is not immediately visible; thus the issues need more research to be better understandable. In the rest of the paper we first discuss the effects of distance on context, collaboration and communication and then use the theory of the formation of social institutions to conceptualise the problem area.

2. Making Difference

The manifold of the short- and long-term effects is difficult to grasp in one glimpse due to its huge complexity. Here we have chosen three issues which in our opinion are significant. They are the context, collaboration in groups and communication in tele.

2.1. Context

If workers are not working at their "ordinary workplaces" they must find a new workplace. In some professions, like travelling salesmen's, distance from the main office is nothing new and new technologies are eagerly applied in communication between the actor and the office. In this case the effect of technology is minor: only the communication channel is changed (e.g. from phone to Internet) and all other variables (like the type of information, interaction with customers, location of the workplace, etc.) are kept constant. The consequences are very different in areas where the use of information technology changes also other aspects of work. Needless to say there are, of course, special cases where this reasoning does not apply. Such a situation is for instance the use of tele work to employ persons with mobility and profound sensory impairments, who otherwise would not be able to participate in the normal work community (Hesse, 1996). An other category of working community for which working at home has been an advantageous solution for a long time is freelance artists, journalists, musicians, etc. For these tele work has provided tremendous advantages.

However, for most of us there are obvious problems. Far from all of us have spare rooms available for performing work uninterrupted. Moreover, continuous presence at home appears to have dysfunctional consequences for family togetherness when the possibility to go to 'adult day-care' is not there.

Robinson (1993) presents a thorough review of concepts that are specific for computer supported cooperative work (CSCW) systems. Although it is not a taxonomy, they are issues that will influence the usability of CSCW depending on their absence and presence. One such issue, which directly has contextual significance for tele presence, is 'situated action'. The term 'situated action' refers to the fact that although we may have knowledge of how to, e.g. open a door (push or pull) we may not know how to open it if the door has, for us, an unusual design (Norman, 1988). Hence, even if we know how to perform work, we may not 'know' how to do it in a different setting. Therefore, a situated action requires always more resources (like attention, problem solving, learning) than a routine action and has in that way a clear connection to productivity.

2.2. Collaboration in groups - Individuals and individuals in groups

Hare (1976, p. 5) lists five characteristics which differentiate the group from a collection of individuals: "The members of the group are in interaction with one another. They share a common goal and set of norms, which give direction and limits to their activity. They also develop a set of roles and a network of interpersonal attraction, which serve to differentiate them from other groups." Increase in distance between the actors has effect on all of these characteristics (See also, March and Olsen, 1976).

The way individuals and individuals within groups behave and how performance of groups can be enhanced with information technology has been subject to much contro-

versy. This controversy is clearly visible in the debate concerning the effectiveness of computer mediated communication systems (CMCS) of which group support systems (GSS) represent one category. In the early days of GSS a number of benefits from the system over ordinary face-to-face meetings were presented. One essential argument was that group members could communicate even when they were unable to be at the same location (DeScantis and Gallup, 1987). A second benefit was quite often mentioned: the advantage of carrying on a discussion anonymously. However, it has also been observed that people behave differently in face-to-face meetings than with CMCS, which corresponds with the claims by Hare (1976) and March and Olsen (1976). It has been found that groups are in fact ineffective at exchanging information (Kiesler and Sproull, 1992, Hightower and Sayeed, 1996, Sproull and Kiesler, 1991). This tendency has been called biased communication. This is interesting because one motivation to form groups has been that groups have access to a larger amount of information than individuals. Group members can reveal previously unknown unique information and therefore it has been assumed that groups make more informed decisions (Hightower and Sayeed, 1996). Sproull and Kiesler (1991) and Hightower and Sayeed (1996) find that the reality is often different from the ideal.

In face-to-face discussions there are in particular two factors impacting the potential benefits. Hightower and Sayeed question the first factor, i.e. the degree of uniqueness of information. Unique information is such that is known only by one member. The second factor deals with the effectiveness of information exchange, where studies have found that groups have been unable to benefit from the information pool. Issues affecting information exchange are size, information load, degree of structure of discussion, etc. Issues affecting whether information will be revealed are a person's ability to recall information, have an opportunity to reveal, and decide to reveal information. GSS have tried to solve some of the problems related to the last issue, such as opportunity being time dependent or the fact that only one person can talk at a time, and social influence. Still, it remains for a person to decide to reveal information. Because people tend to bias their comments to match perceived preferences, they will mention information, which supports their own initial predisposition.

The above-discussed cues, which are available in face-to-face discussions, are excluded from CMCS discussions, thus reducing the richness of communication. It has been shown that the absence of non-verbal cue limits the information amount exchanged and when the normal give-and-take situation has disappeared, comments and the discussion seem to loose focus. In addition, the varying ability to type and read (and write grammatically sound text) affects the success of CMCS groups effectiveness. CMCS groups have been found to use more time for setting an agenda. In CMCS groups increasing dysfunctional communication has been found due to lack of social control because of anonymity. Therefore, conflicts tend to be more pronounced and deeper (Sproull and Kiesler, 1991). On the other hand, anonymity has promoted more equal participation in discussions.

In their thorough analysis of the foundations of GDSSs DeSanctis and Gallupe (1987) present a taxonomy of different environmental settings based on differences in group size and dispersion of group members (see Table 1). Using this taxonomy they present how DGSS design can be made compatible with the decision settings and how technology - and what kind of technology - can be utilised in different settings.

Table 1. A taxonomy of four environmental settings of GDSSs (adapted from DeSanctis & Gallupe, 1987, p. 598). Note that both Group Size and Member Proximity are scales, not dichotomies.

		GROUP SIZE	
		Smaller	Larger
MEMBER PROXIMITY	Face-to-face	Decision Room	Legislative Session
	Dispersed	Local Area Decision Network	Computer-Mediated Conference

DeSanctis & Gallupe justify the scales of the taxonomy with the social science literature on group behaviour which suggests that "the nature of the information exchange and the outcomes of decision making change when groups become extremely large, have irregular communication, or when face-to-face contact is absent" (ibid., p. 597). We claim that the distinctions made in the taxonomy are very profound and should be taken seriously - which has not been done in most of the GDSS research.

There are three important aspects to be taken into account. First, group behaviour is not the sum of individual behaviours but has special characteristics. Second, people behave differently in a face-to-face interaction than when they spatially separated. As a consequence, we can not generalise the results obtained in face-to-face groups to distant groups. Third, the type of communication used in a distance communication has a substantial effect on the outcomes.

When group members are spatially separated, some kind of communication medium is required. Rather often computer supported systems require explication of the information. The case study by Sachs (1995) describes nicely the effect of the medium: when telephone conversations in a problem solving situation were replaced by a text based messaging system the consequence was that conversations were translated "into a linear series of tickets unpredictably handled by an array of workers, none of whom speaks with another" (p. 40) - and performance was less efficient.

2.3. Communication in Tele

The two fundamental assumptions in computerised tele work arrangements concern the type of information and the type of interaction. As all kind of distance work requires a technological medium for transmission of information the assumptions about the relative importance of different kinds of information are crucial. In IT research the generally held assumption seems to be that explicit, quantifiable information is about all what there is - or what is necessary. In his work on organisational culture Schein (1992) has summed up what kind of assumptions IT personal and users/managers hold about the nature of information.

Table 2. Assumptions about the nature of information held by IT community and mangers/users (adopted from Schein 1992, pp. 280 - 281).

IT community	Managers and users
It is possible to package and transmit information accurately in an electronic medium.	One can only transmit raw data and that information must be extracted by other means as a separate tasks.
Information can be validly divided into bits (e.g. quantitative indexing of personnel records).	Meaning derives from complex patterns or gestalts.
Information can be frozen in time on a screen or on a printout (e.g. predetermined Syrian battle plan).	Information is always changing and dynamic
Faster transmission and computation are always better than slower (who sees what at what time).	The costs associated with speed may not be worth it.
More information is always better than less (or a hierarchical organisation).	Managers often get too much information, and what they need is more of the right kind of information; IT produces information overload.
The more quantifiable the information is, the better (the problem of representation and validity).	Much qualitative information, such as performance appraisals, should be left in qualitative form rather than converted into numbers as a "convenience" to the system.
Ultimately, a paperless environment is more efficient and desirable (reduced costs and accessibility).	The ability to see and manipulate paper is intrinsic to some kinds of tasks (e.g. technical limitations of presentation).

When we communicate through a technical artefact much of all other than explicit and quantifiable information is filtered out or neglected. In other words, the type of transmittable information corresponds rather closely to the conceptions of IT community, but to a lesser extent to the conceptions of managers or users. Explicit, quantifiable information is not, however, the only piece of information which matters in human-to-human communication. It has been found (Schein 1992), for example, that only about 15 % of CEOs from a broad range of large and small companies in a variety of industries personally used computers. The main objection of non-users was the type of information available through information technology: "..many of them felt that they needed face-to-face contact to calibrate what was being said to them and to determine how their own messages were being received and that even teleconferencing did not give enough cues" (ibid., p. 280 - 281). An extreme danger may be found in ironical expressions which in a face-to-face contact can be interpreted as intended while it telecommunication easily will receive the opposite meaning.

2.4. Summary

The discontinuity from presence to tele presence has effects on many aspects of work. The management of tele work is therefore a really challenging task, which can be succesful only if the persons doing it have a holistic view on these aspects. Such broad understanding, on the other hand, is feasible only as far as there is a (theoretical) framework to bind together all effects which seemingly are more or less fragmented. In this paper we suggest the theory of social institutions (Berger & Luckmann, 1966) to provide such a framework.

3. Absent Institutionalisation

What is the core of the threatened social aspects, which many critical writers so nostalgically desire when they write about tele work? Values and trust is one object of concern.

Some others prefer talking about organisational culture. We find that the concept social institution as defined by Berger and Luckmann (1966) very well conceptualises the problem area and gives a useful framework for designing and managing tele work.

Social institutions are the result of the process of institutionalisation. This process is best characterised by generalising the process of individual habitualisation into collective institutionalisation. Habitualisation may be seen in terms of economy of activity. In a new situation the actor has to find a novel way to act. If it turns out to be successful, the actor is likely to use the same rules when the similar situation occurs again. Repeated performances of the same rules become habits. Then the actor no longer has to pay deliberate attention to these rules. This kind of familiarity with the rules on how to deal with the close environment saves much of human energy and makes people free to concentrate on more demanding tasks. Berger and Luckmann describe this familiarity by the sentence "Here we go again".

Institutionalisation is collective habitualisation. It adds two aspects to individual habitualisation. Firstly, as the result the members of the social institution share the same rules. This is a necessary prerequisite to all collaboration. This adds normative power to the rules, because there is a pressure to assume the rules consistently. The previous slogan now becomes "This is how these things are done". It should be noted that the rules are not only rules of acting but also rules of knowing. Thus, institutionalisation gives an interesting view to the discussion about knowledge sharing as well.

Secondly, the shared rules also include the rules of collaboration. These are general rules such as handshaking, but also rules on how to deal with particular individuals. For example, knowledge of co-workers indicates what one can in a normal or stress situation expect from them in terms of knowledge and skill, or trust and commitment.

Of course, all of us know that in our modern societies we very seldom meet anybody like Robinson Crusoe, who is able to do isolated habitualisation, which is not simultaneous institutionalisation. Learning mechanisms are typically very subtle. Often there are no written rules, and furthermore, even these implicit rules become visible only when somebody breaks them (all are supposed to know that!). In tele work we do not have such a rich learning environment available. In most cases we do not have even a tradition to build upon. This means that learning in those environments sometimes is closer to habitualisation than institutionalisation, which really is not very good for future collaboration.

These concerns are nicely illustrated by an example received from a multi-national travel agency [personal communication with a district manager], which decided to purchase video conference equipment in order to reduce the need for people to travel to the necessary joint meetings. The innovation was eagerly received, and rather soon the number of persons participating in the meetings increased significantly. Then it often happened that in one meeting there were people who had never met each other before. It turned out that such collections of co-workers could not work together in the meeting. Finally, the company experienced an paradoxical outcome from the implementation of this technology: travelling need increased dramatically, because all people wanted to meet each other in order to get the capability to sit in a joint video meeting.

The institutionalisation framework gives new exploratory power in dealing with problems of tele work. For example, the three issues discussed in the previous session can be analysed.

The new work context implies the need for habitualisation and institutionalisation in the new tele context, because the familiar context no longer supports the work. The resulting

institutional rules are probably not as homogeneous than they were in work with presence, which makes the collaboration less seamless. The rules for collaboration must also be radically revised. In analysing the group's work it is practical to regard the group itself as an institution. The group has internal and external (the image of the group to the environment as if it would be a single actor) rules. Both types of rule are likely to change in the shift from presence to tele presence. The degradation of rich communication in presence may have effect to the quality of the outcome of the work. The illocutive force of the speech acts (command, question, commitment, etc.) is more easily misunderstood. This is obvious in a situation in which the actors cannot trust on the validity of the sincerity hypothesis.

4. Discussion and Future Work

Our purpose with this paper is not to be against tele work. It seems, however, that many optimistically oriented authors and designers of organisational information systems, are proceeding uncritically towards the replacement of presence by tele presence by using those wonderful technological tools. Our purpose is to point out that the issue is much more complicated than just a technical implementation. What is needed on the top of this is organisational implementation (Kling & Allen, 1996).

In particular, we are sceptical against the "fix it" attitude to information technology. We do not believe that the problems created by the introduction of technology always can be solved by means of introducing more of the same. We are not saying that we should throw away our technology: many times this would be impossible. But even in such irreversible situations we have good reasons to take a break and analyse the breakdowns in depth by means of relevant theoretical frameworks. This would create a chance to find novel alternative solutions to the experienced problems. This paper is a start for such a work. The next step would be to try another theory for this kind of analyses. From our point of view the most promising candidate is the activity theory by Leont'ew.

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There's a Time and Place for Telework: How Social Networks Affect Telework

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Abstract

Telework means different things to those with different working networks. Remote work radically restructures work networks for those in bounded but not unbounded networks. Since remote work distances network members, telework makes it harder for those in bounded networks to exchange resources and contact their network members. By contrast, those with loosely knit networks of clients and colleagues are freed from the constraints of returning to a fixed space; telework eases their work.

We report on 50 sales people -- 29 with remote work experience -- in different market segments in one firm. Small market sales people have bounded coworker and client networks that are office based. Corporate market sales people have sparsely knit networks of clients and colleagues. Our research shows that how they do their work determines how they telework. Telework marginalizes those employees whose networks deteriorate, while empowering those that work more efficiently at the margins. Therefore, companies need to investigate how people work together and apart, before embarking on this new way of work.

I. Introduction

"Teleworking sucks!" shot out a salesman in a Blue Company elevator when we queried his small business team's new mobile policy. It was puzzling because the media, government planners, and scholarly enterprises celebrate the gains for those that give up the downtown cubicle to work from their suburban homes. Further, others from the Blue Company telework trial had portrayed work at home as liberating. But clearly these small business sales colleagues, dismayed at losing the support of their work group, challenged our conclusions.

Diverse comments like these underline the uneasy jostling of teleworking images. Teleworking is embedded in society, and management and employees compete to define and control this new form of work. We find contrasts in discourse between those in distinct occupational sectors. Telemarketters, pushed out from the office, feeling an appendage to a telecommunications machine at home, are dismayed at losing their social ties at work. They view telework as a cost cutting measure that benefits management (Soares, 1992; British Telecommuncations,1994; Velosa, 1997). At the other extreme, professionals defend this chance to locate at the margins and gain control over the quality of interaction with others (Mirchandani, 1998; Olson, 1982). Our research on a large Canadian telecommunications company explores variations in employee perspectives by describing the work structures which contour views of this new form of work (Dimitrova & Salaff; 1998; Hardwick & Salaff, 1997; Salaff & Hoski, 1997). This paper finds that social networks shape how sales workers work at a distance.

The Model: Implications of work networks for teleworking

We have long known that features of workplace networks establish work rhythms and attitudes. Most important of these are structure and density. Reviewing studies of e-mail contact, Wellman (1997) finds that professionals that work in "office fishbowls" communicate differently from those in "office nets". Extending these findings to tele-working employees that are physically outside the office can suggest how the structure of networks shapes remote work.

The comparison of network structures starts with the notion that many teleworkers work in teams (Li, 1998). How the team uses the office is central to the structure of their work contacts. Dense, bounded work groups are co-located, small, narrow in range and homogeneous. Team members work exclusively with the same people on each project. They yell over baffles or use other face to face modes of communication. Such bounded work groups with overlapping contacts maintain social control through face to face pressures. By contrast, the colleagues of those in unbounded networks are spread out over a wide territory. They repeat few of their diverse work contacts for each project. They use a range of communication modes, from face to face to mediated on-line communication. Work relationships are weak. Supervisorial sanctions, colleagueship, and on-line work flows are adequate for social control even at a distance.

However, knowing about internal network structure of coworkers is only half the story. We also look at the ways teleworkers work with their clients. Whether they are office or client based, whether the clients themselves are organized as individual units or loosely networked, also shapes teleworking. Office versus client-based teams work in different ways, both before and after the office is disbanded. Views of telework vary as well.

Company Background and Those We Studied

The telecommunications provider we study (which we call "the Blue Company") is a key industry player, with an established history. Its many sales teams handle various products and services in two provinces. In the mid 1990s, the Blue Company moved towards virtual organization with a pilot project in several departments to determine how to support telework as a product. Remote work empowered these lucky few managers and professionals. This changed when telework as a product joined an internal policy to cut costs and improve productivity. In 1996, the Company invested in laptop computers, and ordered outside salespeople to give up their Blue Company offices. The Blue Company supported mobile sales work in the belief that because sales workers travel, they need no fixed office.

Bechky & Osterlund (1994) refer to such a belief as a "prescriptive representation" of the sales process. This "represent[s] both the way that the sales world is seen by other parts of the corporation (more specifically, higher management) and what the corporation wants the sales world to look like." However, work processes are cultural constructions that are negotiated and made meaningful by socially situated actors (Featherstone, 1993). No one in the firm had analyzed actual negotiated and interpretive sales practices before closing offices. Our research on the negotiated sales process found organizational, not technological, issues were key. One important feature of the sales process is the role of the office in team work. We found further, the usage varied among those with small and large business accounts.

While all sales people do collaborative selling, implementation and after sale service of complex, integrated technological solutions, the work process varies by de-

partment. On the one end, small business salespeople sell 1-800 numbers, small phone switches and data lines to over 200 customers with under $10,000 billed revenue a month. Team members include long distance, machinery, and data salespeople. By contrast, salespeople that represent large accounts configure call centers and other complex phone systems to a handful of national accounts with multi-million dollar a year business. ("Middle-end salespeople" sell long distance services, PBXs and other technologies to around 20 somewhat larger companies.) With contrasting markets and product mixes, salespeople develop their own forms of team work. We thus investigate the structure of these diverse ties with colleagues and clients. With different forms of team work, responses to telework are likely also to vary.

Another contrast is between long term and recently hired salespeople. Long-timers joined when the Blue Company had a reputation as a good employer. Employees introduced their kin and friends and were loyal to Blue Company culture. In the current uncertain telecommunications environment, this is changing. Long-term salespeople that rose through the ranks compete with new hires from sales backgrounds. Seasoned employees believe telework favors young rootless workers. Whereas old timers perceive telework as a threat, new hires know little of former practices and adjust more easily.

Not a precise technical term, teleworking takes many forms (Lamond, et al., 1997). We report here about full time Blue Company white collar employees, eligible for internal careers, that do not have sole use of the company cubicle. Their work arrangements range from those with their main office at home, who may occasionally drop in on a company office to those that mainly book a cubicle, much like a hotel room, at company quarters. The cubicles are not "theirs," and employees bring their own laptops and files with them to work every day. All are teleworkers in its most extreme form: they telework every day.

We interviewed 94 Blue Company employees in our overall study, of which 70 work remotely. In this paper, we analyze the responses of the 50 sales workers among them, 29 of whom with mobile experience. Their ages range from 28 to 46; their modal age is 40.We contacted the high-end sales teleworkers from the name list of the Blue Company telework trial. These include corporate sales workers that years before had arranged privately with their supervisors to work remotely. They joined the company trial to legitimate their status and to get hardware and technical support. The Blue Company offices of those that plied the small business market were closing, and their salespeople had to telework. Our sample includes almost as many women as men. Nearly half of the sales force came up through the ranks; more were fresh from school or from sales in other firms, reflecting the turn towards a more competitive force.

We gathered material with a three-session, in-depth interview schedule, did on-site observations, sat in on focus groups, collected time-budget studies and analyzed 850 responses to an internal survey. We conducted interviews in the teleworkers' home office to understand the family context. We spoke with their supervisors. We taped interviews, transcribed them verbatim and analyzed the texts qualitatively on NUD*IST, a textual data management system that allows us to look for themes in the data while keeping the context. Among these themes were differences in attitudes of those in differently structured sales teams.

Teleworking Opinions at a Glance

The following bar graph describes levels of approval of telework by salespeople in the corporate and small business account markets.[1] We see that the views of the "small business long distance, machinery and data" are most negative. Some do not like the idea of telework. Others do not know. Still others, mainly the middle-level sales people or new hires, support this new policy. In contrast, "corporate call centers and long distance salespeople" uniformly favor telework. However, supervisors of large, one of a kind accounts disliked the idea of teleworking enough to scuttle its application to their teams.[2] In the pages below, information about their work and client networks helped us understand these mixed opinions. As we came to understand how these salespeople networked over time and space to get their work done, we began to understand their views.

SALES VIEWS OF TELEWORK BY DEPARTMENT
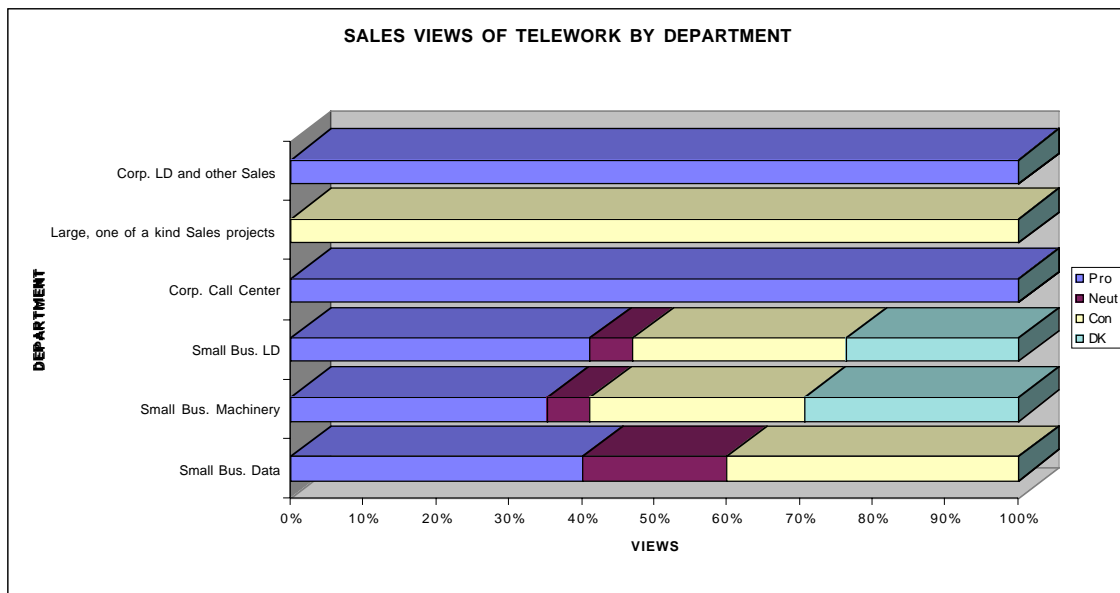
Office-based Telework: The small business sales team as office fishbowl

Before being pushed out of the office, these salespeople worked as a tight office based team, which was restructured when they became mobile. Telework made it harder for them to work as they had done and their comments reflect frustration at the broken office fishbowl.

Work Relations with Clientele

The small business sales team spends little time at each of their client offices. Mandated to visit a half dozen clients a day, they cannot tarry. The individual business client offices are mainly family firms, tightly organized internally. Since few are multioffice firms networked with others, these small businesses do not have complex needs. They need one-stop solutions.

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[1] We group together the middle- with small business account sales people because some had both markets.

[2] We further found (not shown here) that the pros and cons are not distinguishable by the product they sell, whether equipment or services.

Further, the salesperson does not develop long term client relationships. Clients do not draw them into their networks. Their clients are spread over several kilometers' distance. One cannot introduce another, because the sales base is assigned by geography. From the salesperson's view, their client base is unstable, as firms change districts, go over to the competition, or shut down entirely. Further, the Blue Company redistributes client bases yearly, to equalize opportunities for salespeople. Against odds, long time salespeople may try to establish customer loyalty. The salesperson believes she needed to construct a relationship to make the client feel special, priding herself on giving the customer "TLC".[3] Finding time to build client trust is hard, however, when the company increases the work load.

Telework as Speed up

Telework was accompanied by reduced support in the office and increased workload, making it even less possible to spend time with each client. The Blue Company raised the quotas of client contacts and dollars sales. Management expects teleworkers to move quickly from client to client. Long term employees and new hires with sales backgrounds see these changes differently. Perceiving these changed expectations about their output, long-term employees object to telework as speed up. To them, telework may lead in the change from selling as a quasi-clerical job during office hours to selling as independent agents. Women with young children complained that since they began teleworking, their workload increased. This raised the ante, and they could not keep up.

> *The biggest problem and the biggest complaint that I have is that a lot of the things that are put upon sales people in here are differentiated by your sex...As well as working mothers, okay?...And a lot of that is not taken into consideration. The individuals we have in our group, the young males that are just recently married without family, or the single males, have better opportunities...[In t]ime and efforts towards the job. It's like any business. They expect you to work 24 hours a day. And it's obvious that if you're a single person you have more time…. But if you're a married mother, you don't have the same time but it's expected that you do….And when I go home at night I don't have the same opportunities as everybody else to be able to continue doing my job at home because I have a new job when I get home, you know, taking care of the family and everything else you know. So these are things that I realize and a lot of the new people that they hired into our group, it's evident, are young single fellas…. And it's even been suggested to me that young males have better stress levels, different organizational skills, they're not as complex as women as far as being organized, getting the information together before going out to see a customer which, not necessarily is advantageous or right, but it's just males have different brain categories and do things a little bit differently, you know….Because a lot of the peers that I work with are married women with children. And we're having difficulties dealing with the amount of work load, especially after hours…. We're getting ourselves stressed out. (Nonteleworking, 39 year old sales rep, taking early retirement)*

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[3] TLC means "tender loving care".

A 30- year old sales woman bewailed the changing sales climate.

> *We used to have days where we would cold call customers to make appointments, right? So that was a way of getting us to.... So one day the whole district would cold call and the person who had the highest number of appointments or whatever like that, or sales whatever it is that they made for that day. They might give them tickets to Blue Jays game or some, you know, these are just, you know, little things to get the group um. It's just discouraging that you know it used to be fun and it isn't fun any more. People are coming in and they're like oh god, it's Monday. I mean you're working, you're some place for eight hours a day. To me that's a lot of your time. You should be enjoying it. The fun's gone. It's a cold place. I think later on, maybe not now, but I think they're gonna start, they will weed people out. They seem to be getting very... things are very cold, um, you know what I mean? Its kinda like, well if you can't keep up with it, maybe you shouldn't be in this. And that's the way things seem to be going. So, in our group alone, ...[t]wo have already ... taken the package. Another one is leaving this year. I think myself and one other person will be the senior people. Everyone else is going to be new. (With company 5 years, about to work from home)*

Another complained that it was hard to give good service with speedup.

> *Because when we go out to see a customer we like to be organized. We like to have all of the data, all of the information in a file folder. We like to go through the processes in a specific way because that's the way we've been trained to do it for the last 10 years as well. Maybe isn't the right way to do it any longer. So just go in and shoot from the hip and you know get the job done and don't worry about all of the paper processes. But then if we don't do it the way we think is right for the customer, the customer is going to be the one to suffer in the long run. Cause I mean I talk to customers every day. They appreciate what we do for them based on being able to know their business before we even walk in the door, be able to communicate to them. You know where they stand with us as far as the services, show them information. Be able to talk to them about more than just long distance, you know, talk to them about telephone equipment, talk to them about their bill, if it boils down to that. And customers appreciate that, and that's not what's going to continue with the new breed in the company. (Nonteleworking Sales Rep, age 39, taking early retirement)*

By contrast, new hires took on the company perspective and worked within guidelines. One bragged that he was used to working night and day for full commission in a previous job. He called those others that disliked telework "lazy". Whether old or new employees, however, under the new regime, of which telework is part, sales reps can spend limited time with clients.

The office as aplace where work gets done.

Small business sales people are multi-site networkers, whose main relationships take place in the office. A brief look at each type of key work relationship -- supervisors, support staff, and coworkers networks -- shows how the office is the place where the work gets done. Because the office is so central to each relationship, it is clear that telework will cause problems.

Supervisors

To supervisors, the office was an important but unheralded space in the sales process. They dismissed its importance, seeing the office is a way station in journeys to the field.

These sales reps they aren't really working from home. Home is their base, that's where they leave from in the morning and that's where they come back to at night, but the job is to be out there. The job is not to be at home. The job is to be out there on the road. Now they have the tools at home and if they were staying home one day or doing whatever, then the tools are there for them, but the job is supposed to be they're supposed to be out of there. (Downtown sales supervisor)

Another informed us how she had told her sales team that telework builds customer relations:

[W]e're not so much trying to get you to work from home. We're trying to get you to be out with your customer more and if that translates into having an office at home as opposed to paying to have an office someplace else then that's the right thing to do because I think everybody agrees that we want and need to be out in front of our customer more. You know you need to be able to develop customer loyalty.... The whole idea of having to come to an office isn't really lining up with that philosophy of trying to be out in front of customer.s (Suburban sales supervisor)

Although she noted that salesworkers could not be in the office and in front of the client at the same time, she did not recognize how much they needed office support.

Coworkers

The office was the space that linked work activities. The physical concentration of the bounded low-level sales people had given rise to a division of labor that worked through a concrete place for face contact. This place was the office.

Team organization is based on the clients' address, a concrete concept of place. Before teleworking, sales teams selling similar products and serving different districts shared an office floor. Each team contains people responsible for functionally specific sales of machinery, long distance network lines, and data lines for that customer base. The long distance sales person is the team leader. She makes the "cold" call, and looks for openings for her colleagues to sell machinery or data lines. When they work together on a complex proposal involving all three functions, all share credit for a sale.

These sales people want quick solutions, and coworkers are the best source. Passing along information depends on face to face contact. Sales people learn about new products or pricing through serendipity, often word of mouth. Since teams with similar products sell to customers in different locations, they can substitute for each other in many ways. The office was where they knew could find each other. They yelled over their half-walled cubicle baffles to get responses. They did not use remote technology. When they worked apart, separateness was problematic.

If there are some issues... that are happening with some of my colleagues that I should learn about, I'm not going to find out about it at home. (Long distance sales woman, teleworker, age 50, 6 years with company)

Providing answers was easy when together, hard when apart.

The down side [of telework]is ... because you're not meeting with your co-workers on a regular basis, you might be knocking your head against the floor

trying to figure out a solution and those things before it would be like you would talk over a coffee and that person would have that solution for you in two minutes and you took two days to figure it out. So there's less group cohesion, you know…. So the only way I mean I'd find out [an answer to a problem] is if I called around and called around but if everybody's out on the road the way we're supposed to be during the day you're not going to get hold of somebody, so you don't get to bounce a lot of ideas off each other.

A 43year old sales rep to the middle-market segment, soon to telework, anticipated,

First, the biggest thing with teleworking I see is it takes away the personal contact. You're there at your house, when you're there. You don't see anybody else, you don't communicate with anybody else. You're on the phone or on the computer. No interpersonal action with anybody else. And I don't think it's a good idea. People here, … even if you don't work with them, you see them. You can say 'hi', 'how you're doing, what's going on?', that type of thing. You stay at home, who are you going to look at, the four walls. I don't like that idea. …[My boss is elsewhere]. So that's another thing. I think everyone should be together. At one location. Despite difficulties, many adjust,

Sometimes when I'm in a jam and you become frustrated, it'd be nice to be able to talk to somebody that understands it. But that's when you've got to pick up the phone and do it yourself. Where if they're in the office, sometimes they can see it happening and say let's go for a coffee. So it's becoming more aware of where, how do I word this? You've got to become aware that you know maybe you need to walk away from it for five minutes and things like that. (Equipment saleswoman teleworker, aged 35 with long tenure)

Apart from problem solving, they depended on others' presence and on the group cohesion to get a boost. Work was tense. They talked over their sales at formal meetings and at informal chats. They saw through mood swings. They were depressed when their work did not go well. They compete as well as work together. Political discussions raise or lower morale. The fishbowl was a gossip bowl. When only a few teleworked, the rest passed hearsay that these had been seen golfing or at pubs together during work hours. Out of sight, they backbit and were jealous. But they had only each other to turn for support, and the office was the contact point. A supervisor who saw the centrality of teamwork, feared closing the office.

I guess the concern I have is that they could lose some of… the teaming. Because of the environment we're in and their product, portfolio, [they] rely on their peers for a total solution, if we don't recognize that and provide the opportunity for them to meet periodically and exchange information and idea, we may lose some of the synergies that we've been able to have.

Problems contacting support staff

Technical and clerical support personnel who help work up the proposal, install the order, and follow it up are also in the office. Several in the team compete for their support. Before teleworking, sales people used their proximity to this sales support to push themselves forward in the queue. Getting their work done quickly took personal intervention. They previously communicated with them by word of mouth. They had to hand papers in, because few procedures were electronic. They eyeballed the workload of the support, and tried not to promise a client a delivery that could not be met. They

prided themselves on their personal talents to get ahead of the queue. They exchanged gifts and jokes, to turn relations with support staff into people with faces. "I get to the installation early and bring the team coffee and donuts to make sure they get the work done on time." "I take the foreman out for lunch." "I never forget a birthday". They also sought favors to rectify the many glitches in the installations. "I promise installation a beer and a pizza for getting me out of a jam; of course I never pay up," one joked.

> *A sales individual like ourselves, we have objectives now put upon us to be out on the road a certain period of the day and then to pass our work over to individuals on the inside, our support people who are supposed to implement and run with the problems. But in most cases the complexity of the request is something that just can't be handed over through a telephone call, or a quick e-mail to the other member of the team. Every customer that we go and see is complex in themselves as far as their requirements are concerned, and the time it takes to explain the situation to another individual is wasted time whereas I feel most of the time that I could probably end up getting it done much faster if I did it myself. ...*

She concluded that teleworking added to her communication work:

> *And if I'm sitting out in the field and having to deal with people here doing half my job, how are we going to communicate?*

An equipment saleswoman, aged 35 with a long tenure with company, had previously used body language to assess whether her support personnel could take over her work. She had trouble negotiating her increased workload from afar.

> *[My support's still] in the office.…He's really good, but he gets stressed out sometimes too cause we're all calling him. Where if we were in the office we would all know that everybody else is doing such and such, but [as a teleworker] you don't have that flexibility. See if I was in the office I would have known that so and so was doing such and such. Therefore you know my support person couldn't have done it because they were busy doing something else. Now I have to depend on him to tell me whether he can do it or can't do it, right?…Well before I could walk over and sit down and show them everything I wanted them to do, or like talk to them in person. Now we're faxing or we're you know doing voice mails back and forth.*

Technical problems

Technical support is hard to get from afar, because the office is the location for Company technical staff. Salespeople had trouble servicing or connecting machinery from different vendors on their own.

> *Well the problem that we foresee is trying to get technical help and you're over the line and you can't get the help you need, or something is broken and you're trying to get a hold of someone to get it fixed and you're unable and that's the type of, from a technical standpoint, you could foresee that type of stuff. Or you're trying to use this machine and all of a sudden something goes wrong, but you need some help to and there is nobody around so you have to make a phone call.*

And another,

> *Well you can do a lot of conference calling and that kind of thing[at home], but if my computer needs fixing, I can't do it at home. (Long distance saleswoman, teleworker, age 50, 6 years with company.)*

<u>Supervision problems</u>

It is hard to supervise mobile sales people when they are in the office, and distance supervision is more problematic. Supervisors complained that they could not keep up with their sales people, who in turn griped that their supervisors did not know what they were doing. Supervisors needed to maintain day-to-day contact for teleworking sales people on the move.

Like in other words even operating out of their homes I should still know exactly where they're going to be tomorrow. If I go in on my computer, then they should have input from wherever they're inputting.

They also worry that loss of personal contact would get in the way of recognition.

I have a problem with the fact that you now will be removed from, you become lost because it's like now you're seen and you're heard and you're known and people tend to be people that they see and talk to and you're out there in the world so like you could be lost in the organization, become just a number. ... (A long term middle level equipment salesman, about to telework)

Telework causes problems, because the office is central for each type of work relationship.

<u>The technical "fix "</u>

The Blue Company proposed purely technical solutions to these problems, but these did not work as promised because the issues are organizational, not technical. New software enables remote workers to access central data bases for marketing information on their customers. Supervisors monitor the sales people in their sales cycles using electronic logs of client visits and other project details. Just having computers and modems did not mean these remote workers could use them at a distance, however. As Kompast and Wagner (1998:113) found, "Although many tools exist, not all have been made generally available and integrated".   For example, the new software cannot access a number of company data bases from outsider servers. Anticipating the problems, a long service middle-level equipment saleswoman said, *None of us feel that the Company, with their technological changes, is ready, and is not going to be ready at the end of the year. How is this going to impact us being thrown out to telework when the inside people are not ready to assist us, you know. So these are a couple of concerns that we have where we realize that yeah, they've been telling us for ages that they have to get rid of real estate, they have to do this, they have to do that. But in actual fact the onus is always on the sales person to pick up the pieces and continue on. But if the rest of the people are not ready to follow suit, then it makes it very difficult for us.*

Inside the office she accesses the telemarketing screen to check the customer's billing information.

But if I telework I won't have the privilege any more. It'll be taken away from me because I won't have the same input function at home as I do here.… It's the server. It has to be connected to a different server to see the different codes.

Bureaucratic procedures do not lend themselves to the remote paperless office.

The most difficult part… is the resources in terms of the orders and the procedures. They are not up to snuff. ...If [only]we had the confidence that we could go to our laptops and input all our needs and know that someone's going to do it at the other end, providing we provide them with the proper information. ... [I]t's

the procedure…. There should be more done on line. As I said, there's too many people touching paper… They have to fax[the order] somewhere else. My support doesn't … input the order on line. He does … only with some products. …I should be able to download it directly to the person that's going to complete the order and get a due date for me and it should be downloaded back to me on my computer. (Low-end Sales person with company 6 years.)

Technical solutions to supervision were also posed. There was on-line software that was supposed to coordinate work schedules, but it did not work properly. As a result, few check it and most use the phone because of the uncertainty that the other person will read the on-line materials in time. This person found it hard to rely on email for quick response.

I haven't checked my e-mail in three days to tell you the truth. Because if I don't do it first thing in the morning or if I don't do it from home late at night, then I don't get a chance to do it. (Q. [W]hen you communicate with [your supervisor]what is the content of the communication) To get advice. Mostly I would send her a voice mail though because I would know that she will get that voice mail right away. 'Cause if she hasn't checked her [intranet] either, I could be waiting a couple of days to get a response. So I would e-mail her to ask her a question or to keep her up-dated on a couple of customer situations, to let her know what I've been doing in some cases, to give her high lights. Or to let her know of some problems that I'm running into…At least maybe once or twice a week.

Nor does her supervisor count on the saleswoman's reading her e-mail.

[She sends] mostly voice mail…To book out some time that she wants to see me, to let me know of some problems on a particular account that I might have, to relay messages that have been given to her on specific accounts that should really be directed to me.

Solutions: Developing new work forms.

Dispersed sales people cannot vie for help at a distance and have to find new ways to work. They come up with ad hoc solutions to replicate face-to-face ways of work that they had built up in the office.

(Q. How is the fact that nearly all of you are teleworking affecting the way you work with each other?) You call each other. You use the telephone instead of seeing each other. We used to go to break together all the time from 9:00 to 9:30 and share all the information at that point in time every day, and then not take an afternoon break. Well now we don't do that. So you have to be very cognizant of touching base with those people every other day or so, just making sure is there anything I can help you with. Is there any leads? Blah, blah, blah. Stuff like that... With my network peers cause they're the ones that are going to be giving me leads and things like that.(Q. Do you find it difficult?) No. But I have a very strong relationship with them…Cause we know each other so well. We've worked with each other for so long. I don't think it's a problem and if it is we usually address it early before it becomes an issue.

Existing personal relations help others trust the complex information he transmits at a distance.

You have to talk slower on the phone because a lot of information is now being given over the phone where you were in front of the person before, face to face.

So you have to be careful that you're giving the information correctly. And like I said before you have to continue a strong relationship with those people.

A seasoned salesman returns to the office often to rebuild these relationships.

I don't feel that you have the same relationship as you would if you were in the office, because you're not seeing them everyday, you're not going for a coffee with them the odd time, that type of thing. So you know definitely you're just another phone call, another voice mail as opposed to up live and in person. So there a quite a few times, like I'm still in the office two or three times a week. ...I know for me if I don't see somebody, dealing with them on the phone is one thing but when you do meet them and see them and you know spend some time with them, you develop I believe a little bit better relationship. (Middle level sales teleworker, male, with young children,10 years in company.)

An office worker anticipated that if she were to telework, she would often go to the office,

I would almost have to because of the way I work and the way I feel, the only way I'd be able to get the job done right is to be on top of things. And the only way I can be on top of things is to see the individual and what they've done. Not necessarily every day but it may be every other day. ...It's a big question that we all have as to how are we going to operate because we deal with so many different individuals on a daily basis within the organization. Not only to get the job done but our team players. We have people responsible for phone equipment for our customers that we have to meet with on an ongoing basis. To pass leads to them, to talk about a specific application with the customer, and to even sometimes go out to see the customer together with them. (Nonteleworking Sales woman, 39 years old, taking early retirement)

Recognizing that work at a distance makes it hard to communicate with their co-workers, they invented new forms of contact, scheduled more meetings and working breakfasts. They still used the face to face medium. The twice a month face to face meetings became weekly, and even those were not enough.

(Q.) If you were a manager of [your sales group], is there anything you would do to make teleworking more effective?) I guess I would try and just pull in some more communication. Like... the weekly meeting is great. [M]aybe if we could have kind of defined, like, let's say we had like a set conference call for 15 minutes or something during the week, like if it was set every Thursday at 2:00 or something. Just to say hi to somebody, do you have any questions? How is it going? Blah, blah, blah. That wouldn't hurt. The e-mail thing, that happens all the time. I would try and do some more social things I suppose just because ... this is a whole new group. So nobody really knows each other. So I would try and push something that way. (29 year old teleworker, female middle level customers)

New work forms evolved to rebuild the broken fishbowl,

I would love to see something to bring back that team environment, the water cooler. That's the one thing they haven't replaced with the whole teleworking thing. It's the concept of the water cooler where you talk about your weekend, what happened at your last appointment and all those kind of things. I think they should do it through an Internet site, which is set up for the video conferencing. ...It's funny, 'cause after our breakfast meetings, you'll find that everyone kind of wants to hang around a little bit in the office and just chat about stuff. People are

anxious to talk about stuff. They are, you can sense that. It's weird, you'll come back from our meeting, and we're all walking towards our desks, and everybody just kind of lingers and before you know it, there's four of us standing around, 'listen to this'-- we start talking. We're starved for that, so I think we all sort of jump on it. I am anyway. (New salesman, divorced, aged 30, teleworker, middle-market segment)

That most of these new forms of work contact are face to face supports our view that the bounded work network is their chosen way to work. The ad hoc personal solution is to rebuild bonds. The small business sales team has developed new organizational, not technical, solutions. To recreate the office fishbowl as a formal solution, close contact has to be recreated.

Higher Levels Sales and the Work Net

Corporate level sales workers construct loosely bounded networks with both co-workers and clients. Their work is client centered, and so moving the center of their work away from the fixed downtown office does not change how they work. Rather, telework enables them to operate better around and within their networks.

Work Relations with Clientele

Corporate sales people have been the special representatives to multi-national companies for years and their work is centered on anchor accounts. They have long term, sustained client networks. They spend most of their time at client locations. The clients of high-level sales people are large organizations that are themselves networked. The sales people navigate within this network.

> *Of course the Bank is almost [as big as] our Blue Company. I mean it's massive, it's across the country. Now I'm not responsible for that, I'm only re-sponsible for the immediate area here, but they have divisions everywhere.*

The networked nature of the clients frames the work. The sales representative sells within the clients' networks. Consultants work with different groups within the client company, and compete within clients for projects. Their ability to network their custom-ers lets them meet several clients from different divisions of the same company together and count these as multiple calls to meet their quota. They are protected from speed up.

> *Two different departments within the company could be two contacts be-cause I can go and talk to customer service, for example and be there for two or three hours and then go for lunch and then my next appointment in the afternoon is in sales and marketing of the same company-- so that would be two contacts.... These can be different branches from the same client.*

Reps do not have to "cold call" clients. Clients themselves seek out the consultant for a potential project, because they know she is their special representative or their col-leagues with similar needs referred her.

> *Sometimes they call in here. A lot of companies know Team Call Center services, so they will call our switchboard.*

For example, a Call Center project within a new brokerage telemarketing center in the Bank was initiated when,

> *a woman came from Vancouver. ...She called me because she'd known the Team Call Center...there. [T]hey needed to fine tune this [broker's group]. So she called me and she said, let's meet, I want to meet with you myself.*

Networking within clients' networks widens sources of information and referrals for projects. The work she does must suit the clients' clients. Following through the clients' own networks further involves the corporate sales rep in her client 's world.

> *At the higher levels and the senior executive levels we need to talk about business issues and like with Chemical Org. we just had a meeting with one of their business units to talk about the marketplace they're in and the problems they're having selling to the marketplace and problems that consumers are having. Then we would come away from that and probably develop a solution to help them so I guess part of some of the sales training we have is to understand our customer's customer. So we help our customer deliver to their customer. So with X products division of the business unit that we met with we were able to come back to them with a really interesting solution that they're really excited about. So that's from the higher up relationship developing from just understanding what their business does and how we can help that business. That's a whole brand new sales outreach, an idea that we opened up....So the IT and the telecom groups typically have a strategy for developing the technical or delivering a technical solution to their end users. And then we can go to the businesses as well and I've been successful in both my client businesses to look at how we can help the business units deliver service.*

This representative to manufacturing companies hoped that her client would promote her in other units of the international company. Networking the client network increased her contacts.

> *[W]e will be starting to visit Montreal more often. Um, with Hardware Org., Calgary we have to go to from time to time. And Boston… In sales you still need these contacts. ..I believe more work gets done when you meet face to face. Or more commitments are made, yeah. As a courtesy, you can't just talk to people on the phone all of the time. You have to build more of a rapport and relationship developed with face to face. I would never not meet face to face. I look at it more from a relationship-building, thing where I'm developing a rapport with these people or have a rapport and have to maintain it. I can't imagine any sales person who would be successful in our company that dealt just over the phone. I mean other than the telemarketing people but certainly at the higher level sales people you just couldn't do it*

These large clients are also networked with their own competition, with whom they vie to upgrade their service. Knowing that one company has bought a package that would improve connectivity and get more customers, the competition is likely to do the same.

> *It's like uh, you don't want to go into the X Bank and start telling them what you were doing with the Y Bank last week. So you don't do that. But, they talk to one another, they know what's going on. They know that the other banks have got the scheduling program, now I do keep rubbing that in.*

Clients as sources of project knowledge

Clients are the most important source of project specific knowledge like department objectives, problems, preferences, and interpretations of the situation. This further ties the sales rep to the client.

There's a number of ways we would meet with the business units. Because I've been on the Chemical Org account for a long time, most of them know who I am and would call me directly. Often I go with my contact out of head office to meet with them as her source of expertise. Sometimes, the head office people bring me in when the application is starting to develop and they get a little over their heads or need us for whatever. At Chemical Org., it's middle or lower management. Chemical Org.'s a really flat organization so they don't have…multiple layers of people to deal with but I deal with everyone from director down. Typically the VP usually doesn't know that much about telecommunications. They're very, how do you call it, self managed and very empowered. You know, the lower management people have enormous multimillion dollar budgets that they are responsible for. With Hardware Org., I deal with everyone from the president to the switchboard operator.

Client ties become social ties.

Consultants develop extensive client networks: some are one shot while others are stable relationships which evolve into social ties, even friendships. Their unstructured contacts blur work and social relationships. Socializing with clients is encouraged, and may be organized. Since these social ties are mainly organized to further business and socializing occur within the interstices of meeting a business need, the ties further link the sales rep to the clients. The clients are so large that not everyone knows everyone in the networks. Sociability aims to further spread contacts and to increase trust within the decentralized client network.

The consultant mentioned a software program demonstration as an example. Special sessions are given to demonstrate communications software packages, and these become social events for the sales representatives.

I invited [my account] and they had a one-day overview of the … Program.…It was a pretty good reception, it was a full house. So every time there was a break, we sort of, you know, hang around and talk to them and see how it's going. [A]nd this is what I'm doing this afternoon, is like a follow-up to that, to try to close them on either set, either buying the whole program or the modules. …I came down here, joined them for lunch. I had lunch with them. And then I stayed around here, I just talked to some other people and now this is where if we're talking network, I talked to a woman that I know, she's a friend but she's also with Team Call Center. She's with Video Conferencing. So I had a chance to catch up with her. Saw some other Team Call Center consultants in the afternoon.

The Blue Company and their clients organize Christmas parties and golf days.

June 19th, I played golf at the Lion's Head with my [group and my Bank accounts] so I was there all day long and I networked with-- there must have been 100 people!

She described a Christmas party in the client's Board Room, known for its native art collection.

Yes, it is a beautiful room and I'd never been there before like in that, I had been to the [Museum] but I'd never been there in that kind of a setting. And it's wonderful to meet people at a social level, now there you discuss business because it's the relationship that you have, but you get a chance to meet all kinds of people that you wouldn't.

A sales rep. spoke of the importance of building trust by socializing with her customers. Meetings are capped by lunch.

> *On Friday, I was at Chemical Org. for the entire morning meeting with my corporate head office clients. We had a planning session with one of the Company's suppliers on a conference call. There were three supplier representatives from all over North America and two Chemical Org. people and myself on the call. Then, we reviewed a number of things that are happening and our next out of town meeting agenda, went for lunch and I drove home for the afternoon. So basically that was my week.*

She is encouraged to have social relations with clients outside of work.

> *The contact I have at Chemical Org., we've formed a sort of personal relationship only because we've worked together for so long we're quite good friends. She's met the fellow I live with only because he had to drop me off at the train station one time when we were travelling, but she's met him and I've seen pictures of her family and I know her sister quite well.... Once for my birthday, a bunch of the girls at Chemical Org took me to a concert at the Gardens and so there's a bit more of a kind of personal relationship with the Chemical Org people. And, um, two of the people at Software Org. there's a certain level of personal relationship. I knew some of the Software Org. people before I took the account over. I knew them outside of work.*

> *My national account manager likes a more personal relationship, so at Christmas time he invited some of the senior people from Software Org. and Chemical Org. to bring their families to the Sky box to see "Beauty and the Beast". So I think as you are on an account for any length of time and working closely with those people, always in business, there's a lot of personal stuff happening whether people are aware or not. So, you know, if you're tuned into that you form a fairly close, personal relationship.*

The consultant's support is herself encouraged to build social relations with the clients.

> *I'm going to be working with the customer setting up this guide. ...Me and him hit it off too well, really, he comes from the same ideas you know, that's another thing you meet a lot of different people and he's one of the people that I really hit it off with, well with, we think a lot alike so anytime I see any information, like there is a book I loaned him for motivation and incentives for his reps.... Then I also had a really good book on 50 ways to win new customers so I loaned him the books and anything I come across that I find that one of the managers will enjoy or they could use it I would lend them to them. Yeah you create your own personal library. .. It depends on how much you want to get involved with your customer... I got the idea from Sandy, she does that a lot. ..It's up to individual, each individual. Everybody sort of does their own [way].*

The office is not a work place.

With "ownership" of their accounts, consultants and salespeople generate their own projects and make the major decisions. Since they do not work on projects with other office members, the office is not central to their work flow. Instead, they bring wide ranging networks meet their needs.

Corporate sales' internal work relations and those of their client contacts extend past the office group. They bring a wide-ranging network to deliver "value-added serv-

ices" to their powerful clients. They construct project teams that draw on different people from different areas for different functions. They also cultivate a broad base of network members, in and outside the Company, as advisors for support and services, and to get unstructured, political, strategic information. These work networks are large, diverse and not stable.

For instance, the sales representative to a multi-national manufacturing firm works with several teams. The consultant to 1-800 call centers for national clients serves as contact person who funnels down solutions from various company experts to her client. They maintain contact with many colleagues, anticipating need for diverse information. They coordinate their work with their national counterparts to achieve uniformity and share information about the client. These national counterparts do not work together on a project, but instead give advice from a distance. They are used to drawing on diverse networks to meet their technical needs. There are occasional face-to-face exchanges with the office based workgroup. Most of their work contacts are with others and much of these exchanges are at a distance.

> *I can't be in Vancouver and I can't be in Montreal because we have territory assigned but we are working with the same customer so I would call my counterpart in B.C., in Montreal, all over the country. We exchange information and say, 'this is what we are doing in Toronto, what are you doing in Vancouver?*

Spontaneous teleworkers

Long obvious to these team members that they have no special need to return to the office each day, several years earlier one team opted to telework. A saleswoman recalled proposing working from the home because their unit was expanding, and space was tight:

> *It really evolved to the point where as we started to grow we didn't have office space for a lot of people so we put a proposition forward to our own manager and said, you know like do you really need to see our face in here four days out of five, like I don't think so. Because 90% of the consultants' time should be spent in front of customers anyway, the need for them to be here every day from nine to five just didn't exist, so it made sense to establish yourself either at home or here and it was far easier for the company as well as for the consultants at that point in time and specifically myself to set up at home than it was to continue coming down here every day. Also at that time I had accounts that were all over the place. I had one out in[the northeast of Toronto], I had another one out in [southwest of Toronto], so I didn't need to be downtown. As a result of that I guess I was probably…. was the first one who virtually moved out of here…I started it and very shortly after that we had [others] work from home .*

Through telework, sales reps to the corporate market, who rarely needed the office environment for their work, gain more control over their time.

> *Just working my own schedule, like you know being able to, if I feel like it on the weekend I can go up and I can do something you know rather than drive into the office and do it so my time is a lot better organized, yeah, I don't waste so damned much time. And I find in a lot cases when you're into the office, there's a lot of socializing and that doesn't enter into now. Like I'm here to work and if [my colleague] and I have lunch, it's normally a short lunch. [consultant to high end business market]*

27

For these corporate salespeople, telework means social, not informational, isolation. Her colleague mentioned:

> *I wonder if I'm doing the right thing. I mean it gets me down too sometimes because I am so isolated, you know, but then it's everything I do is really generated from myself anyway.*

<u>Support services</u>

To get technical support, some drew on the teleworkers in their area. One administrative team had built up a regional network of contacts, which reduced the need to go to the office for specific problem solving. One lent her fax machine to her colleague so that he could skip trips to the downtown office. Another phoned one of her many company contacts when she could not set up Power Point properly. She did not need to return to the downtown office. Since their administrative supports were designated to them, they could contact them one on one and need not go to the office for their joint project work either.

<u>Supervising the sales network at a distance</u>

Despite verbal support of teleworking, distance supervision is still problematic. Supervisors are less in touch with the sales consultants than before. They worry that the sales person will ruin a crucial client contact. Social control occurs indirectly through seeing long distance income results, but this takes time to appear. Supervisors would accompany the sales people on their trips occasionally. Generally, however, socialization and teaching were the main forms of control.

They tended to stress the personal element in teleworking.

> *You have to be very disciplined. There's no question about that. ...It would be far too easy to be at home all of the time and just sort of forget about work and just get things done around the house that you wanted to get done to start with so you do have to be very disciplined. (Consultant's supervisor)*

They constructed the concept of "good teleworking personalities". A consultant thought she was the teleworking type, since she likes being alone, enjoys the quiet of her home, and her independence.

Part of supervision is promotion. High level teleworkers that want to move up in the company must be visible. A supervisor recently promoted from teleworking sales person explained,

> *I think you have to be careful. You have to strike up a balance of visibility. You can't be totally telecommuting 100% of the time and not make yourself visible to some degree to the people that you work with. You have to have that visibility and if you don't, you're quite right, you will get passed by.*

Her strategy was to take on a politically visible special project:

> *Apart from just your own consulting job,… what I did was took the initiative to ensure that I got onto to a couple of the[internal Company] project teams. I had an opportunity to get some exposure with some of the[higher levels] at that point. You have to maintain that visibility.*

Others reframe their goals, and accept their lack of advancement (Kanter, 1977). Her subordinate thinks teleworking has cons and pros; one of the cons is impact on her career. *"I care about getting my job done, not staying into the office to get promoted."*

Problems for corporate sales market teleworkers exist, but do not stem from the work process. Most problems come from the parent organizational culture. The com-

pany worries about loyalty. The supervisor may be wary that the sales worker will be absorbed into the client organization (Dorsey, 1994). Too, they need to identify for promotion those loyalty to the corporation.

A deviant case

There are high-end vertical sales teams that often are organized as bounded networks. These create unique solutions to new needs. Located in one office, these teams meet and contact each other continuously to work on their dynamic engineering blueprints. We interviewed two supervisors, both of which recognized the importance of team synergy. They adamantly opposed teleworking, which would make it hard for them to communicate. One anticipated that closing the Company office would simply create the need for another office:

> *Frankly if somebody told me my folks would have to work from their homes, I really don't know how we would achieve what it is we have to achieve with the accounts. I think they'd probably be hanging around my house.... I'd have an office in my home and they would have to come there 'cause I'd be able to have more space, you know, in my home.*

The deviant case underscores the importance of network structure for teleworking. The team that is organized as a tight bounded network around the office cannot telework.

Analysis.

Office location is not important, and little happens in the office. That is why telework is not problematic for the corporate end sales. Indeed they have been spontaneous teleworkers. Even before teleworking they spent little time at the office. Now, as teleworkers, consultants have only go there to get supplies or other specific needs.

> *Well, it depends on where the clients are and then, maybe I need supplies so I pick up supplies. ... I do my expenses and then I leave them there. ..Pick up my mail. Although they send me my mail now. It's a perfect system.*

Other corporate market sales employees also think that telework is a perfect system.

Summary

Network structures shape mobile work. A comparison of the internal and external work ties of teleworking salespeople in different market segments finds teleworking harder for those in the office fishbowl. The small business market sales people work in bounded groups based on the office and whose work process depends on intense exchanges a few office-based individuals, while others cannot substitute. They spend little time at each client, and client location is not their work process. For them being remote makes it hard to contact team members, to sustain dense multiplex ties, while offering few rewards. Network differences give rise to different views of speed up and empowerment. Those in tight client networks, saw teleworking as part of the restructuring package that raised output. They have extra work to do but distance work does not improve the work process. When telework creates just in time workers, without easing their work, it contributes to feelings of marginalization.

By contrast, sales people plying the corporate market in looser work nets draw on a wide territory for their colleagues and clients. Their work team networks are scattered, and not located in the office. Passing on information can be done at a distance, without much daily effort. At the same time they spend most time in the client networks, and thus remote work offers the benefits of that teleworking widens their client networks. They can maintain both work and client network at a distance more efficiently than in

an office. Others may substitute for broken network links. For those in the loose work and client net, remote work does not threaten the network. Since gaining more scope from the center eases work and they get more sophisticated technology as teleworkers, telework increases the effectiveness of their work. Thus, they use the distance from the firm central core to their own ends, a means to improve their work relationships. Teleworking increases control over their work time and space.

Whether telework is a boon to liberate employees for self direction, or a means for employers to tighten control is being debated. We can address this debate by referring to network structure. Telework marginalizes those employees whose networks deteriorate, while empowering those that work more efficiently at the margins. Our research shows that how they do their work determines how they telework. How you keep the company you keep sets the scene for how you work apart from them. Telework may radically restructure work networks, and to those with different working networks means different things. Companies need to investigate how people work together and apart, before embarking on this new way of work.

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Scenes from the Call Centre Floor: Working the Mediated Organisation

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Abstract

One of the more widely implemented forms of telework is the call centre, or distance office. The call centre operates with the use of information and communication technologies, routinisation, centralisation and control via standard scripts. As a prevailing phenomenon, the call centre has been alternatively characterised as a welcome provider of clean, white-collar work and rational, tailored services; or a modern sweatshop, Orwellian, tyranical and controlling. Rejecting these dualisms, this paper explores the call centre experience from the perspective of the call agent, the inbound communicator. The agent's job is examined from the perspective of four defining features (i) scripting, (ii) control and surveillance (iii) stress and (iv) strategies for resisting and coping. Using storytelling and narrative, this paper explores the collective and individual sensemaking processes of agents, and teases out some of the rituals, rationalisations and counter-strategies used to cope with the contradictions and stresses they experience. The authors explore some implications for employees as individuals, and as resources. Moving away from the traditional management narrative of strategic choices, cost benefits and logistics, this paper highlights the voices of call agents and in doing so seeks to open up an agenda that has been neglected.

"My first impression of the in-bound room is that it looks like a giant kindergarten. Big, bright, hand-coloured posters and cutouts of names, cartoons and positive slogans are hanging from every inch of wall and ceiling space. I am hit by the sea of voices and wonder how callers can hear above the noise. There is certainly an upbeat atmosphere in this room. The supervisor puts me beside a young man of about twenty-four. I plug in mid call and am daunted by how fast he flies through pages of computer questions and flashing boxes. The third call I hear is successful and my friend clearly knows it is will be because he gives me thumbs up signs half-way through. He takes the credit card details and closes the call, then jumps up and marks a tick beside his name on a huge posterboard, and to my surprise the agents around him motion cheering actions while continuing with their own calls. We get a chance to talk a bit then - he tells me he has been there two and a half years, and that it's a pretty cool place to work."

Introduction

Teleworking describes the emergent or deliberate strategy of locating work remotely – as facilitated by the convergence and diffusion of information and communication technologies (ICT). While the mention of telework usually invokes images of employees 'telecommuting' from their homes, an increasingly recognised element of telework is the call centre, a variety of the 'distance office'. Although purer forms of teleworking remain fragmented in their uptake, the call centre has been adopted relatively widely. In this manifestation of distance work, work and employees are centralised to one location, frequently offshore, and tele-operators provide a focused and specialist point of contact for the remote consumer.

In the UK and in the Republic of Ireland, call centre positions account for a significant portion of new jobs. While it is extremely difficult to get accurate figures, one possible indication is the growing number of companies advertising toll free numbers (Gillespie, Richardson and Cornford 1995). A conservative estimate is that there are over 20,000 people employed in call centres in the UK at this time, and that the UK is leading Europe in accounting for 38% of all call centre positions (Datamonitor 1998). Fernie (1998) proposes an estimated 1.1% of the UK workforce is now call centre based, which, she notes, is more than the combined employment of the coal, steel and car manufacture industries. However, the call centre phenomenon is controversial.

In one popular vision, (particularly promoted by local authorities anxious to announce new employment), it is the first stage of a clean, white collar, post-industrial society, where information is the raw material that steel, coal and cotton once were. At the other end of this controversy, critics characterise the 'cult' of the call centre as Orwelian (Denny 1998, Fernie 1998); as modern sweatshops which automate rather than informate, which are footloose, and create a vulnerable and deskilled workforce. They point out that many of the new jobs are 'replacement' or transfer jobs within their own in-

dustries (for instance, the creation of telebanks has enabled closure of many high street branches resulting in redundancy for trained bank officials).

Whichever view you take, the evidence is that the call centre is having a defining effect on organising structures and new employment. Given this trend, we need to know more about the experience from the perspective of employee. Who works in the call centre? What kind of working environment does it provide?

The call centre phenomenon is located within a converging set of trends. (i) Employers are grappling with a genre of extreme flexibility, process reengineering and dynamic competition. (ii) Customers find themsleves within a McDonaldisation culture (enjoying a diet of instant availability, standardised products, and consumer-worship) which easily translates to a tele-services culture. (iii) Employees are experiencing a redrawing of traditional employment patterns in the form of upshifting, downshifting, and flexible career and work patterns.

Call centres offer tremendous advantages to the employer. Routinisation means that professional expertise is distilled, scripted and programmed into the system, allowing the employment of relatively untrained staff, the potential for greater control over productivity and standards and the creation of an 'intellectual assembly line' (McGrath and Houlihan 1998:61). Rather than high-street rents and professional salaries, money is spent on intensive advertising and promotion. The combined result provides a much heightened organisational (and employee) flexibility and responsiveness, and significant cost savings. Many existing and emerging industries have shaped and benefited from the growing tele-culture and prime examples include banking, travel companies, government agencies, information services, customer support, and direct sales organisations. Some call centres provide multi-lingual operators and so can supply whole geographic regions from a single site.

Contemporaneous to this is a recasting of employment category and skill requirements. Call centre work represents both the upskilling and professionalisation (white-collaring) of production work, and the deskilling and routinisation (blue-collaring) of some traditionally professional work. In many cases, the agent needs little process or content knowledge - instead it is held superficially in the scripts, and embedded in the computer systems. Workers are hired for their computer and telephone skills, personality and flexibility and customer service orientation. If skills are required they are likely to be in computers or languages (many graduates are finding their first employment in such call centres). In this way, teleservices jobs across industries may almost be treated as a job category, so homogenous is the role and skill of the agent.

Call centre operations offer many attractions to the consumer. They are frequently "one-stop-shops", open all hours, accessible by a freephone or lo-call telephone number, from the convenience of one's own home. They greatly reduce the need for the consumer to travel, meet face to face with the company, fill in forms, or wait in line. In

general, the needs of the caller are anticipated and the transactions are rigidly pre-planned and solidified through the use of non-negotiable computer forms and accompanying scripts. As the call takes place, the operator inputs information directly onto a computer database. Of course, what for the customer is an individual, occasional transaction, is for the agent one of perhaps hundreds of almost identical transactions during the course of the working day. This process, the intensity of the call centre work environment and the repetitiveness and control of the script make the experience of the agent the focus of our concern in this paper.

Objectives of this Paper and Methodological Approach:

The literature on telework and alternative officing weaves a managerialist narrative, exploring important questions about future trends, strategic choices, logistics and implementation issues. There is however, another side to the story. Within this paper we highlight the experience of the agent as an individual and as a resource. The story we bring you is based on observations and insights drawn from one of the authors' own work as a call centre agent (or 'Inbound communicator') over a nine-month period. Our goal is to raise some debates about the call centre experience from the relatively under-explored perspective of the worker. Participant ethnography values situated practice, lived experience and local knowledge. It facilitates an exploration of the subtleties, complexities, tensions and interrelationships with the wider context (Brown 1992). It allows the discovery of espoused versus actual practice, and gains insight to the values and beliefs embedded in the routines. As the saying goes, we often learn more by doing than by being told. In the context of a largely monodirectional telework literature, ethnographic fieldwork may help us to understand the experience on the ground, the effects of call centre work on people, and of people on the work of the call centre.

This paper then, represents a partial narrative of one person's experience of the process of 'becoming a member' of a call centre community (Brown and Duguid 1991). It is interwoven with voices from other co-workers, observations of practices, artefacts and content themes, and 'stories from the floor'. It aims to be an impressionistic tale; particularised, contextual and anti-grand theorising (Van Mannen 1988)

Narrative and Storytelling in Organisational Research:

The storytelling medium can be used to illustrate, highlight, interpret, teach, deconstruct or reconceive experience. Stories come in traditional form (beginning, middle and end), and in snatches (abbreviated stories, metaphors and indexing), and in gossip and talk. They inhabit the language used, and the scripts followed. They appear in symbols and artefacts of the organisation (such as noticeboards, office layout and group alliances). The stories told in and about the organisation offer insight on the ethos and culture, approved attitudes, shared meanings, contrary beliefs (O'Leary 1997) and accumulated wisdom. They help preserve culture (Howard 1998), shape behaviour (Boyce 1995), embody new members (Brown and Duguid 1991), gauge organisational "tempera-

ture"(Wilkins 1983), define boundaries (Gold 1997), cross boundaries (Brown and Duguid 1991), remember, forget and recreate organisational history (Orr 1990, Blackler et al 1997), make sense of practice (Blackler et al 1997), create and capture knowledge (Bruner 1991), facilitate collective action (Deuten and Rip 1997), channel tensions, contradictions and conflicts (Boje), provide forums for rebellion (Watson 1994) and political intentions (Feldman 1990), provide psychological armour (Leidner 1993), create change (Martin 1990), release emotion (Gabriel 1995), and capture the evolving, 'becoming' nature of the organisation. In all these ways, stories become a currency for organisational learning and self understanding.

How does the organisation use this resource? How do stories get told in a scripted, information driven organisation? At Direct Quotes, where time for informal interaction is restricted, and the scope for reinterpretation is limited, stories still play a big role. In part, this is a natural association with a sales philosophy - selling is all about telling a good story. Perhaps more importantly, stories can provide an valuable counterpoint to the relatively structured and controlled nature of the agent's job. Despite the monotony of the job, and the commonality of their experiences, agents frequently talk about their work during break-times, and seem to enjoy and gain catharsis from hearing about each other's difficult or unusual customers. As Gabriel (1995) argues, even within data-dominated environments, members seek to read meanings into daily events, and create new interpretations with others, obstinately re-asserting their unpredictability and plurality (suggesting that not everything about the scripted organisation can be 'managed').

The Mediated Organisation

We characterise the call centre as a mediated organisation for several reasons.
(i) Intrinsically, the organisation is mediated by information and communication technologies. (ii) ICT bridges the gap between the encoded knowledge and the agent, between the agent and the customer. Face to face customer contact is substituted by virtual, tele-mediated contact. (iii) The agent is a mediator between the external and internal life worlds of the organisation (in fact the agent is usually the only contact customers will have with the organisation, beyond a written contract). (iv) The agent also performs the role of buffer – often on the receiving end of customer frustration and anger at mistakes made by the company at large. (iv) We further identify mediation in the interplay of shaping influences and dependencies between employer, employee and customer, each working on the other (and both customer and employer specifically working on the employee) for the achievement of their goals.

A Profile of 'Direct Quotes':

Direct Quotes is a financial services organisation, specialising in direct sales. With approximately 400 employees, it is currently expanding with plans to double in size within the next four years. The main building is divided into long halls individually dedicated to inbound call processing, outbound sales, a customer helpline, claims proc-

essing, with smaller training and IT support departments. The management and business planning operations and the warehouse and document dispatch units are located at two other sites. This paper relates to the inbound department where currently about 200 staff work various contracted shifts. Of these, 65% are full-time employees, working on a continental shift basis (annual hours contracts, longer hours in peak season, shorter in low season). Pay is above average for the area. A full-time basic salary averages between £9000 - £11000stg, with team leaders earning about £1000 more. The bonus scheme can account for a substantial increase in income, with a small number of top earners potentially adding 50% to their salary. Although about 65% female, the age and career profile is very mixed. Because of the potential for flexible hours, many employees are mature students, parents returning to work (with children at school age, or having left home), or retired, redundant or retraining individuals. Several are studying for school, college and degree training. The full-time core workforce is slightly more homogenous; mostly local and longer term, relatively younger and less likely to have experienced post-compulsory education. Many will not yet have decided on a career path. Many openly see their jobs as temporary or welcome subsidiaries to other interests. Only a very small number of agents elect to take the industry exams (which are part funded by the company) which would traditionally have shaped the career path of agents, pre emergence of the call centre.

Socialisation

Core criteria for call centre agent selection are behavioural skills, personality characteristics, and specific abilities such as telephone manner and ability to be part of a team (Gillespie et al 1995). As such as key element of the job, social interaction skills are taken seriously. Direct Quotes operates a fairly extended and intensive selection procedure involving telephone interviews, an assessment centre, listening-in, a sales roleplay, a group interview and an individual interview. This also gives the prospective employee a realistic preview of the job. Undoubtedly, this process in itself imparts some socialisation, and engages a level of commitment. Employment begins with a four to six week induction and training programme. During this time newcomers are heavily socialised to the culture and beliefs of the organisation. Most of the time is spent on systems training, but this is interleaved very skilfully with an imparting process based on seemingly informal and off the cuff story telling. During this time, participants are frequently sent out on the floor to listen to calls, and so simultaneously get to know people and the rituals of the floor. It is interesting to note how little emphasis is placed on understanding the business, compared to practical process skills. Once on the floor, new agents are shadowed by more experienced agents who give advice on technique and 'the way things are really done'. All agents undergo a systematic programme of refresher training throughout their employment.

The job of Inbound Communicator:

I arrive, badged and ready, and the required ten minutes early. I sign in and state my hours, oblivious now to the din of eighty or more one sided conversations; go to the large cupboards that line the end of the room, and collect my tray of papers, my cup (for I will drink two to three litres of water during my shift, so dry is the heat in the room) and find a desk. If I am lucky and feeling sociable, it will be with the bank of desks that is my own team, or alternatively anywhere in the room I can find a space. It is my responsibility to get logged on in time, so that none of my time is lost on the control monitor which records my activity second to second from then on. Oddly, I don't feel too bothered at the prospect of the nine hours to come, of which one will be an unpaid lunch hour, and during which I will be called for two ten-minute breaks. Each day has its consolations. Saturdays, generally quieter and friendlier callers - Mondays, though intensely busy at all times, a great day for sales.

Assembling my tools, (headset, product information files and pad and pens) I log on to a computer, and note the ten or so phone messages awaiting me, but may not check them until there is a lull in calls later in the day. My first call: always a little bit faltering, but then once the words are uttered "Good morning, Direct Quotes, How can I help you?": I am back in the swing. Today I will take between 80 and 100 calls, aiming for an efficient three-minute quote, but depending on the conversation and co-operation of the customer, most will take longer. My job is to ascertain each customer's requirement, talk them through a rigid series of questions which determines a price, then seek to complete the sale. For each hour, I am expected to sell .5 of a product. This earns me my basic wage. For each policy over and above the target, I will earn a bonus. The fact is that many callers will not be suitable, and it is, as another agent advised me, a question of a numbers game. "Get through them quickly, and only spend times on the ones you can sell". Although this is part-time work for me, there is something oddly comforting about this job. Still, I am glad not to be facing a forty-hour week of it for the rest of my days.

Without a little irony, the agent or 'inbound communicator' is literally plugged via a headset, to the phone and monitor that indicates the nature and length of each current activity. As soon as a customer dials the number, they are connected via an Automatic Call Distribution System to the first available agent. The agent has very little control over whether to take calls, and is required to indicate a reason on the monitor, for every moment not available for or taking a call. All non-available / non-call time is referred to on the monitor and throughout the organisation, as 'idle time'.

The core structure of agent work is (i) telephone and sales proficiency (ii) specialised and concentrated training (iii) standardisation and (iv) control (Gillespie et al 1995). Leidner (1993) theorises interactive service work as juxtaposing employer, employee and service recipient in an odd power relationship; in which the employee finds themselves manipulating and negotiating with the service recipient, on their own behalf, as

much as the employers. Call centre work is just such an example, where the organisation trains the employee with limited product knowledge, attitude training and customer service skills and provides a fairly rigid script, to be used manipulate the customer into co-operation and achievement of a mutual outcome. Many callers, familiar with the game, perhaps having rung several other companies already, will co-operate with efficiency, while others become irritated by the robotic rhythm and resist standardisation, seeking to do things their own way. The skill of the worker becomes spotting which prospects can be won and how.

As call centres become more widespread and experienced by employees – we notice the emergence of the "trained customer". As tele-business becomes more common place, the job gets both easier and more difficult. Agents experience greater familiarity and co-operation from customers, but also potentially, greater resistance and alienation. (For example a humorous list of strategies for undermining call centre agents recently appeared in a national newspaper, entitled "How may I hinder you?").

The work climate:

The room is divided into teams, for no other reason than motivation. Sections of the room are distinguished by the childlike names we have somehow chosen; Teletubbies, Legolanders, Toytowners and so on. All around us are colourful slogans: "Get that card number", "That's No Problem, Sir!", "No-one wins an argument with a customer". It is a curious sight. We each have a team leader who answers queries, sorts out computer glitches and gives us feedback on our performance. Their goal and responsibility is to maximise our performance, and their own bonus relates directly to our sales. As with all supervisory roles, management puts them in the middle, when requiring a change in style from us, or increased sales. "If you are not happy with your sales: what is your team leader doing? It reflects on them". There is some discretion in how this role is carried out, and differences in style are clearly apparent throughout the room.

The work climate is busy and informal. Overhead are large LCD displays indicating the service rates, number of calls waiting, and number of agents in 'available'. As calls queue up, lights flash on the display unit, graduating from green to orange to red. This, along with the resulting mood of team leaders, acts as a further pressure to speed up calls, and clear the queues. At particularly busy periods, team leaders or the room supervisor will shout up and down the room, cracking a verbal, if friendly, whip. The atmosphere is jocular, but focused. It is quite common to go several hours without exchanging any words with your neighbour, other then a snatched hello, or to field a quick query. There is a general camaraderie, but an understanding that things get serious when they get busy. The inbound manager is located in the room, and being stern of tongue, is swiftly obeyed. Overall, there is a school-like atmosphere here, alternatively strict and supportive. Despite the operation of teams, the culture is individualistic. Late

return after breaks or excessive idle time is chided loudly and with barbed humour. Periodic "buzzwords" signal issues that managers are monitoring and want improved. Behaviour is usually quickly modified. Offenders receive coaching, warnings and the threat of a note on their file. Stories are told about employees who have been let go for disciplinary reasons. When call demand is high, staff are put under strong pressure to work overtime. Each team bay is surrounded with certificates – such as 'hero of the week', 'lowest idle time' and surprisingly, 'slow coach of the week'. There is a strong culture of remembering and using people's first names. There is explicit encouragement of competition, with monthly bonus earnings published on the walls. Top sellers are well known, though frequently criticised for call 'quality'. There is little interaction with other departments. Senior management are not known to most staff members. Product information and service rules change frequently, and staff received a constant stream of memos. It is frequently observed that there is no time to read them. Staff are occasionally asked to fill in surveys on health and safety, on communications and on morale. Agents tend to show a relative indifference to these and the resulting feedback. In this task driven environment, there is little room for much else. The task is to take a big breath and 'just do it'.

Themes of call centre work:

Some themes of call centre work are worthy of elaboration. Each characterises and shapes, yet is also shaped by, the organisation. Within this paper, we focus on (i) the scripted nature of the organisation, (ii) surveillance and control, (iii) stress and (iv) strategies for resisting and coping. While these themes are not unique to the call centre, we argue that they are an interesting point of departure for comparrison between the call centre and the more traditional white collar, or indeed production organisation.

(i) Scripted Organisations:

The idea that job knowledge and skill can be made explicit and encoded or embedded in a set of procedures or steps has been pursued by management under many guises – scientific management, fordism, the competencies and quality movements being prime examples. If a standard can be articulated and specified in sequence, then employers can use it in training, can reduce the random elements in performance, and can use the resulting 'scripts' to monitor, measure and control employee compliance and performance. In all these ways, it gives the employer greater control over the employer, and arguably the customer (by imposing a structure and menu on the customer, inducing co-operation and limiting choices). Recall Orr's photocopying repairmen and the philosophy of "don't fix the machine, fix the customer".

Leidner (1993) studies the degree to which scripts permeate the world of the service worker, and explores them in situ at McDonalds and Combined Insurance. Agent work is built around pre-planned scripts, which enable the agent to guide the transaction and

elicit required and marketing information in as quick and comprehensive a manner as possible. Scripting thus allows employers to reduce their dependence of employee's "ethnomethodolgical competency" (Leidner 1993:7).

Whether it is possible to fully and finally script human interaction, given its innate unpredictability, is still debated What is certain is that employers are trying. Sceptics cite the 'work to rule' principle as proof that discretionary behaviour and tacit skills will always be required from the worker (Leidner 1993, Johnson 1998, Knights and McCabe 1998), especially service workers . Hochschild (1973) problematises the pervasive scripting of emotion work into organisation job specifications – the warmth of the smile, the sincerity of eye contact. Telephone work has long been associated with a particular kind of manner – as demonstrated by early telephone companies advertising "the voice with a smile" (Frissen 1995). Many commentators observe an increasing tendency for employers to seek to script not just the words and inflections of workers, but their actual personality and attitudes as well. Leidner cites the use of transactional analysis at McDonalds, and 'positive mental attitude' at Combined Insurance, where the training was seen as turning employees into 'certain kinds of people'.

However, scripts are conflicted terrain. They can invoke resistance and displeasure of customers and employees alike. They can require the employee to be insincere and even manipulative. How do agents marry their own self-identity against the identity being imposed upon them? To what extent can the script be acted like a role, externalised from one's sense of self? Is it possible to divorce one's identity from the situation (remembering that for most people, work is a major part of their identity construction)? Leidner raises the concept of self-disassembly and gives the magnificent example of the Combined Insurance Sales Rep who has a note saying "Be yourself!" taped to his dashboard.

Scripts become problematic when the situation is not easily predictable or controllable, when the script or job role invokes conflicting priorities or role expectation, when the customer resists, or when the script is inappropriate or transparent. Discomfort can be strong when the script asks for steps at odds with personal values (for example explicit cross selling, asking people for their credit card when the product is clearly unsuitable, asking for personal information that would seem to have little to do with the callers request). Scripting can also create a sense of people as interchangeable, as robotic or 'fake'. It is generally felt that customers do not like scripts, as they invoke feelings of being 'mass produced' or standardised. For this reason, part of the employee's job is to hide (or 'sugar-coat') the scripting, to make the conversation seem real and original (Leidner 1993). (Here again we see the tacit skills of the employee as they manage the balancing act between being 'too scripted' and too familiar, fulfilling the criteria of the script, and yet responding to customer mood. As a Direct Quotes colleague comments "sometimes you know the minute you hear them speak not to even try asking certain questions"). Interestingly, changes to the script tend to be unpopular.

Does scripting work? There are a number of reasons why they can. Good scripts can help employees achieve their goals (make the sale, and eventually, make the bonus), they require little emotional energy, they can be held responsible when things don't work out, they protect the employee against uncertainty, they allow detachment, enabling the worker to mentally absent themselves to some degree – they can even provide a comforting rhythm and structure (Thompson and McHugh 1995:348).

Ray Kroc (1977) of McDonalds maintained that the secret of a successful routine or script is its effectiveness – operators must be convinced that they are better off in using it than any method they could dream up themselves. This is the essence of scripts – if they work, and achieve joint goals for the employer and employee, then they fit much more comfortably. However, on many occasions staff at Direct Quotes complained about the inadequacy of the script, or of following the script faithfully, yet failing to make a sale. Interestingly, Leidner found that sales trainees at Combined Insurance coped better with disliked scripts once their discomfort with being routinised or "unnatural" was acknowledged.

It is important, however, to distinguish between routines as designed and routines in practice. While there may be good reason for organisational sociologists to be concerned by the oppressive aspects of routinisation, advocates have been criticised for assuming that 'everything management wants, management gets'. There is a great variety in the degree to which scripts are effective, for a range of reasons. These include unintentional subversion by the agent (doing it wrong), deliberate subversion (agent or customer resistance), and conflicts within the script and within the system (for example conflicting interorganisational priorities, pressures of time or incoming calls, versus quality execution of the call). Agents frequently report absently saying the wrong lines, or repeating questions already asked, through lack of concentration brought on by the repetitive nature of the script (which truly flummoxes the customer, and makes the scripting wholly apparent).

Scripts may of course be personalised (for instance agents are encouraged to make conversation about background sounds such as children or dogs barking, to enquire about the weather locally, to admit to having a certain product themselves, and finding it useful….) yet this too can feel artificial. Several agents report discomfort in switching between natural conversation and script.

Does scripting neuter the natural talents of the agent? Most of us follow scripts to a greater or lesser degree in daily conversations - one can almost say that every interaction which is not novel is scripted. Most of the time, we accept that as natural. However, it is uncomfortable when explicit or transparent (for instance Leidner notes her conscious omission of key script lines when there are other customers waiting in the queue, so that they would not see her saying it over and over again). Being 'caught in the act' makes the colonisation transparent, makes us feel like pawns rather than ori-

gins, and singles us out as executants rather than deciders (Castells 1996). In this way, perhaps it is the self-consciousness of the act that is the problem – not the act itself.

(ii) Control and Surveillance

The call centre comes close to perfecting the surveillance metaphor. The technology allows for monitoring of agents' every moment. The display unit details each activity whether taking calls, on an inside or outside line, in "available" (awaiting calls), or in "idle". Average call length, and number of calls per session forms the basis for a conversion rate target. All time that agents are unavailable for calls must be accounted for – the display unit details toilet breaks, break and lunchtimes, if an agent is doing paperwork, in a meeting, or in training. These figures are pulled off daily, weekly and monthly and measured against sales performance and targets. Major operating goals are the premise that there should be no more than a 2% failure of service (callers who abandon the hold pattern), and no more than 10% of time in idle – for any reason. Performance is monitored by team leaders observing the real time statistics on a continual basis (agents will be spotted and rebuked if in idle for any reason, or if late returning from a break), random and structured call listening in (to check for adherence to script) and "double vision" (supervisor following the call and the screen entries on their own computer to check for accuracy – colloquially known as the 'snoop function'). Monthly reviews are held with each agent, to discuss performance and play back recordings of calls, which are rated according to the script and customer service quality "blue-prints". Team leaders monitor for errors or ongoing problems and provide coaching or designate training needs.

Although negative feedback relating to the individual statistics is minimised at Direct Quotes, the potential is clearly ever present. Scarbrough and Corbett (1992) recount the story of a supermarket chain who through the EPOS system establish that each checkout operator should be able to process a minimum of 20 items a minute. Although they do not actually hold employees to it, operators are made aware that it is there as a standard and used to monitor performance. In this way the panopticon is enacted in the technology. Agents are aware that every action is being monitored on the database and that at anytime, a trainer or team leader may be listening in to their performance. Anticipating this, agents monitor and control their own behaviour for the company.

The agent will frequently achieve instant feedback, whether as rapport with the customer, or evidenced by a successful sale. It is quite common for a team leader to comment publicly on individual performance. It is little wonder that call centres have been identified as in ideal arena for research on motivational techniques and performance related pay initiatives (Fernie 1998). With the prevalence of performance related pay, agents are offered the perhaps hollow vision that they have control over their world. Whether this is in fact instrumental to management goals, more than those of the employee, is a question of perspective. Frequently employees may be controlled by the culture, though given the high turnover and flexible hours of call centres, independent

social norms have less chance to emerge. Arguably, employees are also controlled by internalised ethics of customer service (whether natural or induced). Knights and McCabe (1998) cite the example of operator's frustration with employer's double standards on quality customer service as an example of internalisation of control.

It thus appears that agents are controlled by the technology, by the script, by the management, by the customer, by the reward system and arguably, by themselves. Is all this real control or is it just "pseudo-control" – control on paper? Again we must differentiate between the explication and achievement of goals and it is important to note that call and operator statistics invariably require adjustment and 'massage'. However, the truth may be that the control generated by the system is most powerful when internally located. It is not the system, but the presence of the system, which induces self-monitoring behaviour and internalised control. On the other hand, much depends on the extent of investment each individual has in the job – and how much they care about keeping it and impressing their employers. What is clear is the circular nature of the control - resistance cycle. The more employers seek to control, the more employees seek 'spaces of escape' (Knight and McCabe 1998, Gabriel 1995), the more employees seek to regain power and so on.

(iii) Sources of Stress

Call centres conditions can be a source of both environmental and psychological stress. Direct quotes evidences a dramatic mix of styles, with simultaneous use of control and commitment strategies. What is rewarded and what is punished? What are acceptable rebukes? (Shouting down the room to a flicking member of staff – "Jane! I thought you were supposed to be a Christian?"). How does the degree of formality (for instance the rigid documentation of progress and performance) sit against a culture of informality (of attitude and personal interaction)? The prevailing control doctrine combined with a lighthearted atmosphere leads naturally to a sort of paternalistic theory X management style. Beyond the control system itself, management style has significant impact – particularly with reference to ideas raised by Johnson (1998) on the perception of "fairness" and the status of the individual psychological contract. Johnson contends that the agent's perception of fairness in the workplace is a stronger determinant of good citizenship and customer service behaviour, than is job satisfaction. His point reflects a belief that employees are pragmatic about the extent to which they will enjoy their job, and that instead we look for 'fair play', and want to be able to trust the actions and intentions of management.

The monitoring of performance does not feature overtly in constructions of stress as described and observed in call centre agents at Direct Quotes. More immediate stressors include the working environment (noise and heat), the 'force-fed' nature of calls, particularly through busy periods, and the times when people individually, for one reason or another reach "overload". Interestingly, a frequent comment is that when things are quiet, frustration and boredom sets in. Most agents have a preference for a reasonable

level of busyness (especially because sales and bonuses depend on it). The agent, in common with most customer service workers, is placed at the centre of two very different agendas, the customers and the employer's demands. How they resolve this, while also paying attention to their own needs and discomforts, is inevitably variable. Rude customers can be a cause for considerable distress, particularly as agents are required to adopt a benign and compliant customer services role. Bored customers are irritating, but compensate by being predictable to handle and requiring very little emotional energy in return. Chatty customers can offer a welcome break from monotony, and affirmation of a sense of self, or alternatively invoke discomfort and a sense of loss of control over the script. Here the question of personal identity, and reconciling role and identity is particularly important. Work by Kunda (1992) and Hochschild (1983) suggests that both role and emotion work can place difficult demands on the individual, leading to and estrangement from ones 'real' self.

In their study of Probank, a UK telebank, Knights and McCabe (1998) highlighted the fact that stress often relates to changed work practices. At this site, processes had been re-engineered to multi-task between phone work and back-office work, with a norm of two hour periods on the phone, twice a day, with a requirement to switch back to phones whenever there are calls waiting. The researchers observed that staff who had previously either been on the phone or carrying out back office tasks alone, experienced significant stress from the requirement to interchange between tasks. This suggests that the impact of change may have a greater bearing than that nature of the routine, which is a disturbing finding for job designers who would advocate task variety as an antidote to the stress and monotony of routine.

(iv) Resolving the tensions - Strategies for Resistance and Coping:

What kinds of psychic strategies are available to help call centre agents? The literature generally acknowledges a range of choices facing call centre agents conflicted by script, customer, surveillance and stress- broadly divisably into themes of embracing, ignoring or resisting. The emerging picture is that most individuals adopt not one, but a combination of stragegies and coping mechanisms, and that their approach will vary over time and context.

Agents may choose to embrace the script, and affect mastery. They can 'act' in the sense of putting on a company persona, viewing the process of acting as the essence of their job (Ogbonna 1992, Sturdy 1998). One Direct Quotes agent deliberately watches upbeat American videos before coming into work – to get into 'role'. Several colleagues mention the practice of taking on a whole new persona to deal with customers, and enjoying the experience of experimenting with a different personality. Another strategy for addressing the power imbalance, or organisational frustrations, is for the agent to mentally align themselves with the customer rather than the company. For instance, several members reported having actively discouraged a sale when they felt the customer was making a bad decision, or had the potential to get a better price elsewhere.

A further strategy is to turn the script into a game. Games offer a comforting rhythm and release from monotony (Thompson and McHugh 1995). As the agent flicks through the screens, and finds a rhythm with the script, it can very similar to playing a computer arcade game (guessing the price outcome as you go). Team leaders pick up on this with frequent spot prize competitions for the next sale of a particular nature, and by engaging mild team rivalry by recording of sales on team walls, and calling the mid-point and evening totals down the room. A more resistant or subversive game played by agents is the "banana game" whereby agents compete with each other to see how many times they can say the word banana during a call, without the customer noticing. This mocks the inanity of the script as well as providing light relief (admittedly this is a prohibited behaviour).

Agents can resist the system by minimising their efforts, withdrawing discretionary service behaviour, or using a bored or robotic voice; they can go beyond their authority, they can play dumb, be rude, or they can withhold information, unless explicitly asked. A further option is for the agent to fake it – either metaphorically or literally. Knights and McCabe report that agents at Probank frequently fake the appearance of work by miming and mouthing, while not actually on a call. On most current systems, this would immediately be spotted. However it begs the question of whether acting demands less energy than actually performing, and if so – just how stressful the job can really be.

What is the call centre equivalent of a 'spanner in the works'? Prevalent practices include 'flicking' into idle briefly, to return to the back of the queue and maximise time between calls (but this is closely watched for by supervisors, and spoken of derisorily by everyone). The main power is to cut an objectionable customer off – and this is a practice that is less easy to spot, as customers will frequently disconnect themselves accidentally. Agents may also "lose" paperwork or fail to record customer complaints or queries requiring action (in many ways, the system encourages this, as time out for paperwork is frowned upon). It is frequent practice for agent's to ask friends to ring them at before closing time, so they won't be left with the last call (calls come in right until closing time, so calls commenced as the bell goes are concluded on the agent's own time). The irony of all these approaches is that they further contribute to the stress of the environment for everyone else, and that they may have damaging effects on customer service, contrary to management's intentions.

Yet for all the appearance of control and presence of resistance - workers at the Direct Quotes seem surprisingly content with their lot. How can this be explained? Clearly satisfaction is not a static dimension. Sturdy (1998) is one of the few writers to engage with the ambivalent and fluid nature of role embracement, describing it as temporary, limited and contradictory ("smiling and sometimes meaning it"). He observes how members are seen to drop roles occasionally, and get openly frustrated with a customer or colleague (although such de-rolling tends to be done 'back-stage', emphasising the professional 'put on a good show' ethos).

Reactions to stress tend to be channelled either towards the customer, (by being short, with the customer, perhaps mocking the customer, or putting a frustrating caller on the loudspeaker so that colleagues can hear and sympathise, or even by cutting off customers occasionally. Knights and McCabe recount the story of one agent who finds herself physically standing up when dealing with a difficult caller. This somatic response demonstrates a useful coping strategy, when the normal ability to answer back and convey discomfort is not automatically available. They also describe the cathartic effect of team meetings, where the act of voicing a frustration can diffuse it. The role of team leader as buffer, facilitator, interpreter, mediator, advocate and support worker is also very important in this regard.

Latent stress may also be channelled into conflict with other teams, competing for resources. At Direct Quotes, despite the hot desking approach, protective team leaders often make interlopers leave team desk banks mid shift, and find other seats. This causes discontent and frustration and is a further example of the employee being forced to take up the slack for short resources and cost minimisation, as the burden of responsibility gets pushed down the organisation onto the shoulders of the agent.

The question of how call centre employees deal with stress is an important one, particularly in view of evidence that a build up of stress leads to illness, absenteeism and turnover. The call centre industry is well known for employee burnout and high turnover rates.Fernie (1998) cites an average service length of 18 months.

Knights and McCabe (1998) reject the neutral, apoliticised presentation of stress as an individual problem. They argue that by absorbing stress and invoking coping strategies, employees actually participate in its creation and continuance. 'Probank' had a high level of absenteeism through illness, and this adds to existing stress levels because the rota systems do not take absence into account, resulting in ongoing emergency phone cover well beyond staff's rostered hours. At Direct Quotes, staff experience considerable environmental stress (for instance, because of poor air conditioning and the use of fans, hay fever, colds and dry eyes are rife). Yet absence through illness is treated as the agents own responsibility, and hours missed are still counted as time worked for the purposes of calculating targets. The responsibility is thus on the employee to get back to work, if they are going to have any hope of making a bonus.

An overview: Re-telling the Story?

It is difficult avoid a dystopian reading of the call centre - so overtly Orwelian are the images. In this deconstruction, agents can easily be characterised as cyborgs (for interesting discussions see Haraway 1988, Featherstone 1995 and Lupton 1995). The agents can be sketched as colonised by the call centre, embodied by the technology and the script, customers voice inhabiting the ear, bound to the phone monitor, plugged into the

keyboard, and force fed through the involuntary drip of Automatic Call Distribution. Is it helpful to look at the agent in this way? Are there other ways to deconstruct this environment? What are the clashes and tensions between stories of the call centre? Whose voices are represented? Whose are not? Where is the power? What is the agenda? What is the inverse? How do operators narrative-ise their careers, skills, personal histories, attitudes and beliefs?

Within this paper, we have attempted to open up an agenda for such questions, and highlight the reasons why they need to be answered. Ultimately, it is hard to move beyond the boredom induced by the nature of routinised work. Yet for management, regardless of social cost, there must be concern about the impact of the human dynamics on the call centre's effectiveness, and the impact of control systems on customer service in the long run. Even the preliminary discussions of this paper highlight many tensions facing management in terms of the effects on customer service. Having already travelled the path from Taylor to Ford, to Business Process Reengineering, we can be in little doubt that centralisation and routinisation cause problems. Yet what potential is there for employers to abandon control strategies when there is so little intrinsic motivation to be found in the task? To have returned to this place having learned what we have learned about human relations, job design and empowerment, is certainly disappointing.

One of the greatest worries of the call centre phenomenon is the oft-cited fear that it is creating a vulnerable, gendered, career-less and deskillled workforce (Stanworth 1998). Of deep-seated concern is the degree to which the call centre enacts the core-peripheral model (Pollert 1991) where a large group operates through roles, rules and scripts, and someone else does the thinking and controlling. As Scarbrough and Corbett (1992) write, "perhaps the most important legacy of Taylorism and Fordism is not control of the shop floor per se, but the equating of power and control with specialist and objective forms of knowledge". There is also reason for concern about the sustainability of call centres. How soon before Internet technology overcomes the need for a human agent at the other end? In the meantime what skills are these workers acquiring to use elsewhere?

Interestingly, Leidner (1993) and Castells (1996) are both cautious about the deskilling perspective. Castells predicts a reskilling at certain levels, and certainly the elimination of ritual manual input work. Perhaps the best understanding we can have of call centre work is whether it meets the needs of its employees (or whether they are prisoners of it, without choice). Perhaps if offers freedom from the traditional concern of a long-term career. Many employees are attracted by the flexibility of hours, the relative ease of the work, the limited energy required, the immediate feedback, the relatively good pay, and the fact that no further energy is required once the working shift is over. What is not in doubt is that management's agency is met by employee agency, though certainly in disproportion.

But a remaining tension is the contradiction between control practices and the rhetoric of quality customer care. Agents continually bear witness to management's often hypocritical leveraging of control against the cost benefits of customer service and care. Agents are asked to provide maximum personal flexibility, while adhering to the strictest standards of script compliance.

Are there ways that call centre life can be improved? Are there ways we can change our thinking? Metaphors may give us some ideas. "Inbound-Outbound", a call centre management journal, advocates a shift from 'Battery' to 'Free Range Farming methods' (with not so much as a blush). The root metaphor the call centres tends to invoke is indeed the 'Panopticon'. How does our view of call centre change if we switch the panoptic metaphor for another such as 'a conversation' or ' a talking shop'? These metaphors invoke ideas of reciprocity and multi-voicedness. What would an organisation structure based on a 'conversation' look and feel like?

What becomes clear is that a major task of the call centre is the management of meaning. To work the mediated organisation without feeling oppressed requires psychic strategies and a generous flexibility and people orientation. The utilisation of teams, creative bonus systems and a light hearted and fun culture do make a difference. The psychological contract is an important instrument in understanding the fragile balance of the system, and organisations will do well to consider and take seriously issues of fairness, and issues that represent hygiene and motivating factors. The continuing practice of pushing the responsibility and ownership for failures of the system down the organisation is likely to threaten this delicate balance.

Robin Leidner's closing question is whether trust, personal liberty and integrity can be written into the scripts? This is a question on which call centre managers should think hard.

In review, some closing thoughts:

Considering the 'the call centre effect' on agents as individuals:

- agent work can represent a positive life-style choice
- agent work may not translate into a long term career
- story telling provides a valuable space for emotional regeneration
- individuals self-select their suitability for the job
- agents internalise control and self-monitor their performance, partly because of personal values around human relations and customer service
- agents working with scripts struggle with identity issues and clashes of values
- there is reason for concern about the vulnerability of call centre employment

Considering 'the call centre effect' on agents as a resource:

- job disposition fluctuates quite frequently, and employers need to recognise this and find creative ways to support agents when they reach overload
- reinforced control results in employees finding ways of coping which may actually have adverse effects on customer service
- organisations need to take more ownership of their role in the creation of stress
- call centres represent huge savings for organisations, yet the relentless focus on cost containment sees the burden of responsibility pushed right down the organisation - most affecting those who directly engage with the customer
- the comparison between traditional terms and conditions and those of call agents is a reflection of how the organisation values their human resource. Meaningless employee attitude surveys are not. 'You get what you reward'.
- there is a need to reconceptualise the tacit skills and knowledge of call agents
- the focus on management by numbers may blind managers to learning opportunities.
- a major source of stress is caused by conflicts and contradictions of the system (profoundly, the quality versus cost and time axes).
- service employees are generally quite forgiving and flexible, but their perception of fair play and integrity have a dramatic effect on motivation
- the organisation may inadvertently give them more reason to identify with customer than organisational goals.
- agents need help with psychic strategies to cope with their job
- agents struggle with artificiality and identity issues relating to the use of scripts
- management may learn a lot from the stories agents tell

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To a problematic about Telework:
Social Representations

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Abstract

In this paper, we intend to go further in the explanation about the sociological implications of telework. In fact, although all the implications originated by telework in what respect to daily life, it asks for a re evaluation of traditional concepts of sociology, like alienation, collective action, participation, trust and solidarity that are the support of the people's perception about the meaning of work and about the ideal characteristics of it.
The paper is based on the analyses of the most important documents about telework problematic and on a survey to 52 people whose present jobs have the possibility of being teleworkable in near future.

• Introduction

Telework is a recent phenomenon in Portugal, not only as a subject of study but also as a current practice. When we are speaking about telework we often think of it as one of the "new ways of organising work" neither very well known nor very well understood. In fact, recent studies made in other countries emphasise the technical aspects of telework directly related to the emergence of new practices of human resources management. In spite of referring the psychological and social implications of telework, conclusions are mainly descriptive and quantitative. That is why our research intends to be more analytical and to explain more deeply the telework implications at sociological level even thought the phenomenon be hard to define.

The paper is divided in two essential points: telework discourses its social representations. Before presenting the results of the research made with 52 persons, where changes operated by telework on people's perceptions are discussed, we will explain synthetically the discourses organisation about telework.

The first point deals with the telework problematic. In this point, attention is focused in the main differences between the optimistic and pessimist vision towards the post modernity. In what respects the optimistic point of view we are going to present the main aspects that allow consider telework not only as a possibility but also as a reality. In what concerns to the pessimistic point of view attention is focused in the way authors perceive it as a myth and as an ideology.

The second point presents and explains the results from an exploratory research about the changes potentially originated by telework on social representations. In fact, the

success of a telework experiment depends, largely, on individual's perceptions about their actual and ideal workspace, understood not only in a physical level, but also in a mental and relational one, specially if we are talking about work *at* or *from* home.

Is very important to analyse this from the points of view of the potential candidates to this kind of work. Based on a survey to 52 people, whose jobs are potentially *telework-able*, we analysed three dimensions of the concept: power relations, sociability and perception of time and space. These are the most affected aspects since we are comparing three wide paradigms about life and work: pre industrial, industrial and post industrial or actual.

- **Methodological Note**

The first part of this paper is supported by the analysis of the most important official documents produced by E.U. about telework and on the few articles written by different authors both about this issue and post modernity. In order to have a more real vision about the way telework is understood, we interviewed by electronic mail 10 teleworkers selected from a discussion list about telework (eto.forum). Some parts of the interviews are reproduced along the paper. In what respects the penetration of telework in Portugal and Europe, we use essentially the official statistics and reproduced also some tables presented by Korte (1996). It is important to say that the statistics serve only as indicators of tendency; they are not totally reliable due to the following elements: on one hand the non existence of data about each country, on the other hand the lack of an uniform definition.

The second part, dealing with the perceptions and mental images, is based on a survey to 52 people whose functions have the possibility of being *teleworkable,* implying*:*

- High levels of autonomy
- High levels of concentration
- Minimal contacts with hierarchical superiors
- Minimum feedback
- Time flexibility
- Informational work

(Tab.1) - People interviewed by sector of activity

Sector	Nº Interviewed
Services	19 *
1 Bank	8
1 Assurance	5
1 Cars	6
Industry	33
1 Enterprise electronic components	14
1 enterprise lacticionio	12
1 Textile PME	8
N	52

- With 14 refusals.

(Tab.2) – People interviewed by type of job

Type of job	Nª	%
Secretarial	4	7,5
Marketing	5	11,3
Sales	16	30,1
Human Resources	17	32
Finance	10	18,8

N = 52

The statistical data analysis was mainly descriptive due to the fact of being an exploratory study whose main objective is not to argue general lows but to reach behaviour tendencies. Although, there are some regularity on the way people perceive their actual job and workplace, it is not legitimate to extrapolate it to the generality of workers, that is any "conclusion" presented in this study must be interpreted cautiously.

1. Telework Discourses

1.1. Telework as a post modern phenomenon

Telework is accepted as a mark of the so called post modern times (Lyon, 1992) specially because all of its strong relation with the technological development. By this line of thought, telework can be seen in a double movement: as a search of new possibilities and as a way of decadence (Balandier, 1988). This division corresponds effectively to the common vision of any controversial phenomenon, which effects are mostly non-

predictable: pessimist and optimism. Although this categories seems too *dejá vu* to qualify the discourses, they are very useful in order to understand how the discourse production about telework has a strong relation to a net of strategic and specific interests defined by different social actors as the academics, the practitioners and the management *gurus*.

At discursive level, telework is, therefore, a production of the post modernity. Meaning so, it must be seen under that perspective essentially in what concerns two basic points: the society-technology relation (pessimism / optimism) and the supposed emergence of new ways of organising work. We will speak about each one separately even if they are intimately related.

1.1.1. Society - Technology Relation

1.1.1.1.Telework is a potentiality and a reality

This sentence resumes the optimistic point of view of telework, which tends to emphasise the power of technology as *the* saver. This vision, almost "pink" about the future of our societies, is supported by concepts of "global village" (McLuhan, 1967), prosperity society (Lyon, 1992) and society of knowledge (Bell, 1986) in general, and for the metaphors of "chaos" and "net", in special[1].

According to these perspectives, telework offers great possibilities in what concerns to public and private life. In fact, supposing a flexible and non-institutionalised time and place to work, telework would allow conciliation between motherhood and career, live in non-polluted and silent areas and take care of old people. Furthermore, telework would constitute an excellent way of integrating in the work market minority groups such as people with disabilities (Girard,1995), women (that have no possibility of working out of home) or people in prison.

So, telework (in special that happens at home) would represent a kind of re-meeting with a (new ?) life style which values are concentrated around the family, home, leisure time, ecology, health, independence, wealth and community. At the end, this importance attributed to the *authenticity,* whose values are the small, the little, the few, the intense and worth, seem to suggest a regretting for the sins committed during the period after the industrial revolution. It was, indeed, the time of the *organisational man* that gave all to the work and money and "forgot", precisely, the home, children and well-being. The telecottage is actually a picture of the new and ideal life style:

> - *Working at home is very satisfying for me (...)*
> *allows the opportunity of practising sport (...)*
> *and the possibility of organising my work day*
> (telework discussion list subscriber 14.07.07)

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[1] Even if we characterise David Lyon and Daniel Bell as "optimistic" , it is not radical because both consider and alert to the negative aspects of the post modernity. There is no doubt that Peter Drucker, Jack Nilles and Alvin Toffler (not speaking on his last book that is more pessimistic) are, definitively, much more optimistic.

> *- In what respects to personnal live, telework*
> *allows me to have more free time to hollidays,*
> *take my daugther to school in the morning*
> *(...) and work whenever I want. (*telework dis-
> cussion list subscriber *9.07.97.)*

At the management level, telework is believed to improve workers motivation and increase efficiency. There are many cases of enterprises where these are the main advantages of telework. Some enterprises where telework was a success are the following: Intel, Hewlett Packard, Ceapress, Nokia Data, American Express, Finish Telecom, American Telecom and Midland Data, Lotus, IBM. However, t is not always clear the difference between mobile work and telework.

1.1.1.2. Telework is a myth and an ideology

Pessimistic vision of telework consider that it is, above all, a sign of decadence since it provokes social isolation. At the macro level, telework is an instrument of destabilisation of the collective action and a possible way of alienation and manipulation. The pessimism towards telework is related to the thesis of the ludites, to whom technology is *the bad* thing of the modernity.

In fact, there are authors to whom telework is a myth and "in the problematic about the information society, is the clear image of the gap between the futurologists thesis and the social reality" (Serra, 1995:125). They believe telework is neither an idea nor an effective technique used by organisations and individuals. This position, shared by David Lyon (1992:93) denies the visions of the seventies which had defended that 2/3 of the work force in industrial societies would be teleworking in the end of the century (Serra, 1995:124).

To these authors, the relation between telework, improvement in family relations, and reduction in traffic is not valid. Empirical data shows that. Indeed, they consider that telework will not have the *beautiful* future that people tend to emphasise because people like to join each other and the workplace is not only a place where people get an income but also where they get social relationship that apparently is the image of the Human Specie (Kransberg, 1993:50).

> *-About teleworking (...) it is hard for a tele-*
> *worker to be in touch with other personnel,*
> *so he or she has less possibilities to change*
> *ideas, opinions and feelings.* (telework dis-
> cussion list subscriber 14.04.97)

As it is said by Ettighoffer, telework might be a solution for the next century that searches for market in the XX century... it is simply mistaken...

To this perspective, under the flexibility paradigm, telework can be perceived as a way of domination. In fact if the chaos and the flexibility are the main metaphors to classify

58

the actual management we, social scientists, can visualise there a kind of hidden domination. The idea is that with telework employers can rise the standards of productivity and a situation can be reached where there is no a specific space to live and no defined time to work. The non-differentiation of space and time brings about a kind of slavery of the private time and space, which is, definitively, a process of loosing power and identity fragmentation.

Telework mayt, ironically, become an institutionalised way to legitimate the temporary and precarious work contracts which can produce unemployment and exploitation specially of those without appropriate skills/qualifications.

- Teleworkers basic problem is where and when
to get the next job (22.04.97)

As stated in the report of the Granfield University (1996) about the adoption of innovative strategies, it can be used only for opportunistic and immediate purposes like organisational flexibility. This report states that telework can be only a strategic instrument used by enterprises in order to improve their competitiveness and reduce the costs (Ettighoffer, 1992) instead of being used to improve the quality of working life.

Besides this exploitation, in the economic sense, there is the risk of exploitation in the psychological sense. Telework is said to damage psychological equilibrium because of the isolation and potential stress originated by the non differentiation of time and space. In practice, can not it be interpreted as the price to pay for its benefits on efficiency and competitiveness?

There is another aspect that is worth to discuss: the off shore telework. There is empirical information which proves that some enterprises, in order to pay low wages, contract people in other countries (mostly developing ones) to do routine jobs. This fact can became worse because of the lack of specific legislation. In practice it is very hard to intervene and control these fragile work relations because many of these situations happen outlaw in a kind of hidden work market. Futhermore, telework supposes high investments and neither all organisations nor people are prepared for these expenses.

These perspectives emphasise above all that there is a gap between the discourse and the practice. About this matter it is important to note the lack of a consensual definition of telework. In fact, statistics are not very reliable because there is not neither a specific definition about telework nor of all forms it can acquire. Indeed, even in the European Community Reports, there is not an uniform concept. Some questions are pertinent in order to clarify the concept: how can we distinguish a teleworker from a home worker? When can we consider the part time work as telework? In fact, is urgent to debate this. Otherwise, we can not have a real picture about what is happening on the field. In this line of thought, it would be as false to say telework is spreading at low speed as to say telework has a wide penetration.

1.1.1.3. The sensate attitude: between the optimism and pessimism

To understand the real implications of a phenomenon is always useful to radicalise the point of view about it. That was done announcing the most important negative and positive points of telework, but this is not enough: it's essential that we find a middle

position. It is a fact that telework supposes the use of technological communication means (whose specificity and typology are yet not defined and precise). These are mainly instruments, objects that are not *bad* or *good*: its consequences, positive or negative, depend largely on the way they are used and manipulated by individuals or organisations. Telework is also a technique to be used by management, government and individuals, the unique responsible for their application and, therefore, by its implications. In this sense, the more sensate attitude is to opt for an integrated vision that, simultaneously, emphasise all the possibilities telework can give and alert for possible dangers of its implementation.

1.1.2. Telework: Is it a new way of organising work ?

In this point we will focus our attention specially in the potential relation between working at home in the traditional sense (doing a payable work at home) and telework (telework at home that is electronic work *at* and *from* home).

The fact is that the main consequence of the industrial revolution[2] in individual's life was the separation of space and time: a space and a time to live with the family and rest and a space and a time to work out of home (Duby, 1991). This new temporality (where the watch is fundamental) and spatiality, simultaneously, reduced the economic function of family. The importance of large families decreased and so work at home[3] (independent) acquired a residual character. Indeed, it was created a new normality affecting, mostly, the representational level: work is understood as having a job, out of home mostly dependent.

Even if it was not a linear process it is clear that industrial revolution operated a differentiation of time and space and, simultaneously, gave people a new space of socialisation and implemented a new work relations system (dependent work). The so called "modernity" brought the idea that the work happens in a certain space where people go to in order to exchange their workforce for a salary. With the own private space protected from work and conflicts, the "normal" is now working in someone else private space where practices related to the private life as bars and coffees, were reproduced.

1.1.2.1. Is Telework a "back home" process ?

In what respects the situation of telework at home, subject of this paper, it is now legitimate to ask if it is not a back home process that can be seen as a kind of regression by employees (Ettigoffer, 1996).

Indeed, after a long period of time, all the referred changes operated by the "factory" are fundamental to understand how the mental images about work and employ suffers

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[2] It is not a casual relation pure and simply. The fact that matters here is not *the* industrial revolution as it was an isolated happening, but all elements of the racionalistic paradigm (whose values are the linear, positive, rational) which invaded all domains of life in general and perception, in particular).
[3] It's essential that we distinguish between work at home in the sense of earning money to survive (even if it prevails the informal economy) and the domestic work that is not an object of study here.

significant alterations with telework. Actually, it seems to be equivalent to the pre industrial forms of work at home since it suppose also the utilisation of home to work and the independence in the work contract. In this sense telework (at home) would not be a recent phenomenon and to explain its effects we could use the same problematic about work at home.

That comparison is not possible, the history does not repeat itself again. In fact, telework is no longer a pure situation of "working at home" due to three essential reasons. First, telework does not imply more than one member of the family. In second, telework is mostly independent (in spite of the potential fragmentation of the work force that we had referred before) and, finally telework suppose the use of technological and sophisticated information and communication means.

It is, therefore, essential to make and be aware of a distinction between telework at home, domestic work, home work (payable activity executed independently, even if there are situations of subcontracting) and the work done at home directly related to the functions executed at other organisation. In spite of these efforts to clarify the concept, ambiguity persists since essentially this last variation of work at home can be a mix of telework and homework. This happens because a lot of professionals, when executing the referred work often need telecommunications to contact electronically with mates, clients or other personnel (e.g. of teachers, assurance vendors among others).

As said in the beginning of this paper, our objective was to concentrate the research on telework at home (electronic home work). So, after presenting the basic questions about telework implications and origins, and because we consider that its implementation requires a completely new way of understanding, representing and living the work and the "job", we are going to show some important results from a research made in Portugal.

2. Telework in Portugal

As the table below shows, in the European Union United the Kingdom and France are the countries with the highest value of teleworkers. In our perspective Portugal seems, over estimated. In spite of this, we have not yet rigorous statistics about that. Qualitatively speaking, the argument is that if pure forms of telework are not verified in large scale there are evidences (for example by the number of acquired computers and internet packages) that the mixed forms are spreading.

(Tab.3) - Estimated number of teleworkers in Europe

	Population > 15 anos	Employees	Teleworkers	Teleworkers % > 15
Germay	67.733.000	36.528.000	149.013	0,22
France	45.775.000	22.021.000	215.143	0,47
United Kingdom	46.544.000	25.630.000	563.182	1,21
Italy	48.361.000	21.015.000	96.722	0,20
Spain	31.741.000	12.458.000	101.571	0,32
Irlande	2.611.000	824.000	31.593	1,21
Dinemark*	4.287.000	2.637.000	9.431	0,22
Holand*	12.365.000	6.561.000	27.203	0,22
Bélgique*	8.202.000	3.770.000	18.044	0,22
Luxemburg	378.4000	165.000	832	0,22
Portugal*	**7.846.000**	**4.509.000**	**25.107**	**0,32**
Grece*	8.415.000	3.680.000	16.830	0,20
TOTAL	284.258.400	139.798.000	1.254.672	0,44

*Estimated values */ Source: TELDET 1994, EUROSTAT 1994, StBA1994, Korte 1996:28*

2.1. Social Representations – Mental Images

At the situational level, telework affects two structural axes of our life: time and space. At the mental level it affects the way people perceive power (employer-employed relation) and the way they perceive sociability. So, in practice, we need to evaluate the impact of telework in these two aspects. In fact, if we have a picture of the actual life style of people whose work can be "teleworkable" we can reach some conclusions about their acceptability of telework in future, what is very important from the point of view of an efficient human resources management. Our research attention focused, therefore, on the analyses of the following dimensions:

- Power relations – relation between organisation and actor
  - Trust / opportunism
  - Control / autonomy
  - Flexibility / honour
  - Integration / "marginalisation"

- Sociability – relations between actors
  - Isolation / conviviality

- Space occupation
  - Differentiation / non differentiation

- Time spending
  - Definition / non definition

2.3. Main Conclusions of the Study

2.3.1. The Aim: *A Place to Work and a Place to Live*

Although an important part of the interviewed admit they take work to do at home, they do not express willness in doing it constantly. To them, home is a space linked to family, friends, leisure and rest. It does not have an "economical" function. As we can see in the table below (tab.4), 56% of them consider that working at home would mean "steal" time to spend with the family and sport because they would tend to work harder. In spite of this resistance, 85% say they have a special place at home to work, destined to do some hanging work. The space is viewed according to its functions and the idea of occupying the same space to eat, sleep and work is not understood positively.[4]

(Tab.4) - Perception about the occupation of the home

Sentences	A	%	D	%
Home should be reserved to rest and socialise with the family and not to work	**52**	1	0	0
Working at home is a mistake, in the end we work harder	**30**	0,56	22	0,42
Working at home is good because it allows dedicate more time to the family	23	0,44	**29**	0,56
Home is as good to work as to rest	26	0,48	**27**	0,52

n= 52 A= Agree / D= Disagree

This last fact is truly important. Speaking more informally with these interviewed it was clear that they (essentially, those working in marketing, advertising or with co-ordination responsibilities) spend a lot of time working at home accomplishing functions directly related to their jobs. Based on this apparent contradiction one important ideas come across: even if they deny the fact, in a certain sense, they are home workers, what can reveal they do not feel satisfied with that.

In fact, even if it is not a conscious process, there are more and more people taking work to do at home, what is not telework situation (even within this group we find those that a mix of teleworkers since they use electronic means and communicate at distance), but reveals the possibility of "time slavery" (Duby, 1991) since the time ideally reserved to sport, family and rest is occupied by extra work. So, the point is not whether telework causes stress, time and space slavery but whether those who nowadays have a job works harder.

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[4] In spite of this, it is frequent to find people (e.g. teachers) that actually sleep and work in the same space (some of them use the same table to eat and work with or without computer). It is similar to the Japanese even thought that cultural attitudes towards home occupation are different (Ettigofer, 1992).

The question argued by the pessimist point of view defending that telework would mean alienation[5] and non-differentiation of time and space is longer exclusive and linear. Actually, even if telework is not present, those "negative" effects are manifested. In fact a large part of the interviewed argue that they work "too much". What is relevant is that apparently they work harder taking work to do at home (e.g. marketers...) because they want. But the fact is that working harder is away of expressing commitment, so wanted by employers and by actual management theories (chaos) and practices (e.g. self - evaluation), what allows this implicit manipulation and domination. In fact, the autonomy and the appealing to the "do it yourself" or "be your own enterprise" creates anxiety and individuals tend to feel they need to show more work done. So, these practices of loyalty must be subject of true questioning. Telework is only an aspect of it.

2.3.2. The Fiction: *Going to Work and Socialise*

Going to work is a way of getting in touch with other people and having a feeling of professional integration. All of them say that the principal advantage of having a work out of the home is precisely the possibility of having "social contacts". The fear of isolation is high, that is why around 90 % of them say there is one more advantage: the "actualisation" and 38% refer also the "feeling of being alive " as one of the good aspects of (tele)working out of home. So telework, although all the advantages, would be understood as a regression. In fact, if it is viewed as a way to conciliate roles apparently incompatible, in practice it is difficult. So, added to this confusion and non differentiation of spaces and functions there is a non differentiation of roles.

Data obtained in field allow us to add a relevant aspect about this relation between "going to work" and "socialise". In fact, because of the work characteristics (e.g. secretaries), there is not a real possibility to communicate verbally but the illusion of that persists and people live it as it was real. Related to this is important to refer the idea argue by telework defenders that with telework the space of the is no longer a place of work but a place to where workers go in order to socialise and receive information. So, an important conclusion arise: telework do not destroy the possibility to socialise, it only replaces the time and the space where it happens, what is not yet perceived by persons.

(Tab.5) - Perceived advantages of (tele)working at home

Advantages	Nº	%
"Actualisation"	47	0,9
Social contacts/meeting people	52	1
"Feeling of being alive"	20	0,38

n= 52

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[5] *Alienation* is understood here not in the exclusive marxist sense. It is referred as a result of time-space non-differentiation and automatically lack of limits about the amount and the quality of work to be done.

These results indicate also another important idea: technological means are viewed in their instrumental function. They are not seen as having a social function: speak and get in touch by computer is yet interpreted as mechanic and impersonal, without *soul*. For this this perspective*,* technological means serve the informational process, not the communicational one. In this matter we can see that people would prefer a mix situation as it already happens in practice.

2.3.3.   The fear: *Work at Home and the Risk of being outsider*

The table below (tab.6) shows two type of relations: relation between telework and promotion possibilities and relation between telework and prejudice about the its less value.

In what concerns the first relation, data shows that 85% of the inquired people think telework at home reduce the promotion possibilities as also the possibilities of voice (Hirchman, 1972). In fact they fear the opportunism from the side of the organisation (hierarchical superiors). They refer that with telework they could stay without important information about the career, what origins a fear of being outsider in what respects human resources management. In fact, to loose a specific place (office) is understood as loosing power and status. This feeling might help to justify the fact of 85% having considered that working at home can be a way of exploitation. This fear of being outsider is related not only with promotion possibilities but also with employment policies. The middle rank managers are, indeed, those that have been suffering the most the consequences of the economic crisis and the fear of losing the job becomes a nightmare.

(Tab.6) - Teleworking at home and promotion possibilities

Sentences	C	%	D	%
Work at home reduce the promotion possibilities	**44**	**0,85**	8	0,15
Working at home for one organisation has not value	23	0,44	**29**	**0,56**
Work at home is a way of exploitation	13	0,25	**39**	**0,75**

N=52 A= Agree   D= Disagree

It is, nevertheless, important to note that this fear is more often a result from fiction than reality. In fact, the idea that the more closely to organisation they are, the more integration is reached, is essentially an illusion. If top managers do not want integration, it can be denied to the rest of personnel being them geographically near or distant.

As the table shows, teleworking at home, as working at home, has a negative connotation because it is usually perceived by the other as non-working and easy, what can originate conflicts between family members and stress. This kind of judgement is often connected with cultural perceptions and prejudices hardly eliminated.

2.3.4.The Risk: *Between the Trust and the Opportunism*

As it happened with S. Tomas, for the majority of the inquired, it is essential that the employee sees and contacts personally with his or her hierarchical superior. In fact, besides the risk of "marginalisation" and "non-actualisation", there is the risk of the error. To 67% of the inquired, it is fundamental that someone controls and visualises their work. Those sharing the same opinion have control functions. To them, is also very important to see the work done by people they co-ordinate. So they tend to give importance to the existence of a defined time and space. In fact, the "learning organisation" is not, yet, a real practice and the error is often corrected in paternalistic ways.

Besides the question of the visuality, there is always a risk of opportunism since the employee is working at home. It has two possible reasons: on one hand there is the possibility of not doing the work; on the other hand there is the possibility of selling or spreading information to other companies. In order to reduce this risk, management has the possibility of implementing management by objectives and flexibilize the work contract. But, actually, the empirical data, informally obtained, indicates also that managers are not interested in the telework implementation because they are afraid of a possible emptiness of their functions since telework supposes, at least theoretically, that the worker is autonomous, independent and can deal with the top managers because he also knows the work legislation.

All this question about power and authority management must be seen according to the type of culture we are dealing with. The research developed by other authors demonstrate that each culture has her own way of power management, very connected with the concept of honour (Iribarne, 1989). Portugal, as the majority of the southern countries, historically structured by orders, is characterised by a big power distance (Hofstede, 1976). The signs and symbols of power are essential to mark a function and a hierarchical position. So, it is not so surprising that as managers as the subordinates argue that the visual and personal contact is fundamental to achieve the expected results and correct the errors. This question of power distance is crucial to understand why, in Portugal, it has been so difficult to implement participative processes in the organisation and flexibilise the authority relations.

2.3.5. The possibility: Being full time teleworkers

One aspect that helps us understand all these questions about the sociability and power relations is the opinion expressed about the possibility of being full time teleworkers (at home). Although, objectively, the functions executed by the interviewed show characteristics appropriate to be *teleworkable,* inquired people emphasise their function do not fit telework description as it is showed in the table below.

(Tab.7) – Perception about the functions *teleworkability*

Sentences	TA	AP	DP	TD
Imply high autonomy level	0,25	**0,61**	0,13	0
Imply the intensive use of information technologies	0,34	**0,57**	0,07	0
Imply minimum contacts with mates	**0,42**	0,09	0,17	0,3
Require high concentration level	**0,5**	0,44	0,06	0
Do not depend on the feedback	0,15	0,5	**0,27**	0,07
Do not imply the result of others functions	0	0,07	**0,58**	0,35
Do not require direct contact with row materials	0,4	0,07	0,19	0,37
Allow a flexible organisation of time	0,15	**0,44**	0,09	0,3
Do not suppose direct contact with hierarchical superiors	0,07	0,09	0,25	**0,58**

TA = Total Agree / AP = Agree in Part / DP = Disagree in Part / TD = Total Disagree
N= 52

This contradiction reinforces the resistance towards the possibility of working at home permanently with the technological aid. The main reason still be the fear of isolation from the organisation and from the mates even if behind it there are important cultural factors.

- **General Conclusion**

In spite of being insufficient to prove ideas and give general lows, conclusions are elucidative. In what respects to potential candidates (people whose jobs are potentially teleworkable), we verify that, generally, they do not know what telework is, nor what it represents. Moreover, faced with the possibility of being teleworkers (in sense of doing the same job at home), they express resistance.

The main reasons (found) to this resistance are related to the permanence of the rationalist paradigm that still structures our life. The time and space are crucial elements to define symbolically a function. Telework supposes a destruction of the mental structured images about the ideal job and supposes also alterations on the daily habits about work, what became a difficult process.

It is relevant to note that this research is based on a survey to 52 individuals that have been working all their life out of home, in a specific organisation. So, the question of the identity that must not be forgotten when we affirm such tendencies. In fact, we believe that if we had inquired young people, searching employment we could have obtained answers completely different because ideas about employment instability as t practices of new ways of organising work are recent. What we could prove is that even if it is said that is possible to ''change'' habits, in fact it is very hard not only in what concerns to individuals but also it what refers to organisations. Actually, we have now strong reasons to believe that only "young" organisations (dealing with information) co-ordinated by "young" professionals have the necessary characteristics to restore a new order because they are the ones that whose identity is being built on the basis of the so called post modern times.

As said in the beginning, there is not reliable information about Portugal. The fact is that telework, as a real management strategy, is yet experimental and is related spe-

cially with information enterprises (ex: Portugal Telecom). In spite of that, the so called "new ways of organising work" are spreading at high speed. Multinational enterprises are effectively an important agent on this process. In spite of the cultural aspects involved in the telework implementation, some of them questioned in this article, we believe that, in near future, telework (as a mixture of electronic homework, mobile work and homework) will be a common way of working. So, we think that analysing all variations of "the new ways of organising work" are definitively more useful than concentrate the analysis on telework pure and simply.

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Telework, organization and management

Results from a research program in Norway

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Abstract

Norwegian Research Council started a project about telework in 1994. A working group within this project has been dealing with the challenges of organization and management of telework, based on experiences from over 10 pilot companies. Some main results from these field trials are presented in this paper.

Management of teleworkers is in earlier research generally assumed to be very different from traditional management. Our study shows that remote management does not necessarily need to be very different from traditional management when it comes to remote management of skilled part time teleworkers. Full-time telework however requires special considerations from the telemanager. A major motivation for telework in our sample is to utilize telework as part of a company's personell policy. Telework is a tool to attract or keep employees to the company, or give employees a better balance between work and private life. Questions of control and access to teleworkers are relatively non-problematic for managers. Other aspects of leadership, like motivation and communication over geographical distance, maintaining corporate culture and cooperation, are more challenging. Telework also forces the leader to specify the goals even more, and formulate common visions and norms. Telework is well suited to management methods like management by objectives or -results.

Telework often means more usage of electronic communication media, which requires more planning of what is communicated, and how. Another important consideration among Norwegian telemanagers is not to discriminate between teleworkers and colleagues at the office. Telework also implies changes for democracy at the workplace, for example practical problems of gathering employees or questions regading participation in introduction of telework. To maintain cooperation in the company, there is a need for *meetings* to solve complicated tasks, give possibilities for learning, exchange ideas and experiences, and have social communication.

1. Introduction

1.1 Description of research project

Norwegian Research Council started a project about telework in 1994. In this project there has been field trials in more than 10 Norwegian organizations. A teleworking handbook is a main result from the program, together with dissemination of results from working groups on selected themes. These working groups have been established to discuss and formulate policies on selected issues. A working groups on "telework and labour legislation" has discussed the large body of laws, regulations and practices and the challenges from telework. A second group has been dealing with the topic: "telework, technology and security".

This paper presents the main results from another working group, which has been looking at the challenges of organization and management of telework. This group has been working through 1997, and consists of researchers, project leaders from some of the pilot companies, and participants from the employer's and employee's organizations. A report from this group was published in June 1998, in Norwegian language. I have been the leader and secretary of this group. This paper is an abbreviated English version of this report, but supplemented by a chapter on comparisons between our results and earlier research on management of teleworkers (chapter 7).

1.2 Purpose and mandate of the working-group

The purpose of the working group in Norway on "organization and management of telework" was to give advice in introduction and practicing of flexible ways of working, based on experiences in telework-trials in Norwegian companies. The report should contribute to development of good management practices in telework, adjusted to Norwegian conditions.

The working group had the following mandate:
a. Desribe reasons to implement telework as an organizational form, and the role of management in this process.

b. Evaluate questions concerning organization and management in organizations practicing telework. Central topics are:
- cooperations, coordination and management (leadership) of telework
- organization and distribution of work tasks for telework, and control and evaluations of telework
- participation of teleworkers and workplace-democracy for teleworkers, related to work and related to the firm.

c. Consider which organizational conditions are relevant to form the best possible situations from telework. Central topics are: informing, personnel development, recruitment, competence development and learning, mechanisms for control, loyality, accessability, and corporate culture.

1.3 Perspective, limitations and terms in paper

This paper will focus on refering the results from the working group on operational aspects on remote management, not on the introduction of telework. At the end of the paper a comparison with earlier research will be done. This part of the paper is descriptive and analytical, while the rest of the paper is ***normative,*** aiming for advice to telemanagers and managers of distributed organizations.

This paper describes home-based and mobile telework, often in combinations with work in a co-located working-place. In this report the term telework is mostly applied, but the closely related terms remote work and flexible work are also used. Remote manager and telemanager are both included occasionally, as terms to describe the people managing the teleworkers. Leader and manager are also used. Instead of teleworker the words subordinate or employee are sometimes applied.

The most common definition of telework focuses on the geographical distance between employer and the one performing the job, i.e the teleworker. Within this wide definition, the working group has been concentrating on remote work:
- based on usage of information- and communication technology
- is formalized
- happens mainly in normal working hours
- being practiced regularly and constitutes a certain amount of normal working-time.

Even if the focus is on home-based telework, large parts of the results will also be relevant for other forms of telework and for geographically distributed organizations more generally. The latter are organizations where leaders and their subordinates are working outside their offices in meeting rooms, at colleagues, in other building, at customer premises or on travelling.

1.4 Contents of paper

This paper starts with a short evaluation of changes in requirements for management and leadership in general. The focus is directed towards the change in managerial methods based on directing and control, to management through coaching, support and motivation. The following chapter covers challenges in management over geographical distance. Then the effects of telework on different management functions are discussed. Manager's responsibility for organization of work and communication are emphasized. In the end of the paper, differences between earlier research and our results are discussed.

2. General changes in requirements for managers

Todays competitive situation is characterized by a more global and fast-changing market. The requirements of the market is characterized by more individualization and faster changes in customer preferences, and faster technological innovations. Boundaries between branches are blurring, and new competitors are arising. These changes in exter-

nal factors require faster and almost continuous changes. Key words for the company is adaptation and flexibility. Knowledge and information are todays factors of production rather than manual work and physical capital. There will be shortage of knowledge-workers, and therefore competititon to attract and keep them in a company.

A change in values is towards team-work, cooperation and communication. There are greater variations and heterogenity in values and products, and changes in preferences of customers. Customer satisfaction and employee satisfaction are central criterias for measuring the success of companies. Todays workers are more aware of their market value. They demand good salaries, interesting tasks, an attractive and professional culture and possibilities for personnel development. Many subordinates are also interested to see how companies treat them as "integrated total human beings" considering also their "private needs", for example through social offerings from the company and possibilities for work-flexibility. A challenge for managers is to balance the special requirements from subordinates such that individualization is not destroying the community of the company.

Recent studies about management, especially studies of Norwegian- and Nordic working life, adress and recommend a management style based on support, mutual trust and stimulation of subordinates' independence and self-development. The role of leaders in todays working life is to act as a *coach* and specify goals and visions of what to do, while subordinates are giving the freedom to determine where, when and how.

3. Challenges in management of teleworkers

Managers of teleworkers should try to maximise the advantages of telework. They must also consider the dis-advantages of telework, and consider the consequences for the individual teleworker. Previous reseach on telemanagement (see chapter 7) indicates that some of the largest challenges for remote managers areassumed to be: control of teleworkers, to get in touch with teleworkers (accessability or availability), informing teleworkers, and prevent the "out of sight - out of mind" phenomenon. In our Norwegian project these four problems existed only to a certain extent. A comparison between earlier research on remote management and our results are made in chapter 7, as said before.

Our pilot companies claim that their main challenges as managers of teleworkers are the more "soft" and human aspects of managerial work. These factors refer to activities like maintaining good social communication, motivating the teleworker and helping them to avoid feelings of isolation and dissatisfaction. A few companies stressed the importance of developing a new kind of "social competence" for the remote manager: *How do I know that my teleworking subordinates are well when I do not see them face-to-face regularly.* Some organizational aspects are mentioneds as being critical, such as effective IT-support, logistics for the teleworker and routines for handling of telepehone-calls.

In several articles about remote management (e.g Hall, 1997), emphasis has been on the need for more specific goals in managing teleworkers: There is a need for more specific goals and clear communication to avoid misunderstandings and to determine responsibility and authority. Among our pilot companies these aspects are regarded as less challenging than motivation and communication.

Other types of managerial challenges in our sample of Norwegian companies are:
- how to exchange experience and how to maintain personnel development of teleworkers
- how to communicate personal matters over distance and give feedback, also about negative and difficult matters
- how to keep a geographical distributed organization together, and maintain community, corporate culture and democracy in the working place

Our pilot companies also report about the challenges of leading a multitude of persons and work processes, where some are teleworkers and some are not. The challenges of management of teleworkers are not only connected to the relationship between leader and teleworkers, but also to succeed with the cooperation between subordinates at the office and the teleworkers. The objective for the leader must be to give equal attention, independently of working place.

Requirements for telemanagers will be affected by the amount of telework, both the relative number of subordinates that are teleworkers, and how much of his working time the subordinate works remotely. The number of teleworkers have impacts for organizational processes like cooperation, information dissemination and corporate culture. The amount of telework for the individual worker will affect personal conditions like communication and motivation. The telemanager has to solve both these challenges.

Management of employees that combine office work and telework does not necessarily mean special considerations or efforts. There is not a big difference between management of sales-people or consultants, compared to persons that are teleworkers only 1-2 days a week. Introduction of more extensive telework in a company, will demand more thorough planning and changes. The requirements to leadership and organization will usually become more demanding by having a larger number of teleworkers in the company.

The characteristics of teleworker's job is also of importance. An independent job with specific goals means that the difference between telemanagement and ordinary management is not so significant. But a teleworking-job that is dependent on close cooperation with colleagues and leader, needs more thorough planning and more critical evaluation before introducing telework.

Personal characteristics of the teleworker will also influence manager's job. An independent subordinate will have less need for close contact in telework than a more unexperienced person.

4. Planning and organization of telework

Before introducing telework, the company has to develop a telework policy. In this plan the company has to decide on its goals and motivations for telework. Several different motivations for telework in companies have been mentioned in the telework literature, like increasing productivity or reducing costs and office space. In this Norwegian sample the main motivation for telework is to utilize telework as part of company's personell policy. Telework is a tool to attract or keep employees to the company, or give employees a better balance between work and private life.

The manager has a main responsibility in developing and implementing a telework policy. Details of telework policy and - implementation is not a part of this paper, as this is well covered in earlier telework research (see e.g Gray et al, 1993). Planning in this paper therefore refers to planning of operational activities.

As said before, modern management practices are based on cooperation and trust towards subordinates, support and coaching, and directing and feedback based on goals and results. Management of telework is well adapted to methods like management by objectives where the emphasis is on achieved results, less on how results are produced. Telework means more radical changes for companies not applying such methods earlier. For companies initially applying management by objectives, their main difference by introducing telework will be that goals should be more specified than before.

4.1 Planning

Telework is often introduced to gain increased flexibility in organizations. Somewhat paradoxical telework requires increased formalization in some respects. When leader and subordinate have less contact, some activities have to be planned and be more thoroughly agreed on than earlier, because it is more difficult to have more spontaneous meetings for decision making, explanations and clarifications.

As part of the preparations for telework, it can be advantageous that leader and subordinate have a talk discussing various aspects of telework and its consequences. In this conversation they have to go through the conditions for the working arrangement, duties and rights, routines and evaluation-criterias. The firm must have a formal agreement with the teleworker before the start-up of the telework-arrangement, and managers must act according to the agreement in execution of managerial tasks.

Besides continuous dialogue, leader and the teleworking subordinate should evaluate the telework arrangement after 3 to 6 months. Further evaluations should be included as part of the ordinary yearly personell-development conversation between leader and subordi-

nate. As a follow-up of these talks, the leader should take the necessary initiatives and suggest modifications and improvements of the telework-arrangement.

Managerial considerations should also be given to possible negative impacts for remining workers at the office. It is crucial to plan the work in such a way that there is no or major difference in work-load between teleworkers and "office workers".

4.2 Organizational changes and coordination

The managerial function of organization includes a broad variety of tasks spanning from principles of how working tasks should be distributed, to specific routines for IT-support and logistics. Coordination includes tasks like information dissemination and tasks to ensure community in the company.

Telework enables strategic changes in: geographical operations of companies, policy for recruitment, customer contact, and changes in internal processes and routines. Changes in the organization can also be connected to minor modifications of routines for:
- customer inquiries
- information dissemination
- communication
- ownership of equipment
- logistics
- IT-support

4.2.1 Distribution of work, and community in the company

When an organization is geographically distributed, and teleworkers and colleagues only meet occasionally, it is a challenge to maintain corporate culture and commitment. A limitation to the extent of telework is a mean to keep the organization together. Other efforts are effective use of technologies and developing routines for information exchange. Various types of face-to- face meetings, social arrangements like cultural activities and sports also play important roles for development and maintainance of community in the company.

If the extent of telework is above a certain limit, it is most likely that some office workers will have roles as information-brokers and support-personell for teleworkers. Companies applying telework on a broader scale, can utilize more formally support persons as links between teleworkers and the rest of the organization. How this affects work for the remaining workers at the office, must be considered. Necessary correctives must be taken by the leader.

4.2.2 IT-equipment

Information technology (IT) can be an important tool for effective telework. Before introducing telework needs analysis must be done. It is important that the IT-equip-

ment for teleworkers is standardized and can be used together with other IT-equipment and IT-services in the firm. This will make user-support easier and reduce costs. To achieve the benefits of standardization of technical solutions, it can be beneficial that the company itself buys and owns the equipment and software used for telework.

Managers, suppliers and IT-support in the firm must be sure that teleworkers are able to use the equipment and software before start-up. Some companies in Norway consider some kind of authorization for teleworkers. When the equipment is being used, the teleworkers must have necessary IT-support in case of problems and questions.

Security is a huge and important topic in teleworking. It must be a goal that security in teleworking is at the same level as in the rest of the company. Some key words in this connection are passwords, fire walls and encryption, together with locked desks and -offices.

4.2.3 Routines for communication, logistics and information dissemination

Full time- or extensive telework necessitates routines for effective sending of mail, handling of telephone inquiries, ordering of office equipment etc. When applying less extensive telework this routines are usually solved through the regular contact with the office.

Teleworkers should have the same information as people at the office. Our experience from our field trials in Norway is that formal information-dissemination and - knowledge-transfer to teleworkers is rather easy. Various forms of internal magazines, electronic mail, Intranet and telephone can be utilized. A larger challenge in telework is the exchange of *informal* information with colleagues and management. Special attention must be given to inform the teleworker about spontaneous activities or another informal information (e.g meetings), so that he eventually can participate even on short notice.

4.2.4 Personell development and career development

Management has responsibility for personell development in the company. For telework it is important to focus on some aspects mentioned other places in this paper. These includes:
- limit the amount of telework, to support professional and social contact and learning
- conduct regular physical meetings (face to face meetings)
- implement good routines for information dissemination
- ensure effective distribution of working tasks
- offer educational courses where teleworkers are able to participate

All companies need to give their employees education and necessary skills and knowledge. Special needs for education caused by telework is:
- education in Information Technology, especially use of equipment and software at the home office
- education of managers in new forms of leadership (management by objectives, and coaching)
- education of teleworkers in new forms of work (how to work at home)
- education in laws and agreements conncected to telework

Specific requirements for education in these areas should be considered as part of tele-work-planning.

Teleworkers should have the same possibilities for career development as colleagues working at the office. The manager must therefore be careful that teleworkers are not forgotten in planning of new projects and working tasks, or when recruiting to new positions. Telework must not be a reason for not being considered for new positions, even if this can mean less telework. There is relatively little knowledge about the consequenses of telework on career development. An assumption of negative relationship was assumed, because of the invisibility of the teleworker. Recently some foreign studies have given the opposite conclusion, because teleworkers are regarded as more independent, more effective and with more skills in IT.

5. Leadership and communication

5.1 Introduction

When leader and subordinate do not meet daily, mutual trust is needed. In telework the manager must show that he trusts the subordinate to know best how tasks should be performed. At the same time the teleworker must know that he can reach the manager when needed.

Self-motivation is necessary to be a teleworker. The manager also shares the responsibility that the motivation for the teleworker is developing and is maintained. It is generally more difficult to influence subordinates that are located at other places, where interactions happen more rarely and communication media often are electronic and more impersonal. A condition for teleworkers to be motivated is that the leader has time and teleworkers feel welcome when he visits the office. This is a responsibility also for colleagues at the office. The manager must not forget to inform teleworkers of meetings, social gatherings, personell development (e.g courses) and new job opportunities.

If telework is applied by an employee on a broader scale, almost on full-time, the manager has a responsibility to ensure the visibility of the teleworker within the organization. The manager should give information to other colleagues about the teleworker's visits to the office and generally give information about the tasks and eventually some good achievements and results made by the teleworker. With such extensive telework, it might also be beneficial for the manager to visit the teleworker's home-office some times. This is however somewhat controversial, because some regard this as invasion of privacy. A home-visit that is well planned and agreed upon "some times before" can be an effective tool for motivating the teleworker. He is on home ground, and the manager can get a better understanding of the teleworker's total working situation. For the teleworker this can be a good occasion to discuss personal matters, and the need for improvements in working environments, for example ergonomically. At the same time the

leader can inspire and support the teleworker with advice for effective work-habits in the home office, which is of crucial importance in the first stage of the telework period.

5.2 Communication

In co-located work much of the communication will happen spontaneously. In telework the communication must to a larger extent be planned, formalized and be more specific and clear.

5.2.1 Requirements for formalization and clear communication

The manager who has his subordinates located at the same place, has several possibilities to correct and specify his comments and orders. And it is therefore relatively easy to correct eventual misunderstandings. The manager of teleworkers must be very clear in all his communication with his subordinates. It is especially important to formulate specific goals, specify work tasks, express relevant time frames and time schedules and how the leader thinks to follow up the work.

5.2.2 Electronic communication and media choice

Telework normally means increased usage of electronic communication media both for manager and teleworker. By means of new communication means like mobile telephones, electronic mail, Intranet and teleconferencing, the drawback of the geographical distance is reduced. A great part of information dissemination and the professional communication can be done in this way. Management of teleworkers therefore requires that leaders must be able to utilize technology.

The introduction to a flexible organization through telework implies that the quality and effectiveness in communication is essential. The manager of teleworkers must therefore re-consider and adapt his communication with his subordinates. When there is high demand for high-quality communication, personal communication (face-to-face) should be applied. Regular and routine type of communication can be handled via electronic media.

5.2.3 Communication frequency, and identifying weak signals

It is important that manager and teleworker have regular contact, both professionally and socially. Some telemanagers have good experiences in using telephones for motivations, feedback and evaluations. Occasionally the manager should call the teleworker without other motives than finding out whether "he is OK" or not, or to support teleworkers before or after important customer meetings. Managers should feel the responsibility to take the initiative in the communication with the teleworker. Which effort that should be done, must be adapted to the manager's accumulated knowledge of the teleworker. Efforts mentioned above will prevent and reduce the phenomenon described as "out of sight - out of mind".

To find out whether the teleworkers are satisfied, critical abilities for telemanager are to *listen,* to catch *weak signals* and have *empaty*. This is more challenging when manager

and subordinate do not see each other so often. The manager must be aware of *signals* in forms of inferior communication, absence from meetings and poorer results. In such cases the manager must, as soon as possible, talk to the teleworker face-to-face.

Some teleworkers might have problems to handle this new form of work. They might work too much to achieve good results and goals or satisfy customers. It is very important that the manager as early as possible tries to identify signs of "burned out" among his teleworkers.

5.2.4 Feedback to teleworkers

In the traditional organization there are many arenas and possibilities for both spontaneous and planned forms of feed-back. In telework there are fewer possibilities for accidental meetings, and feedback must be more planned.

The manager has at least three alternative ways of giving feedback:
- regular meetings with all his subordinates
- individual talks with subordinates, discussing status and future personell development
- communication via telephone, facsimile, letter or electronic mail

The manager should carefully choose the right communication channel, adapted to the various types of messages and topics.

5.2.5 The importance of meetings

Experiences from our pilot companies show that meetings face-to-face are modified a bit when there is a geographical distance between leader and subordinates. There is greater consciousness about which topics and activities that should be given priority. Meetings face-to-face are in telework to a large extent dominated by topics that require openness and discussion, while routine type of information is distributed electronically.

6. Workplace democracy and participation

Telework also relates to the frameworks within which work tasks are performed, like the contractual arrangement between the teleworker and the employer, or the teleworker's influence on his or her working environment and working conditions. Telework means several challenges for democracy at work. The most obvious one is the question of how telework impacts existing arrangements for democracy and participation at work.

By extensive telework there can be practical problems of gathering employees to meetings, discussions and decisions. The geographical distance might also be a barrier to acknowledge common problems at work, and be able to develop good solutions. Telework can also cause problems for effective functioning of arrangements for representations. There are however both technologies and organizational solutions that can solve these problems:
- good routines for communication
- electronic meeting places
- pre-determined official days at the office
- limits to the extent of telework

Another important question related to democracy is how telework is to be developed and introduced into the organization. Since telework has diffused slowly and experiences are limited, this means that agreements on telework to a great extent must be developed locally, but based on ordinary laws and regulations concernings e.g participation in organizational changes.

A local agreement on telework may include the following questions:
- who are going to be included in the agreement
- rights and duties for the parties
- relationship between teleworkers and non-teleworkers
- the amount of telework
- possibilities to close down telework arrangements
- coverage of costs in telework arrangements
- relationships between the company and the representatives from the employees

A related question concerns who should participate in development of telework. To develop arrangements for a broad number of employees it is important that various opinions are heard. Both existing and potential teleworkers should be included, as well as people with different attitudes towards telework.

7. Comparisons of our results in pilots with earlier research

7.1 Introduction

Management of remote workers is a research topic, which has most of its contributions after 1990. The subject has played a minor role in telework-research from the mid 80's, with emphasis on leadership problems and also that managers are afraid of loosing control of remote subordinates they are not able to observe (see, for example, Olsen, 1982).

Remote management has been relatively well covered in telework-literature during the last five years. The question of control is only one of several actual managerial problems or challenges. Up to today many normative articles have been written on effective telemanagement. A difference in research now and before is that studies from the 1990s consider the management of professional teleworkers. In the 1980s the emphasis was focused on management of unskilled remote workers, performing word processing and data-registration.

7.2 Comparative analysis of traditional management and remote management

Several studies on managerial attitudes towards telework have been performed and some studies on normative managerial requirements and responsibilities. But up to now there have only been a few comparative studies of traditional management and remote management.

Klayton (1995) argues that there are five changes that remote managers must do to become a remote manager:

- increasing their use of electronic communication means
- developing more formalized working plans
- providing more feedback
- creating working relations based more on trust

providing information on office meetings well in advance

Huws (1984) observes that remote managers need more time for management as they have more additional paperwork due to increased auditing and control. Huws et al (1990) say: "There is a need for extra effort to find the remote workers, to get hold of them, and telework requires more to establish a meeting. This was easier when the manager or secretary could scream in the corridor and announce a meeting in half an hour. Such a management style is common, but how effective is it?".

Huws et al. (1990) claim that remote management requires different techniques and different styles that are far from the conventional "over the shoulder method" that is in use in many offices. They believe that teleworkers will be measured by output. Teleworkers can work more independently, can be more self-managed, and this means that the workload on telemanagers might be reduced. The authors present experience from homework in the software company F1-group in UK. This company spends more resources on management than the average of other companies in this industry, measured by managerial "span of control". In the F1-group every leader manages half as many employees as other companies in the industry applying a traditional work organization. Ford and Mc Laughlin (1995) also present results about the span of control for telemanagers: half of the telemanagers says that this remains unchanged, while one-third says that span of control is reduced due to more complicated supervision.

Huws et al. (1990) also refer to a study in the US where half of the executives think that it is more difficult to manage teleworkers. The authors therefore conclude by saying that the introduction of telework seems to require more of managers than traditional forms of management.

In two studies Page & Brain (1992) and Mitchell (1993) have performed interviews with telemanagers. They ask the telemanagers how they have adapted their work methods due to telework. The authors' conclusion is that the majority of managers have an unchanged situation, while a minority of telemanagers claim they have a more difficult job. The reasons are as follows:

- lack of availability of teleworkers is a problem
- reduction of flexibility through increased demand for planning of communication between manager and teleworker.

Paul (1994) supports the view that remote management is more complicated than traditional management. His study shows that telework requires a more formal organization and that managers need to structure it. Often managers are not able to solve a problem when the teleworkers are away and they must wait until the teleworkers return. The telemanager must know where the teleworkers are and what they are doing. But telemanagement is easier over time when systems are in place, routines are developed and

both telemanagers and teleworkers have gained experience. Paul concludes that managers' jobs have become more complicated due to telework:

- problems arise with colleagues who are not teleworkers
- telework requires more planning of meetings and coverage of offices, i.e availability
- installation and maintanance of technology takes time
- problems with top-manager support
- there is a need for organizational rules in telework, connected to availability, organizing of work and selection of which days for teleworking

Lipnack and Stamps (1997) write about virtual teams, but their findings also have relevance for telework more generally. They have interesting ideas about the importance of geographical distance for leadership: "Management in virtual teams is more difficult (and more important) than in ordinary teams. Virtual teams need more management with more specific goals, more information, and more coaching than control". Even in situations with skilled employees they argue the following: "virtual teams that are highly self-motivated and self-managed are leaderful and not leaderless".

All the studies so far have reported that management of teleworkers is more difficult than traditional management. Some few studies indicate the opposite, like Gil Gordon's statement in his recommendations for telemanagers (Gordon, 1994): "In telework the manager avoids the employees "rushing at his door" continuously requiring the manager's immediate attention. In telework the face to face communication is reduced, especially the spontaneous ones. But there will be more use of telecommunications. In this way the telemanager can have more control of his working situation, and he has relatively more communication with his teleworkers at times chosen by the telemanager".

This statement shows that management of remote workers does not always need to be more complicated. The above mentioned studies also indicate that challenges for telemanagers are more than control and ensuring availability for the teleworkers. The need for managerial communication and planning are two of the challenges mentioned in these studies.

7.3 Comparisons of our results with earlier research

As a basis for these comparisons, the following studies have been analysed: Ford & Mc Laughlin,1995; Forsebäck,1997; Gordon,1994; Gray et al,1993; Hall,1997; Huws et al,1990; Klayton,1994 & 1995; Kostner,1996; Kugelmass,1995; Lipnack and Stamps, 1997; Mitchell,1993; Nilles,1994; Olsen,1982; Page & Brain,1992; and Paul,1994.

7.3.1 The difference between telemanagement and ordinary management

Management of teleworkers is in these studies generally assumed to be very different from traditional management. Our study shows that remote management does not necessarily needs to be very different from traditional management when it comes to remote management of skilled part time teleworkers. On this point there are some differences between our results and previous results. One reason for this might be that part-time

telework (combinations of telework and office work) is dominating in our sample, while earlier research mostly has been analysing management of full-time telework. Management of part-time teleworkers is much easier than management of people who work full-time telework, according to our sample. This is also in accordance with findings of Kugelmass (1995). For management of full-time teleworkers respondents in our Norwegian sample also agree that telemanagement is far more complicated and different from traditional management.

Most of the previous studies on telemanagement have been analysing full-time telework. Some common arguments in these are that full-time telework requires special considerations from the remote manager. The remote manager must:

- develop mutual trust with teleworkers, and have the ability to motivate over geographical distance
- have good communication skills
- formulate more specific goals and perform more thorough planning and coordination
- have good abilities in using communication technologies

These requirements are in accordance with our own findings in Norway. We can discuss whether the general statements in earlier research indicating big differences between telemanagement and ordinary management are reflected in the arguments above. These seem relevant also in traditional management.

In the US and UK telemanagement is claimed to be very different from and more difficult than traditional management. There are, however, indications that the "real" difference between traditional management and telemanagement in Scandinavia is smaller than indicated in earlier US research. Some reasons for this are that telework is often only part time, and that potential telework organizations are initially distributed and potential teleworkers often work partly out of their office even before introducing telework. The focus on M.b.O, use of electronic media and developing of trust, are not revolutionary terms within management theories. But these terms are presented as such in some of the literature on remote management. Remote management excludes some theories that have been popular earlier, like "management by walking around".

7.3.2 Motivations and challenges in telework

A difference between our results and previous research is the motivation for telework at company level. The majority of companies in our sample focuses on telework for improved human resource management, while many other studies (especially in the US and UK) argue for telework mostly because of potential cost reductions and productivity improvements.

Earlier reseach indicates that some of the largest challenges for remote managers are to control teleworkers, to get in touch with teleworkers (availability), to inform the teleworker, and to prevent the "out of sight - out of mind" phenomenon. Our results (as also reported in Bergum & Rapp, 1998) indicate that these four problems only existed to a certain extent among the Norwegian pilots:

Control is not a main problem. This result is due to the existing trust between manager and teleworkers. Management by objectives is applied as a method of control, and personal meetings and electronic reporting via electronic mail are also applied.

Availability of the remote worker and information dissemination are only minor problems thanks to new technical support:
- mobile telephones and mail for availability, and
- Intranet, Lotus Notes and electronic mail for dissemination of information

Some respondents mention that the responsibility of information and keeping updated should be more a question for each teleworker than a task for the manager. When the firm disseminates information electronically, it is available for everybody.

None of our respondents reports on "out of sight - out of mind" as a problem. This might be due to the fact that their teleworkers are rather independent. Another explanation is that the concept of telework for many respondents is a combination of remote work and office work, both part times.

7.3.3 Explanations of results

Our results show that the main challenges for managers in our sample have moved from control and teleworkers' availability, to motivation and social communication. One reason for this change might be changes in managers' priorities, from control to coaching. Several books and articles in management describes this change in perspective during the last decade (see also chapter 2).

From a media choice perspective (Daft & Lengel, 1986) we can argue that the main challenges of remote managers activities, social communication and motivations are often characterized by uncertainty and equivocality. Such activities are hard to perform by means of electronic communication media, and these tasks require rich communciation media e.g face-to face communication media (according to Daft & Lengel, 1986).

The characteristics of our respondents mentioned above limit the external validity of our results. The respondents are not representative for all types of companies. Our sample is biased towards companies, employers and employees who have general skills and knowledge of IT well above average level. This sample also consists of remote managers in companies which are mostly larger than the average in Sweden and Norway, even if some small consulting companies are included. These characteristics of the sample will probably mean that the availability of the teleworker and information dissemination is a minor problem. We can also assume that these modern IT-supported organizations have management methods more based on trust and M.b.O rather than more traditional organizations relying on management by walking around or applying more direct control-methods.

8. Conclusions

This paper describes requirements for organization and management in telework, based on experiences from more than 10 pilot companies in Norway. The pilots are participants in a national project on telework initiated by the Norwegian Research Council.

Managers have a main responsibility to establish policies for telework in the firm. Development of agreements and policies are essential. There are several motives for introducing telework. A common motivation in Norway now is to utilize telework as part of companies personell policy- to attract or keep employees to the company. Telework can also give employees a better balance between work and private life.
This paper discusses some general aspects of telework and management. Differences compared to traditional work are emphasized.

Experiences from the pilot organizations indicate that the question of control is relatively non-problematic because of existing trust between manager and teleworkers, applications of management by objectives, and electronic reporting via electronic mail as methods of control.

Manager's access or availability to the remote worker is only a minor problem thanks to new technical support. It is also solved through good routines, for example having a core time in the home office and regular days at the office. Information- and communication technology, more planning of communication and good routines for information-exchange, are therefore basic conditions for effective telework.

Other aspects of leadership, like motivation and communication over geographical distance, maintaining corporate culture and cooperation, are however more challenging for telemanagers in our Norwegian sample. But none of our pilot companies reports that "out of sight - out of mind" is a problem. This might be due to the fact that these teleworkers are rather independent. Another explanation is that the concept of telework for most companies in our sample is a combination of remote work and office work.

For various reasons, it can be relevant to regulate the amount of telework, both the total number and the percentage of work for the individual employee. The telework policy for the firm should describe which working tasks and which types of employees that are potential teleworkers. To maintain committment and corporate culture, telework should primarily be offered to employees that knows the corporate culture, routines and colleagues. Another important consideration is not to discriminate between teleworkers and colleagues at the office. The distribution of competence and work tasks must be considered, so that cooperation between persons and departments is not damaged.

To maintain cooperation in the company, there is still a need for various types of face-to-face meetings. Meetings should be well prepared and consist of a variety of topics, and support exchange of experience and social communication.

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Teleworking in a managerial context

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1   Abstract

The aim of this paper is to reach a more integral understanding of telework, by reviewing it from a management point of view and relate it to other tools managers use to improve organisational performance. A framework of contingency factors and implications of those factors for the feasibility of telework in a specific situation is developed. The feasibility also depends on the form telework takes. This form is defined by the design options chosen, but can – for analysis purposed – be simplified into three categories: homework, telecommuting and flexiwork. The more favourable a situation is to telework – this can be derived from the framework – the more value management attributes to telework, and the more effort they are willing to take to introduce telework. It also determines whether telework, or another tool is chosen to increase performance. And finally, it determines whether a telework project is likely to be completed, or to be interrupted by other developments or lack of effort.

2   Introduction

There is an ongoing discussion on the definition or essence of telework. This complicates any attempt to make a structured analysis of this phenomenon. Fortunately (?), this unclearness about the definition has not stopped workers from teleworking, nor organisations from considering using teleworking as an instrument. Case studies revealed interesting (apparent) congruencies and conflicts of teleworking with other developments in organisations. This stimulated us to try to connect teleworking to other managerial tools and organisational developments, for example strategic human resource management (HRM) and Business Process Redesign (BPR). The aim of this paper is to reach a more integral understanding of telework, by reviewing it from a management point of view. This includes a study of the relationship of teleworking with other developments in organisations.

In this paper we see teleworking as a 'method' managers can use to improve organisational performance. Thus, teleworking is one of the many tools and methods available for managers to improve performance or to adjust the organisation to environmental changes. This means teleworking has to compete with other approaches for solving the same problems. Possibly, different managers choose different instruments for handling the same problems. And there are more problems (or opportunities) that should be dealt

with. To add still more to this complicated field: some problems are more urgent than others, some instruments can tackle different problems, some instruments can be part of other instruments, etcetera. This is the situation in which a manager might choose teleworking as a tool. Jackson (1998) clearly shows the way in which managers address telework. By conducting an analysis of the relative merits of teleworking in organisational change he shows that telework might contribute to the same ends for which the organisation used other contemporary forms of reorganisation. Actually, some changes that were not undertaken as a form of telework could have easily been translated in teleworking terms. We do not go into the specific problems teleworking and other tools can solve, but merely treat the deliberations managers make.

In order to get insight in those deliberations, we start off by defining our view on telework. Then we discuss the feasibility of telework in a specific situation in an isolated way, that is, without directly comparing it with other tools. This gives an impression of the relative value teleworking has in a specific situation. Next, we compare telework – in general – with other tools. In sections 6 and 7 we will then describe two cases of telework, to illustrate the 'competition' between telework and other tools.

3 Teleworking and organisational design

The starting point of our discussion on telework is that we only refer to (the type of) organisations that used to have a 'traditional' structure. By this we mean that work, collaboration and control were office-based. This excludes sectors that are traditionally filled in by freelance and self-employed workers, like journalists and notaries.

3.1 What is teleworking

In essence, teleworking is a form of temporal and spatial dispersion of an organisation (Van der Wielen 1992). This dispersion enables new organisational forms, 'virtual organisations', that are designed to overcome time-and-place constraints associated with rigid bureaucratic structures. They are also based on a different design philosophy with regard to how, where and when work should be done. In practice, most organisations are not completely redesigned to become 'virtual', but they do want to benefit from allowing a less rigid time-and-place structure than the traditional office based organisation.

In order to compare teleworking with other developments, we want to discuss to what extent teleworking is based on a *theory on designing organisations*. Teleworking (or dispersed organisations) is claimed to be based a theory on designing organisations better fit for the flexibility requirements of modern days (Van der Wielen 1992). As such, it is usually opposed to a tayloristic design. This suggests a *contingency* perspective on organisation design: managers try to logically and rationally design structure and processes to fit contingencies of environment, technology, and other factors in the organisation's situation (Daft 1992). A contingency perspective implies that managers analyse the organisation's situation. When they conclude that the existing organisation is no longer fit for the (changing) situation, they analyse opportunities for improving the fit. One of these opportunities might be teleworking. This corresponds with the approach Jackson used (Jackson 1998) to 'integrate the teleworking perspective into organisational analysis'. He weighs principal ends, associated benefits and associated

costs of *different forms* of 'spatial reorganisation' to judge whether each of these forms would benefit the organisation.

3.2   Design options

An organisational design theory prescribes structures and procedures, based on some design *principles*. The principles of telework, as we discussed earlier, have to do with letting go of restrictions in time and place of the traditional (tayloristic) design, in order to allow for more flexibility. It seems that much of the confusion on the essence of teleworking comes from the fact that there are many options for filling in this broad principle. Not only is teleworking applied in different contexts (type of organisation, type of work, type of employee), in any of those contexts different design options exist (see table 1). This makes telework a completely different design theory from for example Business Process Redesign (BPR). Though also on BPR different perspectives exist, this theory is much more specific on the content of the organisational design. An organisation would use BPR theory for redesigning the organisation, but no situation would be classified as 'BPR', and no attempts will be made to count the number of 'BPRing' workers, so why count teleworkers?

Design options for telework (not exhaustive)		
Instrument	**Why**	**Options**
Designing and equipping location(s)	Adapt workplace(s) to tasks Flexibility Allow for different work location(s) Healthy workplace Etc.	Home-office, client's office, satellite work centre, etcetera Redesigning central office Part-time/full-time Choosing location that fits specific task (flexibility) Etc.
Use of technology (ICT)	Support of: □ Access to data (editing, using) □ Access to information (formal, informal) □ Communication □ Collaboration □ Etc.	Portable equipment, GSM ISDN-connection Intranet Etc.
Rules and Regulations	Support of □ Communication □ Control □ Co-ordination □ Etc.	Maximum amount of time spent at home Telework contract Who will pay for what What equipment is granted to which tele-workers Etc.
Agreements	Support of □ Communication □ Co-ordination □ Control □ Etc.	Including subject of telework in meetings Giving home-number when a client phones to the office
(Re)design of jobs	Efficiency & Effectiveness (some tasks may not be fit for distant work) Easing stress on non-teleworkers Etc.	Distribution of tasks among co-workers

♦	*Not all options are available in any given situation*
♦	*There is not always a 'best' option*
♦	*Options form 'clusters' that belong together*
♦	*Options influence each other*

Table 1 Design options for telework

The wish to telework does not in itself prescribe an organisational structure and processes. It gives a - very flexible - framework. The options for filling in telework are partly determined by the goals the organisation wants to achieve (for example reducing office space), the context of the organisation (for example contacts with clients) and other design principles management uses, like empowerment. No wonder there are so many different *appearances* of teleworking. We very much recognise the analysis of Kompast & Wagner (1998) that their exists a diversity of contexts and practices associated with teleworking. Any individual situation is in some sense unique, though some common individual and organisational problems can be pointed out. This makes it in our opinion impossible to understand the essence of teleworking in itself, it can only be understood in a particular context. A teleworking situation is not just defined by it's content, but by a combination of concept, content and the context.

If any single *definition of telework* were feasible, it would therefore be:
Any work situation in which the idea of easing time-and-space constraints of a traditional office – and therefore allowing, stimulating or forcing employees to work (part time) from another location – is used as a framework to adapt the design of an organisation, without completely redesigning the organisation.

3.3 Forms of telework
Though a specific telework design can be unique, it is possible to distinguish different forms of telework. Qvortrup (1998) defines three sub-categories, which are related to social categories (roles and positions). These categories give some basis for discussing the feasibility of teleworking in different contexts, therefore we present them here. We add our own interpretation regarding some design options and some characteristics of the work.

Category	Definition	Design features & work
Electronic homework	Work at home delivered through tele-communications to an external customer	Simple jobs, external customer is – at least in the Dutch situation – usually the employer; never at the office
Tele-com-muting	Work for an employer performed at distance, using computers and telecommunications	Part-time at office, part-time home; many different types of work, that imply little mobility (e.g. writing reports)
Flexiwork	Work performed 'everywhere'(at the office, at home, in travel) using computers and telecommunications	Mobile workers, e.g. sales and consultancy

Table 2 Categories of teleworking, adapted from Qvortrup 1998, p. 31.

3.4 Management of change
It is not just important *what* design management decides upon, but it is just as important *how* the design is made, and how the desired new situation is accomplished. After all, we are not talking about a kitchen table, which is easily made from a paper design,

but about a complex socio-technical change process. In earlier papers we argued that an evolutionary, participatory approach best fits the introduction of telework (Limburg 1997). This means that designing is reserved to 'experts', but that the use-situation is also involved. Our argument that telework is determined by a combination of the concept of dispersed organisation and the context also points to this direction. An important argument for 'situated design' is after all that work tasks must be seen within their contexts, implying that a detached, blue-print design will not result in the desired new situation (Greenbaum & Kyng 1991). Only when applied in a very bureaucratic, tayloristic environment, for improving efficiency, a positivist design approach might be feasible (e.g. Boonstra 1993). Therefore, next to the management perspective of 'fit', the perspective of management of change is very important in understanding telework in it's contexts.

In the next section we will elaborate upon the contingency perspective. We will discuss what contingencies determine the value of teleworking to an organisation.

4   The value of teleworking to an organisation

The value of teleworking in a specific situation depends on its contribution to improving the organisational performance, or increasing the fit between the organisation and it's environment. This is the result from one the hand the 'feasibility' of teleworking in any specific situation (to what extent has the organisation characteristics that make the introduction of telework easy) and on the other hand the importance of the goals that can be achieved by teleworking. In general it can be stated that the higher the gains, the more resources and effort an organisation is willing to spent on introducing teleworking. As this also determines whether teleworking is feasible, the *expected benefits* are one of the contingencies.

It is important to note that this might suggest a very rationalistic viewpoint (just comparing costs and benefits), which is not correct! The introduction of teleworking is, like all other organisational changes, subject to political considerations. Different (groups of) *actors* judge the situation differently and attribute different values and costs to teleworking. The attributions may be correct, but they may also be based on incorrect assumptions. The – perceived – impact of telework is likely to be different for different groups, and might even be opposite. In other words, in a situation in which tasks are – rationally – independent in time and space, managers may think otherwise. In these situations managers often are accused of being old-fashioned: 'modern managers do not need to see their workers to be in control'. Nonetheless, the *perceived dependency* is as important a contingency as the real dependency, because it implies that managers need to change their style. Changing a management style takes much effort, and therefore is only feasible when the expected gains of teleworking are high, and preferably not only perceived by top-management (and workers), but also by the managers who need to change their style.

4.1   Feasibility of telework in a specific situation

In general, when teleworking is applied in an existing organisation, it takes place in *situations in which tasks are in time and space independent on other activities, or can fairly easily be redesigned*. For example, when management believes in strict hierarchical, face-to-face control of workers, tasks are dependent on each other (worker and

manager), and redesign is very hard, so teleworking is not feasible. The more tasks are dependent in time and space, the more effort it would take to introduce teleworking.

The factors determining the time and space dependency of tasks (and therefore feasibility) have been subject to research, amongst others because managers prefer a 'quick-scan' to start with, in order to prevent unnecessary efforts for studying the possibilities of telework. For example, Andriessen & Rikkelman (1997) give a framework for getting insight into the (un)favourability of a situation for telework. The less favourable, the more effort has to be done to realise a telework situation, and therefore telework is less feasible. Quick-scans in telework handbooks often suggest a 'go-no go' decision, in stead of 'when the situation is like this, this kind of telework is worth investigating', which we prefer.

According to literature (e.g. Andriessen & Rikkelman 1997, Van der Meer c.s. 1994, Van der Wielen 1992), the feasibility of teleworking in any particular situation depends on many variables, including task characteristics, characteristics of the worker and leadership style. From literature and our own experience we deducted a set of factors we present in table 3. As worker characteristics are closely related to the other factors (for example some workers have a high need for social contacts and a high need for close supervision) we do not include those characteristics in our model.

Next to the factors that determine the time and space dependency, we added to the contingency factors the environment (as an important factor in determining the strategic value of telework) and the potential benefits of telework (as an important factor in determining the effort the organisation is willing to take).

As we already argued before, the *form of telework* should be considered when studying feasibility. A situation in which full-time working from home is not feasible, might be – with some redesigning! – fit for part-time teleworking.

Beneath we present a table with the contingencies we think give organisations insight into the favourability of a situation for (forms of) telework. Studying these contingencies not only gives insight into the feasibility of telework, it also helps to see what factors need attention or redesign when introducing telework. These contingencies are by no means independent from each other, and concern different levels in an organisation.

Contingency factor	Score (both real and experienced by different groups!)	Most appropriate form of telework	Implications for feasibility
1 *Environment*	Stable	Homework	Positive/Neutral
	Dynamic	Telecommuting	Positive as for gains, complicating as for co-ordination needs
2 *Contacts with clients*	None	Homework and telecommuting	Positive
	Routine	Homework and telecommuting	Positive/Neutral
	Intensive	Flexiwork	Positive as for gains & accessibility, complicating as for co-ordination needs

	Score (both real and experienced by different groups!)	Most appropriate form of telework	Implications for feasibility
Contingency factor			
3 (Potential) *ends/benefits* for teleworking	a) <u>Amount</u> of efficiency, productivity, flexibility, employee commitment b) <u>Amount</u> of consensus on gains	Homework aimed at efficiency only (organisation gains) Telecommuting and flexiwork also require gains for workers	The higher the expected gains, the more positive The more consensus the more positive
4 *Organisational structure*	Bureaucratic	Homework	Negative
	Organic	Telecommuting/ Flexiwork	Positive
	Matrix	Flexiwork	Complicating (because of co-ordination)
5 *Tasks*	Routine	Homework	Positive/Neutral
	Complex	Telecommuting Flexiwork	Positive as for gains (concentration), Negative as for consultation
6 *Role of manager, Leadership style*	Direct supervisor	Homework	Negative
	Facilitator	Telecommuting/ Flexiwork	Positive
7 *Need for Co-ordination*	High	Flexiwork	Negative
	Low	Any	Positive
8 *Need for social contacts*	High	Any	Negative
	Low		Positive
9 *Information storage*	Electronic On-line	Any	Positive
	Physical Personal Archive		Complicating when tasks have to be taken over
	Physical Central Archive		Negative
If the score attributed to certain factors differs highly between different (groups of) actors, this influences the feasibility negatively			

Table 3 Contingencies for telework

4.2   Three typical situations

In practice we found three types of clustered contingencies, that we describe below. Any of the described situations can be either an organisation as a whole, or a part of an organisation that can function relatively independently. As the three categories Qvortrup distinguishes fit neatly to the situations we recognise, they are included in the description. As a result of this, organisations can use the descriptions, next to table 3, to get a first impression on the most feasible form of telework.

Situation 1: Routine, simple
Characteristics of the situation: Stable environment, only routine contacts with clients, (automated) dataprocessing, simple tasks, information handling at a low level of abstraction, little communication required, no need for direct supervision, bureaucratic structure. Therefore tasks are in time and space reasonably independent, because neither collaboration nor direct supervision is needed. Example: call-centre.

Applicability of teleworking: could be introduced top-down, existing structures remain unchanged, tasks do not change, just the location of the work changes. Special attention needed to social contact, being the only thing changing.
Type of telework: Homework.
Goals of teleworking: Teleworking in this context is an <u>efficiency</u> improving measure: less housing costs, improving productivity, etcetera.
Example: A well-known Dutch example of 'situation 1' is OTTO. OTTO is a mail order firm, with a general range of products, of which 80% is fashion. About fifteen years ago they introduced homeworking for their customer service telephone operators. Eighty employees, mainly women, work from home, 60 at the office. They take orders, answer questions and give information, 7 days a week. Customers are unaware whether the operator answering his/her call works at the office or at home. Orders are entered into a computer, which is directly connected to headquarters in Hamburg, Germany. From that computer also information on products can be obtained. The amount of work is flexible, from 3 to 8 hours a day, dependent on schedule and busyness. Operators have regular work-meetings, mostly at the office.
Social contacts are mainly maintained by telephone. The homeworkers are also welcome to visit the office. And finally, every 2-3 months some social event is organised (source: Stiller 1995).

Situation 2: Mobile
Characteristics of the situation: Dynamic environment, employees have many contacts with clients (a.o. face to face), they are very mobile. A complex service or product is delivered, requiring much consultation. Often a matrix-type organisation, many projects, workers need expertise of colleagues. Manager is facilitator and/or 'primus inter pares', working in projects. Workers are very independent, both from each other as from managers. Example: sales, consultancy.
Applicability of teleworking: depends on need for teamwork and occurrence of ad-hoc jobs. Often applicable, but much attention is needed to internal communication (with colleagues and manager) and administrative support. Full-time teleworking possible (when hard-copy documents needed even necessary, because of the need for a physical archive).
Type of telework: Flexiwork.
Goals of teleworking: Variable. Meeting demands of workers for more flexibility (less travelling!) more efficient use of office-buildings, structuration of a situation in which workers more-and-more work from home, etcetera. Officially usually 'win-win', often difficulties in weighing <u>efficiency</u>, <u>flexibility</u> and <u>motivation</u>.
Example: a good example of such a situation is Compu-NL. This case will be further described in section 7.

Situation 3: Complex
Characteristics of the situation: Relatively stable environment, becoming more dynamic. Varied tasks, non of them completely routine. Different departments, from dataprocessing with client support, to HRM-staff. No bureaucratic, hierarchical structure, or a policy to change such a structure into a more open organisation. Managers might not all have the same style, workers and managers are to some extent accustomed to bureaucracy. Some redesign is needed to reach sufficient independence of tasks.

Applicability of telework: applicable when minimal level op flexibility, probably varies between different managers and workers. Different points of attention at different departments, even at an individual level. Much attention needed on leadership, communication and social contacts. Only part-time teleworking, because tasks are not completely independent.

Type of telework: Telecommuting.

Goals of telework: Varied. Officially usually 'win-win', often difficulties in weighing <u>efficiency</u> on the one hand and <u>flexibility and satisfaction</u>. Contribution less obvious than the other two situations.

Example: EduInfo; This case will be further described in section 6.

4.3   Feasibility profiles

The contingencies can be translated into profiles (Table 4), which determine whether a situation is more or less favourable for (certain forms of) teleworking. The three categories of Qvortrup help to get a first insight, because these categories are easily connected to the type of work and organisation. As we suggested in section 4.3, the most applicable category can be derived from the situations, and from table 3.

Feasibility profile for [name of organisation], type of telework: [***]										
Factors: **Impact on feasibility**	Environment	Contacts with clients	Height of benefits	Consensus on benefits	Organisational structure	Complexity of Tasks	Role of manager	Need for co-ordination	Need for social contacts	Information storage
++			*							
+		*				*	*			*
0	*				*			*		
-				*					*	
--										

Table 4 Feasibility-profile

The first step of management would be to get a broad idea on what type of telework would be most fit. This can be deducted from the three situations we described and the contingency table. Next, all contingencies have to be studied separately, maybe using a profile. This analysis has two goals, one: to see how (un)favourable the situation is, and two: to see at what contingencies gaps exist that have to be covered in the design. This means that a close relation exists between the contingencies and the telework design.

In sections 3 and 4 we described telework in an isolated way. In the next section, we will link telework to other tools, as in improving the performance of the organisation management will also take other tools into consideration.

5   Teleworking and other tools

In section 2 we already mentioned that an important connection of telework with other contemporary forms of reorganisation is the fact that certain ends that could be accomplished by introducing (a specific form of) telework, also can be accomplished by other forms of reorganisation. Usually a researcher's interest in telework only starts when

management has decided to give telework a try. But, as Jackson shows, it is very useful for the understanding of the essence of telework to start with the ends management wants to achieve and review the arguments for choosing either telework or another approach.

Another connection of telework with other approaches can have two directions:
1) Management decided to follow a certain approach, let's say Human Resource Management (HRM), and finds telework a useful instrument for implementing (giving shape) or supporting (aspects of) this approach. In the case of HRM this might be a more open relation between managers and employees.
2) Management decided for telework, and finds other approaches useful for implementing or supporting (aspects of) telework.

In short, these connections between telework and other tools have to do with *ends,* and *means* to attain those ends. Seen like this, telework is just another tool in a pursuit for maximum fit and performance. Managers will analyse the environment, analyse the current situation, and decide upon what instruments to use to reach an optimal fit or performance, by comparing the relative contribution of each of the instruments.

Another important relation is the opposite of this: other tools that compete with a telework project, possibly leading to an uncompleted introduction. In our experience the introduction of teleworking is very vulnerable to being overruled by other developments in an organisation. Tools like BPR and HRM often are regarded as more 'serious' than teleworking. Although teleworking can be as strategically important as BPR and HRM, it is in contrast to BPR and HRM also applied (tried) when it just seems interesting to see what is can bring. '*Workers are asking for it, government is stimulating it, and yes, housing costs are a bit high, so why not try teleworking!*' No wonder many projects do not survive after a pilot. In short: BPR and HRM are *always* strategically applied, teleworking only *sometimes*[1].

   Often, the decision to introduce telework is not the result of a careful analysis of the environment, and weighing of the relative value of different approaches. More often, teleworking just appeared to be interesting, seemed not to cause too many problems, and therefore was given the benefit of the doubt. If in such a situation management is confronted with the need to adopt the organisation to a changing environment, telework is very likely not to be included in the analysis, but to been seen as a 'nice toy', without priority.

Contingency factors play an important role in determining the 'life-expectancy' of teleworking. It is obvious that the more unfavourable a situation is for teleworking (which can be derived from the contingency factors), the more susceptible the project of introducing telework is to political tug-of-war and to being overruled by other developments, or by the every day situation of the organisation. After all, the more unfavourable the situation, the more effort is needed to introduce teleworking. Also, the more favourable the situation is, the more likely teleworking is to be considered of strategic importance, and therefore 'protected' against other developments.

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[1]   We do not suggest that HRM and BPR projects are always succesfull, far from that. But, when there is ´competition´ between such tools and telework, telework usually loses.

In the next two sections we will briefly describe two cases of teleworking that we studied closely. These cases illustrate the way managers are confronted with connections between telework and other approaches, and two of the three contexts we described above. In both cases Diana Limburg was (is) involved in the task force responsible for executing a pilot study. We particularly gathered information for designing and evaluating the pilot. This was both done by interviewing persons involved, and by surveys.

6   Case EduInfo

EduInfo used to be a state organisation, but has been privatised in 1994. Its tasks concern carrying out laws and rules regarding education, such as granting, paying and reclaiming scholarships and co-ordination and control of exams. EduInfo has approximately 1400 employees, of which 440 work at the department 'SF'. Though the project researched is intended for innovating the whole organisation, the pilot only takes place in this 'product group'. SF takes care of the granting, paying and reclaiming of scholarships for 600.000 students, and 400.000 former students[2]. The environment of EduInfo is increasingly dynamic, but not very turbulent.

Tasks at EduInfo are varied, from data-entry tasks with some contacts with clients to policy-making and conduction legal procedures. Most employees have to some extent contact with clients, but only by telephone and written. All employees are office based, some do sometimes travel. All in all, EduInfo fits the profile for a ´telecommuting´ situation.

The organisation is supported by extensive automation. Most employees work with the computerised information system, to key in, edit or retrieve data. Non-standard documents are scanned.

The interest in telework at EduInfo started from the possibilities of having workers that are somehow not able to come to the office (e.g. who broke a leg) work from home.

The main argument of lower management was an increase in productivity of both data-workers and professionals when working in the quieter environment of the home. The increasing problem of tight housing was also an argument. Next to this, top-management's goals were to improve flexibility of the organisation and the workers, and to improve worker satisfaction, leading to better performance and lower absenteeism. Workers were interested in having more freedom in deciding upon their time schedule, and increasing their productivity.

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[2]   In The Netherlands all students are entitled to a state-grant, composed of both a gift and an optional loan, depending on the income of the parents.

Feasibility profile for EduInfo, type of telework: telecommuting										
Factors: **Impact on Feasibility**	Environment	Contacts with clients	Height of benefits	Consensus on benefits	Organisational structure	Complexity of Tasks	Role of manager	Need for co-ordination	Need for social contacts	Information storage
++										
+		*		*		*				*
0	*		*				*	*		
-					*				*	
--										

Table 5 Feasibility-profile for EduInfo

The original motivation for writing this paper was that halfway through the pilot-study, BPR was started. Though the results of the pilot did not indicate problems, higher management fears teleworking might endanger the carrying through of BPR. In this case BPR has two main features: autonomous workgroups, that handle the whole life cycle of clients, and emphasis on fast service towards clients. Not only did BPR bring a thorough redesign of the organisation, from functional towards client directed, but it also required a costly redesign of IT. Needless to say BPR was by far the most important thing going on at the time, which had to be defended at all cost.
Had BPR not taken place, than following the pilot, a large-scale introduction of telework would have been started, as the results of the pilot were very positive. Now the organisation is changing so dramatically, the introduction of telework does not have priority. As for telework, nothing fundamentally is changing, neither the value of the goals, nor the contingencies. So the problem is not the content, but priority.

An important indicator of the vulnerability of the project is the neutral score on the importance of the goals. Also the profile is very neutral in general. This indicates that telework is feasible, but is not 'naturally' of strategic importance. Though several persons involved think telework can have large benefits, no one is convinced the organisation depends on introducing telework for success.

7 Case Compu-NL
Compu-NL is the Dutch branch of a large international organisation (Compu-International) in the field of information processing systems, products and services. Over 4000 people are employed, and this number is rising. Compu-International has a matrix organisation, with 'ISU's' (Industrial Solutions Units) at one axis, and 'PU's' (Product Units) and 'GS's' (Global Services) at the other axis. ISU's are responsible for client relations. Opportunities they spot are passed on to relevant PU's or GS's. The teleworking project at Compu-NL mainly concerns sales-staff (approximately 2000 employees). Headquarters of sales are in Amsterdam, clients are based all over the Netherlands (and so are the employees). This is a typical ´flexiwork´ situation. Desk sharing has been introduced for sales-staff in 1992, employees also have had the possibility to work from home before, but this was not really incorporated in the work situation.

In April 1998 renewed interest in telework occurred, due to an increasing pressure on housing costs. Management thinks telework should be introduced for all sales-staff (voluntarily). Employees are very eager to be home-based, because they travel allot and traffic-jams bring about stress and are time-consuming. Partly based on the experience with the prior attempt to introduce teleworking, the project sponsor and project team think the introduction of large-scale telework should be seen as an important organisational change, also needing a cultural change.

Feasibility profile for Compu-NL, type of telework: Flexiwork										
Factors: Impact on feasibility	Environment	Contacts with clients	Height of bene-fits	Consensus on benefits	Organisational structure	Complexity of Tasks	Role of man-ager	Need for co-ordination	Need for social contacts	Information storage
++			*							
+		*				*	*			*
0	*				*			*		
-				*					*	
--										

Table 6 Feasibility profile for Compu-NL

Problems linked to ´priority´ at Compu-NL started already early in the pilot. Many different departments, with their own hierarchical structures, goals and budgets are involved. The sales-department itself is highly motivated to make a success of telework, as the employees are very eager, and the housing is dramatically tight. But departments of HRM, IT and facilities have their own agendas. They do not sabotage the project, but do not give it a high priority either (though the IT department is very helpful). The department of housing for example, has – internationally – started thinking about re-designing housing to improve fit between workplace and tasks. This could of course contribute to the teleworking project, but is in fact designed and executed separately. As this project is approved by, and enforced from top-management of Compu-International, it has priority to the housing department. To them, telework is only interesting where it fits into their plans, not as a redesign on it's own. Another complicating development, instigated from above, is more and more stress on teamwork. As middle managers already have trouble having their workers collaborate, they fear telework might make it more difficult to give in to top-management's wishes. So far, the project management has no authority to enforce actions from other departments.

Top-management of the sales organisation, as well as many employees, are convinced teleworking is the only solution to very urgent problems, so the score on benefits is very high. They attribute strategic importance to the project. The main problem here is the fact that co-operation is needed from groups in the organisation that do not (directly) benefit form telework and have their own priorities, budgets and plans. In fact, it is unclear who is management in this case: the management of Compu-NL, the management of the sales-department of the management of Compu-International? Also, middle management is not convinced effective co-ordination can be maintained when teleworking. As this introduction of flexiwork is undertaken as a form of radical or-

ganisational change, these objections could be tackled in a good telework design and by a good change process.

8 Conclusion

In this paper we elaborated upon telework from a management perspective. We designed a framework to investigate the favourability of a situation for telework. This framework can help to decide upon the effort needed to introduce telework. But it also gives insight into the relative value of telework to the organisation, and therefore it helps to weigh the feasibility of telework in proportion to other tools managers may use to improve organisational performance. As teleworking projects often suffer from being 'overruled' by such other tools, or by everyday life, it is important to decide upon the value of the project. If it has real strategic value, the introduction of telework is more likely to be realised, in spite of possible other developments. If the value is more operational, the introduction might be interrupted. This usually occurs when a pilot is (successfully) ended, and real choices have to be made upon organisational changes and investments.

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Telework and the Bottom Line -
Costs and Benefits of Telework in German Insurance Companies

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Abstract

Telework in the insurance industry poses an interesting example because changes in the market as a consequence of liberalization have led to the need for cost cutting, improved products and better after-sale services. Telework can play a vital role in meeting all of these challenges.

An ongoing survey that *empirica* has started in 1996 shows that while almost all major insurance companies either experiment with or tolerate home-based work in one way or another, only very few have embraced the concept of telework wholeheartedly. Obviously, doubts about the economic efficiency of telework are an important inhibiting factor.

The paper presents new findings on the quantification of costs and benefits of telework in German insurance companies. It draws especially on two cases, one of which being a pilot project covering 23 employees switching to telework, the other a major teleworking scheme encompassing nearly a fifth of the 2300–strong personnel of LVM, Muenster. They show that telework can without doubt be economically feasible, but profitability *in the short term* is hard to prove.

Therefore, corporate decision-makers do still not consider the benefits of telework palpable enough to vindicate large-scale investments. What is asked for is the development of tools that enable companies to measure the benefits of telework in qualitative as well as monetary terms. Although telework experts all over the world agree that inclusion of non-monetary effects into traditional cost-benefit-analysis is essential, scarce progress has been made in developing appropriate methods. To improve this situation, the author proposes a method that combines traditional economic efficiency calculations with measurements of qualitative effects.

1 Introduction

This paper tries to give answers to three questions:

- What is the importance of telework for the insurance industry?

- Are traditional methods of economic efficieny analysis sufficient to support companies when making decisions about if and how to introduce telework?

- How can we measure the economic efficiency of telework in a way that extends beyond the limits posed by traditional tools for analysis?

The questions are dealt with on the basis of evidence from the insurance industry.

2 The role of telework in a changing market situation

2.1 The end of idleness

On the threshold of the 21st century the German insurance industry has reached a crossroads. It is faced with new challenges and new chances that affect the foundations of the industry. German insurance companies will have a bright future only if they manage to adapt to changing market conditions much more flexible and quick as ever before.

As opposed to other branches like the car industry, the insurance industry has developed continually since WW II with annual growth rates of about 5-10% being taken for granted. There have been only very limited competition and stable ownership structures. Due to the considerable extent of continuity in the trade and simultaneous regulation by a state-run supervisory office, innovations in the production and marketing system have filtered through only gradually.

Another consequence has been that jobs in the German insurance industry have for a long time been (and still are) regarded as extremely safe, comparable only to a position in the civil service. There is hardly a branch of the economy that is further away from a hire & fire-mentality. No wonder than that flexibility of labour deployment is very low.

Stability in the insurance trade, however, is by no means an overall negative phenomenon, for the majority of insurance products draws its value to the customer not least from the confidence he or she has in the future of the insurer. For many years, the absence of any abrupt changes in German insurance signalled to the customer that in future, too, one can still rely on the coverage of insured risks.

But altogether, insurance companies were only poorly prepared for a series of changes that emerged more and more clearly in the course of the eighties - and is continuing today. This development was in turn induced by changes in regulatory as well as in market and technological conditions.

The changes can be outlined as follows:

- In the majority of insurance product lines **market growth** is **only modest** due to demographic (stagnant population) and macro-economic (stagnating household incomes) factors. This results in heightened competition for every single insured. In some insurance branches, especially motor insurance, this has led to a **brutal price war**. Premiums go down non-stop, drastically cutting into profit margins in this field.

- The competition is also fuelled by other **financial services companies**, especially banks and stockbrokers, **entering the market**. They offer new products explicitly aiming at traditional resorts of insurers (eg life insurance). Today, barriers to entry in the insurance market are much lower than they used to be.

- The deregulation of the insurance market, that reached its climax with the Third EC Directive in 1992, enables insurers to shape their product range and price policies more autonomously and introduce products to the market much faster. In order to set themselves off against competitors, insurers increasingly make efforts to **diversify product lines**. Customers want new, innovative insurance products that are tailored to their individual needs. This also results in a strong call for shorter product development cycles in order to react as quickly as possible to changes in market demand.

- Changes in consumption habits together with an abolishment of legal barriers induce a **decrease in brand loyalty** (which in the past has set off insurance from other branches of the economy). Now, having acquired a customer does not mean that they can be regarded as safe, but they have to be cared for continuously. Greater willingness to change insurers when the opportunity arises means that insurance licences are gradually becoming just another service commodity.

- The insurance sector as well as the entire financial services sector have been swept by a **wave of mergers and acquisitions** of unprecedented scale and intensity in recent years. A sector in which transnational activities have traditionally been the exception, not the rule is suddenly being affected by the **creation of multinational corporations**.

- Traditional marketing channels are being re-evaluated. The assumption that traditional organizational forms of distribution (i.e. an agent-based, decentralized structure) is the most efficient way to arrange the customer/company-interface is put to the test. Insurers realize that they have to make use of **new marketing channels** like the Internet or telephone marketing to reach young customers in particular, whose consumption behaviour is very different to that of their parents.

- More than ever before, **customer orientation** is of utmost importance to the insurance business. A stronger gearing to the needs and demands of (actual and prospective) customers does not only concern product design, but also the quality of after-sales services. Practically every insurer has plans to **extend service hours** into evenings and weekends, but finds it hard to put this into practice.

2.2 Why telework?

Bearing this in mind, what is the role telework can play to strengthen competitiveness of insurance companies? The insurance business is a sector in which the staff is by far the most important (and costly) input factor. A reorganization aiming at improving the competitive position of an insurer must therefore first consider changes in the labour process. In general, this can happen in two ways:

a) firstly by increasing the efficiency of labour deployment in the course of a ***rationalization strategy***. Here, productivity increases result essentially from improvements in the organization of the work input, eg by improving the interplay between the design of business processes with (IT) production systems.

b) secondly by changes in the *individual* organization of work so that it better accords with *individual* preferences (***human resources orientated strategy***). Here, productivity increases are the result of tapping into productivity resources that lay untouched in the employees themselves.

Of course these strategies can be combined with each other, but one mostly dominates due to the requirements the product market and the product characteristics demand from the labour process. In both of these strategies telework can play an important role, but in very different forms.

ad a) This type of reorganization is of relevance mainly to insurance lines which products are characterized by a high degree of standardization, requiring no detailed explanation to the customer. Today, markets for these products are distinguished by strong price competition. Therefore cost cutting, especially reduction of overheads, is of outstanding importance to insurance companies that want to keep their competitive edge in these product lines.

Rationalization strategies regarding these products aim at a continued business process automation, the use of computer-integrated telephony at the interface to the customer, and customer self-service through the Internet. Telework does play a role largely in the form of centre-based telework in ***call centers***. The deploymant of call centers that are smoothly integrated into an IT-based production system can reduce the cost for customer contacts and improve service quality effectively.

First experiments with ***virtual call centers***, i.e. telephone service employees working from home instead of a central office, have shown that a qualified 24-hour phone service can be realized more easily employing home-based telework. Empirical evidence shows that employees working from home are more likely to accept unusual working hours.

The main intention of applying telework here is to reduce fixed costs and increase flexibility, eg in case of workload fluctuations.

Traditional insurers, however, find it hard to obtain competitive advantages that way. Starting from scratch, market newcomers, eg subsidiaries of US multinationals, are more capable to build efficient organizational structures at low costs. They don't have

to resort to the established staff, but can make use of more flexible contractual agreements concerning job security and working hours. Servicing the German insurance market from abroad will be a possibility soon, as it is already the case in commmercial lines.

ad b) For established insurance companies, a form of reorganization that revolves around taking advantage of existing human resources is a much more promising business strategy. Traditional insurers remain a competitive edge in the markets for insurance products that are characterized by a low degree of standardization, while at the same time requiring detailed consultation by qualified personnel. This is also true for insurance products that require tailoring to individual needs. Apart from a well-known brand name and a huge marketing budget, success or failure in these market segments is strongly determined by the quality of pre-sales and after-sales services. Highly qualified and motivated employees are therefore vital. A decisive question here is how to increase employee morale as effectively as possible without putting other strategic objectives at risk.

As the internal structure of big insurance companies in Germany frequently shows similarities to that of public agencies, it often proves difficult to improve employee morale. The great degree of division of labour in most of these companies takes its toll, as individual clerks have very limited responsibilities and freedom of decision-making.

This problem has been realized by the industry. The introduction of "allround" case processing in back-office functions, which is a common feature in many insurance companies today, is an important step in the right direction. The concept behind this approach is to reduce the division of labour in all those areas where it disproportionately hampers the individual's decision-making powers and feeling of responsibility for the customer.

Employee morale is determined not only by their degree of freedom to shape their work situation, but also by the opportunities the job offers to balance work and family life.

In recent years a change of values in society has made it obvious that traditional work patterns do no longer match the requirements of employees. The weakening of traditional male and female role patterns in personal relationships, especially with regard to rising numbers of women seeking paid work, has given support to calls for family-friendly forms of employment.

Insurance jobs of the future will therefore have to fulfil new requirements that aim at higher flexibility of labour deployment while at the same time taking into consideration changing employee preferences. Telework like no other form of reorganization is capable of meeting these requirements, benefitting both employers and employees while increasing the overall organizational effectiveness.

Transfering work from the central office into the employee's own four walls has far-reaching implications for the person in question. Through the adaptation of work conditions to the individual preferences of employees, wherever possible without negative

impacts on the work itself, home-based telework allows companies to tap into productivity resources that lay untouched in almost every employee. This effect results from

- more self responsibility and independence at work,

- the emergence of an entrepreneurial mentality and

- increased willingness to life-long learning.

There is much evidence that traditional insurance companies will only be able to keep their hold on the German insurance market if they manage to transform the competence and experience of their staff into a true competitive advantage. Telework has proven that it can do just that, while at the same time increasing the flexibility of working hours - without triggering opposition by employees and works committees.

Business strategies in the insurance industry

⁄product diversification
⁄shorter product development cycles
⁄international mergers and acquisitions
⁄new marketing channels
⁄improved after-sales service

Demands on working places/ employees

performance pressure, constant change

higher individual demands on job satisfaction

Change of social values

⁄demand for better compatibility of job and family
⁄search for more self-responsibility and indepence at work

New requirements

⋏ **stronger consideration of individual employee's preferences combined with**

⋏ **higher flexibility of labour deployment**

option: alternating telework

Figure 1:   The role of home-based telework in the insurance business

3   The penetration of telework in German insurance companies

Insurance companies offer favourable conditions for the application of telework on a large scale for various reasons, as there are:

- **suitability of job characteristics**: Specialized tasks in insurance like software and product development, auditing, etc. are carried out relatively autarkical and are therefore especially suited for decentralized work. In the area of back-office functions, card files were replaced by computer-based files years ago. In principle, back-office clerks can therefore work whereever they have access to their data files,

mostly held on a central host. The introduction of imaging (document retrieval) systems will make jobs in insurance even more suitable for telework.

- **technical infrastructure and know-how**: Computerization started early in insurance companies, computers have long since become office standard. At the same time the decentralized structure of insurers (tied agents, regional branch offices) led to the necessity to integrate decentralized business units into a common computer network – exactly what is needed for connecting home offices, too.

- **Organizational conditions**: Apart from the mostly decentralized organizational structure, experience with flexible working hours is another important requirement for the introduction of telework.

- **Personal conditions**: Employees in insurance are rather interested in telework due to a high percentage of female employees, long-term average employment with the same company and central city locations with long communting distances.

There are, however, *inhibiting factors* as well. As already mentioned, insurance companies' internal structures are extremely rigid due to long years of stability and saturation. These structures make it very difficult to realize innovations, especially of the organizational kind. Supervisors are often not accustomed to management by objectives. It is true for the insurance sector - even more than for companies in other industry branches – that middle management are not sufficiently prepared for the challenges posed by *telemanagement*.

Figure 2:   Development of teleworker numbers in 12 German insurance companies[1]

In 1996, 1997 and 1998 *empirica* conducted a telephone survey coverling roughly 100 insurance companies. The results confirmed the observation that only in very few companies telework is a integral part of business philosophy and applied on a larger scale. The majority of firms still make use of telework either sporadically or within the scope of a pilot project only. 35 of 101 insurance companies included in the 1998 survey do apply telework. Of these, 12 cases analyzed by *empirica* in detail are shown in figure 2. In the figure, insurance companies are positioned according to their progression in implementing telework:

- phase 1: informal telework based on individual arrangements between employee and supervisor / low-tech technical solutions / limited to very few company divisions.

- phase 2: pilot project mostly based on agreement between works council and employer / number of teleworkers limited / more sophisticated technical solutions.

[1] 1 = Agrippina Versicherung AG, 2 = Allianz Lebensversicherungs-AG, 3 = Continentale Versicherung; 4 = Deutsche Krankenversicherung AG; 5 = HDI; 6 = Karlsruher Lebensversicherung AG; 7 = Nürnberger Versicherungen; 8 = Rheinland Versicherungs-AG; 9 = LVM; a = Provinzial Versicherung; b = Victoria Lebensversicherung AG; c = Württembergische Lebensversicherung AG

- phase 3: transition from pilot project to general application of telework / employee participation in project is usually subject to supervisor consent / introduction of desk-sharing.

- phase 4: company-wide application of telework / employees have a right to telework / sophisticated technical solutions / considerable reduction of central office space.

The figure includes data from 1996, 1997 and 1998, showing that with most of the analyzed companies the number of teleworkers has grown only slightly.

Clearly, insurance companies still tend to tolerate (phase 1) or experiment with telework (phase 2), rather than implement it full-scale. From 1996 to 1998, however, in more and more companies telework has moved on towards phase 3, as pilot projects have ended and concrete plans for the expansion of telework are being discussed. Anecdotal evidence indicates that a considerable number of insurance companies are preparing to extend telework to more than 100 employees (i.e. 5%-10% of total staff).

The line in figure 2 indicates the diffusion process of telework, measured in teleworker numbers (left-hand scale) as a function of time/ phase of implementation (lower scale). The time it takes to pass from one phase to the next varies from case to case.

Though the figure represents an optimistic model that most likely will not apply in all cases, there can be no doubt that the spread of telework in several German insurance companies has entered a decisive stage. But there are doubts if top management decision makers have been offered enough evidence that telework is not only "nice to have", but that it should in fact be part of every serious corporate strategy to change insurance companies from rigid relics of the past into flexible organizations of the future.

As is shown below (chapter 4), the feasibility of telework has been proven in pilot projects, even if the "real" costs of switching to telework are accounted for.

And telework offers much more than that. The only problem is that traditional economic efficiency models do not reflect the benefits of telework adequately. We will return to this point in chapter 5.

4   Economic feasibility of telework: two case studies

4.1 LVM, Muenster

An outstanding example and at the same time a model for many German insurance companies who are piloting telework at present is the company LVM. LVM is one of the leading motor insurers on the German market with headquarters in Muenster. In 1994, following deregulation of the EU insurance market, the company's management investigated the situation and arrived at the following conclusions:

- Utilization of office space and equipment is far from satisfactory with much room for improvements. Beside the main building housing the headquarters, office space is being rented in numerous buildings across the city in order to accommodate growing staff numbers. Huge sums spent on office space - in combination with unsatisfactory capacity utilization - call for action.

- Customers have growing expectations with regard to service and availability.

- Employees strive for more competence and responsibility in their job.

At the same time, extensive construction work in the central office was about to be carried out. Along with it a decision had to be made whether the temporary loss of office space should be compensated by a new building somewhere else or rather be substituted for by different means instead. Faced with this situation, LVM decided to offer their employees home-based telework. Within no more than three years over 400 employees – i.e. over 20% of local staff – gladly accepted the offer.

At LVM telework means exclusively alternating telework, with 2 employees sharing one central office desk. On every other day, the teleworkers is present at the central office and available for meetings and face-to-face communication with colleagues. The annual additional costs for a "couple" of teleworkers amount to DM 15.900 in average, roughly equalling the costs of maintaining one central office desk (which can now be used otherwise).

The company's top management regards it sufficient when costs are covered, realising that qualitative effects of substantial impact not considered in this calculation do make telework worthwhile. These effects can be summarized as teleworkers showing an entrepreneurial mentality to their work, acting more self responsible and in accord with the customer's and the company's needs. Teleworkers regard themselves much more as being personally responsible for customer satisfaction.

An important factor explaining telework's success at LVM is the charismatic personality of one its members of the board, who has promoted the case for telework emphatically.

The example of LVM has convinced many sceptics in Germany that telework can quickly be made to work if approached pragmatically, and that it can bring advantages strengthening human resources and improving competitiveness: In 1997, LVM was one of very few companies in motor insurance that still made a profit.

4.2 Medium-sized German insurance company, Dortmund

The German insurance company analyzed has 2,200 employees (exclusive employed agents) and is based in Dortmund. While private health insurance is the main sphere of business, the product range includes all other important insurance products, too.

Telework was introduced 1995 within the scope of a pilot project that included a number of different application fields embracing specialists as well as back-office clerks and typists.

The insurance company analyzed implemented telework responding to demand among their employees. Rather than within the scope of a specific strategy, the company uses telework in order to supplement existing programmes and make itself more employee-friendly: At an early stage the insurer introduced flexible working hours to the advantage of its employees. Thus telework proves a logical consequence of the company's strategy to put the employee at the center of its production strategy.

empirica has carried out an evaluation of the project and has been involved in project management throughout all stages of the pilot. Economic efficiency was evaluated extensively analyzed. As a result the researchers applied a new approach towards cost-benefit-analysis, which is currently being tested in 3 other insurance companies (outlined in chapter 5). In the following, the results of one major part of the evaluation system, a calculation of costs and benefits which can be expressed in monetary terms, will be discussed.

This calculation does not only aim at comparing costs for a central working place as opposed to a home-based office (as is usually done, see the example of LVM above), but also at including the costs for switching to telework into the analysis, i.e. the costs for ***change management***. The latter include project overheads, training of teleworkers and supervisors, working hours spent on the project, and others. Costs for change management are usually not accounted for, but make up one of the reasons why companies shy away from reorganization measures like telework. Most of these costs arise in the first 12 months after the start of the pilot project.

In the figures below, annual costs are calculated as an average figure for the first 4 years.

Benefits which were found to be expressible in monetary terms were:

- ***Productivity effects***: Individual performance of teleworkers was measured mechanically as well as via estimates of managers, teleworkers and colleagues, in cases where objective criteria could not be found. Additionally, it was checked if the results had to be adjusted to account for productivity decreases of non-teleworkers, which was not the case.

- ***Savings in costs for recruiting and training replacement staff***: Employees leaving the company permanently or temporarily cause considerable expenses, because substitute employees must be recruited and trained. Insurance companies claim that on balance new back-office clerks do not produce any added value in the first year of occupation. Thus up to DM 150.000 are lost in added value alone.

- ***Lower absenteeism***: Fewer days lost to reduced sick-leave has been observed by nearly all supervisors involved, the average number being 2 days per year.

Figure 3 shows the correlation of annual costs per teleworker and distance between central and home-based office. The dependence of running costs upon that distance acts as a serious obstacle to the spread of telework as soon as interested employees live more than 50 km from the main office.
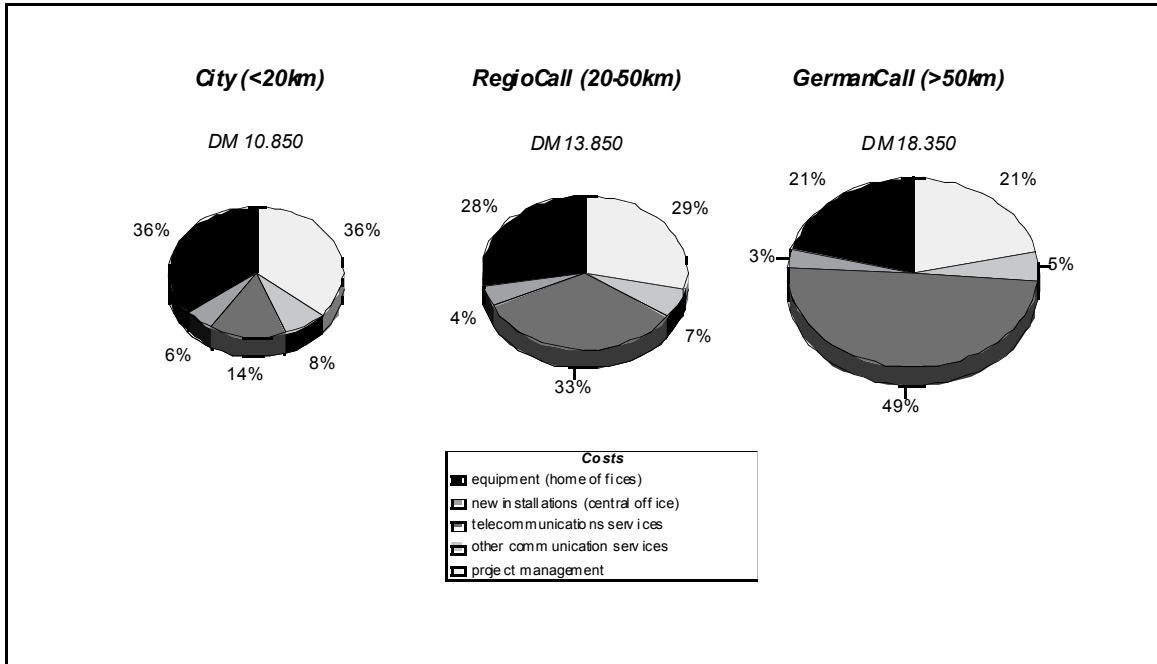
Figure 3:   Annual costs per teleworker (as a function of distance zone; application field: specialists)

Moreover, there are great differences in the costs of telework in different fields of application. Typists cause fewer communication costs compared to clerks because they work rather self-sufficiently, transfering data only occasionally. Back-office clerks use a constant telecommunications connection to the central office because the insured's file
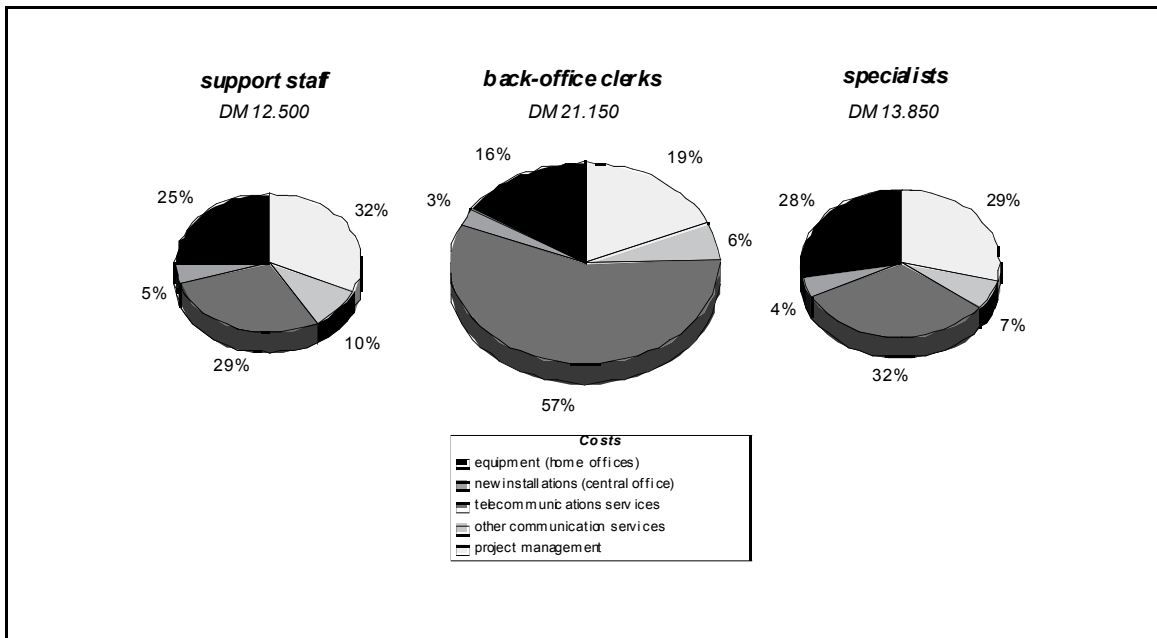

Figure 4:   Annual costs per teleworker (as a function of application field; distance zone: 20-50 km)

is kept electronically on the host and can not be stored periodically on the teleworker's computer. This solution, while diminishing the profitability of telework, is prefered by

insurance companies for data safety reasons. Specialists, on the other hand, do make use of a constant connection to the host only sporadically, but have been supplied with a costlier equipment at home including a video conferencing system.

The benefits of telework - as far as they are expressible in monetary terms - consist largely of productivity increases (approx. 50%), savings in equipment through introduction of desk-sharing at the central office and other benefits like reduced sick leave and savings in recruitment and training expense. Again, differences can be made out when comparing different application fields which are caused by divergent modes of telework (i.e. number of teleworking days per week), differences in productivity effects and in contribution to gross value.
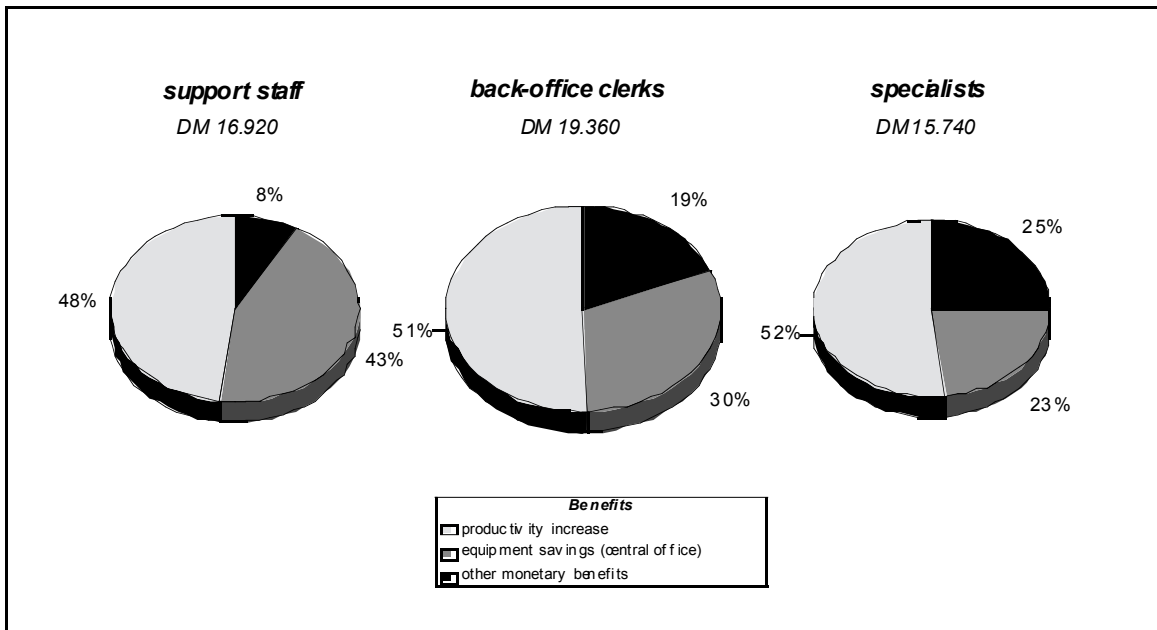
Figure 5:   Annual benefits per teleworker (as a function of application field)

When comparing costs and benefits and keeping in mind that the latter are included only when expressible in monetary terms, the results are heterogeneous: While in most cases benefits exceed costs, profitability is strongly dependent on the conditions and outline of telework in each individual case. From the evidence of the analysis, it can be argued that there is no clear-cut business case for telework when only short-term cost savings are taken into account. While monetary benefits do match costs or exceed them slightly, most companies will not regard these savings big enough to justify a large-scale implementation of telework.

119

	City (>20 km)		RegioCall (20-50 km)		GermanCall (> 50 km)	
	costs	benefits	costs	benefits	costs	benefits
support staff	10.100	16.920	12.500	16.920	16.100	16.920
back-office clerks	13.950	19.360	21.150	19.360	28.350	19.360
specialists	10.850	15.740	13.850	15.740	18.350	15.740

Table 1: *Annual costs and benefits as a function of application field and distance zone (grey: profitable when calculated for first 4 years, excluding costs and benefits not expressible in monetary terms)*

The real advantages of telework, however, lie in the factors outlined in chapter 2.2. How can we take them into account when measuring economic efficiency? And what are the risks if companies rely on old-fashioned capital expenditure accounts when deciding about if and how to introduce telework?

5 Economic efficiency of telework: Measuring costs and benefits

As various telework experts and researchers have already stated, traditional economic efficiency analysis can only to a limited extent be adapted to the case of telework, because most effects of the introduction of telework are primarily of a qualitative nature and achieve payback only in the medium term. To Use these analysis tools as a basis for decision making implies the danger of not realizing the true potential of telework as an alternative to the status quo. It can even result in wrong decisions about how to organize telework, which might have negative effects on business performance in the medium to long term. This will be explained in more detail below, proceding to the outline of the procedure for an extended economic efficieny analysis that tackles some of the problems mentioned.

5.1 The need for a new approach

It is of great importance to stress here what the true purpose of an efficiency analysis of telework from the company's viewpoint should be: It should act as a input for corporate decision making, giving answers to the question if an investment in telework can bring a return in the medium to long-term that compares well to the current organizational situation as well as alternative forms of reorganization. The analysis should account for different modes of telework.

Traditional economic efficiency analysis tools are of limited use for this purpose, for the following reasons:

- the focus on criteria expressible in monetary terms that can be derived from the data usually provided by the company's controlling department means that qualitative aspects are overlooked systematically.

- telework is a comprehensive reorganizational measure that does not aim at short-term profit maximization but at a long-term, sustainable strengthening of human resources through a boost in employee morale and flexibilization of labour deployment. If this is not recognized in cost-benefit-analysis, the results of these calculations are not in line with reorganization objectives and therefore of limited use. This mismatch between objectives of an investment and criteria used for its evaluation does give rise to criticism. Other evaluation tools that encompass criteria not expressible in monetary terms are asked for.

- the switch to telework directly or indirectly concerns cooperation relationships between teleworkers and their work partners. These so-called network effects must be accounted for in an efficiency analysis. However, mostly they are not taken into consideration: Costs and benefits are only researched and evaluated for the teleworker's working place itself. Looking only on one part of the organization as if it was a self-sufficient system means that possible negative or positive effects on colleagues' performance and on the efficiency of business processes that involve more than one person are ignored.

Here are two examples that are meant to illustrate the latter two points:

- Division of labour vs. job enrichment -

A short-term examination might quite possibly come to the conclusion that an extension of the division of labour, with teleworkers designated for other tasks than employees working in the central office, is preferable to maintaining job designations as they are. This corresponds with the situation of teleworking's early days when telework was introduced informally and without preparation, resulting in contact between teleworker and colleagues being reduced to a minimum. While thus, the organizational expense to implement telework can be limited, it would counteract current corporate strategies to diminish divisions of labour. Today, companies strive for job enlargement and job enrichment through which the scope of activity is broadened or deepened respectively. This is especially true for the insurance industry. Telework must not jeopardize these strategies. Quite the opposite should be intended: The increased self responsibility and independence that employees show when teleworking should be made use of to support and accelerate the move towards an abolishment of unnecessary divisions of labour, putting more responsibility in the hands of those who have to do the work.

- Permanent vs. alternating telework -

Permanent telework, i.e. working exclusively from home, brings with it great advantages from an economic point of view because working desks at the central office can be disassembled completely or used otherwise, meaning considerable savings in equipment and office space. However, permanent absence from the office surroundings is unsuitable for many employees (see below), because possibilities for face-to-face communication with colleagues (formal meetings as well as informal small talk) are essential for the job. This is all the more true as teamwork becomes the dominant way of organizing work in more and more companies. Disadvantages which might result from unsufficient communications between teleworkers and central employees will

show only after a longer period of time. That means that short-term cost-benefit analysis will not include these effects.

The importance of this issue justifies a closer look on the determinants of productivity improvements through telework.

5.1.1 Productivity improvements through telework - what makes the difference?

Companies, especially the supervisors of the employees in question, prefer alternating telework to permanent work from home. A number of reasons are brought forward for this, but these have not found their way into efficiency analysis. Generally speaking, the productivity effect of telework is evaluated and calculated per day, based on the (implicit) assumption that each *additional* day of telework causes the same productivity increase. This assumption must be put on trial, though, as can easily be understood from the following figures. They are not based on empirical data but are meant to be hypotheses, whose plausibility is underpinned by anectodal evidence of many kinds.

Quite contrary to the assumption mentioned above, the extent of daily productivity changes caused by dislocation of work is strongly dependent on the extent of telework, i.e. the number of days per week spent at the home office. Take for example a specialist working in insurance, eg a software developer. As schematically shown in figure 6, the effect of less disturbances at the home office is strongest when teleworking is limited to a few days per week. This is due to the fact that the first tasks transferred to the home office are those which are most affected by disturbances and need longer periods of dedicated, concentrated work (eg writing reports). However, the more days you work from home, the more everyday-tasks that could just as easily be dealt with in the traditional office environment are done from home, because they are less susceptible to disturbances (like for example phone calls).

The effect of reduced opportunities of face-to-face interaction with work partners is dependent on the extent of telework, too. When teleworking only one or two days per week, the effect might even be positive: In the traditional office environment, many communication tasks are executed face-to-face due to spacial proximity and habit, but could more efficiently dealt with by telephone or e-mail (see Pribilla et al., 1996, pp.19-24).

However, this changes drastically when telework is extended towards almost permanent or permanent work at home. Predominant absence from the office environment means that the teleworker is secluded from circulating information, especially informal information that might be vital for their work. Even when teleworking is supported by new IT like video conferencing or application sharing, face-to-face interaction remains indispensable for many communication tasks and cannot be substituted for by technology (yet).
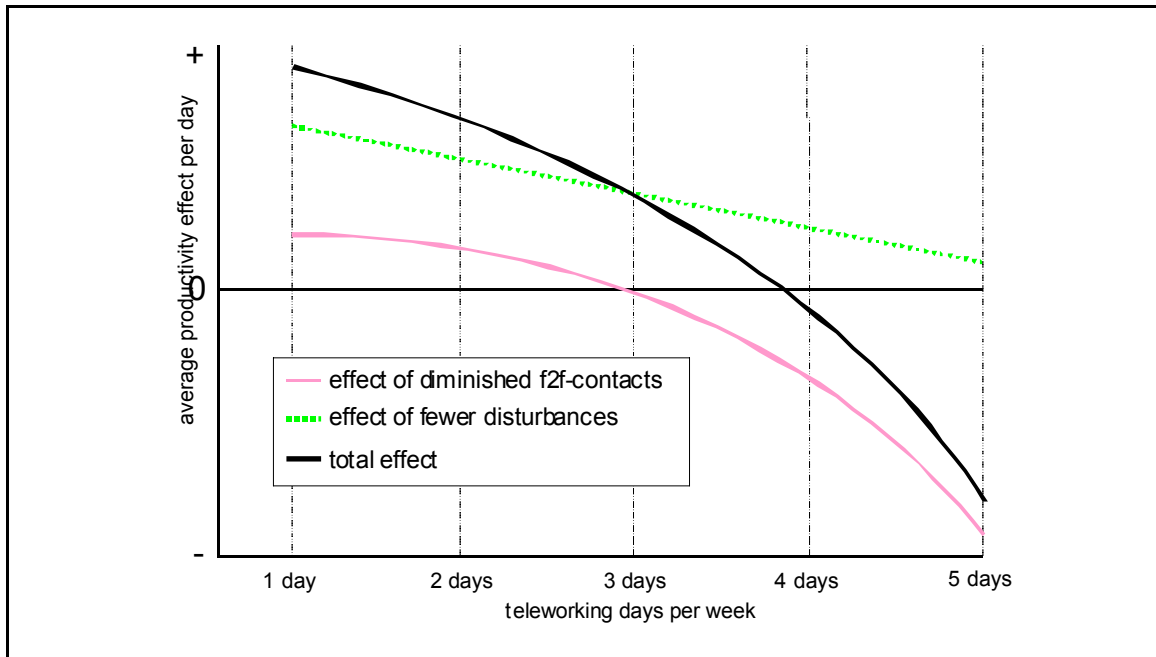
Figure 6:   Correlation between teleworking days per week and average daily productivity changes (application field specialists)

Therefore, the total productivity effect of telework (black line) might fall to 0 if specialists in insurance (fig. 6) work from home on 4 days per week, and may even turn out to be negative in the case of permanent telework.

The exact position and curvature of the lines in figure 6 might of course differ slightly in each individual case. For example, in the case of clerks (see fig. 7) the effect of fewer disruptions at the working place when teleworking might stay constant while telework is extend, and the effect of a reduction of face-to-face interactions will be less distinct.

Nevertheless, the underlying tendencies remain the same: The ***marginal benefit of telework*** regarding its effect on productivity ***is decreasing***, i.. from a starting point of one day of telework per week, each additional day of telework produces a smaller (in some cases even negative) benefit compared to the status quo (permanent work at the central office).
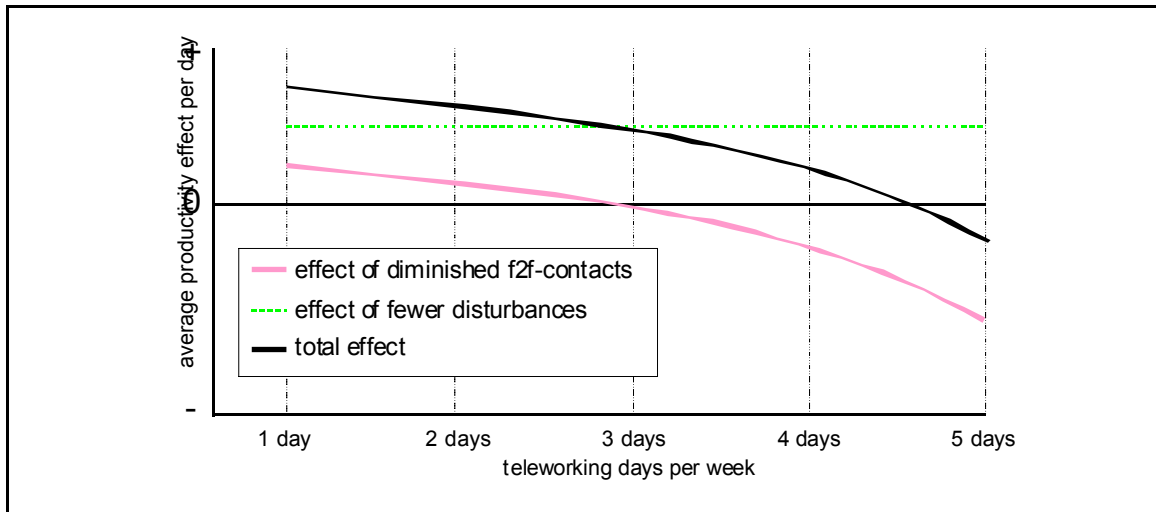
Figure 7: Correlation between teleworking days per week and average daily productivity changes (application field clerks)

While these findings do nothing more than mirror the widely accepted superiority of alternating compared to permanent telework, they imply at the same time that statements about productivity effects, if only changes in productivity per day are considered, irrespective of the number of teleworking days per week, may be incorrect.

5.2 Proposal for an extended economic efficiency analysis

For an extended economic efficieny analysis, that lives up to the requirements outlined above, the following principles must apply:

- *Participation*: The more a corporate strategy focuses on the employee as a human resource, the more participation-orientated evaluation tools are needed. All groups directly involved (teleworkers, colleagues, supervisors) should participate in the decision making process.

- *Target orientation*: The evaluation of reorganizational measures has to be orientated towards its targets. Otherwise – as is unfortunately often the case in reality (Reichwald et al. 1996) – findings can not serve as a basis for decision making, concerning eg the expansion of telework.

- *Comprehensiveness*: Analysis must also include criteria that are difficult to quantify or expressible in monetary terms.

- *Avoidance of pseudo-objectivity*: Most economic efficiency calculations of telework take into account criteria directly expressible in monetary terms (i.e. costs, savings, additional proceeds) as well as those that are only indirectly expressible in monetary terms, eg the increase in productivity. On the one hand, this makes calculations easier, as in most cases neither the individual contribution to gross value is known, nor does the change of performance affect the company's results directly (the exception proves the rule here, such as salesmen). On the other hand, to include evaluation criteria non directly expressible in monetary terms means that the

124

final results are more dependent on certain assumptions which are difficult to verify[2]. A cost-benefit analysis must therefore allow for a distinction between evaluation criteria of different grades of reliability.

For the introduction of telework, approaches to a so-called extended economic efficiency analysis (eg Rinza/Schmidt 1992, Reichwald et al. 1996, Hereth 1997) can be applied. They would then focus on comparing the status quo (work at a central office) to the introduction of telework for a certain proportion of staff and other options. Likewise, various organizational types of telework can be compared.

The common methods of extended economic efficiency analysis consist of a combination of traditional capital expenditure accounts and benefit value analysis. The latter substitutes a non-dimensional scale for monetary quantities. Each digit on the scale indicates a certain degree of utility, similar to the marking system at school.

The procedure of the analysis can roughly be outlined as follows:

1.) The first step is to define the system of targets as well as relevant subtargets of the measure and to identify criteria suitable to measure the success of the introduction of telework regarding the subtarget in question. Defining the target system it is important to choose criteria that are independet from each other[3]. The main targets of the project should be defined by top management in order to secure accordance with the corporate strategy. Definition of the lower hierarchy levels of the target system, however, should also include middle management to meet the principle of subsidiarity.

2.) Next, the relative importance of the targets and subtargets is set. All groups directly involved should take part in this process (i.e. top management, teleworkers, supervisors, colleagues and possibly others).

3.) After that, data about criteria values, i.e. cost and benefit contributions, need to be collected. Here one has to differentiate between three groups of criteria:

- criteria directly expressible in monetary terms (eg equipment costs and savings),

- criteria only indirectly expressible in monetary terms (eg changes in productivity, time savings) and

- criteria not at all expressible in monetary terms (eg employee satisfaction).

With the latter, the persons concerned (teleworkers, supervisors, etc.) will have to be asked for their judgement. The question will be, what effect the measure (introduction of telework) has had on a certain variable (eg employee morale).

4.) Following, the criteria values are added up separately for the three components of analysis:

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2   As a consequence just about any result can be worked out through variation of the assumptions applied.

3   s. Reichwald/Höfer/Weichselbaumer (1996), S. 132ff.

- With criteria directly expressible in monetary terms, capital expenditure account is calculated.

- As for criteria only indirectly expressible in monetary terms, these can mostly be calculated on the basis of assumptions only. As assumptions have varying validity and are often spring from belief rather than knowledge, it is advisable to calculate best-case and worst-case scenarios in order to prevent pseudo-objective results.

- With criteria not at all expressible in monetary terms, a multiplication of value (eg "6" = very important) and the degree of change through reorganization (eg "+2" = small improvements) is necessary. This leads to a partial benefit value for each criterion. These values can then be summed up.

5.) Finally, the results of a) capital expenditure account, b) calculation of costs and benefits not directly measurable in monetary terms and c) of the benefit value analysis can be integrated. There are various methods to chose from. Usually, all monetary values must also be transferred into benefit values in order to arrive at a total benefit value of a measure.

When presenting the outcome of the analysis to others, eg the board, one should always retain the results of the three different analysis components separately. It is advisable to integrate them only to show that the total benefit value obtained herewith can be compared to alternative measures and the initial condition (with regard to their contribution to the reorganization's objectives which have been set beforehand). Separate the results that have been obtained by different calculation methods clearly, and both analysis - and the assessments reached - will be far more transparent. At the same time, the participation of all interest groups in the valuation of subtargets (see above) makes sure that their interests are taken into account (especially of those people who are to put the ideas behind the reorganization into practice and make them work).
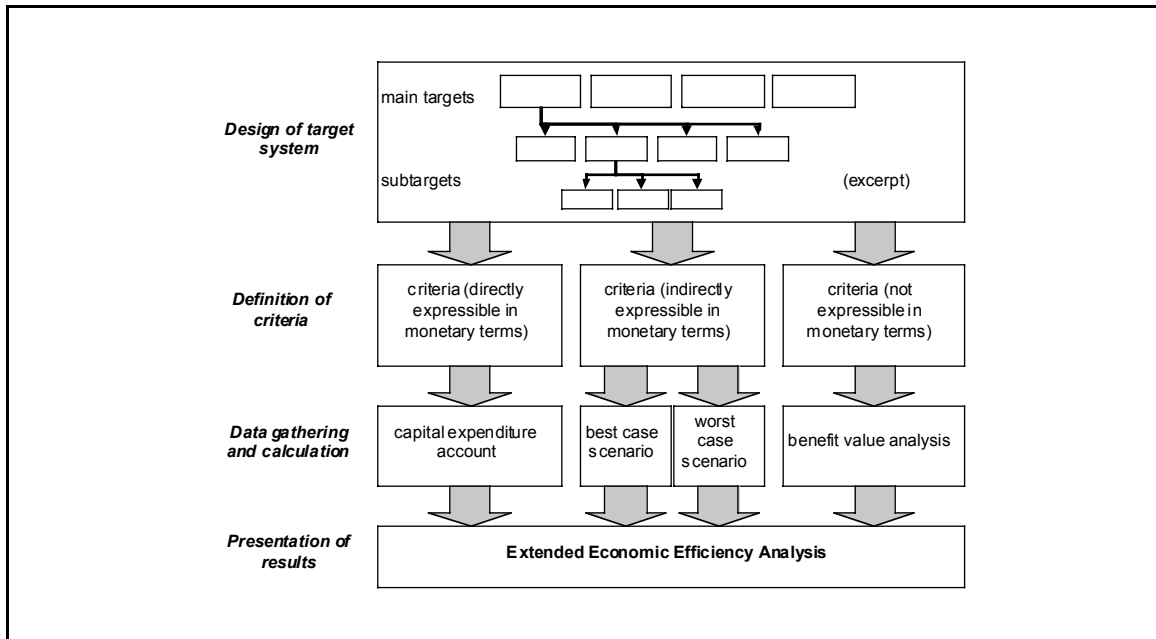
Figure 8   Extended economic efficiency analysis

This approach is currently being employed by *empirica* to evaluate telework pilots in three insurance companies.

6   Concluding remark

German insurance companies do still shy away from implementing telework full-scale. While almost all major insurers do either experiment with or tolerate home-based work in one way or another, only very few have embraced the concept of telework whole-heartedly. There are a number of different reasons for this, but evidence suggests that one of the strongest inhibiting factors are the difficulties in showing that telework can not only be economically feasible, but also bring in a high return in the medium to long term. An extended economic efficiency analysis is an approach that can possibly remedy this situation.

Moreover, companies should not base there decisions about if and how to apply telework merely on the results of traditional economic efficiency analysis because this might lead to negative repercussions on overall organizational efficiency in the medium to long term. Telework is not profitable per se, but must be organized in a way that maximizes its benefits. Thus the pitfalls of short-term cost minimization (eg if permanent telework is implemented for the sake of instant savings in infrastructure) can be avoided. Nevertheless, it must not be forgotten, that the potential benefits of telework are considerable and worth every effort.

127

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IT and alternative forms of working, living and communication -
By flexibility in time, space and organization

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Abstract

Developments in the IT area points forward to significant possibilities for creating new organizational structures in every branch of society, from which individuals, companies and public institutions can derive many advantages. Changed relationships in time and space due to IT give possibilities to increased freedom in physical and functional organizing of different activities. As a consequence, we can anticipate the emerging of new living patterns and social structures. In particular, this applies to what so highly affects our living patterns, namely how and where we work. New working methods have emerged and established. Teleworking, Telecenters, Satellite office – there are several appellations for the more flexible ways of organizing work.

In Sweden 1995, for instance, about 400,000 persons were telecommuting 1 day or more per week. This means about ten percent of the Swedish labour force. As compared with results from a study ten years ago, the net increase since 1986 (for telecommuters working 1 day or more per week) is over 20%, and the average teleworking time per week has increased with 25%. There are also more than 300,000 people in Sweden who can and would like to go over to some amount of telecommuting.

Many sectors that constitute core areas in the society will gradually be affected, and more markedly as time goes by, as telecommuting becomes more widely diffused and grows in both intensity and number of people involved. Some of the areas that already is influenced in one way or other: trips and transports, travel patterns, design of residential housing, planning the physical environment, social, cultural and commercial services, education structures, social relations, regional development (structure), etc.

IT, SPACE AND TIME

There are well-founded reasons for the judgement that developments in the IT (information technology) area point forward to significant possibilities for creating new organisational structures in every branch of society, from which individuals, companies and public institutions can derive major advantages. Anticipated changes will affect us in many ways and have profound effects in many of the basic structures of society. In an increasing number of areas, IT is a natural instrument in daily life. Within perhaps ten years, virtually everyone will be in one way or another a user of or linked to some type of information system. *A new technological era has thus been ushered in.*

The *spatial, and hence the functional, organisation* of our activities, such as work, housing, service, travels and transports, etc have always previously had their natural *limitations in the form of physical restrictions like distance, location and time* - restrictions related to the available opportunities for moving about at any given time. The development in which we can now see the first changes in this respect is the general point of departure for the various studies we have carried out. The background to these changes lies above all in developments in the area of *information technology.*

 The perhaps most profound changes will occur in the fields of organisational and working life, but gradually ever more areas intimately connected with our private lives will also undergo significant transformations in various ways. As a consequence, we can anticipate the emergence of new living patterns and societal structures. In particular, this applies to what so highly affects our living patterns, namely *how and where we work and live*, how we transport ourselves, how we do shopping etc. There will also be changes that affect other areas of societal structure, including the economic, social and political arenas, which will of course also be reshaped in different ways.

It is, of course, difficult to have a definite opinion about what shape this development will specifically take: it depends on how a large number of factors of direct and indirect importance will evolve. Among these, naturally, in addition to the fundamental economic prerequisites, is technical development itself. In our increasingly globalise world, we are also highly dependent on and influenced by changes that occur in the world around us – and, not least, altered scales of values can lead to modifications of both functional and physical nature in existing societal structures.

In this presentation we will focus on the opportunities, the changed behaviour, and the effects of the new relationships among **time, space, organisation and communication** *contained in the potential of IT.*

We also seek to describe the *developmental tendencies* and consequences of the *shift in the paradigm of temporal geography* to which the expansion of IT opens the way. The starting point for the analyses is the theoretical arguments based on *relations between methods of organising and communicating and the resulting spatial repercussions.* Changes in the organisation of *working life* have constituted the core of these discussions. The potential of IT for creating *flexible organisation of work* attracted attention at an early stage. *Telecommuting* is one example of *one* such flexible work method that puts the focus precisely on the relationships among organisations – communications – spatial repercussions. The first conceptual and more concrete project in Sweden based on these ideas was carried out in 70s and early 80s. Later, an extensive study specifically devoted to telecommuting was conducted in Sweden in 1986. By the results of the follow-up study of the extent and structure of teleworking in Sweden in 1995 it is possible to illustrate the development over nearly a decade.

We have chosen to conduct analyses of new operating methods and forms of work, primarily focused on teleworking, starting from three different points of departure. The first is the *individual perspective*, i.e. we proceed from how the individual people react, their preferences, the scope of the phenomenon, future prospects, etc. The second perspective is the *companies' or employers'* motivation to "go along" (as heretofore) or (as more recently) too more actively introduce teleworking. The third point of departure is the *societal perspective*. What role do public institutions play, for example in the creation of relevant regulatory systems? And what effects can be anticipated in various areas – e.g. with regard to traffic, transports and communications, the planning of housing and the physical environment, regional policy, etc? The emphasis here is on *characteristics and behaviour as seen from the individual perspective.* Though that does not imply that the other two perspectives are missing from the analyses.
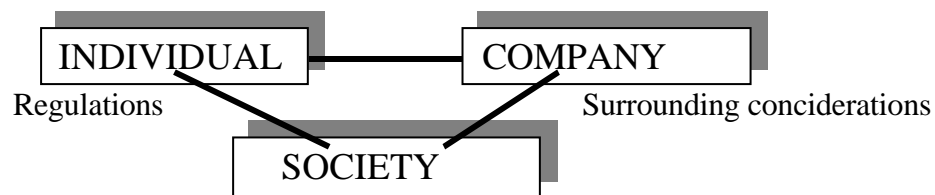
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INDIVIDUAL ——— COMPANY
Regulations              Surrounding conciderations
              SOCIETY
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Figure 1   Telecommuting – an analysis from three approaches.

A NEW PARADIGM OF TIME-GEOGRAPHY

The emergence of information technology and its gradual penetration into all areas of society opens the portals to and hence the opportunities for, modified patterns of activity and ways of life. Both working life and private life are influenced. The profound changes in how we work, live, travel, satisfy various demands for service etc. also influence the entire structure of society. However, this involves not only purely physical structures like buildings and roads; the economic, social and political arenas are also affected.

The background of the development, in which we now find ourselves, is above all the differently flexible and cost-effective organisational structures that can be developed. IT has been developed for different roles or objectives, e.g. to take over and further improve work operations, streamline production, and so on. But in the present paper it is primarily the *telecommunications element* in information technology, i.e. the function in IT that has to do with the *transmission, transfer and exchange* of information and knowledge *among different locations in space (people/places)* which constitutes the most decisive feature here of this technology.

The development of the communications element in the IT technique means that *relationships among strict schedules, waste of time and physical distance (space) will be radically altered* because the technique shrinks the physical distance between contracting parties to virtually nil. Even with IT, there still exist distance-related factors of an economic nature, but they are gradually decreasing in potency. But still even linguistic, cultural and psychological factors can be experienced as hindrances.

The IT-Landscape

The fact that the telecommunications element in IT applications revokes or neutralises the friction of distance implies that *time-space relations acquire a new meaning*. To move about physically results in a *loss, or consumption, of time*. A meeting requiring physical presence necessitates the movement of at least one of the parties, simultaneously as the *juncture in time*, i.e. when the meeting must be held, *is locked in*.

With regard to other types of IT media, e.g. fax or e-mail, there is in principle no deadlock in either time or space affecting when contact can occur. *The technique is distance-independent* and oblivious to the geographical locations. This means that in principle it is – viewed technically – just as easy to communicate from Helsinki to Tokyo as to Stockholm. And *communication/transmission is nearly instantaneous*, which means no, or insignificant, consumption of time is required. The technique provides *freedom in time and place for communication*, i.e. information can be sent from places and at times convenient to the sender. Similarly, information can be received, and replied to, by the receiver whenever and from wherever s/he finds suitable. These forms of contacts can be described as "asymmetrical or asynchronic." *We have acquired flexible forms of contact – "meeting places" can now be described as virtually "dimensionless."*

The degrees of freedom in time and spatial dimensions create an independence that provides entirely new prospects. Meetings among people and telephone conferences require

131

simultaneity, as do videoconferences, which also, heretofore, have implied a certain amount of locale co-ordination. This demand does not apply, however, to most forms of IT communication. The technique creates wholly new conditions for what we formerly called "telepresence," i.e. the possibility to participate in activities at a place without having to be physically present at the place in question.

Another possibility that more and more companies are exploiting is to use IT to take advantage of and *utilise the time zone differences between continents and countries*, among other things to increase cost-effectiveness in their activities. For example, companies in the USA and Europe buy services in the IT field like programming, data processing, etc from companies in India and countries in the Far East. A Company in the USA can, for instance, send over data for processing at closing time. The material is processed in New Delhi while it is night-time in America, and returned to the USA at the end of the working day in India, hence being available for further processing in America when the new workday begins there. It is not only the time differences that are interesting, but also the access to relevantly trained personnel and, not least, significant cost benefits. Other examples are supplied by European companies who use the distance-independent and direct-communication features of IT to gain economic advantages.

What has been described above very strikingly illustrates how this more advanced information technology, combined with creative thinking, radically modifies the possibilities of other, more unconventional solutions to the problem of space. This will be of great significance henceforth in discussions and policy debates, e.g. concerning regional or spatial development.

One can state that when IT and its *telecommunication function* is utilised as an instrument for contacts, transmission and exchange of data and information, and so on, there will be *different time and spatial relationships – a new, or modified, paradigm of time-geography* can be said to have emerged.

The Art of Organising

People (both individually and collectively), businesses and public institutions all need, and are able, to organise life in different ways. As in so many other matters, this largely involves playing off one's own interests against those of others – not infrequently resulting in conflicts. Since the individual person's weekday is to such an exceptionally great extent connected to work, a large part of the possibilities for organising life relate directly to the individual's function in, and interplay with, working life. Even if the focus is placed on behaviour on the individual plane, changes in the organisation of work make up the core of the following discussion.

Particularly with regard to all competitively challenged enterprises, which basically includes companies in all lines of business, *the capacity to find creative and innovative approaches* to all of the functions within an enterprise – production, administration, marketing, etc – constitutes an increasingly important and decisive factor.

Changing Character of the Business Sector

Parallel with the emergence of new organisational approaches, the business sector has undergone – and continues to undergo – major structural changes. One of the most discernible features when reflecting on the changes in occupations is the mutations among sectors. As we know, throughout the 20th century employment in agriculture has declined greatly and was for a long time replaced with job opportunities in industry. This culminated during the second half of the 60s, after which we see a gradual decline in industrial employment and a simultaneous increase in the number of people working in the production of civil and social services.

When it comes to the future employment developments in industry, *according to estimates and prognoses in Sweden the number of industrial employees up to the year 2010 will gradually continue to decrease to 7-8% of the total number of people employed*. And the people within industry who are directly involved in the production of goods ("on the shop floor") will amount perhaps to only half of that.

Changing character of the social structure
In the society of farming and handicrafts, the nearly universal pattern was that work was done in, or close to, people's homes. Only certain urban industries and public enterprises had their specific workplaces, mostly in the central districts of cities and communities.

The breakthrough and steady expansion of industrialism radically altered the picture for virtually everyone who worked for pay. The home environment and the work environment were separated in both physical and functional respects. Travelling to and from work, commuting, was a fact of life. This is a kind of travel, based on an organisational form of the activities of the business sector, that has subsequently never been really questioned – despite the fact that it lays claims on a significant part of the human being's time, strength and other resources.

The *organisational structure* of the industrial form of production has in principle stamped the way of organising all other types of enterprises and activities as well, both different types of administrative functions and functions involving social and civil services. *The company is, and is symbolised by, its physical plant*, usually embellished with its logotype and often its name. When the establishment of new activities in a locality or relocation from one place to another are discussed, it is largely the physical appearance of the company with which the affected tasks are involved. This constitutes the very emblem of the company's existence, and hence of workplaces.

It is in the light of this transition from industry-dominated structures to knowledge and service-dominated economies, along with the development of IT, that it is possible to anticipate the opportunities for radically changed forms of organisation and probably a different kind of social structure.

Where Are the Jobs – And Where Will They Be?
Mentally, humans have long assumed that making a living is connected not only with a company or employer as a juridical person but also with a physical place, or a tangible building. The expressions "I'm at work" or "I'm going to work" are very common in everyone's vocabulary. We mean that we are on the company's premises (office/building) or on our way there.

We are going to have to readjust our way of thinking in this matter. *In the future, it is going to be increasingly important to start out from where the people with the desired competence live or want to live, rather than starting with the place where a company that seeks that competence is administratively registered and attempting to recruit personnel to that place.*

Towards Greater Flexibility and Fewer Deadlocks
The cornerstones of our daily existence have come to be *work and housing*, between which we move in fixed patterns – i.e. travels (commutes) to and from work. The whole structure of society is built up around these "fixed points" and movements – not to mention the stalemate in time and space, where the time clock, for example, has come to symbolise the *heavy constraints on the human being in terms of time*. The temporal and spatial organisation of working life has been the crucial determining factor for the behaviour of human beings in time and space.

It is a fact that, in connection with people's jobs in our society, the vast majority of regular movements – commuting to and from work – are concentrated in short periods of time in the morning and evening. The fact that few people live, work and enjoy various kinds of leisure activities in one and the same place results in the need for
movement, not infrequently over long distances. An ordinary 2-child family's pattern of movement in a day is schematically illustrated in the following figure.
It is evident that a very large amount of movement of a relatively usual kind occurs during a workday and a workweek. People living in small communities manage this with rather reasonable investments of time. But in a metropolitan region or out in the countryside, the conditions are different. The workplaces can be located far from home and from one another. Travelling implies considerable sacrifices, and the normal daily program can often not be managed within a reasonable time frame, using public transportation, but presupposes access to one and perhaps two cars.
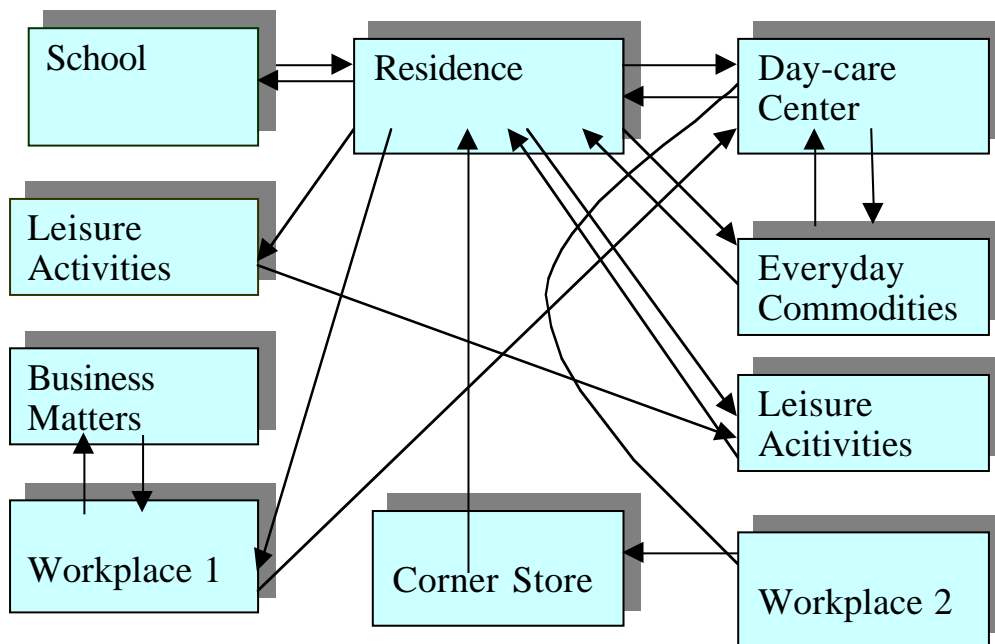
Figure 2   Example of daily activities and consequent need for travel.

The prerequisites for using IT to achieve more individual and flexible organisation of working and living conditions have been manifestly improved. Thanks to this, the opportunities for bringing the individual's different needs into line, and for solving the "time puzzle" presented by the programs for work, travel and private life, have expanded. In other words, the prerequisites for personally being able to decide *the place and share of travelling in one's time frame* have improved noticeably.

We are so accustomed to *commuting to and from work* that we do not reflect very much about the existing possibilities to reduce or eliminate some of this kind of travelling – albeit we would often very much like to do so. The force of habit often blocks the thoughtfulness required to bring about change. We quite naturally take ingrained behaviour for granted – a form of behaviour, a habit, seldom or never questioned.

Of course, not all movements or travels are experienced as arduous and a drain on resources. But the really challenging advantage of IT is that it makes it possible to reduce the physical transports that feel like obligations and sacrifices, and instead commit our resources to travels that we experience as more rewarding.

In the presented strictly regulated structure, the overall system of traffic is a completely decisive element in the social apparatus. In order to carry out their perfectly normal everyday lives, people have come to be dependent on a functioning traffic system, and assume as self-evident that such a system will always be available. Furthermore, *the traffic apparatus is to a large extent dimensioned, and continues to be dimensioned, in line with the travel needs occasioned specifically by commuting in the morning and afternoon.*

Viewed from an socio-economic perspective, there is much to be gained if travelling, and hence traffic, is reduced. It has been estimated that if traffic during morning and evening rush hours in Stockholm could be reduced by so modest an extent as 6 to 8 percent (assuming the current population size), the need for further expansion of the traffic system would decline.

New Work Methods and Forms of Organisation

New, more flexibly constructed organisational forms are now being created and refined on the basis of the possibilities accorded by information technology. The form that has so far perhaps received the greatest attention is *teleworking* or, as it is sometimes also called, *telecommuting*. Another type of flexible organisational form, or rather flexible work method, is made up of a growing number of people with what might be called "mobile offices."

Yet another variant is so-called *neighbourhood offices or telecenters* – this organisational form has many names. This type of workplace, in which the idea is that people from different companies can telecommute, has not as yet had any major impact.

One variety of what earlier was called branch units of the company's main establishment is so-called *satellite offices*. These are characterised by being run with functions that use IT techniques to serve the company's customers without direct personal contact with the customers being required. In principle, these satellite offices can be located anywhere as long as the telecommunication requirements for the activities are available.

Another form of teleworking can occur at *existing local offices of a company*. Instead of commuting every day to the head office in e.g. Stockholm, it may be possible to schedule work one or two days a week at the company's or organisation's office in one's home district. Of a somewhat different character of organisational form, yet still presupposing more or less advanced IT techniques, are so-called *virtual organisations*.

VOLUME, STRUCTURE AND DEVELOPMENT OF TELEWORK

So new working methods have emerged and established themselves as a result of being able to loosen these bonds. Teleworking, telecommuting – there are several appellations for these more flexible ways of organising work on which we here focus our attention. The labels indicate that there is both a spatial perspective, *where* we work in relation to some other function/activity, and *how* we work to bridge the physical distances that result. For the latter, IT constitute an important component – indeed, a prerequisite. IT in all its guises thus functions as the super glue that holds everything together.

The amount of telework is also a matter of definition

Up until now, developments have been characterised by taking advantage of the opportunities for *flexibility*. This implies that teleworking is largely utilised as a *complement* to working in an ordinary (traditional) place. Hence we can state that there is no unequivocal definition of teleworking. We have, however, established the following definition for the empirical section of our study, which follows.

Gainful employment which is entirely or to some extent located in the home or some-where else other than the ordinary workplace. The lower limit for the temporal extent of teleworking is set at 2 hours/week. Agricultural workers and childcare personnel are not included.

Teleworking in Sweden

During 1995 a study was carried out that was a comprehensive charting of the extent, structure and development tendencies of teleworking in Sweden[1]. The results in the present section are based mainly on the empirical material gathered from the Statistics Sweden investigation of living conditions 1995. The population studied comprises over 6,000 people in Sweden between the ages of 16 and 84. Thus the results throw light on tele-commuting from the perspective of the individual person.

The total number of telecommuters in Sweden in 1995 amounted to approximately 700,000. It corresponds to ca. 18 % of all people employed in the country. Nearly *one-fifth of the Swedish labour force is regular telecommuter*. To the 700,000 telecommuters included in this study can be added somewhat more than 250,000 people who work at home up to 2 hours/week. Compared with results from a similar study 1986 there is a rather small net increase, about 4%, in the number of telecommuters. Around 75% of these people normally worked up to 10 hours/week at home. Hence the majority of them had a strong connection to the ordinary workplace.

Teleworking is Flexitime Working

Table 1 presents a general distribution of work time put in at a distance. There is, however, something of a difference in the distribution by classes for the extent of teleworking between 1986 and 1995. Hence not all of the values in the table are comparable in detail, yet they nevertheless provide a good picture of the important features of the development.

	Total number	Percent
2 – 7 hours/week	315 000	45
1 day	125 000	18
2 days	140 000	20
3-4 days	70 000	10
Full time	50 000	7

Table 1.   Distribution of teleworking time in 1995.

If we look at those who telework 1 day or more per week, taken together, they represent about 400,000 people or 10% of the total labour force in Sweden. The greater number of these people work on flexitime between the ordinary workplace and a workplace at home, but being wholly absent from the ordinary workplace for entire days bestows a more formalised character on their teleworking. The majority telework 1-2 days per week, nearly 40%. Of these 400,000 people, those who telework full-time constitute a clear minority: only 50,000 people. The number of *employed* people in the whole country who telework full-time is only 10,000.

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[1] Engström M-G, Johanson R, Follow IT into New Forms of Organisation and Work Methods, KFB-Report 1998:5

Sex – Age - Education

Distribution by sexes is not quite equal: 62% men versus 38% women. This is, incidentally, not very different from the situation in 1986.
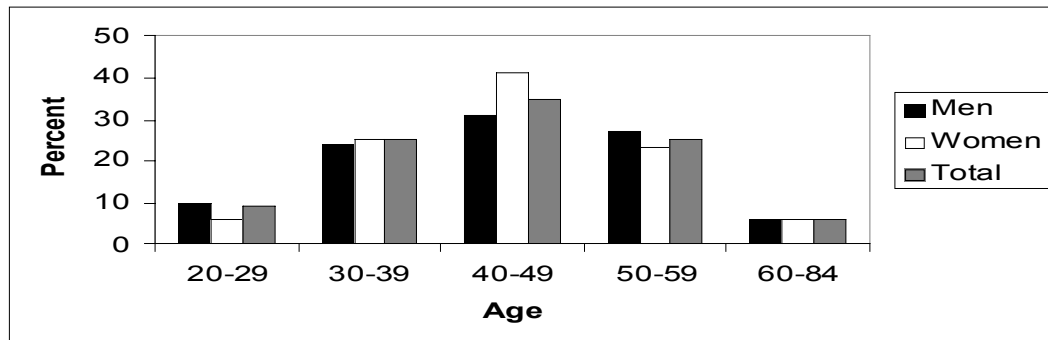

Figure 3.   Sex and age distribution of teleworking 1995

The largest number of teleworkers, just over one-third, are in the 40-49 age group. Then come the 50-59-year-olds and the 30-39-year-olds. Thus this means people who have managed to establish themselves on the labour market. Generally speaking, younger people telework to a lesser extent. This may seem to be somewhat contradictory, not least when considering that younger people must be viewed as more computer mature and more favourable to change, and should thus find it easier to exploit new work methods in combination with new techniques. More important, teleworking is less congenial in a situation where one is trying to make a career on the labour market.

One interesting difference between 1986 and 1995 is that there has been little displacement between age groups. In 1986, the number of younger people (i.e. 20-29 and 30-39-year-olds) was somewhat larger than in 1995. From this point of view, then, teleworkers have grown older. Which raises the question of teleworking as an element in the various phases of the life cycle.
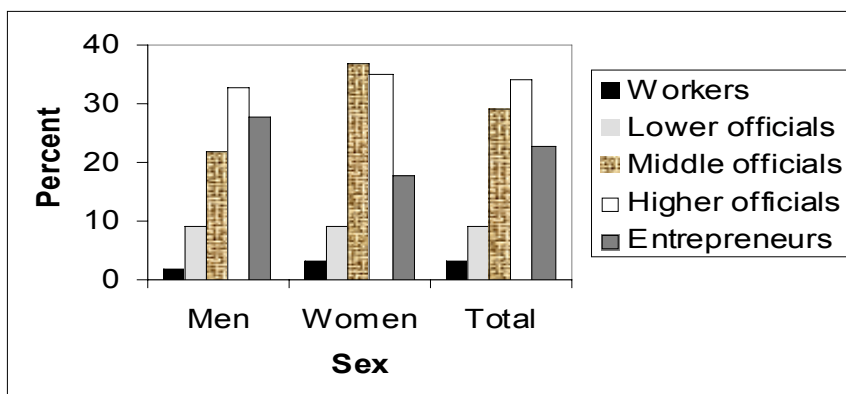
Figure 4.   Socio-economic distribution of telecommuters 1995

It could be determined from the findings of the 1986 study that the "modern" telework in one's own home is done mainly by white-collar workers, entrepreneurs and freelancers. There has been no significant redistribution of the shares of the different groups between 1986 and 1995.

Another way of characterising telecommuters is to look at their educational profiles. In comparison with the population at large, for example, the number of college graduates is

nearly three times higher among telecommuters than among Swedes in general. However, it is more to the point to compare the figures *within* the socio-economic groups where teleworking is frequent.

The telecommuting white-collar employees and entrepreneurs consistently reveal a higher level of education than the average for their respective groups. Small changes occur between 1986 and 1995 in the education levels of telecommuters, which should reflect the general trend in society, where more and more people have some post-high school education.

Time as the Key

We have determined that virtually all teleworking still implies some "oscillation" between an ordinary workplace and, primarily, the home. The temporal extent of teleworking is therefore interesting in many ways. One of them is being able to portray who the telecommuter is; another is scrutinising in greater detail the conceivable consequences of telecommuting. The freedom in terms of time – and space – provided by teleworking significantly enhances the individual's freedom of action. But different kinds of behaviour can be expected if teleworking is mainly a way to distribute work between different places during a day, or if it means working at home one or more days per week. Thus time becomes an important key. Here we turn to the vast majority who put in *some* of their work time in a teleworkplace.

A somewhat larger proportion of men telework less than one day, i.e. are included in the category of those who normally divide the workday up between home and an ordinary workplace – or, possibly, take their overtime home with them at night! On the other hand, a larger proportion of women telework 1-2 days. In the group who telecommutes 3-4 days per week, which is on the whole quite small, the proportion of men is once again somewhat larger.

Regarding age: the older the person, the more teleworking time per week. Even if the differences among the age groups is not dramatic, we notice that weekly teleworking time increases with age.

More Teleworking

The net-increase in the number of teleworkers since 1986 is only about 4%. (The *turnover* of telecommuters during this period cannot, unfortunately, be reported with the assistance of this study.) A shift has occurred to the extent that *the average teleworking time per week has increased*, which is an interesting change, especially if it continues. If we combine the number of telecommuters with the time spent teleworking we find that in 1986 the average work time was barely 1.2 days per week. About one decade later it was 1.5 days per week, i.e. an increase of 25%.

This development is interesting from other points of view as well. In part, it confirms the picture of the telecommuter as by and large a flexitime worker, who implies that *time is divided between a traditional workplace and the home*. Although the proportion of telecommuters who work in principle 3-4 days evinces a small decline between the occasions of the two studies, there are nevertheless some groups of people who have notably altered the extent of teletime put in. *White-collar workers in more prominent and leadership positions, as well as freelancers, telework to an even greater extent.* From mainly teleworking only up to one day in 1986, in 1995 two or more days of teleworking has become more unusual.

Among the different branches of business, it is primarily in *banking, finance and insurance that a striking increase in teleworking has occurred.* For example: in 1986, 75% of the telecommuters in these businesses put in less than one day teleworking; in 1995, that

had dropped to just over 40%. On the other hand, however, the proportion that telecommute 2 days had increased drastically from 6% in 1986 to 27% in 1995. Even the share of those who telework 3 days or more has doubled; here we find about 25% of the telecommuters in these branches of business.

Computer Aided Teleworking

In 1986 there were about 45,000 telecommuters with computer support, corresponding to 5% of all telecommuters. Since then personal computers, along with certain kinds of communications auxiliaries (e.g. mobile telephones and telefaxes), have changed immensely from being relatively exclusive tools to being almost standard appliances in the home. In a study commissioned by the IT Commission, Statistics Sweden shows that in 1995 over 60% Swedes between 16 and 64 years old are or have been computer users. ("Computer users" means people who use computers, terminals or other computerised equipment at work or in the home.)

Against this background, it follows naturally that teleworking with the help of data and telecommunications has increased immensely. In 1995, 56% of all telecommuters used personal computers as tools. If we consider the more communications-oriented portion, 19% used a personal computer with a modem, 20% used a telefax and 6% used e-mail. Though when we reflect on the general expansion in the IT field, there is good reason to suppose that the proportion of telecommuters who use computers, faxes and e-mail has grown substantially since the time of the study.

The Pros and Cons of Teleworking

If in the early days there were certain apprehensions about teleworking, a marked shift in attitude was noticeable before long. One factor contributing to this shift was surely that modern telework took on a totally different character than the former "working at home," with which many people were undoubtedly making comparisons. This favourable impression has been reinforced as the number of teleworkers has grown and a number of practical questions about support elements – computers and modems and the like, information, contacts with co-workers etc. have been answered.

Even though it has been possible to remove a number of concrete misgivings about the disadvantages of telework from the discussion, it is certainly true that a new way of working will have consequences. The pros and cons can and should be studied from various points of view, and here we concentrate on the perspective of the individual.

In this context it is of course essential to adopt a very broad plan of attack. Details that affect the individual level, for example, quickly manifest themselves and are often given a prominent place. This applies not least to the positive effects of flexible work/telecommuting. If we view the break-up of work organisation as a whole, in combination with the information technology revolution, we find the emergence of an entirely new societal configuration in which both positive and negative effects will of course present themselves in very complex structures. Nor must the *time perspective* be forgotten. It may be appropriate to consider comparison with "industrial society" or "automobile society;" is it possible to state simply what is positive and negative, both in detail and overall? This simultaneously indicates that the effects, both individually and taken together, are of especially great significance when it comes to the ways in which society is going to develop.

Teleworking and Its Implications for Travelling

The opportunity to influence travelling, both in scope and kind, is often emphasised as a particularly positive effect of teleworking. The term "telecommuting" indicates that it is information which is to travel with the help of telecommunications, not necessarily a per-

son who must travel to set places where work or other activities take place. The attention here is naturally directed to work-related travel, which accounts for nearly one-fourth of all transports in Sweden. This extensive travel to and from work is also, in many places, dimensioned for the transport apparatus, including both roads and the system of public transportation. Thus a great deal stands to be gained by at least reducing the peaks of work commutation. A reduction of traffic also has consequences for the environment.

Less congestion also offers possibilities to improve the physical environment, not least in metropolitan areas where traffic facilities of various kinds have pre-empted a lot of land and created barriers. It may even turn out that the demands for expanding the traffic system can be curtailed. In concrete terms: Can the requests for large projects involving roads and railways be reduced if telecommuting increasingly replaces physical movements between the home and the office?

The effects of information technology on travel patterns are best understood if the individual is placed centre stage. People's attitudes towards and application of IT stand out as completely decisive for the outcome, along with gradually emerging changes in patterns of behaviour.

Very simple arithmetic indicates that one day's work at home reduces the *number* of trips by 20%. This can be recalculated in terms of person-kilometres and fuel consumption to provide an idea of the savings that can result from increased telecommuting, in general or in a particular region. In principle, this assumes "all else being the same," which cannot, of course, be realistically anticipated. In the longer run, however, we can expect the appearance of new residential patterns, different choices of mode of transportation, more leisure time travelling, etc. One effect of telecommuting is the emergence of new patterns of travel when the temporal and spatial deadlocks play an increasingly minor role. The implication is thus that the changes we see before us will affect not only the extent of travelling but also its structure.

On the microlevel, however, it is still far too early to register any clear-cut effects of tele-working with regard to extent and structure. Hence it is far too early to draw any long-term conclusions concerning future investments in infrastructure, for example.

WHAT'S HAPPENING ON THE HORIZON?

The basic features in an essential part of the picture of developmental trends with regard to *where, when and how we want to and will be able to work in the information society* are fairly clear. Movement in the direction of *increased flexibility* is apparent. This implies that we are going to see a number of new types of organisational forms and work methods about which we know very little today, but about which we may make some educated guesses. Here, as so often in the past, the precursor is likely to be the IT constituent in the business sector. In this case, there are two partially overlapping features of organisational form. One touches on the company's/employer's overall organisational structure. The other has to do with the individual workers' functions and ways of organising their work in time and space (and in relation to their co-workers).

When discussing possible or conceivable (or desirable) tendencies of future developments, it is important to specify the assumptions employed in judgements and calculations. Some of these have been mentioned earlier, but some factors deserve additional attention.

When discussing both the current extent, and especially the coming development of tele-working, then it is important to remember that the changes in work methods that we have

so far been able to observe, have occurred mainly within the framework of the structures that long characterised the organisational principles of the industrial society.

This means that new and palpably different ways of organising work are still hampered by the models for running enterprises that were applied within the framework of the factory culture. To assimilate different approaches, new knowledge, different values, and hence let the old ways debouch into ways of working that are substantially different from current practices, requires a not inconsiderable measure of reorientation, and not least among employers and managers on various levels of working life.

This reasoning implies that the changes that can be introduced now – through the development of information technology – will have to deconstruct and bridge over the prevailing structures in order to make progress. And this is a sluggish process, because the various structures on which enterprises have previously rested are tenacious! Among the major obstacles, perhaps the greatest are the valuations and ideas of various groups concerning the principles for how enterprises should be run and how work should best be done. All of these conditions guarantee that suggestions for other ways of running enterprises and carrying out work tasks than the prevailing ones will, at least at the beginning, encounter a very narrow doorway, partially blocked by institutional inertia.

Nonetheless, the development, application and penetration of IT is, as earlier said, spreading to ever more areas, which implies that ever more people are included and become participants in the potential of the technique. The technical possibilities increase all the time – the technique is polished, capacity expands, new applications become available and open up hitherto virgin territories. The changes in work tasks within existing enterprises, and especially the new business areas that are constantly emerging – in many respects depending precisely on "ITfication" – facilitate the spread of the technique in principle throughout every facet of society. In addition, there are concurrent changes in valuations and many other influential factors in the surrounding world (internationalisation, new regulatory systems, etc.) which make it gradually easier to introduce new forms of organisation and ways of working.

In another 10 - 15 years the picture of society concerning the features studied here will be even more altered, because today's prerequisites for confronting future development are appreciably different from those currents in the past. But what can one say about the *course of developments for future work methods*? "Developments" here refers to the changes in various factors. If we focus specifically on home-based telecommuting, the following features can be applied to the concept of development or change.

The most common measure with which to indicate growth is the *number* of people who telecommute. But we can also describe the *time scope* in which changes in telecommuting occur.

What Potential for Teleworking?

A comprehensive and systematic analysis of the possibilities of reorganising enterprises for greater flexibility - in the light of such things as the technical prerequisites provided by IT, more precise descriptions for the goals of various tasks, access to creative thinking, and not least a reappraisal of the attitudes of employees - would affirm that a very large proportion of tasks could be carried out from a distance. In terms of the immediate future, however, we are still talking about redistributing part - not all - of one's work time to a different place (primarily home) than the ordinary workplace.

The potential for teleworking can partly consist of those people who are already engaged in part-time telecommuting and who would like to augment that time. It can also consist of people who at present do not telecommute at all, but who would like to do.

It is still maintained in certain circles that there is a limitation on the numbers of tasks that can be carried out via teleworking. This is not so surprising in and of itself, since we continue to find ourselves positioned at the very onset of developments in the field of data and telecommunications. Also, existing ways of organising work and old modes of thinking continue to set their limits. Even within a reasonable time frame however, as 10 – 15 years, it is likely that there will be surprisingly few work assignments that cannot be carried out from a distance. In an overall perspective, there should be hardly any really practical and organisational obstacles to a significant expansion of various forms of teleworking.

Yet another measure of potential, obviously closely associated with what has been said above, is how the individuals themselves view the possibilities of carrying out their *current* assignments by telecommuting from home. Here we can identify two groups: those who never telework and those who presently telework to some extent.

Among gainfully employed in Sweden who presently do not telecommute at all, there are some 500,000 people (ca 12% of the total) who find it practicably possible to work more than 2 hours/week on their present jobs. The potential of quite new telecommuters should thus be significant; it is almost a question of doubling. If we put a limit of at least 1 day per week we will have over 300 000 people or 8%. To that we can add people who have previously been in the borderlands of teleworking (up to 2 hours/week) and who can imagine teleworking more. In conclusion, we can expect that even among those who are already teleworking more than 2 hours/week there are some who can imagine enlarging the scope.

If all those who wanted to were able to telecommute one or more days per week, it would involve almost one-fourth of all people gainfully employed in Sweden. However, we should bear in mind that this share expressed in number of working days corresponds to less than 10% of the total number of workdays in the country. This is explained by the fact that the time people wish to put in teleworking is predominantly one to two days per week at present.

The Company as the Motor for Increased Teleworking
Individual choice and attitude regarding different IT applications have thus far appeared to be most decisive for developments up to this point. Only when many people accept and begin to use new technical innovations and allow other behaviour more or less fit into the new situation will the effects be reflected in substantial changes

Accordingly, up to now it has essentially been the wishes and attitudes of individual people that have pushed development in the direction of so large a magnitude of teleworking as we see now. *The next significant phase in this development, however, will in all likelihood be impelled by progressive companies/employers*.

Another area is the effect of various kinds on society in more general terms that may result from wider adoption of telecommuting. Many of the sectors that constitute core areas in society will gradually be affected, and more markedly as time goes by, as telecommuting becomes more widely diffused and grows in both intensity and numbers of people involved. Here we offer a very concise presentation of some of the areas that will come to be influenced in one way or another.

The effects will make themselves felt in different areas with different *time displacements.*

- Trips and transports
- Design of residential housing
- Moving patterns
- Planning the physical environment
- Services: social, cultural, commercial
- Educational structures
- Social relations
- Regional development (structure)
- Etc.

The basis for a number of different effects that can be observed and anticipated in these areas derives from the changes in organisational forms that have been made possible for companies and other types of enterprises through new applications of IT. *Travelling and modified travel behaviour* has been discussed earlier in this report. This is an area in which it will *relatively soon* be possible to see new travel patterns. No major effort is normally required to adapt to different travel habits.

The interior design of residential housing or an adaptation of existing housing will probably appear gradually and in accordance with individual requirements, and can be implemented as and when needs and desires arise. As far as new construction is concerned, we view the matter in a completely different light. For one thing, it will probably take a while before new approaches are adopted; for another, it will surely take a long while before they are actually applied in the production of new housing.

The other areas mentioned above will probably be affected at a later juncture. No doubt it will take longest to be able to observe any palpable *regional effects* in the form of developmental innovation. Here, many people place great hopes on the possibility that IT can be an instrument used to bring about improvements in the competitiveness of outlying regions. Somewhere between these near and distant junctures we will probably see changes in the other areas, from *social relations* and *services* to *planning of the physical environment.*

Modifications in Human Actions and Behaviour

From the perspective of the individual, there are basically five different lines of development, or rather courses of development, that the telecommuter (or potential telecommuter) can resort to for maintaining or changing his or her situation.

- **Work part-time (or full-time) at home without moving about.**
- **Move to another place (residence) or to the vacation home, but keep the job (with a combination of telecommuting and commuter trips to the workplace).**
- **Look for new job opportunities, partly by telecommuting and partly by commuting from the present home.**
- **Working part-time at home without moving about, in combination with greater utilisation of the vacation home (e.g. by extending holiday trips).**
- **Working at home with no connection to a fixed workplace (working in networks, project organisations, etc.) This provides greater freedom to choose where you want to live.**

IT as it affects our daily lives

We can see even now how a number of activities/functions in our society are affected by the application of information technology. This has consequences for

- those who work with these functions, i.e. the organisation of their work undergoes change;
- those who utilise the services/functions in question. This is probably where we can find the greatest effects.

And, in turn, such applications of IT contribute to the flexibility and greater freedom in time and space, which pervade this entire report as a major motif. For example, this involves the entire range of services offered by banking, insurance companies, travel agencies, and so on. *Telebanking, teleshopping*, etc. have become more or less conventional usage's.

For a number of years now, the concept of *telemedicine* has established itself. Expert assistance is now available in many fields. Now it is even possible to employ a combination of IT and robotics to carry out medical procedures involving patients and surgeons who happen to be in different places. Just a few years ago, hardly anyone could believe that this was possible. This demonstrates that most people will find it difficult to imagine the extent to which new and progressively developing techniques can be used for – regardless of field and assignment.

Distance education is another kind of technical application in terms of bringing people together. Furthermore, various kinds of *computer-based expert systems* have been developed, at the outset primarily for the business sector. Such services have been developed, step by step, and introduced directly into the household. There is a fast growing lot other of applications what we have no space here to mention.

Future Work Methods and Forms of Organisation
In this connection it may be interesting to think, and speculate in general terms, about how the next generation of organisational structures might appear. Those who succeed in developing new, more effective forms of organisation will obviously enjoy a head start in the attempt to develop successful companies or enterprises. This is a decisive component in the incessant challenge for companies etc in their quest to capture the formula for success in our kind of economy.

Via the tendencies to change in organisational matters that have previously been thoroughly described, there are also changes in the earlier applicable and dominant employee/employer relationship and the number of people who now are self-employed. We can see, and foresee, a development in which more and more people (e.g. through the possibilities of teleworking and, gradually, for more employers) will become entrepreneurs, establishing companies or corporations, and so on. It can not be precluded that there may be a need in the future for other kinds of indirectly employed personnel ("self-employed" people) with subsequent demands for modifications in laws and regulations.

Nevertheless, the principal phases of many tasks will continue to consist to a substantial degree of manual or physical input or require physical presence. It will probably be a while before construction workers can build a house with the help of IT and robots, and before the Same can sit in their homes and manage the rounding up and sorting out of their herds and so on up in the mountains. On the other hand, they can handle registration, reports, bookkeeping, etc. with IT tools.

Yet even in areas that require more physical presence new advances are being made that sounded like pure science fiction only a few years ago. As mentioned earlier, doctors have proven that it is possible to carry out operations on distant patients using IT and robot techniques. Miners no longer have to man their drilling machines in a cold, wet and risky work environment to bore their way through a mountain – they can sit at a control

panel in much more pleasant surroundings and work. Even farmers will soon be able to avoid sitting in their tractors to plow, fertilise, harvest, etc. Experiments indicate that in some years these operations can be carried out with machines controlled by telecommunications.

So there is no categorical answer to the frequent question about what jobs can and cannot be carried out from a distance – definitely not concerning tasks that many people would perhaps like to believe impossible to handle by teleworking. The structure of work assignments is of course not static in the face of unrelenting development processes.

More interesting in this connection, however, is the altered structure that can be created for the enterprise's spatial organisation of different work tasks when IT is more fully utilised. Simultaneously as old attitudes about where work should be done (located), when it should be done, and how it should be done can be radically changed for more and more activities. The customary and traditional linkage between tasks, prescribed places/premises and fixed times can then be relaxed or even eliminated.

The Regional Structures of the Business Sector in a New Guise

The discussions, analyses and descriptions usually presented about the business sector in various districts or regions often begin with employment data classified by line of business or industry for the so-called "daytime population" in the geographical area concerned. These takes for granted the people who work in the companies and other enterprises located in that district or region. The "night-time population" of a place has not been an equally relevant measure for description, since there is a stream of commuters who perhaps mainly travel in only one direction - e.g. *from* the place in question.

In line with the developments described earlier, the relevance of this type of description will diminish. It will be more interesting to look at the population who live *and* work in a district or region, what kinds of work assignments/employment, education, etc. they have, rather than to concern oneself with the address of the company/employer. IT provides ever more people with the opportunity to live in one place and have their employers located someplace else.

Concepts like localisation policy, relocations, location subsidies and so on, as traditionally understood, lose thus their physical and applicable sense. The place, district, region of the company or other enterprise has then in context – in the IT time/space – come to have an entirely different signification.

Towards a New Symbiosis

To the extent possible, perhaps with greatest consideration given to economic conditions, people have gradually allotted higher priority to the choice of desirable housing and living environment. Of course these priorities vary during one's lifetime and for different family situations. When you are young, it may be appealing to live in the heart of the city with its multitude of activities. When you become a parent, it may be more attractive to live in a more peaceful, less intimidating place closer to nature. And later in life you may discover new priorities that imply a change in both housing and location.

The goal of many people is to be able to live in their own house. Furthermore, Swedes, like other Scandinavians, are far more likely to have their own vacation homes than people are in other countries. (In various connections, it is often said that Swedes retain a strong streak of their peasant background, with a powerful urge for natural surroundings, in contrast to others, particularly, perhaps, southern Europeans.)

However, for more than a century (the industrial era), access to suitable and available jobs has basically determined where many people actually live, even if, for many, the

geographical distance between where the job is located in relation to where one resides has continued to grow. But in principle it is now possible to use technology to assign increasing numbers of work assignments to the places where people want to reside, i.e. begin with where people want to live and move the work to them instead of moving people to the places where the plants and offices have been located (built), which has been the normal assumption for the decisive relationship between workplace and living space since the dawn of industrialism.

The generation of jobs – the need to have certain tasks carried out – can and does arise in completely different places, both at home and abroad. And a steadily increasing proportion of the tasks that are necessary or desirable to have carried out can also, with the help of IT, be handled from the place one wants to be – even if that place happens to be of a temporary nature.

Thus we can imagine work assignments within a number of enterprises as being more or less *released from the spatial dimension, i.e. having no obvious or unconditional ligature to a particular building or location*. The mentally well rooted association with a physical place, a building, to which we are accustomed because of the organisational structures that originated in the industrial era, can thus be abandoned.

CONCLUDING REMARKS

The future development of society will be characterised by an increasing dependence on various IT aids. We are only at the dawn of that development. Obviously there will be many more or less impassioned reactions against many of the changes that will result. Many people will worry about what will become of the human being in this brave new world ever more based and dependent on technology. It may appear as though it is the human being that must adjust to technology rather than vice versa, even though there has been a clear movement lately in the direction of more user-friendly techniques. And others will ask what will happen to social relationships if "everyone is sitting in splendid isolation just staring at a screen?"

Every introduction of a radically new technique is generally met with great scepticism and often with hostile reactions from different quarters. For many people, changes often imply insecurity and sometimes frustrations that can result in stressful situations. Unfortunately, it seems that the introduction of new technology is unavoidably accompanied by certain negative effects. Basically, this is how it's always been. With the breakthrough of industrialism, and in principle throughout the era it has dominated, significant numbers of people have been afflicted both physically and in other ways. It is unlikely that information technology will similarly lead to physical injuries, but we cannot exclude the possibility that it may give rise to other problems.

Within the European Union (EU), strenuous efforts are underway to increase the use and application of information technology across the board, but above all by small and midsize companies. It is widely hoped that this will contribute to creating more new jobs, as unemployment is perceived to be the single greatest problem in Europe at present. An essential part of the policy behind this commitment is to stimulate companies/employers to introduce new forms of organisation and new work methods, such as telecommuting. Special action programs have been adopted to propel these initiatives towards goals that have been established for their realisation. Slogans like "10 million telecommuters by the year 2000" have been formulated by the so-called Bangemann Commission which works with various IT policy issues in the EU.

We can certify that the *confinements to time and space* that have generally applied in the past as restrictions – e.g. on the possibilities for various enterprises to (re) organize them-

146

selves – have gone through a radical change. The need to exchange information and make contacts by moving about physically has been forever altered by the attributes of information technology. Primarily, it is the communication and atomization features of IT that have facilitated these emancipation's so that we now enjoy vastly different freedom of action.

This can, indeed, be viewed as part of the development towards generally greater flexibility in society, a change that gradually permeates ever more services and functions. Most physical and temporal deadlocks associated with earlier ways of operating can thus be dissolved.

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Combinations and tracks: An investigation of the relationship between homework and mobile work

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Abstract

In temporary discussions on telework, both mobile work and homework are considered as important subjects of the debate. Generally speaking, the attention has turned from homework towards mobile-work during the last five years, both among researchers and in the public. However, little effort has so far been done to study the interaction between these two important types of telework.

Too often mobile work and homework is treated as separate entities, assuming that there is a clear-cut boundary between them. The main argument of this paper is, on the contrary, that there indeed is a close link between these two categories. Moreover it is argued that they stimulate each other respectively, and that there is a movement both from homework to mobile work, and vice versa. Thus, the most important form of telework in the future, will be a combination of homework and mobile work, possibly supported by a variety of so called " flexible offices".

The paper is based on two kinds of data: Firstly a broad survey-analysis of the Norwegian labour market, conducted by Telenor R&D during the period 1994 to 1997. The key-questions have been repeated two times during the period, and it has given us the opportunity to follow closely the development of homework and mobile work in Norway. Secondly, the analysis is based on experiences from a number of case studies among Norwegian enterprises. Since 1995 Telenor R&D has been involved in several field trials with homework and mobile work.

The full paper consist of three main parts: In part one the development of mobile work and homework in Norway is presented, highlighting recent findings from our new survey. Then, in part 2, the connection between homework and mobile work is elaborated more in detail, referring to several case studies. Different combination and "tracks" towards telework is discussed. In the last part of the paper, the main arguments are presented in full scale, followed by a brief discussion on the arguments implication for the general development of telework.

1. Introduction: the modes of telework

As often remarked by observers and researchers, there are a wide range of definitions on the concepts of telework. Despite a considerable numbers of efforts during the last 20 years or so, the field seems to be too heterogeneous and diverse to be covered by one single definition. This general lack of precision has lead to considerable uncertainty when measuring the phenomenon, (Huws 1988, Qvortrup 1992, Castells 1996). The multitudes of definitions has resulted in estimates of numbers of teleworkers fluctuating between 1 and 20 % of the workforce (Kraut 1989). And the difficulties are getting even worse when trying to compare the numbers in different nations, or estimate the future development of telework.

But even if there is no single definition available, there are on a more general level a common understanding of what are the "basic characteristics" of telework. The difference between work and telework seem to be much like the one between erotic artworks and pornography; it is hard to define precisely, but in real-life situations we can always tell the difference.

In general, there are three main characteristics that is commonly used to "frame" the field of teleworking (Huws 1988, Huws et al 1991, Korte et al 1997, Olson 1987)[1]:
- It is first of all *work* regulated by some sort of agreement
- It is work that is done on a certain *distance* to the main office, employee or contractor
- It is made use of *Information and communication technology* (ICT) to assist the work that is conducted at a distance.

With reference to this general framework, some major types of telework have been pointed out as most prominent. Although it is possible to identify several subgroups[2], *homework, mobile work* an *telework centres*. seems to be the three major types. The analytical difference between these three types is that the work is conducted in quite *different physical settings*, either in a private home, a community of fellow workers or in a variety of public places (including private cars, which is something in between). When used over a longer period they off course represent different opportunities and chal-

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[1] Beer & Blanc has been surveying over 50 different definitions of telework and they report that there seems to be a common characteristic that they all focus on three dimensions: organisation of the work , distance between the employer and the employee and the use of information technology (After DiMartino & Wirth 1988).

[2] Subgroups have been mainly constructed with respect to the type of work contract between the employee and the employer (self employed, employed), time used for working at a distance (the whole week, one day, in the evenings, etc) and the use of technologies (advanced use, simple use, etc). For a more detailed discussion, see Holti, Stern, (1986), Huws et al (1991), Korte et al (1997) and Forsebäck (1995)

lenges for the individual teleworker and the organisation he or she belongs to. In this paper I will refer to this as different "modes" of telework[3].

A fourth element that has appeared in the discussion during the last years is the new types of office environments - *flexible offices* - that often is used to support the teleworking. There are great variety her, but most of them share some sort of reduction of individual office space on behalf of an department or a larger organisational unit (See: Duffy 1997, Becker, Steele 1995). In its most rigid sense this is represented by "hot-desking" or "JIT-offices" where the employees are using they offices only part of the working week. I will here use the concept "office sharing" (OS-systems) to refer to this area.

The interest in the different types of telework has fluctuated strongly during the last 20 years (Huws 1991, Qvortrup 1992, Julsrud 1996). To a certain extent it looks like the initial interest for homework and telework centres more recently has turned into an interest for mobile work and flexible offices. Still, homework seems to be the target of most of the interest and research programmes in the field (Korte et al 1997). This may be due to that this type often appear as a more "positive" type of telework, providing most of the positive outlooks like a more comfortable working situation, an apparently more family friendly working situation, and the potential for reduction of work related travels. Mobile work is more easy linked to negative side effects, such as over working, stress, and increased use of transportation means.

The focus of this paper…

In this paper I will focus my attention on the relationship between the different types of telework, mainly homework and mobile work.[4] The reason for this interest is firstly, that this seems to be a very much neglected area. Due to the lack of a clear definition there is a certain tendency to include all kinds of telework in documents dealing with the subject, as if it were a referring to a well defined work practise with a predictable outcome. But homework and mobile work may in many areas have very different impact on the individual person as well as on the organisation and the society at large. Thus, to speak about "the impact of teleworking", without being very specific on the type of telework, is in many situations meaningless. In other studies there has, on the contrary, been a tendency to focus strictly on one single type of teleworking, leaving the impression that there is no connection between homework and mobile work. But if we focus

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[3] A similar use of the term is coined by Korte et al (1997)

[4] I will limit the discussion in this paper to "homework" and "mobile work". The reason for this is that this is the two main forms of teleworking, which has reached a necessary numbers of users in Norway

too closely on one type of telework, say homework, we might have the ill-fortune of overlooking several interesting broad patterns of development.

Secondly, I believe that a closer analysis of the relations between the different types of telework may reveal some interesting *combinations* of teleworking-types used by organisations. The interconnectedness off the different modes of teleworking is taking different forms, both regarding their individual design and their development over time. In some cases it is possible to investigate typical "*tracks*", where organisations have been moving from one form of teleworking towards others. In this paper I will draw attention to some recent Norwegian case studies to illustrate such "combinations" of telework-types, and the "tracks" they have been following.

2. Homework and mobile work in Norway

My initial interest for the combination between homework an mobile worker was triggered by working on a *survey analysis* of Norwegian teleworkers. At Telenor R&D we conducted our first national telework survey in 1994, and have since then supplemented with follow-up studies in 1995 and 1997. This statistical material has given us an interesting and unique opportunity to follow the penetration of telework -both homework and mobile work- within the Norwegian society.

Even though Norway is representing a small population of about 4 million people, I believe that the result have relevance at least for the development in other Scandinavian countries.

The data

Planning the survey, we expected the number of "advanced teleworkers" working from home major parts of the week and making extended use of communication technology, to be minimal. Therefore we decided to use a wide definition of telework, including also supplementary teleworkers. Our definition of *homework* thus included every employed person who conducted more than 5 hour of paid work per week in their homes. (We have however excluded employees in the agricultural sector). *Mobile telework* similarly refers to every one doing paid work outside their office site and their private homes more than 5 hours a week. The use of ICT has in our analysis not been applied as a defining criteria, but used in the analysis to describe certain sub-groups. The records from 1995 and 97, includes 142 persons which were doing homework, and 308 persons were doing mobile work.

The interviews was done by the Statistics Norway during November 1995 and November 1997. Using available files over registered households, they ensured a representative sample of Norwegian employees. In addition I will refer to one earlier study from 1994

very similar to these. This survey was asking several of the questions, however including a larger sample of households.[5]

The penetration of homework and mobile work

First of all, our material showed that there has been no increase in the numbers of people conducting work-related tasks from their homes. Unlike what has been reported from at least one recent US -investigation, our survey indicated rather that the number of *homeworkers* have been levelling off during the last years.[6] While there was as much as 8.1 percents that worked at home in 1994, this was measured to 7.3 percent three years later. Due to an estimated error-level on 1.7 % this do not necessarily indicate a decrease, but the number of homeworkers seems however to stay put on 7-8 percents.

In contrast the number of *mobile workers* - defined as employees working more than 5 hour outside the normal office and the home - has increased somewhat the last two years, from 16 to 17 percent. This means that there is around 140 000 Norwegian workers using their home as an office, and around and 390 000 who conducts work in their cars at hotel rooms, railway stations or other public places.

Looking at the general patterns of telework it is evident that a lot of work is done outside the regular office, even if it is done as a supplement rather than a substitute for ordinary office work. Based on these findings, the home does appear as the most central type of telework in the future. Not only are the mobile group of teleworkers twice as big as the homeworkers, but it is also the only one witch shows a growing tendency.

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[5] For an extended presentation of the results from this study, see Bakke (1996), and Bakke, Bergersen (1997)

[6] According to a survey conducted by FIND/SVPM, a New York-based market research and advisory company, more than 11 million people reported working as telecommuters in 1997, compared to eight million in 1995. This implies that the number of Americans who telecommute from their homes to their place of business rose by three million people or 30 percent during the last two years. For more information see: http://www.att.com/press/0797/970702.bsa.html
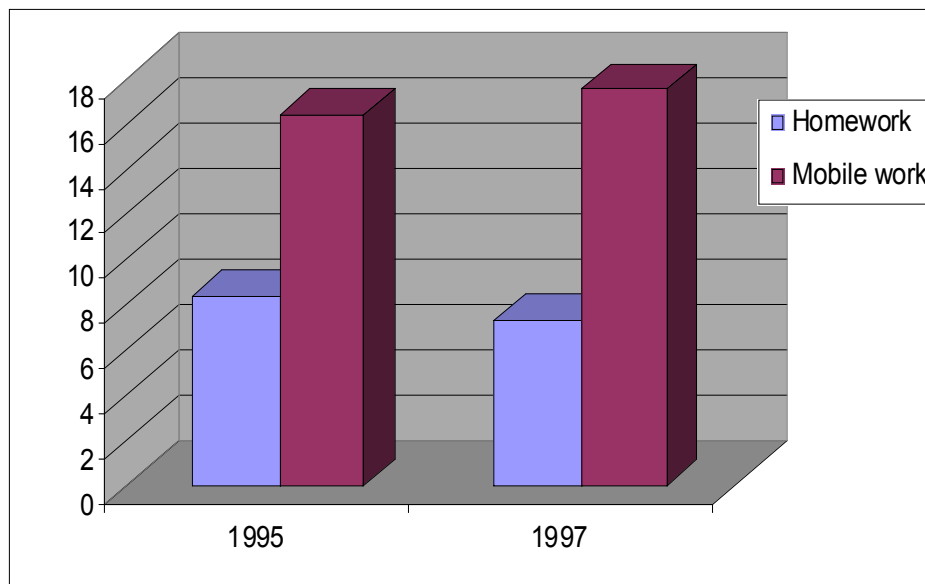
Figure 1. Diffusion of homework and mobile work in Norway, 1995-97. Percents of the total labour force.

Contrasting homework and mobile work

Taking a closer view at the social characteristics of the homeworkers and the mobile workers, it appears to be some striking differences: Firstly, the *homeworkers* seems to be concentrated within some isolated parts of the labour market. The employees doing "educational and scientific work" are in a clear majority. In this group every 4th person was working from home more than 5 hour a week, which is twice as much as the average among employed in "private services". The high number of homeworkers in this group is probably due to that Norwegian teachers in general have a strong tradition for taking along work home. It is, however, interesting to notice that the fastest growing segment during the period 1995-97 was the "private services", where the share of homeworkers doubled from 6 to 12 %.

Turning to the *mobile workers*, they are first of all scattered over larger parts of the labour market, even if "manufacturing industry" and "private service" are the most prominent. As it appears from table 2, mobile work is common both among employers in the transportation segment as well as in "trade, bank and insurance". "Education and research" are in fact the only categories where homework is more common than mobile work.

153
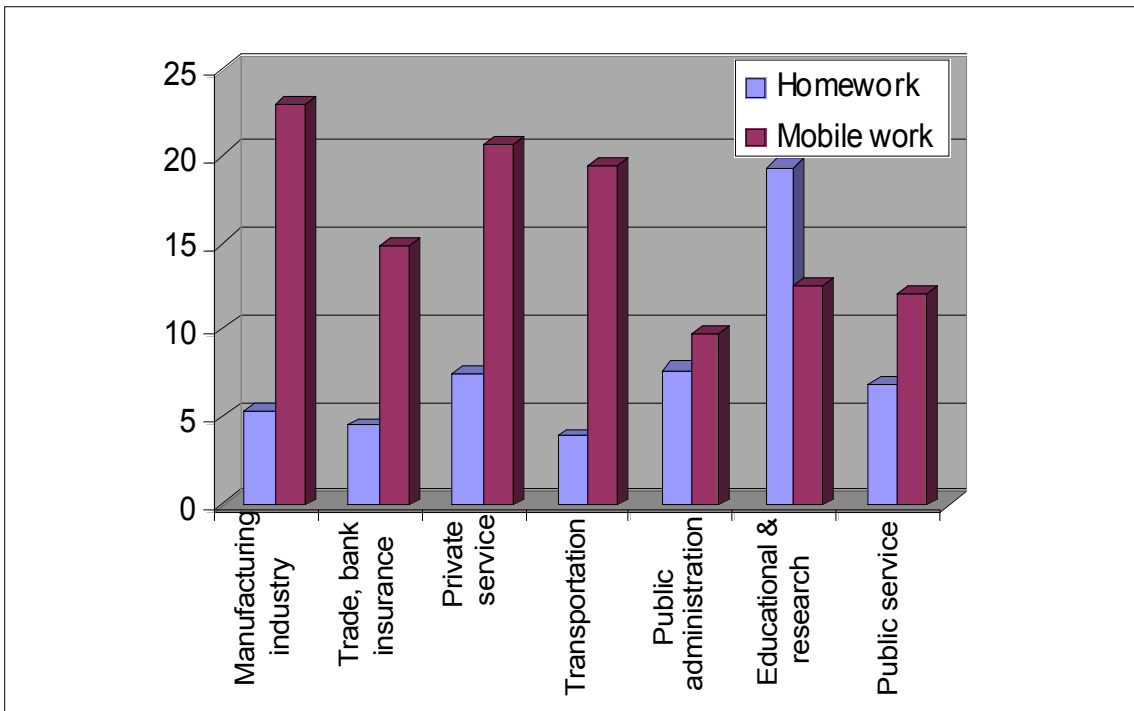
Figure 2: Homework and mobile work 1995-97. Classification of main work. Percent of each group
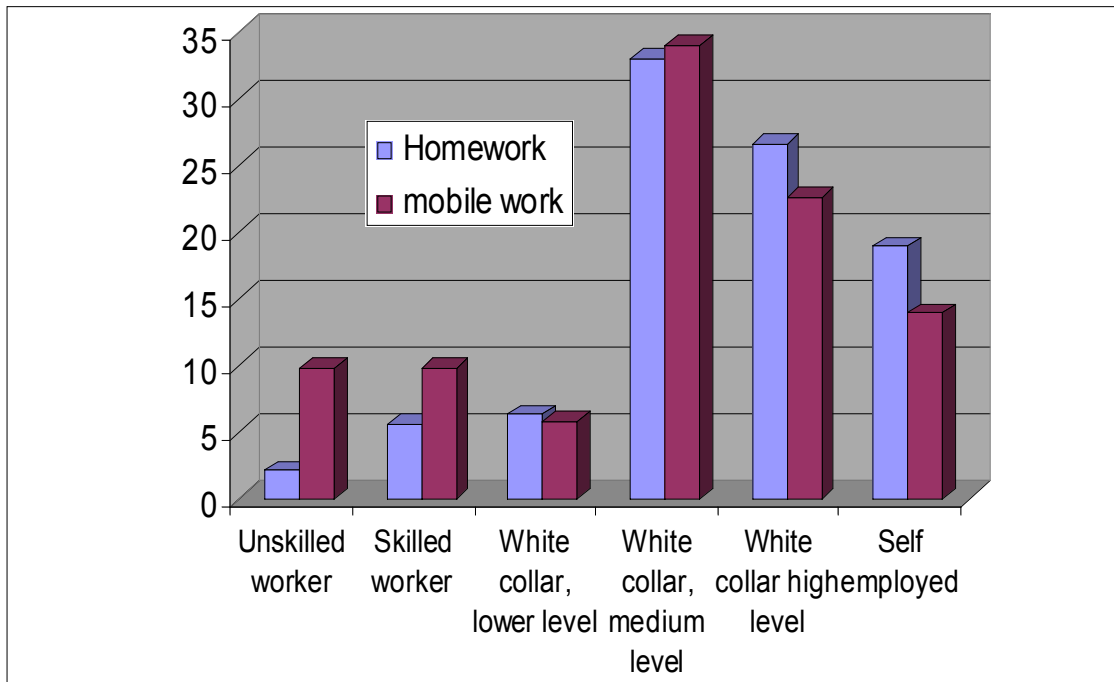
Figure 3: Homework and mobile work. Status on the labour market. Percent

Secondly, it is clear that there are more well educated and *more managers among the homeworkers* than the mobile workers. While the "high level, white collar workers" more often take their work at home, the skilled and unskilled workers tends to conduct more mobile work. This difference has obviously something to do with the type of

154

work that is hiding behind this very broad labels. Doing work outside the office is, after all the normal situation for several groups of manual workers like road-workers and truck-drivers. We should be aware of that the mobile worker, as it is defined here, may not necessarily fit the image of a business man on the run with a lap top and a cellular phone under his arm.

However, both types of teleworkers are dominated by employees doing a lot of *over-working* during the average week. For employed persons with 45 hours -working weeks or longer, both types of telework seems to be very common. The fear of misuse of telework by "workaholics" thus seems to be very real.

Thirdly, the mobile workers also tends to use slightly different communication technologies, than the homeworkers. As mentioned in the introduction we did not include "use of technology" as a criteria for our definition of telework. Rather, we decided to use this as a non-dependent variable indicating the mode of communication towards the employer. In general, the teleworkers have extended their use of both telephones, cellular phones, telefaxes, and e-mail during the last two years. But they do also use more regular mail and physical meetings. The use of e-mail have increased sharply during the period, making it the most popular communication link for the Norwegian homeworkers and mobile workers.
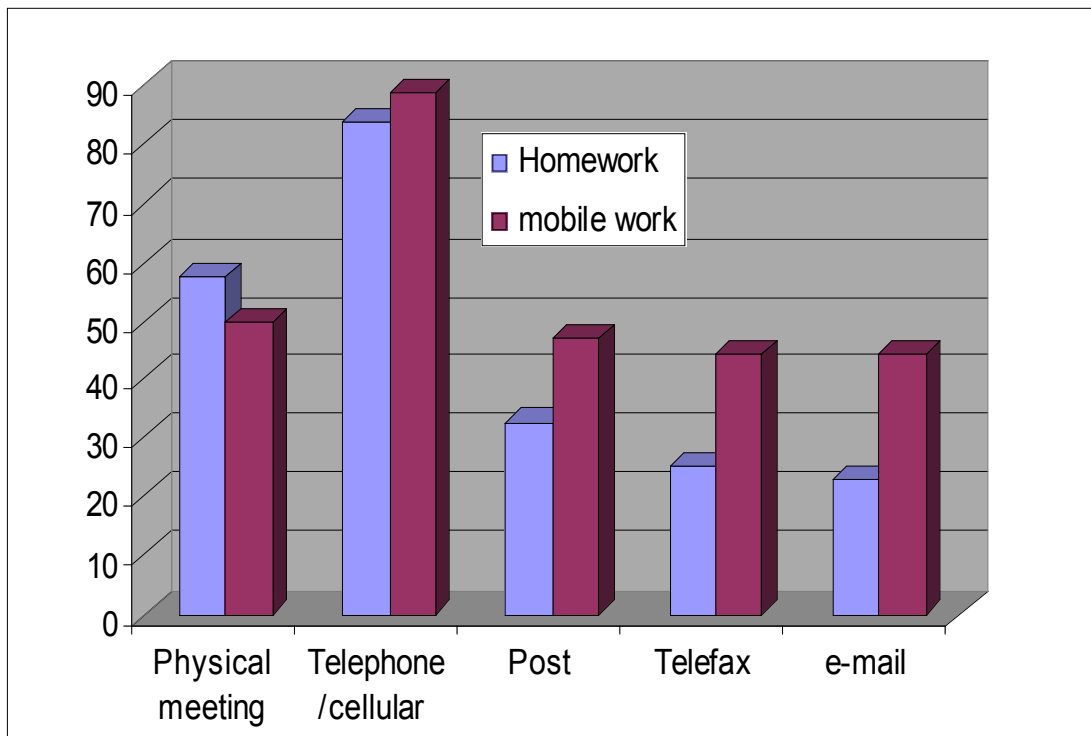
Figure 4. The use of communication media for homeworkers and mobile workers. Percents within each category

Looking at the differences between the homeworkers and the mobile workers, it is clear that it is the latter who are most intensive users of communication technologies. The share of mobile workers who use e-mail is almost twice as the share of homeworkers. This suggests that the homeworkers are using the communication media in an other way and may be also with other *intentions* than the mobile workers. It supports other findings indicating that the homeworkers may have a need for less communication technologies, may be because the are doing an other type of work.

The relationship between homeworkers and mobile workers

To sum up, our data indicate that more work is done as mobile work than as homework. The numbers of mobile workers also seems to be increasing slightly faster than the homeworkers.

Comparing these two groups shows that there clearly are differences between them, for instance when it comes to type of work. It seems like the typical homeworker have a relatively high education, working at a university or a research department. The home-office is used as a supplementary work-place, used to catch up with the work-tasks he did not have time for during the regular workday. In contrast, the typical mobile worker has medium level education, he is working in a sales department, but uses the technology more extensively so that everybody can reach him everywhere.

However, in-between these extremes there are a considerable overlap between homeworkers and mobile workers. Focusing on the similarities between these two groups we find that they show a significant correlation. It turns out that in many cases it was the same individuals who work at home and outside their homes. In fact, in our material every third homeworker was also a mobile worker. Comparing the analysis from 1995 and 1997 the numbers who combine homework and mobile work show a growing tendency, even though the numbers are relatively small.
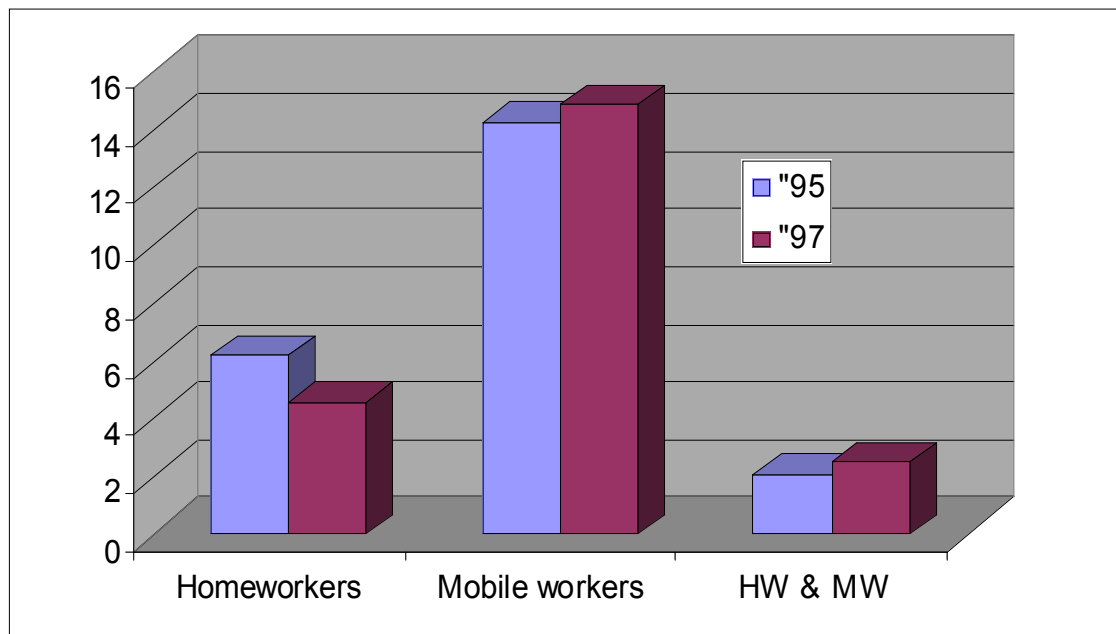
Figure 5. Teleworkers combining homework and mobile work 1995-97.

Anyhow, this indicate that there is a combination of different modes of teleworking taking place, sometime taking form as homework, other times as mobile work. The question of interest here is not simply if there *is* a connection, but also *in what way there is a connectio*n. In the second part of this paper I will analyse more closely some typical ways that users are integrating both mobile work and homework

3. Combinations of homework and mobile work

How is the combinations of homework and mobile work taking place in the enterprises and by the individuals? Field studies[7] of enterprises implementing telework conducted by Telenor R&D has given some understanding on how this is done in what we believe are "typical Norwegian enterprises". I will here present three of our case studies, each pointing at individual combinations of homework and mobile work.

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[7] The field studies have been conducted during 1995 -97 and is part of a broader project financed by the Research Council of Norway. The project has included a total of 9 trials in business and governmental organisations (See Julsrud 1996, Bakke et al 1997).

The insurance department

This case shows how an department of an insurance company have taken advantage of teleworking in their organisation. The department is part one of Norway's largest insurance companies, and their core business is the adjustment of insurance claims on the private market.

Since 1996 the staff of insurance adjusters in the residential market have been teleworkers. The telework-practise was established for several reasons: On the one hand they wanted their adjusters to work in a closer connection to their customers, so that they could get a better relation to the users of their services. Secondly, they wanted their own employed adjusters to have a greater share of the total work done, on behalf of external contractors. This provided the insurance company with better control over their insurance activities. Thus, the re-organisation of the insurance adjuster's work was part of larger changes to make the department more effective and service oriented.

The insurance company decided to use a combination of mobile work terminal, and home offices for their adjusters. Since 1996 a number of 15 employees have worked as partly homeworkers and mobile workers. The number of adjusters spending time at the head office has as a consequence been reduced, opening for an OS- system at the head office. It was simply less need for individual offices when everybody was working from home or out in the field.

The editorial office

The second case study refers to a group of workers in a weekly magazine on technical issues. The head office is located in the city of Oslo, but several of the core editorial group lives in the suburban areas. One of the journalists is located even further away, living in the south west of Norway, covering issues related to the oil-sector.

The need for a more flexible way of working was obvious, and they decided to give permission to work at home for three members of the staff. The object of the trial was to develop a more convenient workplace for the staff. After the trial period of 2 year the editor and the management was very satisfied with the homework arrangement and the way it had affected the organisation of the work. They stated that the new option to do work at home had increased the individual productivity as well as created a more family -friendly work-place.

However the journalists where hardly beginners on the mobile work. They had for a long time been working on different places (hotel rooms, cars, press conferences). The new thing here was that they got a new formal permission to conduct their writings in their private homes, and that they got the technical equipment to receive and send text

through a modem. Thus, their mobile work style was supplemented by homework, moving the small editorial office further in the direction of a "virtual enterprise"[8].

Banking department

My last example is from a banking department in central Oslo, where there has been implemented an office-sharing systems for a group of business-advisers. The banking department, which is part of a large bank in Norway, have a special responsibility for financial services for business customers. The telework was initiated in connection to the planning and building of new office facilities. The goal was to develop better offices for arranging meeting with the customers, and the advisors where going to be play an more active role towards their customers. They decided to use a office-sharing system, based on a hot-desking principle allowing the department to use more space for meeting rooms.

However the office system was only one side of part of the plan. The advisers, who used to do their work at private offices, communicating with their customers by phone or traditional mail, where encouraged to do more of this at the customers locations. The idea was that they could be giving better service to their clients when they could look up their client in person. The new office equipment included a lap-top computer and a cellular phone, with built-in capacity to connect the internal network of the bank. This mobile office is supplemented with home-office solutions making the work day more flexible for the employees.

In general the bank encouraged the homeworking, giving all their employees the opportunity to rent a home -PC from the bank. In the long run the advisers will be able to work at home full days as well.

4. Tracks towards telework

The case studies above shows only a small fraction of the variety of combinations of types of teleworking-types used by modern enterprises. There are several other cases, some of them including other types of telework such as telework -centres. The point I would like to stress here is simply that *homework is very often used in combination with mobile work and office sharing systems*. The findings from our pilot studies confirm and explain the results from the national statistics: There is a tendency that the workplace is extended beyond the office building, but the home is not at all the most obvious alternative. The use of mobile offices to better reach customers and clients seem be one very attractive strategic for implementing telework in a number of businesses.

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[8] This project did not only include journalists, one member of the economic staff did also start doing part-time office work from home. In his case the homework was not supplemented by mobile work

The steps the enterprises take when they start teleworking, is particularly interesting, because they suggests that different forms of telework are leading the way over to the integration of even other types. For example, in the case of the insurance company, homework was introduced in tandem with mobile work. The possibility for the insurance adjusters to work at home appeared as a positive add on when the company introduced mobile work. The office sharing developed naturally as a third element, because traditional office appeared as unnecessary when he employers almost never was at the head office. In the case of the journalists, the homework was on the contrary a pleasant extension of the regular mobile work-style.

There appear to be blurred distinction between homework and mobile work, and they are often introduced in parallel. The development of these two "modes of telework" however, seems to be propelling new forms of using the physical space at the regular office, labelled as "hot-desking" "office sharing" or "just -in time offices". The development here is clearly bi-directional: On the one hand enterprises which starts using OS -systems, usually substitute the regular office with a mobile office, and homework trail close behind. On the other hand, enterprises giving way for homeworking on a larger scale soon discover the potential reduction of costs when they introduce an office-sharing system.

In short, this investigations suggests that homework, mobile work and OS systems is the tree legs that pins up the trend towards greater flexibility regarding the place of doing work. However there are some important point to be made her: Firstly, that there is not all kinds of homework, mobile work and office sharing that fit together in a triangular way: Mainly employed homeworkers, working full days away from the office, is using the homeoffice as a substitute for a ordinary office location. Similarly, not all types of OS-systems will be relevant to combine with homework. The one that most often is used in combination with mobile work a homework, tend to be more directed toward saving of costs for office buildings.
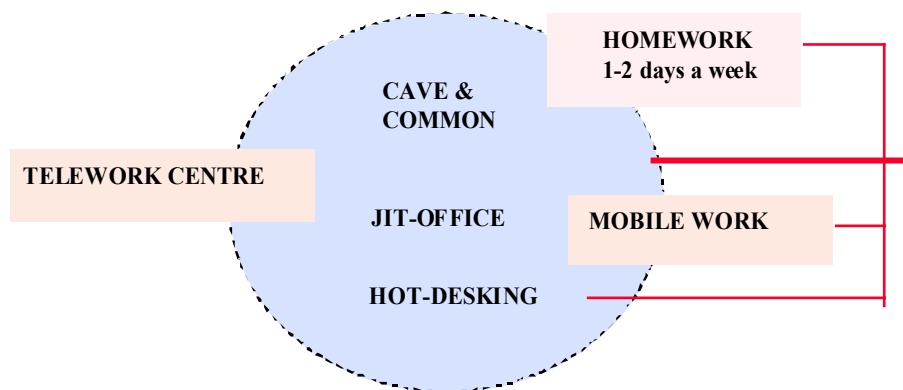

Figure 6. Combinations of types (modes) of telework and OS-systems (examples)

There do exists a more "positive" tradition focussing on using the office space for the development of work relations, enhanced collaboration and sharing of information (Becker, Steele 1995).

Secondly, I would like to emphasise that this is no place where one can expect to find "mechanical" lines of development. Even if there is - as I have argued - a close connection between the different types of telework, the one will not necessarily lead to the other. For some enterprises only mobile telework will do, but other -like the insurance case - will implement all the basic forms. One major reason for this is that homework, mobile work and OS systems offer different *opportunities*, all attractive in today's "informational capitalism" in its own way: Mobile work open the way for closer contact with customers and clients; homework prevent unnecessary use of time used for travel and gives better access to distant labour markets; office sharing reduces expenses for office areas as well as more efficient way of working together. What you choose is a question of the type of business, the particular organisational strategies, and the individual employers needs. Together, however, they constitute a set of highly complementary elements, providing today's and future enterprises with several important benefits.

5. Conclusions

During the last twenty years or so there has been a certain tendency to focus closely on the potential elimination of travel distance with the use of ICT. I believe there is a danger here, if we think that the electronic media is merely a substitute for physical meetings or travelling. In the case of teleworking, information and communication technology do not make place of work, "irrelevant" as some commentators like to announce; on the contrary *it makes place more important* as it is possible to choose exactly the right location for doing your work. The insurance adjuster can write his notes as he touches the crashed car with his hand, the financial adviser can help you at your own office, and so on. The office is simply no longer the most obvious place to write a document.

New communication technology makes *different places* thinkable as workplaces, depending on the type of work in question. However it is not only the question of finding the optimal working environment at stake here, but the reengineering and re-thinking of almost every processes in the enterprises with the use of advanced ICT. To cope effectively in a "informational capitalism" organisations of all kinds will make use of ICT to organise in new and creative ways. The development of various constellations of homework, mobile work, and OS-systems will continue to be an important element in this organisational experimenting and redevelopment.

The argument I have proposed is that no single type of telework will dominated the future work-life, but rather combinations of the basic types discussed here, with the possible supplement of teleworking centres. The hypothesis raised, is that they all stimulate each other respectively: Mobile work and homework will increasingly stimulate to rebuild traditional offices into "just-in time offices", and vice versa. If this is

proven to be right the different modes of telework will all contribute to gradually expansion of work conducted other places than the traditional office.

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Telework in Europe

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Abstract

We have analysed the presence of telework in organisations across Europe using a survey targeted at human resource managers. We have demonstrated that the use of teleworking as a flexible working practice is still marginal, but growing. Telework is present in all countries and sectors. Differences appear to be large between countries, but not so large between sectors as might be anticipated. In the survey, there appears to be in every country at least one organisation where a substantial proportion of employees are teleworkers in every country.

We have identified a number of determinants of the use of teleworking in organisations. Organisations that have recently gone through a change (a relocation, merger, acquisition or take-over) employ more teleworkers. Such an effect is stronger in the public and service sectors in which the presence of telework is somewhat higher than in most other sectors.

We found that higher rates of staff turnover reduce the likelihood that organisations use teleworkers. We have interpreted this finding by hypothesising that high staff turnover rates are a sign that employees are not motivated. This reduces the opportunities for management to use telework, due to the difficulties of management at a distance. We also come up with evidence that suggests that unions are able to delay, or even prevent, the introduction of telework in organisations.

Our empirical results demonstrate that the determinants of telework and home-based work are about the same, except for national differences. This strongly suggests that the causes and consequences of telework and home-based work are equivalent for the organisation and its management. This may indicate that a distinction between telework and home-based work is not meaningful in empirical applications.

It has been well documented that differences between the labour markets in Europe, and the behaviour of organisations in these markets, are vast. Nevertheless, despite these differences, we were not able to show that the determinants of teleworking (changes in the organisation, staff turnover rate, type of sector, size, etc.) are different across European countries. Differences in the presence of telework among European countries must therefore be due to factors that are not included in the current analysis (e.g. culture). We hope to see more comparative research in the near future to identify these factors.

Introduction

Organisations are in a process of permanent change. Managers constantly have to restructure organisations and their relations with employees. It is expected that new information and communication technologies will induce organisations to adapt their systems with sometimes far reaching consequences for operations. New developments in information and communication technology, and world-wide liberalisation of the communication market that will remove barriers to regulating communications, will decrease the costs of communication even further.

Some of these developments are already visible today. For example, technological progress has resulted in the opportunity to telework for an increasing number of occupations in different sectors. Organisations have restructured traditional office-based jobs to be performed at home (or remote, at the clients location or elsewhere) using modern communication technology. Teleworking nowadays covers a range of jobs from routine clerical work to senior management positions, using a range of methods to exchange information (telephone, fax, mail or e-mail). Teleworkers may be fully based at home or may still work at the office a number of days a week. Although research in a number of countries indicates that teleworking is still marginal (Huws 1993; DGV 1996; IRS 1996a, 1996b, 1996c), a considerable growth in the use of telework is expected (Nilles 1988; Handy and Mokhtarian 1996).

Teleworking allows labour to be matched more closely to the needs of organisations, since it offers flexibility of workplace (Weijers 1995, van Reisen 1997). As a result, telework can facilitate the restructuring of working hours, and thus makes it easier to introduce flexible forms of work. For example, new employees may be hired on a part-time temporary contract, even when they live at considerable distances from the organisation and are obviously not willing to move residence to reduce the commuting distance. Practitioners and academics have also noted other advantages (see, among others, Gordon and Kelly 1986, Huws et al. 1990): increased job satisfaction improving motivation and job effort; and reduced numbers of days lost due to illness. Less fatigue due to commuting and working without interruptions may also increase productivity.

Another advantage of teleworking is that it reduces the need for office space. However, cost savings may not be fully realised, since office space cannot always be marginally reduced, and relocation can be very expensive. Thus, a relocation will often outweigh the reduction in the costs of office space. Moreover, many teleworkers still feel the need for a designated desk in the office. As a result, to benefit from the reduction in office space, organisations may have to introduce 'hotdesking': a system where teleworkers do not have a designated desk in the office, but share desks with other teleworkers. The consequences of hotdesking are however largely unknown.

The disadvantages of teleworking have also been spelt out in the literature. Organisations have to pay for the cost of communication. Not so long ago, these costs prevented the economic use of teleworking (Nilles et al. 1976; Huws et al. 1990). The cost of communication was one of the employers' major - and most quantifiable - expenses incurred in telework (Huws et al. 1990). However, these costs are falling

rapidly, and the cost of communication will probably not be a factor of importance to any organisation in the near future. Still, other costs may arise from lack of co-ordination and integration with other staff, and the reduction of possibilities for learning between staff.

Like traditional homebased work, telework essentially is a work agreement where managers are not able directly to monitor the job effort of their subordinates, or are able to do so to a much lesser extent. For example, it is difficult to know whether an employee works the number of hours agreed upon in the labour contract. In some professions, by measuring the production of individual employees, managers may overcome this issue, in particular when performance-related wages are paid (for example, translators are paid in relation to the words translated). Furthermore, shirking will be rare, when employees are motivated due to promotion opportunities (or lay-off threats), or because the job is intrinsically interesting.

Nevertheless, in other professions, either individual output is difficult to measure instantaneously, or individual output is subject to external factors that are not under the employees' control. In these jobs, a performance related method of pay is neither viable nor acceptable to the employee. Regular meetings between manager and employees, or teamwork, may then substitute for more traditional ways of monitoring.[1] Managers are more likely to introduce teleworking when they are convinced that the employees are highly motivated. If they feel this motivation is absent, management may introduce telework only when it is directly linked to a performance related method of pay or other incentive methods.

In light of the above discussion, it is not surprising that teleworkers are still a marginal element of the workforce. Management issues still constitute the major barrier against greater support of telecommuting programs by executives in the USA (Yen et al. 1994; Mokhtarian and Salomon 1996; Gordon and Kelly 1986; and Olson 1988). Similarly, in the UK, practitioners mention that successful teleworking requires supportive management (IDS 1996).

Since the opportunities for teleworking became apparent about two decades ago, teleworking has received attention from different scientific disciplines (sociology, transport sciences, economics). However, research has focused mainly on the consequences for employees and has tried to estimate the potential of telework for reducing commuting time see, among others, Shamir and Salomon (1985), Hamer et al. (1991, 1992), Haddon and Lewis (1994), Huws et al. (1996)). Research focusing on the use of teleworking in organisations and the impact on organisations is generally more recent and is dominated by case studies (Huws et al. 1990, Huws 1993). As a result, current knowledge about which types of organisations - and which countries - use teleworkers is extremely limited. This is not surprising: current information on the incidence of teleworking in Europe is limited due to the application of different definitions and

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[1] For example, Huws (1993) identifies two polar extremes of distance management in her sample: teleworkers who are paid by results and who do not meet the managers regularly (about 20% of the teleworkers) and teleworkers who are paid on a regular salary or time basis, and for whom regular meetings are an essential instrument of management.

surveys, and, more fundamentally, reliable data on teleworking exists for only a limited number of European countries (DGV 1996; IRS 1996a, 1996b, 1996c).

Several research issues are raised by this discussion. First, we need to have more information on the use and growth of teleworking in different European countries. In addition, we wish to know what are the determinants of the use of teleworking arrangements in organisations and under which conditions organisations introduce teleworking. For example, is the size of the organisation relevant? We also wish to know whether the effects of the telework determinants are the same for various countries, and whether these determinants are different from those of homebased work. In this study we aim to answer these questions theoretically and empirically by investigating the determinants of the use of telework in European organisations. The results are based on the Cranet-E (1995) survey, which was targeted at the most senior HRM managers in large organisations.

The current paper proceeds as follows. In Section 0, we introduce a theoretical framework that contributes to our understanding under which circumstances organisations will introduce teleworking. In Section 0, we introduce the Cranet-E (1995) survey and we calculate the incidence of teleworkers in the labour force. In Section 0, we estimate the determinants of telework in European organisations, followed by a section concentrating on the service and public sectors (Section 0). Then we test the hypothesis that the effects of the telework determinants are the same for various countries. In Section 0, we evaluate the robustness of our findings. Section 0 provides a comparison of the determinants of telework and (other) home-based work. Finally, Section 0 presents a summary conclusion.

When will organisations introduce telework?

Although the introduction outlined some factors which may explain why organisations may encourage or deter telework, we still need to know *under which circumstances* organisations increase the use of teleworking arrangements. This issue is of particular importance, both for managers in organisations and for policy makers.

Telework may be regarded as one of the many new flexible working practices (Brewster et al. 1997). Hence, from a more general perspective, we are interested in knowing when organisations introduce new forms of working practices. We will try to answer this question by making use of the LeChatelier principle (Samuelson 1947).

Our basic presumption is that organisations will introduce new forms of working practices when these practices are more cost-effective than current practices. In addition, we observe that the usage of any working practice is associated with other 'fixed' factors that are costly to change. Now suppose that we observe a fall in the cost of a working practice. We argue that it may take considerable time before organisations will increase the use of this working practice, because it takes time to change the fixed factors. Organisations will only take full advantage of the fall in cost of the working practice, as the 'fixed' factors are changed. This idea is known in the economic literature as the LeChatelier principle (Samuelson 1947; for a recent contribution which generalises the concept, see Milgrom and Roberts 1996).

To give a relevant example. Office space and telework are substitutes, in the sense that less office space makes it more profitable to telework: when an organisation employs more teleworkers, it benefits from a lesser need for office space. Now suppose that managers see the costs of teleworking fall; they employ more teleworkers. However, they can only take full advantage of the decrease in the costs of teleworking, as they can reduce the costs of office space - by, for example, selling of leases, not renewing rentals or relocation. Hence, organisations will wait to increase the use of telework arrangements until these costs are reduced.

To give another relevant example. Telework and distance management are complementary, in the sense that distance management encourages employees' self-responsibility, and therefore the use of teleworking; when an organisation employs more teleworkers, it benefits from a "management at a distance" style - which implies different kinds of supervision or another remuneration system. Organisations can only take full advantage of decreasing costs of teleworking, as managers give employees more self-responsibility. However, changes in management do not occur continuously, but in discrete steps. Changes in management often occur when the organisation goes through a merger, an acquisition or a take-over. Hence, organisations may wait to increase the use of telework arrangements until the next re-organisation.

More examples can be given, but the general principle is clear. Whether a working practice is a substitute for, or a complement to, another 'fixed' factor is immaterial. In theory, when the costs of the practice fall, the use of the working practice will increase, and increase even further as soon as the fixed factor is changed.

In the current context, the LeChatelier principle states that when the costs of communication fall, it may take considerable time before organisations increase the incidence of teleworking. So, the LeChatelier principle may explain a low incidence of teleworking by noting that the benefits of teleworking are related to other factors, which will change only gradually over time. Furthermore, the LeChatelier principle makes clear that the use of teleworking will be increased as soon as the organisation relocates or goes through a change. In conclusion, the LeChatelier principle may not only explain *why* telework is still not common, it also suggests strongly *under which conditions* organisations will increase the use of telework arrangements (for example, when they relocate).

The data

The data we employ in this paper are from the '1995' Cranet-E survey, which now contains data on human resource management issues of private and public organisations in 22 European countries (Brewster et al. 1996). The survey includes a question on the proportion of employees who have a telework contract. Thus, it allows us to examine the incidence of teleworking across Europe (see Tresgaskis and Daniels 1996).

The survey targets organisations that employ more than 200 employees. In a few smaller countries however, the survey targets organisations that employ more than 100 employees: about 20% of the observations in the survey involve organisations that employ less than 200 employees (and these have been included in the data used in this paper). About 70% of the observations of the survey have been completed by the most senior personnel or human resource manager. The other observations involve less senior

specialists in the same field. Occasionally, the questionnaire has been answered by the chief executive or the company secretary.

The data set used in this paper contains the first 14 countries to report in 1995 and contains 6306 observations, in total. We exclude data on Italy, since the number of observations is small and *none* of the Italian organisations stated that they have employees on a teleworking contract. We also exclude Norway due to an error in the questionnaire in their. Furthermore, we exclude data referring to missing observations on the presence of teleworking. This leaves us with 4987 observations.

In the multivariate analysis, we exclude data referring to missing observations on the explanatory variables. This leaves us with 3980 observations on teleworking (and a range of other characteristics) in 12 countries. The data is not evenly distributed over the countries, however. Though all countries have a number of observations of more than 100, more than 40% of the observations come from the UK or Denmark.

In the 1995 Cranet-E survey, the following question is asked: "Please indicate the approximate proportion of your workforce who are on the following contracts". The respondent may tick the following answers on teleworking: less than 1%, 1-5%, 6-10%, 11-20%, more than 20%, or, not used. [2]

Table 1. Teleworking in organisations (in %)

Not used	< 1%	1-5%	6-10%	11-20%	> 20%
86.7	8.5	3.0	0.5	0.5	0.7

The frequencies of the proportion of workforce on a telework contract can be found in Table 1. Consistent with other surveys across Europe (e.g., IRS 1996a) only a few organisations - less than 15% in the Cranet E-survey - have workers on telework contracts. The incidence of teleworking differs substantially across Europe (see Table 2 [3]). In Sweden and the Netherlands, more than a quarter of the organisations use telework contracts. In Finland and Switzerland, more than 10% of the organisations use them. In other countries, the incidence of telework is lower. Nevertheless, in all countries in our survey, there is at least one organisation with more than 5% of employees on telework contracts and, in most countries, there is at least one organisation with more than 20% of teleworkers.

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[2] Although the question refers to a *contract*, it cannot be ruled out that respondents have answered the question by referring to the employment of employees who are teleworkers without a telework contract. In much of continental Europe a 'contract' is a written document - in the UK and Ireland, a contract is legally enforceable from verbal exchange or by behaviour. Moreover, we feel that respondents may have easily overlooked the word 'contract', as a earlier question referred to changes in *arrangements*. We have therefore compared the data on telework contracts with those on a change in telework arrangements: a quarter of the organisations that use teleworking arrangements do *not* use a teleworking contract. Either, therefore, written contracts are more common than previously thought (IRS 1996a; Reisen 1996), or, more likely, many respondents have answered the question on contracts by referring to arrangements.

[3] To compare the data among various countries, we present in Table 2 the data for organisations with more than 200, but less than 1000 employees only. We have repeated the above analysis, restricting the data to organisations with less than 500 employees. The results are similar to the ones reported in Table 2.

Table 2. Teleworking in labour force populations (in %).

	S	CH	NL	IRL	FIN	DK	B	UK	E	F	WD	ED
Not used	70.7	89.4	74.8	92.8	86.6	91.3	91.9	91.9	94.7	91.6	93.1	99.1
0 - 1%	22.4		17.6	1.2	8.2	6.0	5.11	4.8	3.0	7.5	5.9	
1 - 5%	15.1	8.7	6.9	3.6	3.6	1.7	1.28	1.9	0.8		0.5	
6 - 10%	2.7	1.0			0.5	0.7	0.85	0.5				0.9
11 - 20%	2.7	1.0		2.4	0.5		0.43	0.2	0.8			
> 20%	2.3		0.8		0.5	0.3	0.43	0.7	0.8	0.9	0.5	
N	219	104	131	83	83	298	235	577	131	277	202	117
Freq. ($/^{oo}$)	37.6	23.7	22.0	15.2	14.9	12.4	10.4	9.1	5.1	1.6	1.3	0.2

Notes: Sweden (S), Switzerland (CH), Netherlands (NL), Ireland (IRL), Finland (FIN), Denmark (DK), Belgium (B), United Kingdom (UK), Spain (E), France (F), and western (WD) and eastern part of Germany (ED); N = number of organisations, Freq. = frequency of teleworkers in population.

The Cranet E-survey provides useful information on the incidence of teleworking in organisations in Europe and, uniquely, provides it at organisational level. In Table 2, we also present the data on incidence in an additional form, since in international comparisons, the incidence of teleworking is usually given as a percentage of the *labour force*.

Given information on the proportion of teleworkers and the number of employees in every organisation, one can calculate the proportion of employees in the labour force for every country. Since the survey conveys information on the intervals of the proportion of teleworkers in the organisation, we estimate the proportion of employees in the population, assuming that the proportion of teleworkers in an organisation is binomially distributed (see Appendix 1 for details).

In the last row of Table 2, the incidence of teleworkers in the labour force is given, in terms of the number of teleworkers per 10,000 employees. The results show a large variation in the proportion of teleworkers in the European labour forces. For example, in Sweden there are almost twice as many teleworkers as in the Netherlands, four times as many teleworkers as in the UK, and 20 times as many teleworkers as in the western länder of Germany.

Empirical analysis

1.1. The ordered probit model

To identify the determinants of telework, we will use the following framework. As dependent variable, the proportion of teleworkers is used. This variable is defined using the following ordering: *1:* not used; *2:* less than 1%; *3:* 1-5%; *4:* 6-10%; *5:* 11-20%; *6:* more than 20%. To explain the observed variation in this dependent variable an ordered probit model is estimated (for another application of the ordered probit model in the field of HRM, see Ferner 1997). The underlying response model can be described as:

$$Y = \beta' x + u$$

where Y is the underlying response variable, β is a vector of parameters, x is a vector of exogenous explanatory variables, and u is the standard normally distributed error term.

170

Next we define the constants $\alpha_0 < \alpha_1 < \ldots < \alpha_m$, where m denotes the number of categories of the dependent variable, and where $\alpha_0 = -\infty$ and $\alpha_m = \infty$. Y is not observed, but it is known to which of the m categories it belongs. It belongs to the jth category if:

$$\alpha_{j-1} \leq Y < \alpha_j \quad (j = 1, \ldots, m).$$

The model can now be estimated using the maximum likelihood method, see, e.g. Maddala (1983). This method allows us to estimate the coefficients β in an efficient and consistent way. The main restriction is that the model requires the explanatory variables x to be exogenous (x is not affected by Y). The coefficients β have a similar interpretation to the coefficients in the familiar regression model. [4]

1.2. The explanatory variables

The Cranet-E survey contains a large number of exogenous variables that may explain the variation in the incidence of teleworking.[5] We use 11 country dummies, and a dummy that distinguishes between the western and eastern parts of Germany. The size of the organisation is measured by the number of employees. We include 3 dummy variables: less than 200 employees, between 200 and 500 employees, between 500 and 1000 employees. Organisations with more than 1000 employees form the reference group. Moreover, we distinguish between six different sectors (see Table 3).

Staff turnover (percentage of employees per year) and absenteeism (percentage of days per year) are used as proxies for the motivation of the labour force. High staff turnover is an indication that the match between employer and employee is of a temporary nature, suggesting that employees have few promotion opportunities, receive less training, and arguably, are less motivated. Absenteeism is another proxy for motivation, since motivated employees are less likely to be absent.

A variable that captures staff turnover is defined as follows: *1:* less than 2%; *2:* 2-5%; *3:* 5-10%; *4:* 10-20%; *5:* 20-30%; *6:* more than 30%. The variable that captures absenteeism is defined as follows *1:* less than 2%; *2:* 2-3%; *3:* 3-4%; *4:* 4-5%; *5:* 5-10%; *6:* more than 10%. A majority of the respondents - about 60% - however does not know the organisation's figures on staff turnover or absenteeism. We include therefore dummies for missing information on turnover and absenteeism.[6]

We also include a variable that measures the unionisation of the organisation. The variable that captures unionisation is the percentage of the labour force of the organisation which are union members, defined as follows *1:* 0%; *2:* 1-25%; *3:* 26-50%; *4:* 51-75%; *5:* 76-100%. We include also a dummy variable, that is, one when the market into which the organisation sells is growing, otherwise zero.

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[4] We have also estimated a censored regression model, but it did not converge. Apparently, this model is not flexible enough to describe the data at hand.

[5] Given the low incidence levels of teleworkers, exogeneity of the explanatory variables can be safely assumed, since a few teleworkers can hardly affect variables that refer to the whole organisation.

[6] The high proportion of missing information on absenteeism and turnover is probably an indication that the data is held at site level and not usefully aggregated at the organisational level from which the respondents are drawn. The dummies for missing information on absenteeism and turnover control for a potential source of bias.

Finally, we use three dummy variables that capture changes in the organisation, which may affect the internal human resource management system, during the last three years. We distinguish between three types of changes: *i*) relocations, *ii*) mergers, acquisitions or take-overs, and *iii*) large staff increases (more than 5% of workforce).

1.3. Empirical results

Empirical estimates of the ordered probit model are shown in the second column of Table 3. Studies have shown that the country factor is, in a European comparative analysis of labour market practices, usually one of the most important explanatory variables (Brewster and Hegewisch 1994). This result is sometimes challenged by theoretical considerations, which hypothesise that the introduction of new forms of work organisation has been consistently and steadily diffused throughout Europe: hence, only small country differences would be likely to occur.

In line with the comparative empirical studies, we find that much variation in the incidence of teleworkers is ascribed to the country. According to our estimates, in Sweden, the Netherlands and Finland, teleworking is more common than in the UK, whereas in Spain, teleworking is less common. These effects are significant at the 1% level.

Table 3. Empirical estimates of the determinants of telework

	Presence of contracts		Increase in telework arrangements	
Countries				
Sweden	1.354	(13.62) ***	3.011	(12.88) ***
the Netherlands	0.487	(4.27) ***	1.102	(4.13) ***
Finland	0.421	(3.56) ***	0.457	(1.32)
Turkey	0.223	(1.32)	-0.481	(1.00)
Switzerland	0.201	(1.56)	-0.354	(0.92)
Belgium	0.205	(1.65)	0.185	(0.68)
Denmark	0.041	(0.38)	-1.006	(2.45) ***
Germany (western)	0.097	(0.85)	0.094	(0.27)
Ireland	0.012	(0.78)	0.543	(1.46)
UK (reference)				
France	-0.125	(1.13)	-0.035	(0.12)
Spain	-0.434	(2.53) ***	-0.683	(1.42)
Germany (eastern)	-0.295	(1.24)		
Norway			0.751	(2.71) ***
Size of the organisation				
Size ≤ 200	-0.352	(3.80) ***	-0.994	(3.97) ***
200 < size ≤ 500	-0.342	(5.32) ***	-0.843	(5.48) ***
500 < size ≤ 1000	-0.216	(3.05) ***	-0.642	(4.43) ***
1000 < size (reference)				
Sector				
Services	0.245	(2.61) ***	0.636	(2.69) ***
Chemical products	0.281	(2.62) ***	0.072	(0.26)

water and energy				
Public sector	0.196	(2.05) **	0.659	(2.83) ***
Retail, distribution, transport and communication	0.146	(1.48)	0.753	(2.51) ***
Manufacturing	0.135	(1.72) *	0.401	(1.99) **
Other sectors (reference)				
Labour force motivation				
staff turnover	-0.056	(2.19) **	-0.009	(0.11)
absenteeism	0.017	(0.52)	-0.085	(1.41)
Dummies for missing information on:				
staff turnover	-0.089	(0.75)	0.121	(0.47)
absenteeism	0.027	(0.25)	-0.356	(1.26)
% union members	-0.047	(1.77) *	-0.157	(2.33) ***
Market is growing	0.055	(1.04)	0.334	(2.58) ***
Changes in the organisation				
Relocated	0.290	(3.60) ***	0.755	(3.89) ***
Merger /acquisition /take-over	0.111	(2.09) **	0.199	(1.47)
Staff increase: +5%	0.055	(0.94)	0.014	(0.10)
Constants				
α_1	1.114	(6.12) ***	-2.535	(5.56) ***
α_2	1.749	(9.51) ***		
α_3	2.245	(11.99) ***		
α_4	2.417	(12.73) ***		
α_5	2.627	(13.55) ***		
Number of observations	3980		4341	
Loglikelihood	-2021.68		-961.78	

Notes: absolute t-values in brackets; *: significant at 10%; **: significant at 5%; ***: significant at 1%.

Although we are able to show significant differences between countries, our data set does not allow us to investigate further *why* teleworking varies between countries (except for the variables we control for). We hypothesise that these differences are mainly due to cultural differences in attitude concerning management at a distance (see, for example, the work of Hofstede 1980) and the advancement of communication technology. However, the observed country differences may also be related to various policies of national governments that have actively stimulated teleworking (e.g. Sweden), as they anticipate that telework reduces the average distance travelled.

The size of an organisation is generally considered to be an important determinant of the internal system of the organisation. Large organisations have an internal labour market, which has a strong effect on the recruitment policies of the organisations (Barron et al. 1985). Large organisations state more often that "vacancies are difficult to fill", their vacancy durations are longer (Van Ommeren and Russo 1997) and they recruit wider geographic areas (Russo 1996). These factors seem to indicate that large organisa-

tions are more likely to introduce teleworking to fill vacancies. In line with these considerations, we find that the proportion of teleworkers increases with size.[7]

In line with Huws (1993), we find that teleworking is not confined to one to two sectors, and that the difference between most sectors is maybe less than generally thought. Nevertheless, this study confirms that teleworkers are more common in the service and public sector even when we control for a range of explanatory variables.[8]

We have argued that staff turnover and absenteeism may measure the employees' motivation. The more motivated they are, the more likely managers will be to introduce teleworking, since motivated workers can be more easily managed at a distance This hypothesis is partly confirmed by the data. Teleworking is decreasing in staff turnover (significant at the 5%), but we do not find any effect for absenteeism. The dummies for missing information on turnover and absenteeism show that there is not a systematic difference between organisations that have answered the questions on turnover and absenteeism and organisations that have not answered these questions.

According to IRS (1996a), most European trade unions have come to accept that teleworking is a form of work that is positively welcomed by a sizeable number of employees. Nevertheless, unions will generally demand, for example, allowances that contribute to the extra cost of working from home. Since telework may weaken the employees' position pertaining to industrial law in some countries (e.g. in Finland), unions are keen to extend legislation to afford teleworkers guaranteed protection. When unions have the power to influence the management's decision-making, it is not unlikely that the introduction of teleworking in an organisation may be delayed or even prevented by some unions. In line with this reasoning, we find that the higher the proportion of union members, the lower the incidence of teleworking (this effect is significant at the 10% level).

Next, our estimates show that the proportion of teleworkers increases when an organisation has relocated (this effect is significant at the 1% level). Such an effect was expected by application of the LeChatelier principle. Office space and telework are substitutes, so organisations will particularly encourage teleworking the moment an organisation relocates to a smaller office space. Another plausible explanation is that although some employees may benefit from a relocation, others may lose, due to an increase in commuting time. For the organisation, this may be the right moment to move to teleworking. It reduces the risk that valuable employees would leave the organisation.[9]

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[7] This effect may be spurious. Even if the proportion of teleworkers does not depend on the organisation's size, larger organisations are more likely to have at least one teleworker. In addition, Huws (1993) suggests that organisations with only a few employees are more likely to use teleworkers. However, our survey does not contain those organisations.

[8] The results suggest that teleworking is also common in the chemical products, water and energy sector, however this result is not found in subsequent analysis, so, not unlikely, the result here is spurious (see section 0).

[9] Research in the Netherlands demonstrates that a relocation over even a few kilometres has a large impact on staff turnover (Van Engelsdorp Gastelaars and Maas-Drooglever-Foruijn 1985). Teleworking may be seen as one of the measures to keep valuable employees. In this light, it is not surprising that a reduction in commuting time is cited as one of the reasons why organisations introduce teleworking (IDS 1996).

Our estimates indicate that the proportion of teleworkers increases when the organisation has gone through a merger, acquisition or a take-over (this effect is significant at the 5% level). Such an effect was expected using the LeChatelier principle.[10] Organisations will particularly encourage teleworking the moment an organisation goes through a change, which may give employees more responsibilities (management at a distance) or may require an increase in functional flexibility.

Our data shows that the proportion of teleworkers increases when the number of employees has increased by more than 5%. Such an effect was expected, since organisations are more likely to introduce teleworking when the demand for office space increases to avoid the costs of additional office space. Nevertheless, this effect is not statistically significant at any conventional significance level. In addition, we do not find any relationship between market growth and the presence of teleworking.

The service and public sectors revisited

In the previous sections, we have used a model, which relies on the assumption that the effect of a variable on telework in one sector is the same as in the other sectors. Such an assumption is not necessarily valid. For example, one may hypothesise that the effect of a relocation in a sector in which teleworking is more common will be larger than the effect of a relocation in other sectors.

We have therefore chosen to repeat the analysis by estimating the model for organisations in the public and service sector, since teleworking is more common in these sectors. The results can be found in Table 4, column 2. The signs of the variables are similar to those reported in Table 3. However the significance of most coefficients is reduced due to the decreased number of observations. In line with the above hypothesis, we find that the effects of a relocation and a change in the organisation through merger, acquisition or take-over are stronger in the service and public sector than in other sectors.

Table 4. Empirical estimates of the determinants of telework in the service and public sector

	Presence of contracts		Increase in teleworkers	
Countries				
Sweden	1.242	(6.51) ***	2.023	(5.23) ***
the Netherlands	0.612	(3.40) ***	0.838	(2.15) **
Finland	0.401	(3.14) ***	-0.726	(1.08)
Switzerland	0.182	(0.25)	0.265	(0.49)
Belgium	0.483	(1.86) *	0.230	(0.35)
Denmark	0.002	(0.01)	-1.662	(2.71) ***
Germany (western)	0.007	(0.03)	-0.226	(0.38)
Ireland	-0.041	(0.14)	-0.123	(0.19)
UK (reference)				

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[10] Mergers, acquisitions and take-overs may of course involve a relocation for some employees, without implying a relocation of the organisation.

France	-0.190	(0.71)	-0.634	(0.83)
Spain	-0.555	(1.51)	-0.683	(1.42)
Norway			-0.337	(0.71)
Sector				
Public sector	-0.042	(0.36)	0.021	(0.07)
Services (reference)				
Size of the organisation				
Size ≤ 200	-0.392	(2.34) **	-0.558	(1.27)
200 < size ≤ 500	-0.357	(2.93) ***	-0.469	(1.72)
500 < size ≤ 1000	-0.215	(1.70) *	-0.545	(1.83)
1000 < size (reference)				
Labour force motivation				
staff turnover	-0.043	(0.88)	0.064	(0.29)
absenteeism	-0.001	(0.01)	0.077	(0.70)
Dummies for missing information on:				
staff turnover	-0.111	(0.49)	0.121	(0.47)
absenteeism	-0.025	(0.12)	-0.356	(1.26)
% Union members	-0.016	(0.33)	0.026	(0.21)
Market is growing	0.059	(0.59)	0.225	(1.00)
Changes in the organisation				
Relocated	0.432	(3.04) ***	0.895	(2.74) ***
Merger /acquisition /take-over	0.231	(2.18) **	0.665	(2.82) ***
Staff increase: +5%	0.076	(0.71)	0.036	(0.14)
Constants				
α_1	0.920	(2.70) ***	-3.056	(3.97) ***
α_2	1.656	(4.80) ***		
α_3	2.355	(6.59) ***		
α_4	2.600	(7.07) ***		
α_5	2.795	(7.34) ***		
Number of observations	1048		1191	
loglikelihood	-2021.68		-305.20	

Note: absolute t-values in brackets; *: significant at 10%; **: significant at 5%; ***: significant at 1%.

Comparative HRM: identical effects in different countries?

Until now, we have assumed that the effects of the explanatory variables do not depend on the country (except for country dummies so that countries differ in their constant term). Such an assumption may not be correct. It may even be argued that due to large and well-known differences between European labour markets (differences in legislation, unionisation, etc.), it would be more surprising if the effects of the explanatory variables

were the same for various countries. So, we test for differences in the coefficients between countries simultaneously.[11]

Differences in the coefficients between countries are difficult to detect when the number of observations per country is low. Tests of differences in the coefficients between *all* countries have therefore little power, because it is unlikely that differences are detected. We test therefore only for differences between the UK, Denmark and Sweden, which together cover about 50% of the whole sample, thereby maximising the power of the tests.

We have tested several hypotheses. We have tested whether the coefficients between UK and Denmark, UK and Sweden, Denmark and Sweden are different, and whether the coefficients between UK, Denmark and Sweden are simultaneously different. The tests indicate that none of these hypotheses were rejected at any conventional significance level.[12] In conclusion, we do not have any evidence that the effect of the explanatory variables on the incidence of teleworking is the same for European countries.

Different question, similar answers?

The Cranet-E (1995) survey includes also a question that refers to the *change* in teleworking. The question is as follows: "Has there been a change in the use of the following working arrangements over the last three years?". The respondent may tick the following answers on teleworking: increased, same, decreased, or, not used.[13] We have excluded data on eastern Germany and Italy, since the number of observations in these countries is small (Norway is included).

Table 5 contains the frequencies of the changes in teleworking. Similar to section 0, we find that across Europe, less than one in seven of the organisations has teleworkers. Of those organisations that use teleworking, almost half of the organisations have not increased the use of teleworkers over the last three years. The number of organisations that have reduced the use of teleworkers is marginal.

We wish to identify the determinants of the change of teleworkers, so we have estimated a standard logit model to identify the determinants of an *increase* in teleworkers. The dependent variable is then defined as a dichotomous variable: 0: decreased, not used or the same; *1*: increased.[14] The explanatory variables are the same as those used to identify the determinants of telework contracts. The results can be found in the last two columns of Table 3. It appears that the results are consistent with those for the incidence of telework contracts: none of the significant coefficients has reversed sign. A

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[11] We used a standard likelihood-ratio test, which yields a chi-square statistic with degrees of freedom equal to the number of restrictions placed on the estimation under the null hypothesis compared to the alternative hypothesis (see Judge et al. 1985).

[12] Details of these tests can be received from the author upon request.

[13] About 0.3% of the organisations do not use teleworking as a work *arrangement*, but, at the same time, have workers on a teleworking *contract*. So, the difference between the answers to the questions on the presence of telework *contracts* and the change in telework *arrangements* is small.

[14] In principle, the dependent variable may be defined using the following ordering: *1*: decreased; *2*: not used or the same; *3*: increased. However, the number of observations referring to a decrease in teleworkers is too small to estimate the model.

new finding is that the growth in telework is stronger in Norway, but weaker in Denmark, compared to the UK. Furthermore, growing markets now have a significant positive effect, and the effect of unionisation is positive and significant at the 1% level. The effect of merger, acquisition or take-over is still positive, but insignificant. The effect of turnover is absent however. Finally, we estimated the same model for organisations from the public and service sector (see last column of Table 4). We find again that the effects of a relocation and a change in the organisation through merger, acquisition or take-over are stronger in the service and public sector than in the other sectors. In conclusion, the analysis of the change in telework arrangements does not fundamentally change the conclusions based on the analysis of the incidence of telework contracts.

Table 5. Changes in teleworking (in %)

Increased	Same	Decreased	Not used
7.0	6.1	0.2	86.6

Note: Eastern Germany and Italy are excluded.

Telework and home-based work: what is the difference?

Telework has often been associated with home-based work. This is not necessarily correct, since not all teleworkers work from home, but may for example work from a 'telecottage' or from the customers premises. Nevertheless, this view is broadly correct in the sense that, nowadays, most teleworkers do work from home. So, what is new about telework?

Most studies argue that telework is different from other types of home-based work, since teleworkers use and exchange information (Huws 1993, Reisen 1996). So, the use of modern methods of communication is thought to be essential. However, we argue that such a difference is not fundamental to the organisation (and probably not even to the employee). For example, managers still have to solve the problem of monitoring the employees' productivity. Moreover, another problem with the distinction between telework and home-based work in a European comparative survey is that the words 'telework' and 'home-based work' may even in translation have a different meaning and connotation in various countries. So, whether a certain job is defined as teleworking or home-based may depend on the nationality of the HRM manager. To overcome this problem we analyse also the determinants of home-based work using the same survey. Our working hypothesis is that the effects of the explanatory variables on home-based work are the same as those on telework, except for country dummies.

In Appendix 2, Table 6 and Table 7, we give the aggregate statistics. Home-based work is more common than telework across Europe. However, it appears that this difference is almost entirely due to a group of organisations that do not use telework contracts, but have between 0 and 1 percent of the employees on a home-based contract (see Table 6). Although a decrease in the use of telework is extremely rare, a decrease in the use of home-based work is not uncommon (see Table 7).

To test our working hypothesis, we have estimated two ordered probit models to identify the determinants of home-based work *contracts* and the change in home-based work *arrangements* (see footnote 14). The results can be found in Table 8 (see Appen-

178

dix 2). We find that the country effects on home-based work are substantially different from those on telework. Nevertheless, Sweden and Finland still have among the highest proportion of home-based workers, whereas Spain has the lowest.

The effects of the other explanatory variables are similar to those reported for telework. Interestingly, we hypothesised above that absenteeism would have a negative effect on telework, but failed to find such relationship. In the case of home-based work, we do find such a relationship (but not any effect of staff turnover). In conclusion, although telework and home-based work may refer to different identities, our empirical results show convincingly that the factors that affect telework also affect home-based work. This strongly suggests that a distinction between telework and home-based work may not always be meaningful in empirical applications.

Conclusion

We have analysed the presence of telework in organisations across Europe using a survey targeted at human resource managers. We have demonstrated that the use of teleworking as a flexible working practice is still marginal, but growing. Telework is present in all countries and sectors. Differences appear to be large between countries, but not so large between sectors as might be anticipated. In the survey, there appears to be in every country at least one organisation where a substantial proportion of employees are teleworkers in every country.

We have identified a number of determinants of the use of teleworking in organisations. Organisations that have recently gone through a change (a relocation, merger, acquisition or take-over) employ more teleworkers. Such an effect is stronger in the public and service sectors in which the presence of telework is somewhat higher than in most other sectors.

We found that higher rates of staff turnover reduce the likelihood that organisations use teleworkers. We have interpreted this finding by hypothesising that high staff turnover rates are a sign that employees are not motivated. This reduces the opportunities for management to use telework, due to the difficulties of management at a distance. We also come up with evidence which suggests that unions are able to delay, or even prevent, the introduction of telework in organisations.

Our empirical results demonstrate that the determinants of telework and home-based work are about the same, except for national differences. This strongly suggests that the causes and consequence of telework and home-based work are equivalent for the organisation and its management. This may indicate that a distinction between telework and home-based work is not meaningful in empirical applications.

It has been well documented that differences between the labour markets in Europe, and the behaviour of organisations in these markets, are vast. Nevertheless, despite these differences, we were not able to show that the determinants of teleworking (changes in the organisation, staff turnover rate, type of sector, size, etc.) are different across European countries. Differences in the presence of telework among European countries must therefore be due to factors that are not included in the current analysis (e.g. culture). We hope to see more comparative research in the near future to identify these factors.

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Appendix 1: Estimation of the proportion of teleworkers in the labour force population

We have estimated the proportion of teleworkers in the labour force population as follows. Suppose that the probability that an employee teleworks is equal to p. The number of teleworkers in an organisation equals x, and the proportion of teleworkers equals t. So, t = x /n, where n is the number of employees in an organisation. The density function of x is then given by the binomial distribution (Mood et al. (1985)) and the proportion of teleworkers can then be estimated by using the Maximum Likelihood method.

The advantage of the binomial distribution is that the variance of t becomes smaller when n increases, so t is efficiently estimated. The disadvantage of the binomial distribution is that it - potentially erroneously - supposes that the probability that an employee teleworks is independent from the probability that another employee teleworks who belongs to the same organisation. Therefore, in the rest of the paper, we employ an ordered probit model, which does not rely on the independence assumption, but which does not efficiently use information on n.

Appendix 2.

Table 6. Proportion of workforce home-based

Not used	< 1%	1-5%	6-10%	11-20%	> 20%
76.0	18.1	4.2	0.9	0.3	0.5

Note: Norway and Italy are excluded.

Table 7. Change in workforce home-based (in %)

Decrease	No change	Increase
1.7	92.2	7.1

Note: Italy and Eastern Germany are excluded.

Table 8. Empirical estimates of the determinants of home-based work

	Presence of contracts		change	
Countries				
Sweden	0.281	(2.88) ***	0.206	(1.91) *
the Netherlands	0.118	(1.12)	-0.218	(1.72) *
Finland	0.369	(3.64) ***	0.132	(1.14)
Turkey	-0.689	(3.35) ***	-0.364	(2.02) **
Switzerland	0.329	(3.02) ***	-0.968	(6.74) ***
Belgium	-0.133	(1.06)	-0.095	(0.73)
Denmark	0.194	(2.18) **	-0.205	(2.05) **
Germany (western)	0.139	(1.49)	-0.479	(4.40) ***
Ireland	-0.312	(2.14) **	-0.242	(1.60)
UK (reference)				
France	-0.430	(4.36) ***	-0.497	(4.47) ***
Spain	-1.057	(5.76) ***	-0.513	(3.43) ***
Germany (eastern)	-0.784	(3.50) ***		

Norway			-0.275	(2.62) ***
Size of the organisation				
Size ≤ 200	-0.254	(3.16) ***	-0.069	(0.80)
200 < size ≤ 500	-0.260	(4.51) ***	-0.130	(2.01) **
500 < size ≤ 1000	-0.172	(2.74) ***	-0.031	(0.43)
1000 < size (reference)				
Sector				
Services	0.289	(3.53) ***	0.271	(2.98) ***
Chemical products water and energy	0.177	(1.81) *	0.131	(1.22)
Public sector	0.399	(4.85) ***	0.308	(3.45) ***
Retail, distribution, transport and communication	0.071	(0.81)	0.192	(2.02) **
Manufacturing	0.991	(1.42)	-0.105	(1.38)
Other sectors (reference)				
Labour force motivation				
staff turnover	0.018	(0.62)	-0.020	(0.29)
absenteeism	-0.057	(2.41) **	-0.037	(0.70)
Dummies for missing information on:				
staff turnover	0.008	(0.08)	-0.121	(0.47)
absenteeism	-0.086	(0.81)	-0.056	(0.26)
% Union members	-0.109	(4.71) ***	-0.066	(2.70) ***
Market is growing	0.070	(1.50)	0.131	(2.51) ***
Changes in the organisation				
Relocated	0.223	(3.10) ***	0.108	(1.26)
Merger /acquisition /take-over	0.033	(0.70)	0.077	(1.43)
Staff increase: +5%	0.048	(0.93)	0.072	(1.26)
Constants				
α_1	0.528	(4.98) ***	-2.52	(19.74) ***
α_2	1.278	(11.82) ***	1.26	(10.70) ***
α_3	1.855	(16.24) ***		
α_4	2.186	(17.79) ***		
α_5	2.328	(18.02) ***		
Number of cases	4022		4539	
loglikelihood	-2026.30		-1484.25	

Notes: absolute t-values in brackets; *: significant at 10%; **: significant at 5%; ***: significant at 1%.

183

Teaching decision making in distributed groups - experiments and reflections

Stefan Klein and Sedat Güler

Abstract

What kind of preparation is required for telework and telecooperation? How do you teach decision making in distributed groups and what are the specific challenges for the participants? What is an appropriate task environment and organizational setting for the application of desktop videoconferencing systems?

In order to study these questions, we have designed and carried out two experiments with graduate students. Groups with two to five participants each have played a competitive business game which requires decisions about thirty parameters related to different business domains, e.g. personnel, production capacity, marketing and IS. The groups consisted of students from two of the three participating universities: University of St. Gallen, Switzerland, University Koblenz-Landau and University Münster, Germany, and had no prior knowledge of each other. The students had email and videoconferencing equipment available to communicate and interact.

The goal of this set-up has been to create a simulated, internally co-operative and externally competitive task environment. The distributed setting has been chosen to confront the participants with the technological and organizational challenges of working at one common project but apart.

From a pedagogic point of view, we will discuss the experimental design as a setting for training and coaching students (and employees) to experience and practice telecooperation. Of particular interest here are self-organizing mechanisms as well as ways and means to cope with external pressure combined with frictions in the internal co-ordination process.

1. Introduction

Driven by global economic trends and the proliferation of information and communication technology (ICT), organizational forms are changing and demanding new qualifications from employees. Space and time are no longer determining (collaborative) work: individuals and teams work together asynchronously and/ or in separate locations. ICT is used to bridge the resulting gaps.

As these new modes of work are quickly proliferating, the underlying requirements for new competencies to successfully manage distributed work and for supporting technologies are still poorly understood. In order to study those requirements and to teach the requisite competencies, which are needed to telework or telecooperate successfully, we have conducted a kind of action research in an experimental setting with student groups in separate universities.

While teleteaching and telelearning primarily focus on the spatial separation of teacher and student, we have assigned a complex task to distributed student teams and provided them with communication equipment in order to support their telecooperation. During these experiments we studied the use and appropriation of communication technology and self-organizing mechanisms and processes among the team members (cf. for a similar setting: Knoll; Jarvenpaa 1995).

184

For the analysis of our experiments, we have developed an exploratory framework which structures the main determinants and outcomes. Although we have studied the specific task environment of decision making in distributed groups, we will draw some conclusions for telework in general.

2. Components of the experiments

The experiments consisted of three components
- a complex, however simulated, task environment
- decision making in distributed teams with
- broadband communication technology support.

We have combined these elements, which were all new to the participating students, in order to create a rich setting with realistic requirements.

2.1 Simulation game as task environment

As the experiments were conducted within an IS department, we have chosen MCC International's IT Management Game which integrates general policy decisions with IT related decisions. The IT Management Game is a competitive business game which requires decisions about thirty parameters related to different business domains. The goal of this game is to learn about the appropriate use of IT within a company and to gain insights into the interdependencies among general management and IT related decisions (for more details about the game see MCC, 1997).

2.2 Decision making in distributed groups

In order to create a more demanding task environment, we decided to have a competition among distributed teams with members from different institutions. We run two separate experiments.

The first experiment with six groups took place during the summer term 1997. Each group consisted of four participants: two students from University of St. Gallen, Switzerland, and two students from the University of Koblenz-Landau, Germany.
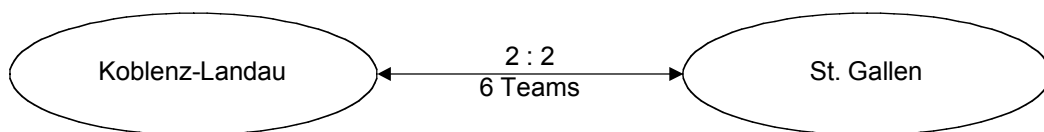
Fig. 1: Team structure for the first experiment

The second experiment was run April 6-9, 1998 among three universities: St. Gallen, Münster, and Koblenz-Landau. We arranged teams with mixed groups of Münster/St.Gallen and Münster/Koblenz-Landau and varying team sizes: the five Münster/Koblenz-Landau groups consisted of one student from each university, the four Münster/St.Gallen groups consisted of two students from Münster and two to three students from St. Gallen.

Fig. 2: Team structure for the second experiment

The game management, i.e. lecturers from the three participating universities, coordinated the game settings and tested the equipment. In contrast to the students who 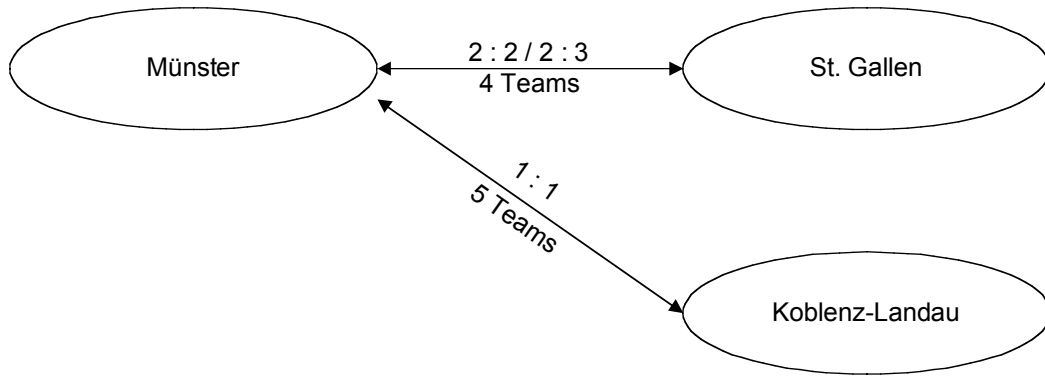had never met their peers from the other universities, game management knew each other personally. Miez Mangold (1996) describes a comparable setting: management game and videoconferencing in an educational environment. However, for didactical reasons he is convinced it is necessary for the students to meet at the beginning and the end of such a game with their counterparts face-to-face. Although this would have been useful for our students as well, we refrained from doing this because we wanted to investigate and teach how people who have never met, establish a working relationship via computer-mediated communication channels.

2.3 Communication infrastructure

The technical infrastructure for both experiments was identical: The students had email and videoconferencing equipment available to communicate and interact. If necessary, they could also use the phone and fax. INTEL ProShare with an ISDN line was used as videoconferencing equipment. The over-all quality of the ISDN connection was satisfactory, though now and then picture quality could have been better. For technical reasons, ProShare's shared screen functionality, which would have allowed the participants to jointly edit or discuss a document, was not available.

3. Analytical framework

In order to capture the rich set of variables we have developed an exploratory framework which is used for a structured and detailed description of the experiment settings and for the analysis of the organizational and behavioral dynamics and effects (for related frameworks cf. e.g. Mayntz; Schneider 1988 and Kraemer; Pinsonneault 1990, 378).

The basic outline consists of computer-mediated communication media and organizational parameters as determinants. The interaction system denotes the dynamics of the socio-technical system. It brings organizational and media determinants together and yields emerging group and process structures as well as media usage patterns. An effect in organizational terms is the group performance and in terms of media impact it is improved media competence.
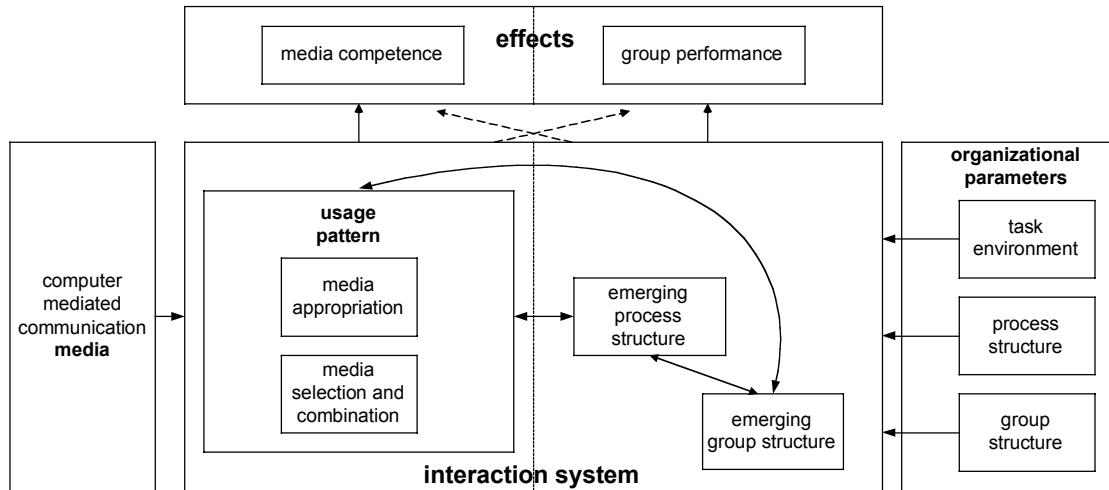
186

Fig. 3: Exploratory framework

3.1 Organizational design

Extended studies of teleconferencing or videoconferencing during the 80ies have shown that the effects of these technologies depend on technical as well as organizational settings (see e.g. Birrell; Young 1984 and Galegher et al. 1990). We will therefore report on the organizational and technical design, which we have chosen, before we will discuss some of the findings with respect to the interaction system and the effects.

3.1.1 Task environment

The IT Management Game requires decisions about thirty parameters related to different business domains. It is a typical business simulation game and complex enough to require negotiations between the distributed team members. During each round, which represents a fiscal year, general management decisions concerning the sales prices, advertising budget, level of production, wages, size of staff, and several market researches have to be made. Interdependent with these general management decisions, IT-related decisions have to be made, e.g. size of the IT-budget, projects to build network facilities, databases, building vs. outsourcing IT-infrastructure.

The players had the task to make themselves familiar with the manual of the business game in advance and had the chance to ask questions in an introductory session. They were asked to formulate a strategy paper together with their counterparts at the other university. After a strategy session they had to hand in a strategy paper. This strategy session was done by email and was not supported by videoconferencing in the first experiment while the strategy session in the second experiment was supported by videoconference. The purpose of the strategy paper was to force the students to formulate their goals which would be a reference point during the game and to prevent them from playing straight ahead. Nevertheless the students were not pinned down to their initial strategy and were able to react to changed or unforeseen circumstances. To become more familiar with the game a test-round was played which did not count for the game-results.

187

For the second experiment the settings of the MCC Management Game were slightly modified in order to model economic trends and to make the game more realistic and increase the joy of playing.

3.1.2 Group design

We designed distributed teams with 2-5 participants and allocated the students to the respective teams (cf. 2.2 Decision making in distributed groups). Though all participants had a good basic knowledge of IT their training was different: the students from Koblenz-Landau study Computer Science with a minor in Information Systems, the ones from St. Gallen study Business Administration with a minor in Information Management. The students from Münster, who only participated in the second experiment, study Information Systems.

3.1.3 Process design

The process design among the two experiments varied considerably:

First experiment

Each week – reflecting one real year of the company- the students had to hand in their joint decisions to the game management while paying attention to tight deadlines for the submission of their decisions. Overall seven rounds of the game were played. One day before the submission of the decisions the students had the opportunity to attend a videoconference not exceeding thirty minutes with their partners. The decisions then were evaluated by the game management and the results were handed out on paper or emailed to the students in St. Gallen. Together with the results, a ranking of the groups was published. In a moderated closing session the students were asked to talk about their experiences and impressions (for further details cf. Klein et al. 1997).

Second experiment

Based on the experiences of the first experiment, the modus of playing was altered: the game was carried out in a compressed timeframe. The duration of the experiment was limited to four days in which the students had to be present from 9 a.m. to 4 p.m.

Day	Morning session	Afternoon Session
1	- Introduction - Strategy formulation	- Test round - Discussion
2	Round 1	Round 2
3	Rounds 3&4	Round 5
4	Rounds 6&7	Closing

Table 1: Timetable for the second experiment

For the strategy formulation and the test round 15 - 20 minutes of videoconferencing (VC) time had been assigned. During rounds 1 to 5 the students had 12 minutes of vid-

eoconferencing to their disposal, in rounds 6 and 7 this was reduced to 9 minutes. After the test round and the rounds 1 and 2 a certain period of time was scheduled to discuss the results and to answer questions of the students.

After each VC session the decisions had to be immediately handed in, were processed by the game management and mailed to the students in Münster and the game management in Koblenz and St. Gallen. The students had to give reasons for their decisions after every round in so called "log files" to make it possible for us to understand how the decision process changed over time.

3.1.4 Communication media

For the interaction among the distributed team members various means of telecommunication services and computer-mediated communication were available: primarily email and videoconferencing, or more precisely desktop multimedia conferencing, and phone and fax as back-up media, e.g. when delivery problems with email came up during the first experiment between Koblenz-Landau and St. Gallen.

3.2 Interaction system

The interaction system describes the organizational and behavioral dynamic among the participants during the experiments.

3.2.1 Emerging group and process structures

While we had defined basic parameters of the group and process structure, we had intentionally left considerable leeway which had to be filled by participants, e.g. how would the work be divided, what would be discussed during the video-conferencing sessions, how would the cooperation evolve over time, how would conflicts or contrary positions be overcome.

3.2.2 Media usage

We had provided a basic set of communication media and a static schedule for the VC usage. However, the students developed different patterns of selecting and combining the available communication channels for different tasks or different modes of communication, such as negotiations or exchanging decision parameters.

Depending on the experiment design, the students developed varying patterns of spreading the communication sessions over time, e.g. more immediate linkage between VC and email sessions during the second experiment with more severe time constraints. Media appropriation denotes changes in the perception, assessment and usage of communication media over time. We anticipated a changing evaluation especially in relation to the VC as this was a new medium for the participants which they had to learn and adapt into their (evolving) task environment.

3.3 Effects

We distinguish the results of the interaction system in organizational terms and in terms of media usage.

3.3.1 Group performance

An external measure of the task-related group performance are the game results. In a broader view, we took also the achieved level of cooperation among the team members and consensus building as performance indicators.

3.3.2 Media competency

We wanted the students to experience and reflect what effects computer-mediated communication had on distributed decision making and collaboration. Media competency denotes the ability to assess the strength and weaknesses of different media in relation to various task environments (Doelker 1994). It comprises an intellectual capacity to give a grounded evaluation of communication media as well as a behavioral dimension of selecting, combining and using communication-media in varying task and group environments.

4. Findings and analysis

We will report some findings and observations from the experiments and their analysis focused on the interaction system and effects in our exploratory framework. The distinction between organizational and media usage aspects is primarily for analytical purposes, during the experiments we observed a close linkage between the organizational and technical aspects.

The (anecdotal) evidence we report is based on

- the closing sessions with our students
- observations during the video conferences
- "official" and "unofficial" conversations with the students
- their strategy papers
- their log-files (only for the second experiment).

The role of the game management was mainly to design the experiments, to handle problems and exceptions and to observe the outcome.

4.1 Group interaction: evolving group and process structure

While we had structured the overall task, team size and membership, a major challenge for the students was to organize their work, divide and assign tasks. The simulation required a combination of thoroughly performing subtasks, such as assessing IT projects, calculating budgets etc., and to make decision that reflect the interdependencies of the various management domains as well as built-in delays in the effects of decisions. While quite a bit of parallel and double work was feasible during the first experiment, the time pressure we created during the second experiment enforced a stronger division of tasks. The groups had to discuss basic principles of organizing their work and used the rich medium VC for the purpose of these negotiations.

Given the different education and specializations of the team members we suggested during the second experiment that the team members should swap their roles, IT manager and general manager, after a couple of game rounds. However, this suggestion was widely ignored and the emerging group structure showed a considerable amount of inherent dynamics and resilience.

The decision making processes consisted of two elements: the strategy development as metadecisions and the negotiations about decision parameters during every round of the simulation.

The goal of strategy formulation was to determine the main business policy decisions for the game, such as price or quality leadership, market share etc. As the strategy development was concurrent with the initial phase of the game, the students strived to understand the structure of the game, major interdependencies and restrictions, so that the strategy phase was less interactive then it would be in an ongoing business.

Decision making processes

The decision parameters were typically developed over three phases of communication and calculations:

(1) During the first email contact controversial and non-controversial items were distinguished and IT-projects for the next round were selected to be discussed during the VC.

(2) During the videoconference the results of the previous round were briefly analyzed and discussed and decisions about core parameters, such as sales price, number of items to be produced, forecast of the expected revenue, IT-projects to be carried out and a rough estimation for the IT budget, were made. Then parameters dependent on the previous decisions e.g. sales-, production-, and IT-staff and less important decisions, e.g. standard wages or market research projects as well as possible alternatives for the next but one round were discussed.

(3) During the second email exchange usually details were clarified, e.g. exact calculation of IT-budget, and a few parameters, one or two IT projects, production volume or sales price, were sometimes adjusted.

Different heuristics were chosen to determine the IT projects: some were budget driven others selected the projects based on the goal structure of the game (IT matrix) and checked the budget afterwards. Some of the students developed their own tools, e.g. calculation spreadsheets, to accelerate the decision making process and to avoid mistakes.

Furthermore all teams allocated more or less time to understand and reconstruct the underlying logic and inherent rules of the simulation model. Some students (successfully) tried extreme parameter settings in order to distort the simulation model.

Emerging group and process structure

It has not become fully transparent for the observers how single decisions were made within the distributed teams, which were forced to make a decision until a certain deadline. We gained the impression that overall the teams succeeded to create a prevailing sense of agreement and neither side tried to dominate the other. But this does not mean there were no conflicts at all: especially in the first rounds there had been disagreements about (strategic) general management decisions and key projects in information systems. However in the first two rounds of the first experiment there were complaints about team mates at the other location which were expressed to the respective game-management: students from Koblenz-Landau claimed that their counterparts were not prepared for their videoconferences while students from St. Gallen argued that they were excluded from decisions. The game management succeeded to resolve these concerns. During the second experiment there were no major complaints and grave differences of opinion were exceptions.

During the game different levels of agreement were achieved: the scope ranged from (near) indifference –"oh, nice, let's do what you just proposed"- over decisions which

represented an compromise which left all players unsatisfied (e.g. unresolved differences about high or low price policy led to a medium price decision) to consensus, which was obtained by exchange of opinions and following discussions.

Definitely the composition of the distributed teams had an effect on how a decision was made:

In those teams with only two members involved (one-to-one relationships between Koblenz-Landau and Münster in the second experiment) the decision process was comparatively smooth.

In cases of more than two participants involved the situation became much more interesting especially in two-to-two and two-to-three constellations (experiment one and Münster-St. Gallen in experiment two):

- We observed that before the start of a video conference the team members at one location aimed to achieve consensus and then tried to convince the partners at the other location.
- During the first videoconferences most groups had a division of roles: one team-member acted as "negotiator" and spoke with the respective "speaker" on the other side, while the other team member(s) acted as "assistant(s)", consulting the game manual and having documents/calculations ready in case the "speaker" needed them.
- The students read their suggestions to their team-mates and these were regularly confirmed without discussion. Only in the case of grave discrepancies, specific parameters were discussed in detail.
- The free exchange of opinions regardless of the affiliation of the team members happened exclusive in later game rounds and only if confidence between all team members had developed (cf. 4.2 media appropriation). The relationship between the distributed team members varied considerably: it ranged from a mere working relationship over small-talk to invitations to visit each other.

During the experiments we noted networking activities in several dimensions:

Team members at one location tried to build a consensus before they would negotiate with their counterparts at the other university.

During one experiment an attempt was made to build a cartel consisting of four out of the six participating teams during strategy formulation of experiment one. The initiative for this action came from the students in St. Gallen, who were successful to persuade their team-mates to do this.

Furthermore there were contacts and information exchange among the competing teams at one location: In the second experiment we had an example for inter-group interaction where students talked "off the record" with each other about their respective team-mates. A computer pool close to the rooms where the VC took place had been turned into a "gossip center" while students were waiting for their results and were emailing with their team-mates. Their talks were not task, but mainly process and group-related.
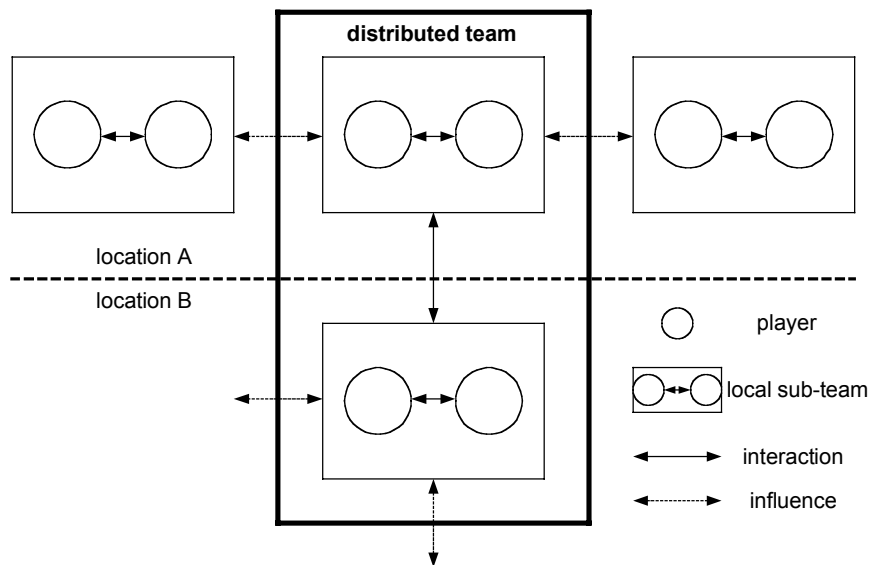
Fig. 4: Multiple affiliations and interaction levels of distributed teams

4.2 Evolving communication media usage patterns

A major goal of the experiments were to let the students experience the respective, situation specific and task related qualities of different communication media and to learn to combine the different media for different purposes. As there was both a repetitive structure in the tasks (similar decisions had to be made for several rounds) and an ongoing learning process about achieving faster and better decisions, communication processes and media usage changed over time.

Media selection and combination

We noticed that the given means of communication were used at different times to solve the tasks. During the game, email contact was typically used to prepare for the video conference by preliminary talks and to determine the subject of the video conference. By email controversial items were identified and postponed to be solved during the videoconference. During the video conference the principle decisions were made. Afterwards came another email exchange in order to clarify details, e.g. exact calculation of budgets, if this was necessary and there was enough time (see also 4.1 Group interaction: evolving group and process structure).

This distinction of media usage supports the findings about the information richness (cf. Daft et al. 1987) of different media and task structure support:

Communication medium Media qualities	Email	Videoconferencing
Information richness	Information poor medium, supports only written messages, emoticons and reading between the lines make email a richer medium, however ambiguous medium and there is a greater risk of misinterpretation	information rich medium, capturing facial expressions, degree of certainty etc., conveys trust
Task structure support	*"doing physics"*[1]*:* supporting and performing well structured tasks	*"talking physics":* supporting ill-structured tasks: strategy development, consensus building, negotiations, mutual encouragement etc.

Table2: Qualities of different communication media

Media appropriation

How did the students use the medium VC which was new for all of them and change their evaluation of this medium over time? One of our main learning goals was to improve the students' media competency. As mentioned before (cf. 4.1 Group interaction: evolving group and process structure) initially two "speakers" representing the local subteam conferred with each other and the other team-members remained mainly silent. What is necessary for evolving confidence, which is the basis for a more open exchange of opinions, between distributed team-members who never met personally ?

The use of VC varied significantly and depended on the flexibility and the social competence of the students. Some had an intuitive access to this rich medium and used it very natively: the use of gestures, interpretation of facial expression, the use of loudness and level of the voice and distinguishing between said and unsaid was realized by these students. On the other extreme some students mere "telephoned" with each other and scarcely looked into the camera. In general the familiarity with the medium increased over time and again the students were very heterogeneous in developing their communication skills.

In some but not all groups confidence emerged with a growing familiarity and the growing experience of joint problem solving. The rich communication medium in combination with the task environment facilitated the bonding of the participants. Failure might be attributed to antipathy, uncertainty or a negative group dynamics.

Fig. 5 depicts two ideal types of communication among the subteams: intermediated communication on the one side vs. direct communication among the team members regardless of their university affiliation on the other. In the later case the distributed team

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[1] The distinction between "doing physics" and "talking physics" was introduced by Merz (1997) as a distinction between face-to-face exchange of research ideas (talking) and running calculation etc. in distributed teams connected via email (doing). We have used this distinction as a metaphor for the richer exchange about strategies, ideas, evaluation of results etc. (talking), even though this took place – as a result of the experiment setting – via VC, vs. calculating the budgets and checking the preconditions of projects (doing).

members have developed a strong sense of identity within the entire group in contrast to the initial us-vs.-them.
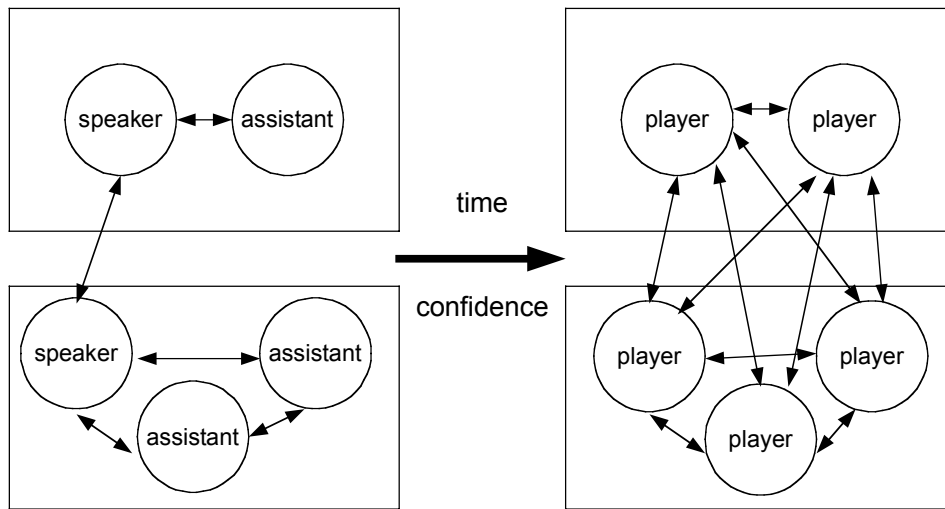

Fig. 5: Ideal types of group structure

A potential indicator of this process might be a diminishing need for VC time slots as the *talking* part becomes relatively less than the *doing* part.

4.3 Effects and results

With this dimension we are trying to conceptualize and measure the outcome of the interaction system in organizational terms and with regard to media competence as an individual as well as group measure.

Group performance

It may seem obvious to measure the group performance by the size of the cumulative profit a group had obtained during the game. In the appendix the results of both experiments are given. For a comparison among the two experiments, parameter settings (economic trends in the second experiment) have to be taken into account.

There are, however, numerous contingencies, such as a wrong perception of the game in the initial phase of the game which could not be compensated or neglecting to carry out market research and therefore losing the chance to benefit from underlying economic trends, which have a stronger influence on the outcome of the simulation than the group performance. And even a high cumulative profit is not necessarily an indicator for good group interaction? The good game result could be the effect of an individual performance where one student dominates all others or might be attributed to the different educational background of the students (management, IS or CS) or qualification of the group members. It is even harder to assess the impact of media support on the game result.

A better indicator might be the efficiency of self-organization and the quality of consensus building and negotiation processes. However, we did not have appropriate measures for these parameters.

195

Media competence

Most of the students achieved media competence as an intellectual capability which was shown in the concluding discussions about relative strengths and weaknesses of VC and adequate application domains.

As a behavioral dimension, some of the students during the second experiment had learnt to instrumentalize the specific features of VC to accomplish the given task, they efficiently allocated the diminishing time slots to tasks which required an information rich channel, such as negotiations, consensus building and to keep the morale high. At the same time they allocated more structured tasks to email communication.

Telecooperation competence

Telecooperation competence is an aggregate of group performance and media competence: How well have the participants achieved to use computer-mediated communication media in order to solve the given task in a distributed group environment? We do not yet have adequate measures for this dimension but have observed the development of group related problem-solving capabilities over the course of the experiment. In the end distribution of the team was no longer regarded as a major obstacle but rather as a challenge. Curiosity was raised and some of the students wanted to get to know their peers personally.

5. Conclusions and outlook

As the experiments we have conducted, have provided some interesting insights, however only limited empirically useful data, we would like to briefly touch upon different perspectives and indicate further questions

(1) Research perspective

We have done experimental research as a by-product to a teaching exercise which resembles in some ways action research: we have been part of the teaching exercise, actively defining the environment and several parameter settings. Within these settings we let the students find ways to telecooperate in order to solve the given task. Out main focus was the interrelationship of media usage and emerging organizational arrangements. The evidence is anecdotal at best but indicates the salience of group dynamics and affiliations of the team members on the one side and significant changes in VC usage and assessment over time.

(2) Teaching perspective

We have tried to create a rich learning environment. In the students perspective the simulation game was the main task, which indicates that the task structure is very important to gain and keep students attention. While we and the students have experienced some limitations in the underlying simulation model, this has had an advantageous albeit unintended side effect on our experiment: the students were confronted with ambiguous results and had not just structured, immediately task-related about the decision parameters but also less structured meta-discussions. We have tried to facilitate a "experience and reflect" approach and allocated some time for feedback sessions about the experience with VC technology and the group dynamics.

(3) Relevance for telework and generalization of results

Given our research design, any conclusions for telework must be tentative. We found that the combination of organizational parameters (task, group, process) and technology is very critical for the acceptance and appropriation of new technologies. Despite a very rigid schedule for the VC sessions, the students developed various procedures to align communication media and task solving. Some leeway for experiments with individual combinations of technologies and appropriation over time were apparently useful. From our experience we would conclude that similar experiments are a good way for (technology/ media) requirements analysis in preparation of telework as well as part of an implementation strategy which exposes the (future) teleworkers to the perils and promises of telecooperation and helps them to reflect training needs or needs for specific organizational or management arrangements.

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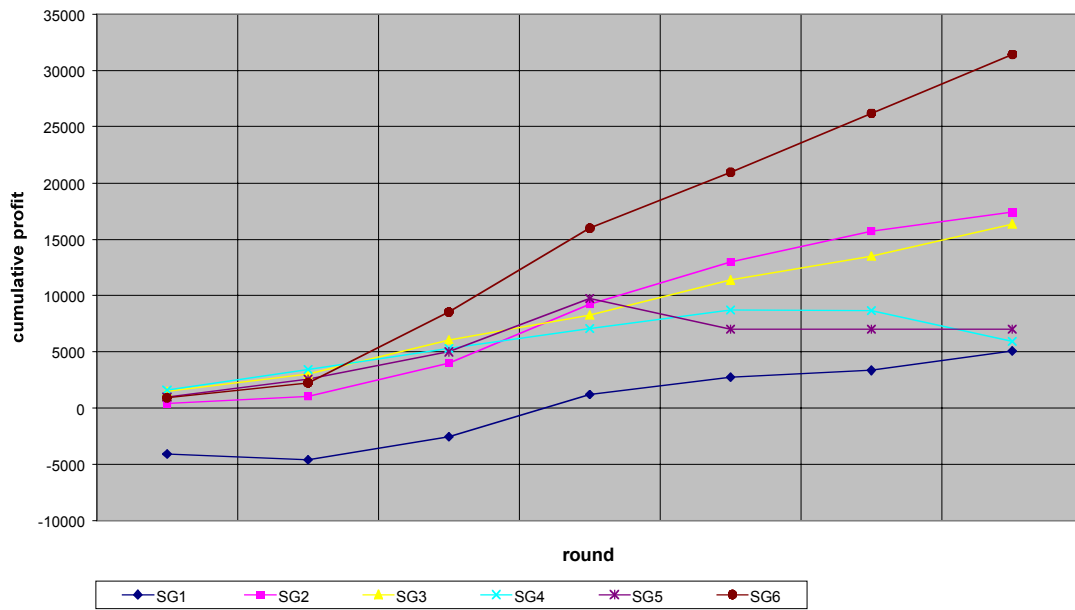
Appendix

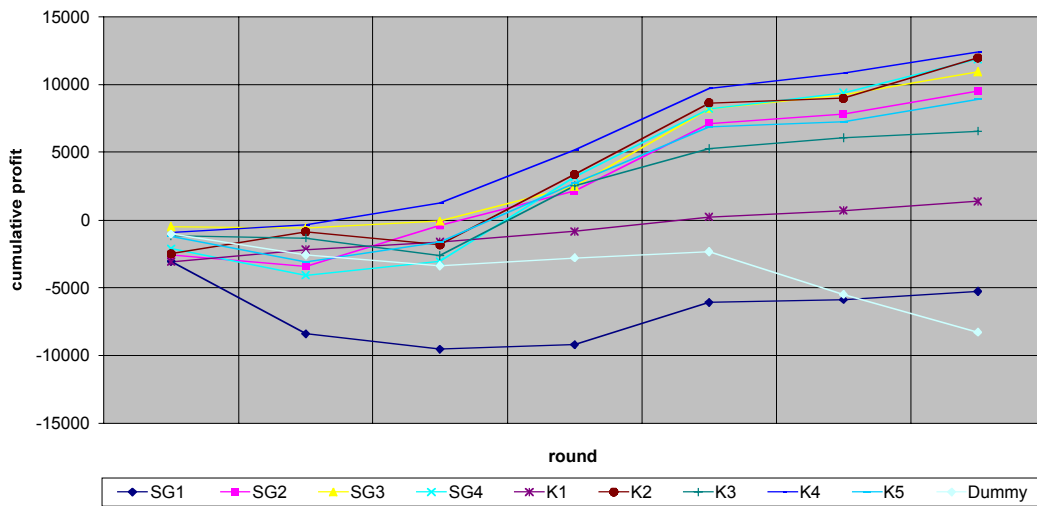*Fig 6: results of experiment one*

Fig 7: results of experiment two

Creating a Tele-Education Environment for Virtual Business Training

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1. INTRODUCTION

The competitive environment around most businesses and companies is changing with accelerating speed, i.e. competition is becoming world-wide, organisations are becoming decentralized, new products are developed faster, new producing technologies are emerging and new delivery channels are available. Organisations are in the midst of whole new challenges and are seeking for better competitive position and productivity.

There is also a demand for the training methods to be able to describe the characteristic of the recent and future environment and to train the employees to be able to operate effectively and productively in this environment. Regardless of the level of productivity improvement desired, people as decision-makers and as responsible for task execution need to understand thoroughly what they are part of in order to be able to cope with every day tasks. While the world around businesses is changing with growing speed the business game processing methods are still quite the same as 25 years ago.

Saffo (1997) has noted: *Better tools can narrow the gap (*between the volume of information and the effectiveness of the sense-making tools that technology has built for us*). In the next decade, the most important new sense-making tools will be those that help people visualize and simulate. Visualization techniques reduce vast and obscure pools of data into easily comprehended images. And simulation systems will become intellectual training wheels for executives, allowing them to experiment with strategies in the forgiving world of cyberspace, in much the same way that pilots in the Gulf War ran practise missions before flying the real thing.*

In the future the use of management games in learning will probably be at least as common as today (Elgood, 1996): *Technological development will certainly not slow down, and one will be able to simulate more situations with greater realism and greater ease. ...work will be seen as an activity that should be rewarding in itself, and enjoyable, and therefore something to which game-playing can reasonable be linked.*

The purpose of this paper is to introduce an advanced business game processing technique and architecture. Applying this technique the benefit of using a business game would in several aspects be more effective compared to the traditional techniques. With this technique the training can be carried out decentralized in real-time over a network environment. While this suggested business game architecture itself is decentralized, with it should also be possible to describe and study the properties and

characteristics of telework and virtual organisations, and possibly even to train workers to cope with telework environments.

While writing this paper, the author is working on a construction of a real-time processed business game. After the completion of the game the aim is to study the use of decentralized real-time processed business game on training.

2. MODERN BUSINESS DECISION-MAKING ENVIRONMENT

Business games offer the participants knowledge on how the decisions carried out affect the business environment and thus prepare the participant to learn more about decision-making by experience. The game used should hereby describe the actual decision-making environment of the organisation. As the environment has changed considerably, two aspects of the change are briefly described.

2.1 Changes in the significance of time

Traditionally strategic decisions have been long range decisions, and operative decisions have been every-day-like, executed often by a sudden change or need in the business environment. Today, the world is changing more rapidly than ever, mainly because of technological development. The speed of change reflects, of course, on the way operational decisions are carried out, but it also reflects on the way strategic decisions are made.

Some years ago the strategic planning process was seen as a planning tool with which (Näsi, 1991) *the environment is forced to bend if the company only knows its planning procedures properly We are dealing with an ideal world: Information is available, the company has money and resources to create and shape things; the CEO and the secondary management have time to discuss the matter; they are also capable of understanding all the preconditions of good decision making and the connections*.

Nowadays, the future is very difficult to predict, but it is also realized, that mastering the future does not necessarily demand predicting. The faster and more effectively we can react to changes, the less we need to predict them.

Näsi (1991) states that the development of the traditional strategic thinking has moved from the strategic planning and portfolio management stages to a new stage which he describes as strategic gameplaying stage (Näsi, 1991, p. 35) *the central task of a strategist is to make good moves on the play ground. The key to the third stage is to view strategic thinking as gameplaying... The limits of the ground or board are more undetermined, the rules are only partially known and can change and the player must create and develop the alternatives - by him/herself.*

In this turbulent competitive environment the customers expect shorter times of delivery, accurate deliveries and fault free products. The speed of reacting to market changes has become an essential competitive factor. Very likely this development will even become more rapid in the near future, because the technical evolution is enabling

shorter production development periods, new product innovations and new ways to organize customer communication and transactions.

A company mastering time has several new characteristics compared to a conventional company (Kanerva, 1991): it develops integrated functions and operates without function boundaries in accordance with process workflow. Experts and users work together both in planning and implementation. Flow of information is emphasized and information passes fast through the organisation.

Because of the fast decision-making the present batch-processed business game methods do not describe the environment of the decision-making well enough.

2.2 Teleworking

As organisations have converted to an information age economy, they have also decentralized their organisational power and authority (Hesse, 1995). This has lead to a situation where decision-making power is as near the front line of operations as possible. And this - together with the advances is communication technologies - has allowed organisations to decentralize themselves geographically. By decentralizing activities organisations aim to reduce complexity, increase flexibility, improve efficiency, and create new strategic opportunities (Jackson and van der Wielen, 1998). These dispersed organisations are called virtual organisations and are designed to overcome time-and-place constraints associated with rigid bureaucratic structures. What has emerged is a new type of organisation that often relies on telework.

For people as employees in this new environment, the change has been a rapid one. It is obvious that technologies develop so fast that people have serious problems in trying to adapt to all changes. Teleworking involves several changes in the working practise compared to a non-teleworking environment. These changes may concern, for example (Jackson and van der Wielen, 1998):
- Self-management by the workers themselves
- Reduced input control
- Output-oriented management and supervision
- Skills involved in managing the psychological and social boundaries between work and non-work
- A need for better knowledge management and organisational learning
- Issues of commitment, loyalty and organisational identity
- Better team-building skills and trust between the parties

If the change is so obvious and the areas of change are so many, it is distinct that also the business training should be adjusted to correspond to this development. What is suggested here is that – compared to more traditional business training - tele-training could be in many ways a better practise in training virtual business.

3. ADVANCED BUSINESS GAME TECHNIQUE

This paper describes a business game processing method with which the decision-makers of different organisations could be trained to understand for example the mechanism of supplier selection, competitor activities in the competitive environment, strategy formation and alignment in a turbulent competitive environment, the importance of human characteristics in customer transactions, the operation of the supplier-producer-distributor-customer chain, stakeholder thinking and how to control distribution channels and subcontracting. At present all of these activities may involve characteristics of virtual collaboration and teleworking.

This paper will observe the methods of implementing a business game where several groups of participants make up several companies which all compete against each other. These companies fight for the same factors of production, same customers and same sources of funding. In every game there are several companies competing and by this is simulated the actual competitive environment where each competing company is composed of people who make human decisions.

It is essential that the business game environment is constructed in a similar way as the real world environment. This means that the connection between the players, the supply market, the customers and the capital market needs to be real time processed. Thus, different parts of the game must be connected to each other via a network. On point of view of the technical game processing the role of place is inessential (as described later on this paper). But what is essential is the role of time in decision making and the communication between the companies and different stakeholders. If the participants of the game are decentrally located, the business game training situation can be made to resemble the actual virtual business environment and teleworking.

3.1 Real-Time Processing

Present business games are not realistic in the way they are executed. They work in a batch-processed manner, which quite poorly adapts to the real world business environment. The batch-processing model works in a linear order in which (figure 1):

1 the participants first enter their decisions for the first business term or season,
2 the decisions are given to a game model which includes the game rules and operates with the decisions,
3 the game model gives the results for the participants from the first term
4 this iteration is continued from 1 as many iterations as needed in order to meet the goals given for the learning program
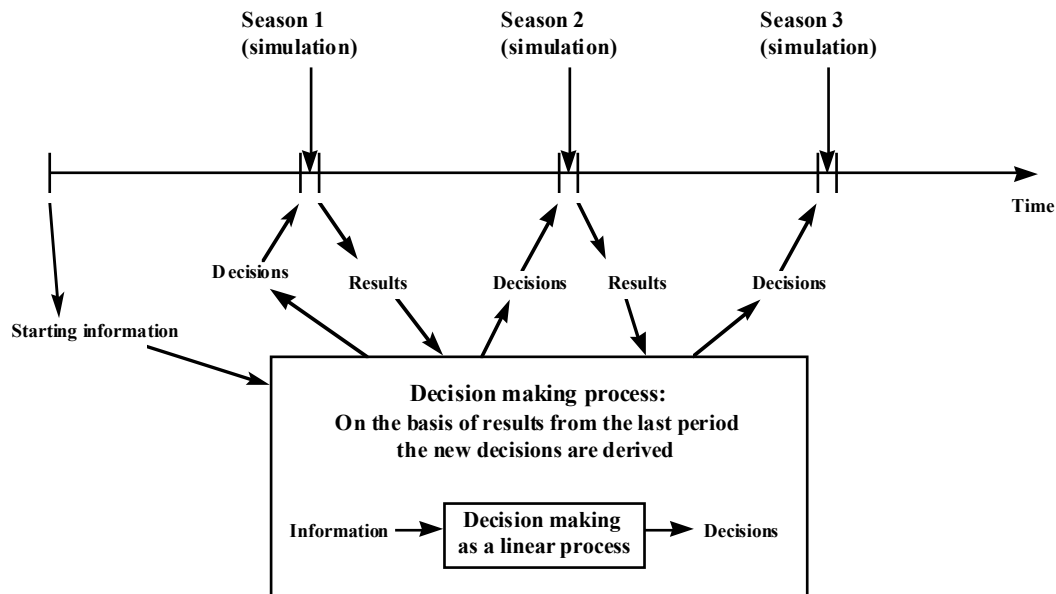
Figure 1: *Batch-processed business game.*

Batch-processing simulation works in a way where all the decisions from all the competing companies are first made for the whole season to be simulated. Then the simulation phase takes place and all the decisions are processed as a batch, all decisions being equal in the processing.

The problem with the batch-processing method is that world very rarely works in such a sequential order. There are hardly no business areas where the decision makers first enter all their decisions for the next budgeting term, then rest during all the actual term, and enter again the business in the end of the term to analyze the term results executed and to prepare the next budget.

So far the computer based simulation games have worked batch-processed which means that the model can not illustrate the actual functioning of real world decision making. The disadvantages of batch-processing are obvious (Lawrence, 1997): *The result of this is simulations which severely limit the management experience. Participants cannot afford to test strategies and plan contingencies since they are tied to their decisions for the entire period. This can often be unrealistic. ...In general, such business simulations tend to lock their participants into a particular approach towards decision making which reduces their potential value. The acute lack of flexibility discourages creativity which is often a trait which should be emphasised in management training. Such an architecture also means that the only data available for analysis are period to period macro or aggregate level parameters. No data is provided on the transactional level because batch simulations do not generate it.*

Proposition 1 means that the next generation business game model should work the same way as the normal business environment works, i.e. decisions making and having results from decisions made should happen in real-time mode when so also in the real-world environment. Real-time mode means that decisions are made continuously when in the game model and game market occur situations which need to be reacted by the

participants. In a real-time model decisions are made as soon they are needed or at least as soon as the decision-maker notices the market situation needs actions from him.

To sufficiently realistically represent the turbulent business decision environment the significance of time must be included. This is accomplished by building a business game, which includes internal time - a game which works as normal business environment so that different business events and decisions are processed, executed, and decided in virtual real-time. A game which has its own time, although the internal game time is much faster than the real world time.
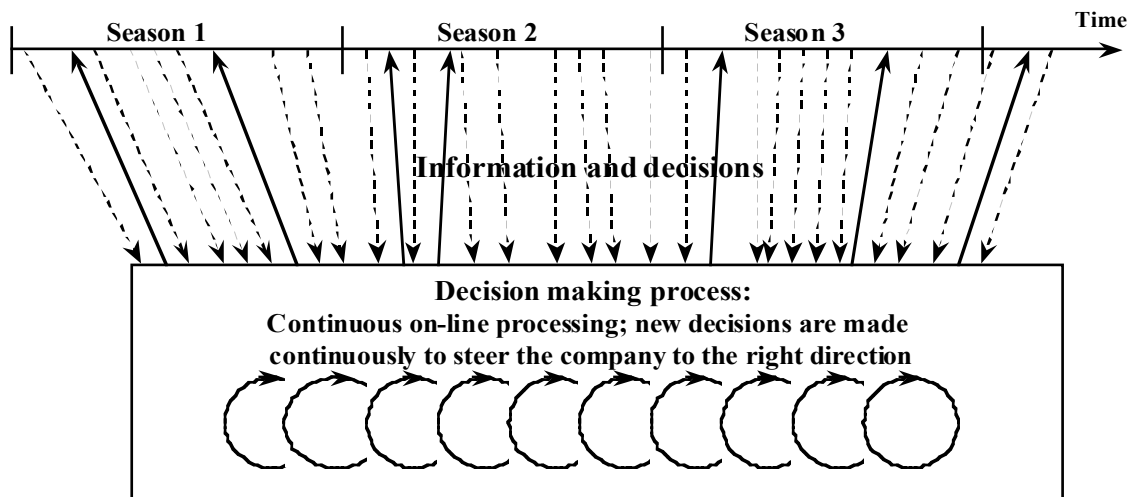
Figure 2: *The real-time processed business game environment.*

In real-time simulation all the events and processes take place continuously. If not necessary, the simulation processing does not stop at all. The participants who steer the company see all the market events and internal processes on-line. What ever happens can be seen instantly and reactions also can be carried out instantly. The simulation works exactly as in real world business environment with the exception that the internal simulation time is exhilarated compared to the real world. Figure 2 describes the real-time continuous on-line simulation.

3.2 Configurability of the Game Environment

For the learning itself it is important that the business model adequately resembles the real world environment of the participants. Learning is deeper if the business model is realistic compared to the real environment. This means that the game model must be dynamic and can be tailored according to the purpose and the target of the learning project. Proposition 2 means that the next generation business game environment should be configured for the players to describe their own business environment.

Research from empirical studies on simulations used for improving manufacturing operations (Räsänen, 1996) points out that *the level of detail in the (game) model matched to the manufacturing conditions under examination is a crucial issue in an organisation-specific simulation. We discovered from the feedback on the simulation*

exercises that if there is not enough detail in a simulation model, the persons taking part in simulation exercises are likely to consider the employed simulation model invalid for circumstantial problem solving.

The demand for a real-world resembling business game means today that the game must describe the actual structure of companies and their stakeholders. The chain from suppliers to customers and the connections between the company and its most important stakeholders must be included in the game in order to give the participants a correct holistic view of the business environment.

4. THE ARCHITECTURE OF THE REAL-TIME PROCESSED BUSINESS GAME

Real time processing demands a platform, which offers on-line connections between the different parties in the business game. This means a network environment. While the real-time processing technology demands a computer network platform, the technical solution of the game becomes decentralized, as in figure 2. With present network technology the participating computers (i.e. competing companies) can be situated geographically decentralized. The distances between the parties can be considerable without any disadvantages for any of them, because the data transfer times are insignificant compared to duration in human decision making. Thus, differences of some seconds in transfer times are so brief that none of the groups will benefit from being earlier informed, because the human decision making will nevertheless take tens of times more span.

With this structure based on a network the different entities (companies, suppliers, customers and funding organisations) are distributed. This represents the old structural situation before the age of decentralized organisations. Each of these entities has its transactional data maintained in databases. The participating companies have their own transactional data saved on local databases. The supplier, customer and funding databases (the market data) are maintained in the network server. This structure enables the sharing of the market data. All the companies are technically equal in terms of access to the market data.
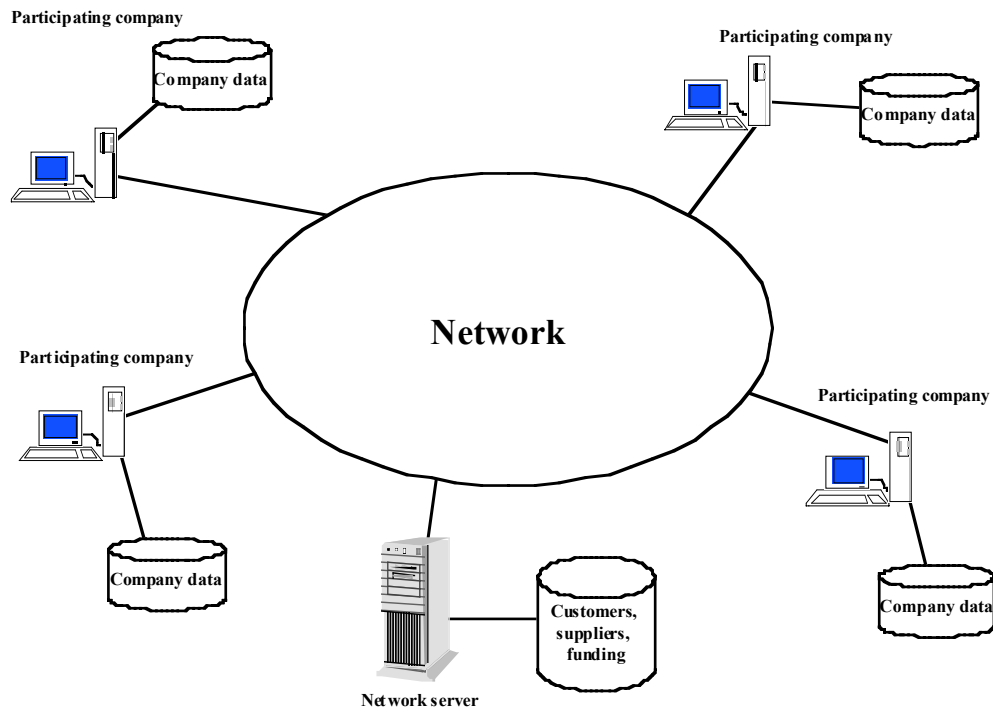
Figure 3 *The network architecture of a real-time processed business game.*

As described in figure 3 the real-time processed business game resembles the real world environment. But this architecture has decentralized only the complete companies from each other. The essence of virtual organisations and telework embodies the possibility that almost any company functions or tasks can be decentralized and work geographically distributed.

With the network environment and functionally accomplished game structure the entire functional decision making inside the company can also be decentralized. In this form the company transaction data bases are maintained in the network server and can thus be shared with several workstations all working on the account of one company (figure 4). Because the company databases are shared, the different company workstations can also be geographically distributed. Location of decision making is inessential. Instead the collaboration between the company branch offices and remote members is vital and it is possible only by the virtual teamwork between the offices.
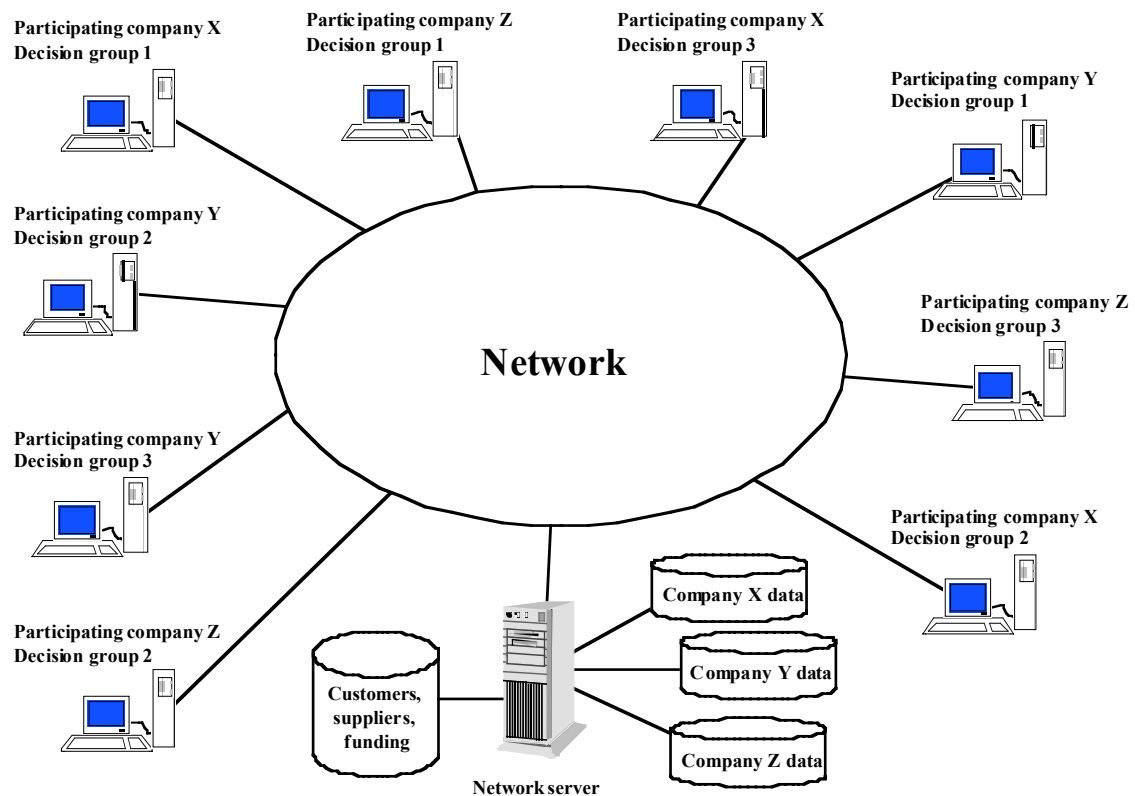
Figure 4 *Multiple company branch offices connected with each other with the company databases on the network server.*

Besides of functional decentralization the business game can be further developed to describe the present state of telework technology. In the case of figure 4 the branch offices need to have methods of communicating with each other. This can of course be realized with conventional financial indexes and accounts. These lay the ground for business decision-making, but are insufficient for effective cross-functional collaboration.

Besides of financial figures there must be diversified communication about the goals of the business entity and common agreements on these. This can not be accomplished just by dividing plain financial figures, but demands direct communication between the company offices.

Present telecommunication technology serves several instruments to accomplish communication between remote offices. Thus, the new business game could include cross-functional e-mail, voice mail, Internet phone, videophone, and so on, to support the internal company communication.

The game architecture can further be virtualised by changing the customer, supplier and funding markets from computer automated to human controlled. For example, a bank – instead of being an automated computer program – could be a virtual company steered by human participants and thus making real human decisions on which companies will be given funding and which will not. As a matter of fact, all the different parties in this virtual environment can be replaced from computer programs to

human controlled entities and each of these entities can be further decentralized so that the decision making within the entity is decentralized over the network.

5. THE NEED FOR VIRTUAL BUSINESS TELE-EDUCATION AND TOPICS FOR FUTURE RESEARCH

Virtual office workers need access to continuous learning throughout their careers in order to keep up with rapidly changing technologies and job requirements... Teleworkers have as much, if not greater, need for training compared to workers located in corporate offices. Isolation from management and co-workers can mean that home-based workers miss hearing about corporate issues, as well as the opportunity to benefit from the knowledge a co-worker may be able to share Training provides a formal means for employees to obtain the knowledge and skills that enable them to perform their jobs satisfactorily, and consequently, contributes to employee job satisfaction (Whalen and Wright, 1998).

People working in the same organisation need to know each other and their own role in the organisation structure. Jarvenpaa and Ives (1994) note that much more than the traditional organisation, a network organisation relies on its knowledge workers and their continuous ability to learn and grow. According to Jarvenpaa and Ives, the human resource management in a network organisation requires, among other things, empowered knowledge workers. This is obviously true also in virtual companies and teleworking.

Employees are considered empowered when they (a) get information about organisational performance, (b) are rewarded for contributing organisational performance, (c) have the knowledge and skills to understand and contribute to organisational performance, and (d) have the power to make decisions that influence organisational direction and performance. Considering the objectives of business games, a decentralized business game should be a means to train workers of an organisation to become better workers at least in the cases of items (a) and (c), because a business game can provide the workers the knowledge and skills to understand the information used to measure organisational performance and thus to contribute to this performance.

Face to face communication is essential in getting to know your co-workers, but in training teleworkers - as the workers often are scattered in different locations - it is not always possible to gather all the people in the same place. While it is often difficult to gather the employees of a company simultaneously in same room for training, a decentralized tailored business game could be a medium to train these abilities needed.

Whalen and Wright (1998) mention five reasons for organising distance learning instead of traditional classroom style training:
1. ability to take courses at a convenient location
2. access to expert instructors regardless of geographical location
3. interactivity of technology-assisted instruction that adds value to the learning experience

4. reduction of costs for the employer
5. increased employee access to training because of reduced costs

In case of decentralized business game training, an addition to this list could be the benefit of learning to use realistic tele-working tools in a virtual tele-working environment. If it really is so that the real-world environment similitude of the simulation enhances the learning process, then the decentralized business game should enable more effective learning of virtual working.

Another motive for decentralized business game training could be the aim to increase trust between distributed company tele-workers. Jarvenpaa et. al. (1998) note that in global virtual teams trust is pivotal. In global virtual teams the team members (1) remain in different countries, (2) interact primarily through communication technologies and (3) rarely see each other in person. Trust is needed for preventing geographical distances from leading to psychological distance.

Although the real-time processed business game might not be an instrument to increase trust between distributed company workers (which it, however, could be), at least the game could be used to better examine the evolution of relationships between virtual team members. Moreover, Jarvenpaa et. al. note that the research on trust in global virtual teams is a wide-open field. Future studies should examine if virtual teams go through the type of transition between inertia and revolution in the work behaviours and themes found in face-to-face teams.

Still, Jarvenpaa et. al. note that *team exercises that focus on increasing information exchange among team members and encourage commitment and completion of tasks early in the collaborative process might be expected to have a positive impact on perceptions of other members' ability, integrity, and benevolence, as well as team trust overall*. This implies that a business game like decentralized training method could increase trust between team member and enhance the productivity of a virtual company. The Jarvenpaa et. al. study - the aim of which was to explore the antecedents of trust in a global virtual-team setting - did not confirm that team-building exercises have direct effect on trust. But this may result from many of the limitations in the study, not the least of them being the fact, that the study communication medium was limited to electronic mail.

Jackson and van der Wielen (1998) note that managers dealing with remote employees and virtual team members who may seldom meet, need to develop new abilities if they are to profit from the new ways of working. Jackson and van der Wielen note also that technologically driven approaches to telework give little attention to the organisation of work. The social and organisational changes often underestimated are, for example:
- how to develop a meaningful vision of how telework could be introduced as a viable, strategic solution
- that the geographical dispersion of workplaces cannot be isolated from the broader influences of production

Distant learning is a category of training, which is technology-based, and where the instructor and students are separated geographically (Whalen and Wright, 1998). The decentralized tailored business game could be one answer on how to:

- train the employees to understand the company modes of action
- visualize the holistic structure and goal of the company
- make the employees to become acquainted with each other through the organisation
- make the employees to learn distant co-operation with each other
- make the employees to learn to cope with new communication technology
- orientate new tele-working employees to organisational issues

6. CONCLUSIONS

Real time processing demands a platform, which offers on-line connections between the different parties in the business game. This means network environment. The present state of networks enables the training to be geographically decentralized. Thus the training occasion can be compared to virtual organisations and telework. The advantages and disadvantages of tele-training are greatly unexplored. The real time processed business game could also serve as a research platform to gather information about how people behave in environments where they are greatly dependent on tele-working mediums.

Jackson and van der Wielen (1998) state: *In short, we need to develop new, integrative perspectives that provide more robust ways of analysing and theorising teleworking phenomena and so aid the task of understanding, implementing and managing it. A recognition of this – and the fact that there is a range of interests involved - is essential if the debate on teleworking is to move forward.*

While writing this paper, the author is working on a construction of a real-time processed business game in co-operation with two industrial partners to which the game will be configured. The game is planned to be in training use in the beginning of 1999. After the completion of the game the aim is to study the use of decentralized real-time processed business game on training and to survey the possibilities, benefits and disadvantages of the game compared to conventional business game training. One of the research subjects will be tele-gaming, i.e. arranging a game event where the participating workers are geographically distributed.

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Master of Science Education as Telework

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Abstract:

Telecommunications are vital device for researchers to exchange information between researchers located in different places around the globe. This kind of exchange can be regarded as external concerning individual institutions. But also internally there are also people with matching interests inside them. Why should they hold their meetings gathering in one place face-to-face at the pre-agreed point of time?

An electronic media was tested in creation and development of proposals for M.Sc. thesis in information systems science at the University of Turku in the spring of 1993. The reasons for this were (i) to test a new way of cooperative problem solving, (ii) to give more conversation time for the individual projects, (iii) to make these conversations independent of time and place and (iv) reduce the tutors work load. The results at that time show (i) reduction of time used in participation compared with the traditional procedure, (ii) deeper attention to the actual matters, (iii) variation in involvement depending on the participant's phase of thesis preparation, (iv) acceptation and utilization of the independence of time and place and (v) the participants' subjective opinion of having more to say when given enough time.

This paper clarifies on the one hand the theories behind the dynamics of such a gathering of students and on the other hand discusses how advancement in electronic communication has changed the scene since. A literary review focuses the phenomenon from two different angles that include educational sciences and organizational communication. Curiously enough both views anyhow seem to converge in a few basic issues, although their emphasis vary due to their different backgrounds.

On the basis of the discussion further experimenting is suggested and the application of the teaching method into other forms of education is encouraged. Especially, one issue should be researched thoroughly; Does new technology add value to the outcome, i.e. thesis?

1 Introduction

1.1 General

Most of research exchange today takes place through telecommunication between researchers located in different places around the globe. This kind of exchange can be regarded as external concerning individual institutions. But internally there are also people with matching interests inside them. Why should they hold their meetings gathering in one place face-to-face at the pre-agreed point of time? However, quite often university curricula do not often keep up in pace with the technological advancements. Some

traditions remain untouched and life goes on as usual. But, should students at crucial stages in their studies, have to hold meetings with their busy professors and tutors at timepoints suitable for both parties tying themselves to reception hours or even to being at the premises?

One tradition in the university curriculum is the seminar for creation and development of proposals for M. Sc. Thesis. The seminar has most usually been held face-to-face, once a week lasting one semester. However, an attempt to test whether there could be new ways of acting was conducted in information systems science at the University of Turku in the spring of 1993. The reasons for this were (i) to test a new way of cooperative problem solving, (ii) to give more conversation time for the individual projects, (iii) to make these conversations independent of time and place and (iv) reduce the tutors work load. The media used at that time was an electronic network conferencing (ENC) system.

The focus on this paper is to critically review the attempt made in 1993. To do so I will first have a new look at the theoretical background of the phenomenon of seminar i.e., which are the dynamics of such a gathering. Second, I will discuss on the one hand some of the original findings, and on the other hand try find what kind of changes have happened since 1993 in exploiting electronic devices. A literary review focuses the phenomenon from two different angles that include educational sciences and organizational communication. The latter part of the paper describes briefly on the one hand the original case study, and on the other hand how it could be done today. Still one issue remains unsolved; Does new technology add value to the outcome, i.e. thesis?

1.2. Definitions and problem formulation

The group action involved is usually called, in Europe and especially in the Nordic Countries, a seminar. This term is used here in two different meanings. As an institution it refers on the one hand to an educational institute for nursery and elementary school teachers or priests, and on the other hand to a specific form of education at for example a university. The second and a wider meaning for the word is an event for presenting or elaborating (conceiving) ideas or models for operation. Etymologically the term originates from the Latin word 'semen', nursery or garden, and the word seed has been derived from it in many languages. In this paper I will use the term in the meaning of a special educational activity in the university curriculum.

It is usual to have seminars at different levels of the curriculum at the university. They are deemed to give the students a chance to present their ability to manage a research project on their own. In lower level seminars students are usually given a subject and some literature to study. From these each makes a report (paper) and presents it to the participants at a seminar session. These occasions resemble public dissertations in a minor scale with opponents (not always). One has to defend his/her work "publicly" among peers. In these occasions the role of the teacher is to chair these sessions, not so much teach (of course the teacher later assesses and approves the performance). This

way a seminar differs significantly from lectures, and can not be regarded as a teaching incident but a cooperative learning incident.

A special seminar is also used as a part of the requirements for achieving a master's degree. Before starting the preparation of the master thesis a student has to provide a plan for the study. This prospectus is presented in a seminar where all students who are active in thesis preparation then take part. Usually this seminar lasts a semester.

At the beginning during one or two first sessions the tutor holds lectures on the arrangements and common guidelines for the thesis preparation. Thereafter each participant in turn presents his/her plan in a session, where it is discussed by other participants and approved by the tutor. Although participation into all sessions and careful preparation for the conversation in advance is obligatory for each participant, a few problems still arise. The goal of the seminar is on the one hand to assess the feasibility of the project and on the other hand to give collective assistance for the 'novice researcher'. However after presenting the prospectus the public discussion of it is over and the student is again left on his/her own only to discuss its advancement with the tutor. Another problem is communication. Although many of the 'fellow researchers' might have good hints and remarks concerning the study they cannot produce them in the session due to their communicational slowness or shyness, or because of not having had time to examine the paper in advance.

In the following literary review I will discuss the idea of the seminar through two frameworks: An educational scientific incident and a form of organizational communication. The main emphasis is set on organizational communication, but the educational angle will hopefully provide extensive understanding of the phenomenon in question. Although the seminar group seems to be quite academic by nature, fits its handling as a working organization quite well to be studied on the basis of the regularities of working life. Especially the idea of telework leads to ideas of computer supported cooperative work (CSCW), because the question in it is not about teaching but collaborative problem solving.

2. Previous research

2.1 General

In this chapter the aim is to shed some light on approaches to collaborative problem solving in a seminar through reviewing recent literature on the subject. This review covers two different foci to the references. These include educational science and organizational communication.

The educational science approach reviews some of the recent discussion that applies for explaining the phenomenon of a seminar. This discussion deals mostly with children working pairwise or as self-managing groups in problem solving. Anyhow age, ability or the size of the group are not essential factors in assessing the validity of the results

(Hoyles et al., 1992). Keywords at this consideration are Peer Coaching, Peer Tutoring, Cooperative Learning, Cognitive Change, Conflicts and Mindfulness in Learning and Transfer.

The seminar action in case resembles the forms of communication that are familiar from everyday working life. Therefore the second angle taken deals with the basics of these forms and conformities. On the whole the aim of the following review is to form some kind of ideal type (Weber, 1947) of the said seminar.

2.2 Educational points of view

The seminar work encompasses extending of understanding and the application of the extended understanding from the participant's point of view. The striving towards the thesis resembles strongly problem solving, where understanding is needed as a tool. Understanding can be defined as an active process. It requires combination of facts, combining the new acquired information with the already known, gathering pieces of knowledge into a whole. It is not enough that one has knowledge, it also has to be transferred. This transfer can occur through 'conversations', either as social communication between individuals, who negotiate and share meanings, or as an individual's internal debates.

Understanding does not involve only matters linked to the subject and their relations but also an ability to transfer and apply this relation to new contexts. 'An agreement over an understanding' encompasses individuals, each of who exteriorates his/her own understanding and confirms that other being along enhances his/her previous concepts. Conversations need not be only verbal. They can also be gestural, pictorial, mediated through computer interface or internal.(Entwhistle & Entwhistle, 1992)

The seminar work can be regarded to lead to 'agreements over understanding' described above. Through these agreements students find new dimensions in their own subjects and moreover give valuable knowledge to others, about angles that otherwise might remain unnoticed. A comment producing the perception of some things belonging together, pieces falling into their places in a puzzle, matters depending on each other, or one's mind locking into a certain pattern - these all describe what understanding is about.

Mindfulness of learning and participation constitutes a vital point in a seminar. Because the participants are in different stages in their work, their motivation to participate into the conversation and to take action on account of it varies. It is often thought that people who have the knowledge and skills probably use them as well when given the chance. This is not anyhow the case in the real life. There is evidence that individuals act most of their time under the assumption that, what they do is right because 'it seems reasonable', and by that realize the principle of least trouble (Salomon & Globerson, 1987). Participants who have reached further can have problems in orienting into collaboration, and thus their contribution to others remains less than it could really be. Likewise even

constructive suggestion from others can be rejected, because, at the end stages of their work, new, possibly sensible suggestion might cause confusion or - at its worst - to have to start all over again.

Reasons for people not acting, learning or transferring information so well as their knowledge acquired presumes are manifold. One can anyhow discern three distinctive groups: (i) Cognitive reasons, like shortcomings in bringing out and manipulating the acquired knowledge, applying erroneous ideas or strategic and generalization mistakes. (ii) Motivation reason, like expectations, uncertainty of facts or own knowledge, and indiscreet expression of failure. (iii) Personal reasons, such as will to lean on anything habitual, apparent and well known. Many other reasons can of course be found, but the common factor to explain the level of utility of ones capacity is mindfulness, a state of mind that can be defined as "the volitional, metacognitively guided employment of non-automatic, usually effort demanding processes"(Salomon & Globerson, 1987, p. 625).

Mindfulness plays a significant role in the seminar work, especially in the recruitment of participants. If every participant feels participation mindful, he/she is more willing to help others and also more inclined to approve and realize suggestions from others in his/her own work. On the other hand the opposite of mindfulness, mindlessness in someone's participation can cause a failure of the whole groups work. There are also more distal factors affecting mindfulness (and effectiveness) such as an individuals' overall tendency to mindfulness and the mental atmosphere of the student group. These factors, as well as the above mentioned, should not be left unnoticed in the development of the seminar work. They can be influenced directly, whether they hanged on individuals or environment (Salomon & Globerson, 1987). Socio-cultural factors - culture, mental atmosphere, common ways to perceiving situations, shared habits etc. - can be taken into account in the group division and recruitment. These factors however lead easily to using common 'scripts', 'eulogy', 'obvious' solutions, blind empirical and socially approved intuition and performing of 'standard operations' (Salomon & Globerson, 1987). This kind of action usually leaves the paradigm intact, and scientific contributions lean.

There are also more proximal sources to mindfulness. Situational motivation causes different approaches. A participation requiring application of tedious processes, that often are secondary for the goal (e.g. low usability of interface), lowers often level of efficiency. The will to accomplish, an important link between motivation and effective behavior, generates often in conflict situations ('not a chance to speak', problems with the interface) a desire to leave the participation into conversation or performing the task into a later point of time. A more mindful behavior can be expected in situations that rise from the will to accomplish, a positive self-esteem, sufficient (or insufficient) amount of justification, or from an obvious success as a result of participation. A further primary source of mindfulness is also advantages and values that can be reached through performing the task. On the whole only poor mindfulness can be expected in

situations (and matters) that are demanding too much (or too little) of the individual, in contrast to his/her perception of own abilities (Salomon & Globerson, 1987).

Cooperative learning refers to a learning environment, where small groups of students study together to reach a common goal. The composition of the groups can vary in size, structure (homogenic, heterogenic) and sex. It can also depend on the form of collaboration. These aspects define different methods of cooperative learning (Light & Mevarech, 1992). Different named types of groups have been developed in the literature. These taxonomies are not anyhow essential in this context. It is although worth mentioning that all these frameworks come from two basic sources of which one emphasizes social behavior and the other cognition.

Educational sociologists assume that assimilation, under 'positive contacts', can create relations between individuals, that can in turn have a positive influence on the students motivation, self esteem and views. Cognitive psychologists on the other hand set weight on the role of cognitive interaction in the learning of small groups. They say that cognitive interaction can have many positive features that develop understanding. These features include "*conflict resolution, cognitive scaffolding with no apparent conflict, reciprocal peer tutoring, overt execution of cognitive and metacognitive processes and modeling*"(Light & Mevarech, 1992, p. 156).

There are two leading schools of thought in the area of cooperative learning, Piagetian and Vygotskian that rule the empirically oriented research. Either view is referred in almost every report on the subject. The problem anyhow is that they both are too global to explain the acquired results in the area (Mandl & Renkl, 1992). Without going deeper into the whole theories, a brief introduction of some views seems appropriate. The Piagetian theories support stagewise assimilation through identification with and thereafter adapting to matters. They draw little attention to impulse-counter reaction -learning (Entwhistle, 1988). Vygotskian theories are on the other hand based on the use of cultural tools (languages, numbers, gestures and other symbolic tools) in the influence on, regulation and steering of social environment. Social tools act as outside messengers of the information regulation and interchange for social activities between individuals. They can also act internally by changing from outside communication tools to internal communicative signs. The language changing to internal speech means a change from a communicative to cognitive function (Leontjev, 1977; Salomon, 1990).

The Piagetian approach emphasizes the importance of a cognitive conflict in the rearrangement of knowledge. Cooperative learning is effective, because it promotes the formation of socio-cognitive conflicts through participants' different opinions and approach strategies. Seen in this way the interaction between peers, that is characterized by a 'free' interchange of mental models, is especially effective in furthering cognitive change. The Vygotskian perspective does not deny the socio-cognitive conflicts, but emphasizes, more generally, the importance of generalization of social level processes. Mechanisms that are not based on conflicts, such as the processes built through coop-

217

erative learning, are remarkable sources of in the enhancing of understanding. Thus an interaction between a novice and a more competent partner - who brings in an expert model by coaching and supporting - is a very effective method for cooperative learning (Mandl & Renkl, 1992).

So on the basis of the above these two schools present completely opposite views on the composition of the group. The question arises: Should a seminar group be formed from individuals who are at different levels with regard to knowledge and skill, or should it be completely homogenous in these regards? This calls for future research concentrating on recruitment factors, learning environment, learning behavior and educational results (Mevarech & Light, 1992).

How do "power relations" arise in a homogenic self-managing group? It seems that a good learning result requires the existence of at least one student-teacher. This individual as well as the whole group has to approve of this role. It seems that these individuals have this role already at the beginning (or it appears soon after the beginning). It is also essential that the student-teacher has some special knowledge and skills. This role encompasses leadership of the group's action; monitoring the advance of the work, sharing knowledge, a will to offer at least help in action and discrecy among peers(Hoyles et al. 1992).

It is worth questioning if it is possible to build strong universal theories on cooperative learning on the basis of present research. Therefore it would be advisable to develop more local frameworks that base themselves on the following aspects: (1) the knowledge domain, (2) the type of learning objective (basic skills vs. conceptual insights), (3) psychologically and educationally relevant dimensions of the learning environment, (4) mechanisms of compensation and substitution in social learning process (Mandl & Renkl, 1992).

The knowledge domain has quite seldom been involved in a process-outcome research. It would anyhow be more fruitful for any discipline if along with its theory formulation one would study the development of the discipline and its socio-cognitive processes side by side.

Many researchers find it too simplified to assume that certain forms of cooperation would produce similar benefits in all contexts. Piaget and Vygotski type arrangements do not assume exact assumptions on the socio-cognitive processes of the learning context. It is assumed that Piaget arrangements (homogenic group) apply most effectively when more radical transformations are needed. Vygotski arrangements suit better in situations where problems to be solved are more familiar. Anyhow conclusion should not be drawn without taking the knowledge domain into account.

The psychologically and educationally relevant dimensions of the learning environment are never one whole entity in any area. For example in educational computer programs

the student is assumed to have discipline specific knowledge and skills concerning knowledge domain, level of embedded semantics or a wider frame of learning the program represents. Learning to use spreadsheets in a group does not bring along any wider understanding of computer science. On the other hand understanding the automatic function in the program requires basic knowledge of mathematics.

In search for the socio-cognitive process variables, that are reliable predictors of learning benefits in cooperative learning, one assumes in advance that they are necessary and sufficient requirements for learning. Only this way one can expect the existence of certain processes to correlate with learning benefits in different contexts. Literature anyhow shows that assuming necessary and sufficient requirements is problematic. It seems for example probable that some cooperative groups are effective because of mechanisms based on conflicts and some because of consensus processes.(Cf. Bolan & Tenkasi, 1995) Therefore one should bear in mind that there can be different forms of effective groupwork.

Shortly, in order to deepen our knowledge of cooperative learning processes, we need more specific theories than the present Piaget and Vygotski approaches. A new kind of thinking in cooperative learning is required, leading to models that define more specifically the learning environment, the interactional relationship between the contents and objectives, and take into account the mechanisms of compensation and substitution in social learning processes (Mandl & Renkl, 1992).

Peer based interaction for example in computer environment is no educational panacea. It can be feasible, not only as an application, but also as a starting point into the research of cognitive, metacognitive and social processes. It seems that cooperative learning through computers opens possibilities for multifocused evaluation of the results of peer based interaction. These include knowledge skills, universal learning strategies, problem solving processes, and creative thinking as well as factors referring to psychosocial motivation, self evaluation, relationships between individuals, and social behavior (Mevarech & Light, 1992).

2.3. A view from organizational communication

"*Organizations are social units (groups of people), that are particularly built and continuously rebuilt in order to reach for different goals. They are characterized by following factors:*
- *Division of work, power communicational responsibility, that has been designed particularly to reach goals.*
- *The existence of one or more power centers, that control the collective aims of the organization and govern it towards goals.*
- *Interchangeability of personnel.* "

<div align="center">(Etzioni, 1973)</div>

"An Organization is a group of people, who systematically aims for particular goals through regulation over people and often also instruments"

(Wiio, 1992; translated by the author)

The definitions above both say that (i) an organization consists of a group of people, (ii) organizations aim together for mutual goals, organizations share responsibility, and (iv) organizations are systematical. Morgan (1989) uses same kind of definitions, but he states at the same time that such definitions destroy all interesting features from organizations, because they are seldom so rational or unanimous as the definitions might suggest.

Morgan's (1989, p. 67) illustration of a project organization states for example that it "*is much more like a network of interaction than a bureaucratic structure. Coordination is informal. There is a frequent cross-fertilization of ideas, and a regular exchange of information. Much effort is devoted to creating shared appreciations and understandings of the nature and identity of the organization, but always within a context that encourages a learning oriented approach. The organization is constantly trying to find and create the new initiatives, ideas systems and processes that will contribute to its success."…" A loosely coupled organic network has decided to become and stay as such."… "It has a small core staff who set strategic direction and provide the operational support necessary to sustain the network, but it contracts to other individuals and organizations to perform key operational activities"…" It changes constantly as different ideas become on line".*

The illustrations of organizational forms above together describe quite well the seminar activity in case. Such a seminar could be perceived as a contemporary project organization with some images also from an organic network. This perception can be deemed to be possible in order to examine the activity through organizational communication approach. Some authors anyhow would not see it as an organization although it fills most of the requirements given above (cf. Sjöstrand, 1979, Wiio, 1992).

Communication is exchange of information between people. Organizational communication is communication within organizational context. It means a creation and an exchange of messages in a network - which is in a state of mutual dependency - in order to respond to environmental uncertainties. (Goldhaber, 1985)

Organizational communication is such handling of information, that links partial systems of the organization into action in order to reach the organization's and its member's goals, and links the organization to it's environment of action (Wiio, 1992).

Effective communication usually requires that a similar concept, name, meaning and feeling for all participants. Thus they share the meaning. A message is a composition of symbols that have a meaning. In connection with messages one can speak about a way

of communication, communicator, and meaning of communication. Boland and Tenkasi (1995) talk about problem solving in communities of knowing. They say that "*the problem of knowledge in knowledge-intensive firms* (here communities of knowing, of which a seminar group is an example[1]) *is* **not**[1] *a problem of simply combining, sharing or making data commonly available*". Therefore they suggest two strategies for problem solving depending the nature of the problem and the group structure:

1. When the problem is well structured and the community routines are well established one can and should use the conduit model of communication (Shannon & Weaver, 1947; or a wider representation Berlo, 1963), where communication goes back and forth from the sender to receiver.

2. When the problem is ill-structured and the community routines are not at all established one can and should use the language game model (Wittgenstein, 1967), where the group has to create a consensus of meanings through language games.

One way to classify organizational communication is to divide it into four functions: Giving information, regulating information, persuasion and unification (Goldhaber, 1985). Here I will use another classification (Wiio, 1992):

- Functional communication refers to the actual function of the organization: to products and service.
- Maintenance communication refers to maintaining the continuity of the organization. It encompasses permanent directives and orders for action and work.
- Personal communication refers to the personal relations, work satisfaction, motivation, feelings, attitudes, and general acquiring of information in the organization.

All these classes can be found in a seminar. Prospect introductions and comment to them represent functional communication. The 'standing instructions' of the seminar (formal procedures, compensations and such) are examples of maintenance communication. Personal communication encompasses 'corridor conversations', 'whispers', and other unofficial 'letters to the editor'.

An organization is formed of consecutive chains of people, where each member has his/her own place and assignment. Messages run through particular 'paths'. These paths form a net. A composition of many nets is a network. (Goldhaber, 1985, Blair et al., 1985) A communication system between to people - a dyad - is the basic form of communication systems. The roles of members, the direction, addresses and contents of messages, all these have an influence on the composition and form of the network.

The role behavior defines a function and position for each member of the organization both officially and unofficially. Messages wonder in the network into three directions: up, down and horizontally, that is the most usual direction in a seminar. Messages move

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1 Comment and stressing by the author

also often consequently, which means that the same message goes from person to person. Often it changes through trimming, addition, accentuation and revision. The errors in consequent communication usually accumulate on account of (Goldhaber, 1985): (i) messages from various channels mix together, (ii) too many messages are handled simultaneously, and (iii) messages move too rapidly. In a seminar activity such error can be quite common, especially in an electronic network environment, one can attend to several sessions almost simultaneously.

An organization, aiming for effectiveness, is dependent on the contribution of its members. Organizational climate depends on the perception that members of the organization have on the quality of the relationships and communications in the organization as well as on the quality participation and influence. The organizational climate is more important than communicational capability and technique themselves in the creation of an effective organization. The efficiency of the communication system is not decided by communication technology but by the level on which the communication system can respond to the function and goals of the organization(Wiio, 1984).

The problems of personnel management in an organization has been research already for along time. Concepts concerning communication climate have been given since Taylor and his descendants of the school of scientific Management, through the school of human relations up to the school of contingency theory. Without going deeper into the thoughts of different schools it can be stated that following factors influence essentially on communication climate in an organization(cf. Poole, 1985, Goldhaber, 1985):
    1. Sources of information
    – Are the members satisfied with their supervisors and colleagues as sources?
    – What is the rate importance of these sources of information?
    – Are these sources of information to be trusted?
    – Are these sources of information open to communication?
    2. Changes of acquiring information
    – Can one acquire enough information from significant sources?
    – Is the information acquired useful?
    – Can one give enough feedback of the information acquired?
    3. The organization
    – At what level can members participate into decision-making concerning themselves?
    – Are the purposes and goals understood?
    – Is innovation rewarded, or is it suffocated under arrogance?
    – Are members' suggestions sufficiently welcomed?

The list above can be regarded as a general memo about organizational climate, but one notices that all the views in it apply as such to studying seminar work.

Messages can be classified in many different ways. One of these taxonomies is the following (Goldhaber, 1985): (1) According to message relationship; dyads, small groups

222

and the great public. (2) According to message network; official (up, down and sideways) and unofficial. (3) According to the purpose of the message; function, maintenance and personal relationship. (4) According to the receiver; internal and external. (5) According to the language; verbal and wordless. (6) According to the publication of the message; indirect and direct. All these classified type can form different combinations, where each atom can have nuances in meaning. Therefore communication as a phenomenon is very complicated and contains many problems.

There are different methods to communicate: verbal communication and different technical solutions; computer systems, cable TVs, teletext, telex etc.. Within this context here it is unnecessary to analyze the efficiency factors of different technologies or devices - although at least Mcluhan (1968) says that the choice of media matters greatly. Whichever the method - analysis concentrates on the following factors (Goldhaber, 1985): (1) Contents of the message, (2) timing (how often, when), (3) how the interactions happens (space, location, disturbances), (4) participants (members, how often), (5) initiator, (6) preparation (amount and type of work), (7) feedback (amount, how often), (8) direction, (9) meaning (decision making, information, ...).

In the traditional seminar (meeting face to face) situation wordless speech is quite usual. The code system (cf. Wiio, 1984) lists different codes of the body such as (Fiske, 1992): Bodily touch, nearness, direction, appearance, nodding of head, features and expressions, gestures, postures, movement of the eyes and visual contact, and wordless speech. The last can in turn be divided into two types: Prosodic codes that are linked to the stressing of words (level of voice, accent) and paralinguistic codes, that give information of the speakers emotional state, personality, social status, attitudes etc. (tone and volume of voice, accent, speech errors,....).

All the codes described above refer to a face to face situation. They are all direct codes. Although even representing messages can include direct codes. A written text can have a tone, a photograph can forward feelings (Fiske, 1992). Thus wordless speech can be linked to a literary (or electronic) conversation. As an example, paralinguistic codes can be represented in an Email message by talking loud in upper case text. One can communicate wordlessly through moment of participation, not participating or other such means. For example the saying: "Not to vote is an expression of opinion" can be interpreted as speechless communication.

2.4 Discussion

The two foci described above deal with same kind of matters almost identically. Both angles have been referred by scratching only the surface in this paper. There is a special reason for that: The literature on each subject is so vast that only a little portion can be discussed.

On the whole one can notice that seminar work as a continuos, longer lasting action becomes a hermeneutic circle, where expertise is deepened through recursive deepening

of the research process. Collective action helps in this 'digging', because the continuous growth of knowledge enables a participant to notice an angle, that has not perceived before, and a rutted individual researcher would not even have noticed.

Although a seminar exactly is not an educational incident according to a narrow definition, that bases on the idea of distribution of information, the educational approach gives a possibility to understand those sociological, psychological and cognitive processes that govern all learning situations, as which the thesis preparation also can be perceived. Regarding the seminar as organizational communication makes it possible to apply the large amount of material that the researchers in the field of interaction in business administration have produced.

3 An Illustrative Case

3.1 General

At the University of Turku it has been the custom to gather all students preparing their master thesis into a seminar, where each of them have introduced their proposals in turn. These seminar sessions have usually lasted two hours weekly during the whole term. Participation and presentation have been obligatory.

Formally this procedure has worked well. The problems have mostly concerned the contents and contribution to the student. When a student has presented his/her prospectus, it has been discussed a few moments and formally been approved by the supervisor. This has been the only public tutoring occasion, and after this the student has been left to struggle on his/her own only meeting with the supervisor during reception (usually 1 h/week for 10-50 students).

The procedure has been strongly tied to time and place. Another problem has been the fast tempo of the handling. It has forced the participants to comment the presentation without having almost any time to think about their comments. A good thing in the traditional form has been that it has enabled the students to develop their oral skills and preparedness to conversation.

For the reasons stated above the professor of information system science developed the idea of a trial seminar that would be held in a computer network in order to avoid the said problems and to test a new way of education. The author volunteered for the job to act as a participant and an intendent of the seminar as well as to report the results. The more comprehensive illustration of the test and its results is presented in one of my earlier papers. (Kangas, 1995)

3.2 The original test

The seminar of 1993 was arranged in closed computer network. Before the beginning of the test I scanned suitable systems to be used. The constraints for the system were: (i)

Possibility to run in a Unix-environment and to be assembled into the institution's computer. (ii) No cost were rendered. (iii) Closed from others than the participants. (iv) To fit into the tight schedule for preparation.

A multiple method approach was used for the research: (1)Participants were to report their time consumption on an unstructured survey. (2)The participants were also required to give their subjective personal opinion about the procedures and the system as a free-form comment at the end of test. (3)Participation was monitored through a log embedded in the system. (4) The researcher was a member of the test group inside the organization and in roles varying from observer to catalyst studied the system from inside as an action scientist (cf. Argyris et al., 1985). The Results of the test were analyzed using both quantitative and qualitative methods.

The original sample consisted at the beginning of 18 testees; the supervisor and 17 students. All the testees were gathered into a session at the institution, where they were given a briefing and introduction of the system. At the same session rules for the seminar were discussed and settled. Each of the testees were given written instructions for using the program as well as written rules of the seminar. Thereafter the seminar was held in the computer network each participant participating from the place at the time point of his/her choice. At the end of the seminar the participants were gathered together into a session at the institute to discuss the procedure.

The system was an ENC system that could be acquired free of charge through the Internet and adapted to the institute's computer. Without going deeper into the system specification one can say that at that time it was one of the few "near-on-line" conference systems available.

3.3 The original results

Participation: The rate of participation remained quite low, about 0.7 comments/ participant/paper.
Time Consumption: The average was 15 hours altogether. Compared to the face-to-face situation taking part in in each obligatory session the time consumption was reduced to a little less than a half.
Time and place of communication: Communication seemed to be more frequent towards the end of the semester. The ratio of timing was 45% during working hours and 55% during other time. So the independence of time was noted and well exploited. The original idea was also to view also the places from which participants were connected to the system. However, this was impossible, because system log could not manage this option.
The author's subjective overview of written comments:
- Independence of time and place was well taken for

- Some claimed that the system was easy to use. Others on the other hand said that the low usability of the system and lack of PC-terminals and modem lines did not motivate participation.
- In most reports was the fact that the seminar lasted longer deemed good. It gave enough time to get acquainted with the subject and think about one's saying enough. Also one could talk about matters that remain unspoken in a traditional seminar due to time constraints and because commenting a strange subject requires more concentration to the contents.
- I had an apriori perception of a psychological hinder of writing a comment without the possibility to delete, be a problem. Only one anyhow felt that way.
- Another apriori thought of mine was that this kind of action might alienate some participants socially. Again only one longed for verbal practice.
- Some said anyhow that this kind of action lacks the background that personality might add to the plans.

4 Summary and Conclusions

 The purpose of this paper has been on the one hand shed light on the phenomenon of seminar and on the other hand to analyze through a literary review and an empirical study possibilities to remodel its participation forms. Theoretical review has included two angles: Educational and organizational communication. Generally one can say that in spite of the apparent differences in the approaches, that arise from the different emphasis of each discipline many similarities can be found there. It can be admitted that no one of them can alone formulate a theoretical framework of the seminar activity. They can not do it even combined.

The concept of a seminar itself would require much wider discussion, than on a short paper as this is possible. Although seminar education has already very long been vital part of higher education as a form of learning and interaction, no wider framework for its concept can be found in the literature, neither has it much been studied. Generally speaking a seminar can be perceived as a conversation incident about some subject, or some subjects, where through interaction and cooperation the matter is discussed as many-sidedly and deeply as possible, by introducing and receiving opinions in order to reach as wide understanding (sometimes consensus) of the matter as possible. This way of working differs from many other collective ways of idea development (e.g., brainstorming) so that the semen (seminar) already exist and it is only collectively fertilized. Although seminar in higher education curricula is registered as a teaching incident, the question - widely thought - is not of teaching but a learning incident, enhancing of understanding to a new level. Of course there is also teaching in a seminar, if one perceives as teaching the distribution of knowledge and influencing in order to aim for a certain kind of action model that is done by experts.

The illustrative case involved a test of one, at the moment quite much outdated, electronic media. The original system requirements were: (i) Possibility to run in a Unix-

environment and to be assembled into the institution's computer. (ii) No cost were rendered. (iii) Closed from others than the participants. (iv) To fit into the tight schedule for preparation. Similar settings could be established easily today with manifold commercial applications (Intranets, Email and Groupware Solutions, Lotus Notes™. etc). They can even be surpassed through adding extra spices such as voice mail, video phoning, picture and file transfer and like.

The technology and its advancements as such do not set constraints to their effective use in education in a teleworking environment. As seen in the illustrative case above one can effectivise groupwork already with quite insophisticated and outdated device. The case study showed: Independence of time and place, lower threshold for participation, it eased the supervisor's work load, it raised the level of conversation, it gave participants experience of computer supported cooperation.

Still, the question is more on the quality of the outcome of such efforts, that is to say: One should in the future research concentrate more on the contents and outcome of the work than on the technological context. The dynamics of peer-based groupwork problem-solving should be studied still deeper. Even a scratch to the literature shows that there are numerous issues to be considered when discussing educational teleworking context. Teleworking in education is not a panacea, but it could be tested also in other circumstances at the university environment. Seminar activity should also be developed, not only in the direction that was tested in the case example, but also innovately in order to find new means for collective learning.

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A Social Approach to Flexibility in Distance Working

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Abstract

The purpose of the paper is to discuss the social aspects of the new flexible work practices supported by distance working. The paper starts from the findings that the most widespread forms of telework are not home-based telework as such, but new forms of organisation of work based on communication technology. Three main categories are described: mobile telework, new firms providing "telemediated" services and "mixed telework" combining several working places. They represent the emerging figures of flexible distance working. The paper also explains why "classical" categories of telework, such as home-based telework, satellite offices and telecentres, are declining.

The emerging flexible work patterns concern a wide range of activities and workers and will have much more social impacts than the limited experiences of "classical" telework. From the societal point of view, flexible practices of distance working can result in two opposite types of scenarios: a scenario of individual flexibility and a scenario of "socially sustainable" flexibility. Both scenarios are discussed in the paper and the authors plead in favour of the second one.

The paper is based on a recent book published in French by the two authors and entitled "*Le travail à distance dans la société de l'information*" (Distance working in the information society).

1. The need for an extended definition of telework

Telework has always been a fairly hazy notion, which can cover very different working situations. For some, it essentially consists of office activities done at home, with a status of employee or self-employed worker. For others, telework covers more or less all activities using information and communication technologies. Under this definition, a doctor who has a personal computer and receives medical analyses by electronic mail becomes a teleworker, as does the executive who takes part in a forum in his company.

Specifying what one is referring to when talking about telework is not just an academic question. This definition is important because it determines how telework will be organised. The choice of definition also conditions the identification of tasks concerned

by telework and the estimation of the number of teleworkers. Finally, this definition refers to specific types of organisation and contractual features.

The haziness of definitions is found in statistics too. Actually, there are no reliable statistics on telework. Not because the persons who have compiled them did a poor job, but because some are counting pears, others are counting apples and still others are counting next year's harvest.

Finally, retaining the basic characteristics common to all forms of telework can solve the question on the definition of telework:

- For the most part, these are service activities, intellectual work and non material products, such as consulting services for companies, commercial activities, on-line assistance, administrative and secretarial work, co-operative work like publishing or the conception of a project.

- The working tools are telecommunications, computers and their software.

- All levels of qualification are concerned, but the tendency is for those levels to increase. The jobs which were targeted by telework in the '80s by and large consisted of "support" activities, like data entry or telesecretariat. Now, the trend is to make these support activities increasingly automatised, notably by means of bar codes, optical character recognition, scanning, data entry by the client himself, and extending telework to higher levels of qualification.

- Finally, telework can concern all forms of contracts: employees and/ or self-employed persons, full time or part time, for one or several employers or principal contractors, at home or in other places determined by the employer for all or part of working hours.

Intuitively, one can see that the scope of telework goes well beyond the cliché of work at home. With the technological developments in information and communication, something is changing in the organisation of work, more particularly in service activities. So the time is ripe to have another look at the theme of telework, from a different standpoint than the one used ten years ago. It no longer refers to a few dozen workers – there are tens of thousands of workers concerned; not just a few groups here and there, but entire categories of workers.

In our recent studies of telework [*Valenduc & Vendramin, 1997*], we distinguish six major categories, which constitute the hard core of telework today. The first three are declining; the last three are flourishing:

1. home-based telework;
2. telework in satellite offices;
3. telework in telecentres or telecottages;
4. distance working companies;
5. mobile telework;
6. mixed telework.

These six categories will be considered in greater detail below, but already one can see that the declining forms often concerned a few groups here and there and they were almost always set up as some kind of pilot project. Conversely, the flourishing forms of telework (the last three) concern entire categories of workers in entire sectors of economic activity. These are not pilot projects. The first three categories were often the result of institutional partnerships and were partially subsidised by public funds, whereas the following three are corporate initiatives in response to market pressure corresponding to large trends in the organisation of the economy.

Given this diversification of forms of telework, we prefer to use the expression *distance working*, although "tele" and "distance" are objectively synonymous. The expression distance working has fewer connotations that the term telework and it is more representative of diversity. Mobile work and distance working companies, for example, are rarely mentioned under the telework label, but they are entirely significant for our purposes.

2. A renewal of the debate on distance working

Telework is after all an old idea which peaked in the early '80s but which, ten years later, dropped into indifference for lack of persuasive achievements. So why has interest grown in the last three or four years? Several factors can explain this renewal of interest, but three of them have had a determinant impact: the policy of the European Commission, a new technological set-up, and, more fundamentally, certain major mutations in the economy, mainly in service activities.

2.1. The impact of European policy

All in all, the European Commission's active policy has kept the idea of telework alive and resuscitated the dying notion some years ago.

The European Commission devoted considerable resources to the stimulation of pilot projects; few achievements have taken place without the financial support of the Commission, whether in the promotion of telematics, in the context of R&D programmes (such as STAR, ORA, TAP), or via the structural funds.

In 1994, the "Bangemann Report" on the information society put telework as a top priority. Telework was the first initiative in favour of the information society proposed by the report. It proposed to develop two very traditional aspects, which are precisely those which are no longer popular today: home-based telework and neighbourhood offices. It boasted ambitious objectives, targeting 10 million telework positions by the year 2000. How was this to be managed ? The reply proposed was extremely brief: the report left all initiative to private providers of services, in so far as the telecommunication infrastructure allows it [*European Commission, 1994a*].

In 1994 again, the "White Paper" on growth, competitiveness and employment made telework a line of action. Less geared to technological considerations, the White Paper considered telework as one of the possible measures to "transform growth into jobs", via better dissemination of the exploitation of information technologies. The document,

however, remains very vague about the way telework could concretely transform growth into jobs [*European Commission, 1994b*].

2.2. A new technological set-up

Besides the promotional campaigns in favour of telework, a new technological set-up emerged in the years 94-95. For many years, information and communication technology was characterised by an accumulation of small "incremental" innovations, and technical progress was considered almost commonplace. But the fire was smouldering and recent years have been rich in changes, not just in the professional world, but also in homes and elsewhere, with:

− the Internet phenomenon,
− the digitalisation of mobile telecommunications and the invasion of portable phones, together with the development of networking capacities of portable computers,
− groupware and workflow software, allowing on-line decentralised management of tasks,
− the development of multimedia applications on-line or of-line (CD-ROM),
− new communication systems for teleservices and distance working: automated call distribution systems, computer integrated telephony, voice servers, electronic transaction software, electronic management of documents,
− digital video-communication (audio and video conferences).

All these new developments taken separately seem familiar, but the convergence of all these changes constitutes a new aspect and creates a context for innovation which favours the development of new methods of work.

2.3. Changes in the economy and particularly in services

But neither promotional campaigns of the European Commission nor technological changes are enough to explain the expansion and diversification of forms of distance working. Our assumption [*Valenduc & Vendramin, 1997*] is that the real cradle of distance working lies in certain major changes in the economy, and more particularly in services, mainly the tendency towards a "dematerialised" economy and the restructuring of service activities.

This dematerialisation of the economy is shown in the growing share of non material activities in economic activity, characterised by:

− Growing immaterial production and consumption: the market for information products and services, like software, multimedia, teleservices, is growing faster than markets for material equipment and goods.

− An increasing number of persons are employed in the production and distribution of information, knowledge, cultural and leisure activities, whereas employment in the production of material equipment and goods is decreasing.

233

- Companies draw greater profit from their non material activities than from their directly productive activities, via their financial engineering, financial investments, maintenance, advice and service activities.

- The share of non material investments, i.e. software, organisation, training, human resource management, research & development, is growing as compared to material investments.

In the area of services, except for certain social or relational services, many new forms of organisation are developed around information and communication technologies. Three characteristics in this trend to restructure services are particularly interesting: the separation of production and consumption of services, industrialisation of services and "telemediation" in services.

Separation of production and consumption of services means that a service can be produced and stored in one place and consumed later in another or several different places. Many services are becoming products which can be consumed anywhere and any time. They are becoming more easily commercialised and can be delocated.

Actually, without information and communication technologies, a service is essentially a non-physical activity; it must be consumed when it is produced. The output of services cannot be stored or transported. This characteristic decreases the possibility of marketing services and makes them very localised activities. Conversely, with information and communication technologies, services can be stored and transported at very low cost, since by and large they consist of information. The cost of storage and transport is becoming very low in comparison to the cost of production of a service. This explains the growth of activities like home banking, distance learning and other teleservices.

Industrialisation of services is another major tendency, which is very much supported by information and communication technologies. In the service sector, the movement towards industrialisation increases every time information and communication technologies make significant headway. This industrialisation takes the form of a two-fold transformation. On one hand, codifying data and knowledge tends to standardise most situations handled by employees. On the other hand, systems to distribute tasks, like workflow software for example, automatically move from operation to another, whatever the location of the successive agents involved in processing a dossier or carrying out a task [*Perret, 1995*].

Finally "telemediation" is the third major trend which characterises the service sector. This refers to replacing or completing a "face to face" relationship with clients, by a "mediation by telephone", i.e. offering advice and services based on a telephone call. In a growing range of industries many functions of services involve mediation by telephone, particularly sales, marketing, technical assistance, booking, insurance, market studies, etc. Call centres have developed the supply of services in this promising new niche [*Cornford & al., 1996*]. Growth of on-line services on the Internet can be considered as telemediation evolving in the direction of the Web.

The growth of this type of services is favoured by deregulation of the telecommunications market. The characteristic common to these services based on telemediation is that they are perfectly mobile, both in space and time, meaning that they can be executed from any place and at any time.

All these trends in the organisation of services are what can explain the diversification of forms of distance working and to understand why "telework of the 80s" is now losing speed – if it every got off the ground in the first place.

3.   Declining forms of telework

3.1.   Home-based telework: a fire in the pan

Home-based telework is the best known form of distance working and the most discussed, although quantitatively is has remained well below the optimistic forecasts of the 70s and the 80s. The worker in this case is paid to work, in all or in part, at home. The workers may be on salary or self-employed, full time or part time. Still today, home-based telework is a category of telework that is immediately envisaged in thoughts and discussions about telework.

Home-based telework met with a certain amount of hostility in trade union and social circles, because it threatened to break the spirit of the collective effort and solidarity of the labour world. It also constituted a threat for a very particular target audience: women, administrative employees, part-time workers or those with a precarious status, who were going to be "sent back home", with archaic forms of exploitation and pay.

But the bubble has burst. Despite what certain articles say in the press on the basis of old forecasts, home-based telework is not widespread today – we are referring to the case where the home becomes the main work place, and not mobile or mixed telework which is presented in the following points.

Home-based telework is an experiment done by only a few companies and for small groups of workers within those companies. Few firms have taken the technical, organisational and social risk of intensifying the use of telework. Large public or private companies which have tried the experience of home-based telework have almost never gone beyond the pilot project state which often covers only a very small share of the staff. Most of the frequently cited classical examples generally concern small, specific groups (translators, programmers) in large companies, without affecting the general organisation of their company.

Larger scale experiments often concern computer or telecommunication companies which are testing working methods, not always at home, to try to extend the scope of the markets for new products.

Alongside these minor examples, there are also very specific experiment, often backed by the public authorities, targeting integration of disabled persons. Here, the objective is not the telework as such, but the use of new distance working technologies to promote the professional insertion of disabled persons. These measures are addressed to

specific groups, for whom telework, not necessarily at home of course, represents an instrument particularly adapted to social objectives. The potential offered by telework is far from fully exploited to the benefit of disabled or other persons with reduced physical mobility. Although this concern was present in the first telework experiments in the 80s, it remains a secondary purpose in the promotional campaigns.

The growth of home-based telework in certain European countries is principally due to self-employed labour. It is the consequence of strategies for downsizing and outsourcing used by many companies [*Gillespie & al., 1995*]. The direct consequence is externalising of certain tasks to a network of small companies and self-employed persons, at times former employees. Finally, the rose-coloured picture of home-based telework holds for a very small minority.

3.2. Satellite offices: the future in half tones

Satellite offices are locations at a distance of part of the activities of a company. These offices are often set up far from the major centres and connected with the main premises. The development of satellites offices is based on the geographical separation of front-office and back-office tasks. Most back-office work, particularly the most routine jobs, could be located outside large cities, as long as they are set up in a network with the places where decisions are taken and the main offices.

As other authors [*Cornford & al., 1996, O'Schiochru & al., 1995*], we note relatively few significant realisations of this type in Europe. To the detriment of local development projects, we see that the information handling centres which exist often tend to concentrate in large cities around urban centres and in suburban zones.

As concerns perspectives for the future, we observe that the development and spread of processes for distributing tasks has resulted in the reintegration of back-office tasks, particularly entering and consolidating data, in front-office operations.

Under these circumstances, little local development can be foreseen on the basis of this type of activities. This should encourage promoters of local development projects to be prudent, given that the handling of data is increasingly automatic, particularly with the development of scanning, bar codes, voice recognition and other technologies for direct entry of data, without forgetting entry by the client himself.

3.3. Telecentres or telecottages: running out of steam

If the image of home-based telework is the one that has paled the most, there is another which never got past the experimental stage. This is the case for telecentres or telecottages.

The infatuation with telecentres dates back to the 80s. The initial idea was to set up local centres equipped with a computer infrastructure for workers from different firms, or offering services to different firms. The targeted activities consisted for the most part of a set of administrative support activities (telesecretariat, administrative management,

accounting, translation, etc.) without any specific value added which could justify the use of a telecentre.

Except in some Nordic countries, viable realisations remain very rare, although the telecentre is systematically the image of telework which has motivated promoters of local development in recent years. In countries such as France, Belgium, Italy, any municipalities have tried, via local partnerships and generally with financial backing of national or European programmes, to promote local employment and the development of economic activity by creating telecentres.

From an economic standpoint, small telecentres, which were tried in many countries in the 80s, proved unsuccessful. Almost none was able to survive without public financing.

A characteristic common to many telecentres is that of relying on the drive and participation of a single individual with a strong personality (volunteer, employee or self-employed) and particular qualifications in computer sciences and/or a special role in local life. This dependence is both an asset and a weakness.

Although telecentres may have a role to play in the local life of a community, the ambition of making them agents of economic activity must be seriously reconsidered in the light of past experience. In France, certain telecentres have already moved into other channels and have become training centres or centres with social-economic objectives rather than service companies.

One of the probable perspectives of telecentres for the future is to become local training centres in information technologies. These centres are becoming suppliers of "hands-on" training, in that the persons in the training course carry out real work for public or private clients, near or far. Sub-contracting for public authorities should ensure constant demand and the viability of this kind of initiative. Training objectives in new technologies of the local population are gaining on the ambition of creating teleservice companies.

4. Flourishing forms of telework

4.1. Distance working companies: fair sailing

Distance working companies are specialised in the supply of on-line network services. They provide value-added services, based on information and communication technologies, essentially or exclusively at a distance.

What distinguishes telecentres and satellite offices, which are on the decline, from distance working companies which are thriving in a favourable climate ? On first sight, the activities of the one and the other consist of providing teleservices from a distance. But telecentres and satellite offices were imagined in a context where the main concern was land planning and the economic development of remote areas. All over Europe, these experiments were part of public policies to aid economic deployment and the creation of job openings in less developed regions. The idea was to propose sufficient incentives

to make peripheral regions attractive, by advantageous real estate offers, effective infrastructures, qualified personnel and public aid in various forms.

Conversely, the distance working company, and its emblematic image the call centre, corresponds to another type of reasoning. The call centres are commercial companies whose objective is to manage communication of their client companies. They are a fairly good illustration of the principle of distance working and the strong and weak points of this kind of service company.

First of all, distance working companies are initiatives from private economic agents; firms which are trying, among other things, to take advantage of the effects of deregulation of telecommunications in Europe. While telecentres only offered administrative support activities, distance working companies constitute a new economic activity and a new method of producing services, such as on-line assistance services, telemarketing, market studies, booking, insurance management, etc.

Distance working companies are often specialised in a type of service in which the "face to face" relationship is replaced or completed by a service based on telemediation. For a growing number of services and functions, the relationship with the client – sales, after-sales service, client studies, etc. – is done by telephone, not by direct contact or by mail. More and more companies sub-contract these functions to companies specialised in distance working. They thus exploit a new niche of activities, as they propose value added: availability around the clock, direct management, reception in several languages, etc.

If the distance working companies are clearly a form of telework that is doing well, there are two determinant criteria in the growth of "telemediated" services and the location of distance working companies: less expensive labour and the performance of communications. For instance, call centres are flourishing in Ireland, where wage costs are 50% lower than in Germany, taxation of companies is one of the lowest in Europe, communications rates are decreasing with the volume of calls and population is traditionally cosmopolite [*Cornford & al., 1996*].

4.2. Mobile telework: a ground-swell

Mobile telework is another growing form of telework. It mostly concerns executives, itinerant commercial employees and maintenance technicians. Today it is exploiting all the potential of portable computers and data transmission networks, so that a growing portion of tasks can be carried out at a distance, in other words, anywhere – in a client's premises, at home, in a subsidiary, at a colleague's home or even in the train or a hotel room. Mobile technologies favour greater geographic mobility.

Unlike isolated experiments of home-based telework, mobile telework concerns large categories of employees, mainly "field workers" such as controllers, technicians and sales personnel. In the long run, it reflects a deep-rooted reorganisation of the commercial function and the maintenance function in companies.

The expansion of mobile telework, as opposed to "sedentary" telework (at home or in a telecentre) is the illustration of exploitation of communication technologies and port-

able computers serving new types of organisation: just-in-time, flexible management, etc. In management terms, the objective of telework is to set up more flexible organisational methods which can react more quickly, to seek better organisational productivity [*Carré & Craipeau, 1997*].

4.3. Mixed telework: a growing phenomenon

Beyond the personnel concerned by the new requirements of mobility, the most common form of distance working today is also the most atypical: a few hours per week at home, a few hours on the road or in the field, a few hours with clients, but the main reference is still the office and colleagues. This type of working organisation concerns not only executives, researchers, journalists, graphic artists, but a growing number of qualified employees confronted with the constraints and requirements of flexibility.

Many companies now offer a home computer to their staff members, sometimes without a specific project in mind, but always with an idea of triggering new dynamics in the use of computers and networks. This is a significant evolution in relations between the professional sphere and the private sphere.

Mixed telework is not an exclusive category, because it can cover telework from home, mobile telework or decentralised telework. What characterises mixed telework is the fact that it covers a variety of arrangements, and it changes to meet the circumstances and needs. The result is often a compromise between the pressure exercised by companies for greater flexibility of their executives and skilled employees on one hand, and those persons' need to be able to make personal arrangements in the way they organise their working time on the other. Mixed telework indeed presupposes a certain autonomy in individual organisation of working time and mobility.

All the emerging forms of distance working have two characteristics in common. On one hand, they do not try to develop telework as an end in itself. They target a new niche in the services market: the provision of services at a distance, by means of communication technologies. On the other hand, they reinforce the most flexible forms of working organisation, which overcome constraints of time and space.

5. Two scenarios for the development of flexible work practices in distance working

The search for flexibility in the organisation of economic activities and the organisation of work is not a feature specific to distance working. But the very nature of distance working makes it a choice field for implementing a large range of forms of flexibility. Certain forms of flexibility have already been tested in other types of working organisation, like part-time work, short-term contracts and variable hours, for example. Nevertheless, certain forms of flexibility are more particularly specific to distance working: itinerant work, multiple working places, availability on stand-by, multi-tasking, self-employment at a distance, 24-hour office operation systems, etc.

Opinions differ greatly on the perception of flexibility of distance working. On one hand, the prevalent presentation of distance working shows its potential for the positive

aspects of flexibility: a better balance between family and professional life, working time and training, working time and leisure time. But on the other hand, case studies and empirical data show that to date, what dominates are factors of disaggregation of employment conditions. Distance working becomes a form of precarious employment when it is developed on the basis of strategies emphasising the idea of "labour when you need it", an individualistic culture, disaggregation of the labour force and undermining of solidarity.

Although flexibility is a necessity from the standpoint of economic performance, precarious employment is not. Distance working can present advantageous perspectives for introducing more flexibility in the organisation of economic activities, while sharing work in a way which could be socially positive and meeting a growing diversity of interests within the active population. But these forms of flexibility are only socially acceptable if they include guarantees of job security for the workers. The real challenge which faces decision makers in the political and labour worlds today is to strike a balance between the flexibility of work and the workers' security.

To describe future trends with regard to flexibility of distance working, we have put down two opposite scenarios: one emphasising an individual approach to flexibility, which could lead to the generalisation of the situation of precarious employment; the other reconciles the individual and the collective approach, flexibility and security. As concerns European policies and their supporting documents, the first corresponds to the philosophy in the Bangemann Report, whereas the second is closer to the report of the "High Level Expert Group on the Social Aspects of the Information Society" [*European Commission, 1997*].

5.1. An individual flexibility scenario

In this scenario, distance working allows to apply the "just-in-time" principle to human resources. For companies, the idea is to employ the right person at the right time, wherever that person may be, by giving priority to commercial contracts (with subcontractors, self-employed workers, temporary companies) and without the constraints of continuity associated with an employment contract. Flexibility of skills, working hours and wages is organised on an individual basis.

From this standpoint, distance working can contribute to reinforcing the relation between flexibility and precarious employment in three ways:

- by favouring the use of "contingency workforce";
- by developing a culture emphasising the individual;
- by using the concept of employability instead of the concept of employment.

In the first case, distance working enables the company to constitute a reserve of contingency labour, preferably in the form of contracts with self-employed workers or contracts for the use of services. This way of considering distance working is summed up in a document by the Swedish telecommunications company Telia on the "contingency workforce" [*Forsebäck L., 1995*]. It questions the concept of a permanent job, considered as a work package, in which the population of workers is supposed to work

240

for a single employer, who is always the same. It pleads in favour of individual skills, as opposed to the fordist or taylorist method which give priority to collective skills. The post-industrial society is a society of know-how and this is why individual skills are privileged.

The concept of contingency workforce refers to a growing number of workers who have one year or six month contracts and who often cumulate several jobs at once. From the standpoint of the company, this form of work represents the principle of "just-in-time applied to human resources" mentioned above: as little wasted labour as possible, in the smallest possible space and as quickly as possible, preferably without defects or errors. Getting services outside the company or work done at home meets these objectives. From the standpoint of the employee, this often represents an amount of insecurity and uncertainty but, Telia says, it also represents "an opportunity for flexibility and constantly new challenges, plus freedom, considered so highly by the generation born in the 70s" [*Forsebäck L., 1995*]. The boom in temporary agencies and work "rented" for short periods is a concrete manifestation of this trend.

The individualistic culture is another cosmetic argument used abundantly in certain discussions of distance working. Tomorrow's worker must be able to manage the "enterprise of himself" [*Bühler & Ettighoffer, 1995*] in an autonomous, responsible way. From this viewpoint, the worker is preferably self-employed. One goes from a logic of employment to a logic of a supply of services, with a "polyactive man" as the new worker's profile. This one-man show pursues several careers at once – but one can wonder whether, at another level of qualification, he is very different from a worker-peasant. This strategy suits companies which prefer to buy the skills they need, when they need them, where they are to be found, rather than to pay to have them constantly at their disposal. The same authors foresee the development of new intermediate services on the labour market, such as:

- network associations to assist with professional insertion and job creation,
- networking forms of "labour stock exchange",
- temporary work companies,
- service providers to assist with professional mobility.

"Self-management will give rise to increasingly differentiated ways of working. Workers will exercise trades, not a trade; they will pursue not a career but several paths of skills, at several work places rather than just one. In this new context, the poly-active worker, will use his particular skills to create "plural part-time" by using his multi-faceted talents in many occupations to earn a good living" [*Bühler & Ettighoffer, 1995*]. It can be asked, however, whether for the majority of workers, the self-management era is not very close to a catch-as-catch-can economy. Other authors [*Cornford & al., 1996*] show that many self-employed teleworkers did not really choose this status – they were more or less forced into it by reorganisation in their companies (downsizing, outsourcing).

This kind of model tolls the end of employed labour force and collective solidarity. The self-employed worker is in competition with the worker on salary and companies build up reserves of flexibility. The employer's social role is no longer to ensure employment, but to ensure employability, i.e. to enable someone to acquire and develop skills

which make him "employable" during his entire active life, rather than ensuring a job. In exchange for the loss of concrete security, the concept is rather vague.

From the employer's standpoint, employability means flexibility above all. He wants a well-trained employee that he can use in various roles within the organisation. From the employee's standpoint, this is a kind of "security within insecurity" due to the possibility he is given of having other positions plus the training he gets in order to occupy other functions. It is easy to see that distance working is a veritable cornucopia for those who argue in favour of employability instead of employment. There is clear convergence between this vision of employment and discussions of virtual companies or self-employed telework.

Having said this, individualisation of practices in flexible work is not a disadvantage for everyone. For certain high level professions, notably in the field of services related to information technologies, the new forms of employment or self-employment can be a positive opportunity. No doubt this positive connotation of new forms of work for highly qualified professions is what gives impetus to the over-optimistic presentation of employment advantages of the information society. But this means putting all professional profiles on the same footing, as if the potential and constraints of a system engineer were the same as those of a warehouseman, a secretary or a nurse.

The social risks related to individualisation of flexible work can already be observed: lack of control over the management of one's time, absence of supervision of health and safety, isolation, harassment of portable telephones, the loss of the social ties at work, increasingly difficult training possibilities, little chance of perfecting skills, loss of qualification as a result of the lack of exchange of experience and training.

When flexibility at work is associated with a lack of job security, collective bargaining, when there is any, becomes a defensive exercise and rarely goes beyond licking wounds or putting up guard rails.

5.2.   A scenario for "socially sustainable flexibility"

The systematic association of flexibility and precarious employment, which is dominant in current forms of organisation of the labour market, weighs heavily on social relations and hides a positive potential of the new forms of work. Thus there is a pressing need for social innovation to combine job flexibility and job security.

A "socially sustainable" approach to flexible work could integrate the following dimensions:

– a constructive approach to technological and organisational options;
– a reflection on working hours in a long term perspective, given an unstable professional context (access to continuing training, alternation of various forms of professional commitment, dovetailing with free time, etc.);
– a broader approach to social relations on the job, including new forms of communication and socialisation in diverse professional contexts.

The new compromises could be based on two major observations. On one hand, the potential offered by technology can provide employers with greater flexibility in the management of human resources, given the new constraints of a changing economy. Many technological choices are wide open from the organisational standpoint: they can give priority to forms of "learning organisation" for the benefit of the entire staff of a company, negotiated working hours, opportunities to do on-the-job training. It is possible to negotiate forms of flexibility of work and employment which are socially advantageous, not just on an individual level but on a collective level as well. As a concrete example, the following measures can be classified as "socially positive" forms of flexibility, open to negotiation:

- measures which make it possible to better reconcile family life and professional life, which remain compatible with an open career;
- measures which allow for constant learning and development of skills, in a way better integrated in career plans and which give rise to systems of replacement that create job openings;
- negotiated practices to determine working hours on an annual basis for certain professional categories; these could compensate for working periods which are highly leveraged with long holidays;
- measures which reduce working time so as to truly leave free time and allow consumption of the new services offered by the information society;
- measures giving the best legal guarantees and greater stability for temporary work, seasonal work, temporary contracts.

Moreover, the development of the information society is accompanied by an increasingly significant drop in what was long considered "typical employment" and "typical work": roughly speaking, employment for males with a career in the same profession and the same company. Conversely, atypical professional paths are on the rise: variable part-time, several employers or principal contractors, changes in profession, increased mobility, work at home, mobile work, distance working, etc. But here, labour law and the organisation of social security are based on the typical employment model (a single job for a single employer, in one place, full-time, on salary under a contract for an indeterminate duration). Atypical jobs are left on the fringe of the labour law systems and social protection. Some prospective studies deal with this issue and propose new concepts, for instance replacing the "work contract" with one single employer by an "activity contract", including work and training, with a group of local employers and public authorities, and with the guarantee of a high level of social protection [*Boissonnat & al., 1995*].

This does not authorise the conclusion that typical employment is a good job and atypical employment is necessarily precarious employment. The picture is not in black and white – it is much more subtle. Atypical jobs correspond well to certain personal situations and concern an increasing number of high level jobs for very specialised professions.

The current challenge is to give these new forms of work and employment a full-fledged framework of reference (legal, social and cultural), in order to transfer the social achievements of the industrial society to the information society.

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Current State and Perspectives for Telework in Finland – a Business People View

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Abstract

Telework, telecommuting, remote work are advertised to change the way of working. Information and communications technology (ICT) provides an opportunity to transform working and business processes . Some observations still suggest that people are moving to highly populated city centres in spite of the telework opportunities. Problems concerning division of tasks and processes, support of management, technological problems, location of telework sites and acceptance of new technology to households are some of the major inhibitors of telework diffusion.

The following survey study focuses on three research areas. First, it examines the quality and level of technology used in households of Finnish business people. Secondly, it examines the current state of networking in office and at home and growth needs. Thirdly, it examines the service and financial issues which could hinder the implementation telework technology and processes. These deal mainly with the quality of distribution channel and estimated costs of acquiring new technology into the households of business people. The sample used in the survey represents the views of Finnish small and medium (SME) size companies' managers which actually could gain the most from telework processes.

The new technology must fit easily to the current technology used in households and with no major barriers, either technical or social. On the other hand, the services and contents of possible telework need to be visible. While much of the discussion about the growth of Internet is provoking, we do not know much about the real use of it.

Keywords: Telework, innovation diffusion, households, business people

1   INTRODUCTION

New ways of working such as telework, remote work and telecommuting offer a flexible way to arrange work and business processes in information society. On the other hand it puts pressure in providing technology and applications which fit with the working routines, workplace and household facilities and furthermore, with management procedures. This new way of working is undependent of time and place and includes normally a high use intensity of information and communications technology (ICT).

ICT involves use of computers, facsimiles, teleoperator network services (either by modems, a faster Integrated Digital Service Network (ISDN) connection or very seldom by Asynchronous Transfer Mode (ATM) connection). The advertised benefits of telework or remote work are related to decreasing load of traffic, environmental issues, quality of life and flexible control and improved reward systems for employees. Especially in the European Union telework projects are favoured while it provides possibility to balance regional equality.

In this report first tentative results of possible innovation diffusion drivers in the Finnish small and medium size enterprise (SME) environment are reported. The study is based on a large survey of telework technology and its potential use in Finland. SME's provide a great potential to be flexible in their operations and joint processes, while larger organizations seem to be monolithic and also heavily tied to the traditional office buildings. SMEs can get some competitive advantage from arranging their work in a more flexible and virtly effective way.

2   THEORETICAL BACKGROUND AND CONCEPTS

2.1   Definition of telework

Telework is difficult to define while it is a very evolving concept. However, one of the best definitions and also a complex one is from Gray et al. (1993): "teleworking is a flexible way of working which covers a wide range of work activities, all of which entail working remotely for an employer, or from a traditional place or work, for a significant proportion of work time. Teleworking may be on either a full-time or part-time basis, the work often involves electronic processing of information, and always involves using telecommunications to keep the remote employer and employee in contact with each other." A more simpler definition is "a form of ´flexible´ work which involves distance work, remote work or telecommuting which is dependent upon the use of information and communication technologies" (Moon & Stanworth 1997).

2.2   Innovation diffusion theory and telework

In Finland, in the country of highest percentage of Internet access and well-developed telecommunications infrastructure (Goodman et al. 1995), telework is not very well dispersed and the latest surveys on labour movements from rural area to attractive city areas seem to be contradictory to objectives of telework movement (Talouselama 30/97). Although our analogical telephone network is almost 100% converted to digital networks, ISDN is not well-diffused in Finland. Only about 3-5 % of households have an ISDN access to the network. This might be due to many factors such as pricing of ISDN services, learning potential of users or technological compatibility. Innovation diffusion the-

246

ory is therefore suggested to fit very well while adoption of telework practice is mostly voluntary-based innovation and also seemingly related to managerial use (see Olson 1987, Venkatesh & Vitalari 1992, Vitalari et al. 1985). Needs to invest in ICT equipment in his/her home or other remote office are mostly evaluated from the perspective of personal or family use.

The innovation diffusion theory (Rogers 1983) assumes that a potential adopter engages in mental evaluation of the innovation, and that the likelihood of an adoption decision increases when the innovation promises to have a strong relative advantage over alternatives (relative advantage), is highly compatible with existing practices (comprehensiveness), is not too complex, (complexity), can be tried out (trialability), and the results of the innovation can be observed (visibility).

A new technological, and also social, innovation such as telework demands major redesign of routines and activities from the user community. They need to learn to use the new system innovation and maybe also upgrade or transform their knowledge on using the system in the context of their work. When teleworkers need to buy the technology by themselves, costs of the new innovation is a major inhibitor of diffusion (relative advantage). If the voluntary user needs to put more money to get seemingly similar services from this new innovation (such as an email service) he/she will not probably adopt the innovation. It might also be that the telework technology is too complex and difficult to implement and use (comprehensiveness, complexity). In the same time management procedures need to favor new work design and arrangements in order to support the change process (trialability, visibility) It is also clear that telework needs to be based on trust and not on control. Reward and performance evaluation systems need to converted to fit in this new situation.

3.   THE RESEARCH PROCESS

A mail survey was executed in collaboration with a major teleoperator Helsingin Puhelin Ltd (belongs to a major Finnish teleoperator pool FINNET Group), communications systems company Teleste Communications Ltd (later Miratel Ltd) and a business people association the Junior Chamber of Commerce Finland which was the sample group of the survey. The mail survey was sent on December 1996/January 1997 and replied questionnaires were analyzed during Spring/Summer 1997.

About 4500 questionnaires were mailed and the reply rate was 19,4% i.e. 871 people replied to the survey. The reply rate is acceptable and reasonably high when compared both to the audience ability to spend time to surveys and previous research reports on the topic.
The objectives of the study were exploratory i.e. we observed the audience group's opportunities and willingness to apply telework, use of information networks and their use intensity. Specially we were interested in the level of technology investments in households (computers, network devices and access services), the needs for information society services and sensitivity to acquire new technology to this purpose.

3.1 Sample

The age of the respondents varied between 30 and 40[1] (see Table 1.). The study follows the principles of convinience sample due to the nature of the study. Although the sample

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[1] The Junior Chamber of Commerce Association does not qualify over 40 year old members, except the most advanced members which belong to the organization their whole lifetime.

is biased by age its quality is excellent involving respondents of business organizations.

Table 1. Age of the respondents

Age	Number	Percentage
below 30 years	102	12%
30-39 years	546	63%
40-49 years	132	15%
50-59 years	73	8%
60 -	17	2%
N.a.	1	-

The educational level was relatively high, mainly respondents with a college or university degree (see Table 2.).

Table 2.Background education of the respondents

Education	Number	Percentage
Basic or eq.	39	5 %
High school or eq.	93	11 %
College or eq.	369	42 %
University or eq.	370	42 %
N.a.	1	-

Despite this fact the sample involves a large amount of SME entrepreneurs. Organizational position was mainly either in manager or executive level, work tasks or functions were usually related to either administration, marketing or sales (Table 3.).

Table 3. Organizational position of the respondents

Position	Number	Percentage
Executive	196	23 %
Manager	328	37 %
Clerical	106	12 %
Entrepreneur	214	25 %
Unemployed	3	-
Retired	7	1 %
N.a.	17	2 %

Table 4. Organizational function of the respondents

Function	Number	Percentage
General adm.	164	20 %
Accounting	91	10 %
Personnel	17	2 %
Information systems	52	6 %
Marketing	123	14 %
Sales	155	18 %
Logistics	14	2 %
Production	74	8 %
Technical design	39	4 %
Research & Dev.	51	6 %
N.a.	91	10 %

Most of the respondents' companies belong to the SME group which means a company or organization of turnover not more than 40 Meuro (roughly 42 Million USD) and balance sheet total do not exceed 27 Meuro or do not exceed 250 employees.

Table 5. Size of the respondents' organizations

Personnel	Number	Percentage
1	83	10 %
2-10	257	29 %
11-50	164	19 %
51-250	134	15 %
251-500	60	7 %
more than 500	148	17%
N.a.	25	3 %

The sample is therefore quite unique and repsentative for analyzing business people views. It is usually difficult to find studies where respondents represent highest decision making level (i.e. managers or executives). Respondents also evaluated their knowledge quite good and are using extensively ICT in their work (Table 6.).

Table 6. Characteristics of selected background variables

Variable	Number	Percentage
Knowledge on ICT		
- expert	91	10 %
- experienced	346	40 %
- fundamentals	344	39 %
- novice	78	9 %
- no knowledge	7	1 %
- n.a.	5	1 %
Uses computer in his/her work		
- daily	758	87 %
- weekly	72	8 %
- monthly	13	1 %
- do not use	23	3 %
- n.a.	5	1 %

Uses computer at home

- yes	695	80 %
- no	175	20 %
- n.a.	1	- %

3.2. Preliminary results of the study

Technological environment

The first set of questions examined the amount and quality of ICT technology in house-holds and the level of experience in using ICT (Table 7.). This related to comprehensiveness and complexity to adopt an innovation. The respondents described themselves as experienced or at least having good fundamental knowledge on ICT. They use computers daily in their work. We can say that these people ar e qualified to evaluate the benefits of telework and ICT technology.

Table 7. Processor type and telecommunications of the computer used at home

Type	*Number*	*Percentage*
Processor		
- Intel 386 or older.	104	12 %
- Intel 486	206	24 %
- Pentium	329	38 %
- Macintosh	46	5 %
- other	8	1 %
- no computer	175	20 %
- n.a.	91	-
Telecom device		
- Modem	415	60 %
- ISDN	18	3 %
- Fixed line	1	- %
- other	17	2 %
- No telecom.	201	29 %
- n.a.	43	6 %

One of the most interesting finding was that almost 80% of the respondents informed to have and use computer at their homes and over 60% of computer users also using some telecommunications connection, mostly via a modem. These are very high figures while for example the average of home computer penetration in Finland is normally near 35 percent and half of them are having telecommunications connection. Also the computers were quite latest (Pentium or Intel 486 processor-based). Worth to remark was also that survey participants informed that almost all family members are using the computer system. About 31% replied that computer is used by three of more of the family members (see Table 8.).

Table 8. Users of home computer

Amount	Number	Percentage
1 user	152	17 %
2 users	274	32 %
3 or more users	269	31 %
No computer	175	20 %
N.a.	1	- %

This amount of family users is quite high and might have strong implications to organize telework activities at homes. We can ask: " Do the families need several computers or even a home network with a server and clients with multiple access to the network? If this is the main trend it puts challenges to sales and consultation organizations, teleoperators and digital media businesses.

Organizational support

The second set of questions dealt with organizational support for applying telework as one part of work practice (relative advantage, partly trialability and visibility). According to survey results, companies support telework quite actively, 48% of the respondents informed that their employers support telework arrangements (see Table 9.)

Table 9. Opportunity for telework

Amount	Number	Percentage
- yes	419	48 %
- no	399	46 %
- do not know	35	4 %
- n.a.	18	2 %

However, here we must be careful in interpreting these results while the whole concept of telework is very fuzzy. Most of the organizations doing already telework were SMEs. Many of the previous studies do not indicate that companies are favouring telework arrangements, vice versa, rather being skeptical and wanting to keep control.

Telecommunications facilities and usage level

The third set of questions was about telecommunications facilities. As said 60% of the home computers involved also a telecommunications device (modem or equivalent). Most of the devices were high-speed modems (over 28 000 bps, only 3% had an ISDN access device). Most of the respondents replied their telecommunications device to be slow or moderate when asked about their view of data transfer speed.

Table 10. Intensity of teleworking

Variable	Number	Percentage
Frequency		
- several times per day	63	13 %
- once a day	68	14 %
- several times per week	159	33 %
- once a week	89	18 %
- less than once a week	61	13 %
- n.a.	44	9 %
Time		
- less than 15 minutes	239	49 %
- 15-30 minutes	137	28 %
- 30-60 minutes	44	9 %
- more than 60 minutes	18	4 %
- n.a.	46	10 %

Most of the connections happened couple of times per week and lasting in average 15 minutes. It is therefore obvious that home computers are used for reading and replying email messages and/or doing remote banking which is a very common practice in The level of using network services is low.

The use of Internet network in office and at home

The use of Internet network services for work and business activities was also surpris-

ingly low remembering the highly advertised image of Finnish Internet diffusion. Less than half of the participants teleworked via Internet in their offices and at homes less than 20%. Outside work tasks the figure is little bit higher, 34 %, which means entertainment and other freetime use.

Table 11. The use of Internet

Variable	yes	no	n.a.
Use of Internet in general			
- for work in the office	345	515	11
- for work at home	150	710	11
- outside work tasks	299	561	11

Table 12. The use and willingness to use network services

Service type	Uses now	Wants to use	Do not know/ Do not want	Not available
At office				
- Email	486	269	38	78
- Remote banking	367	288	106	110
- World Wide Web	392	353	42	84
At home				
- Email	262	431	69	109
- Remote banking	309	380	80	102
- Connection to company network	126	447	130	168
- World Wide Web (WWW)	272	441	66	92

Although there is a high interest to find something from the Internet, we also identified a group which has never used Internet and is reluctant to use it in future. This is very surprising while the object group anyway had a very good facilities to do networking activities. It means that the relative advantage of doing telework or other teleactivities is in its embryonic phase. Email and WWW are seemingly accepted in companies, but there are great growth needs in networking business people's homes to company local area networks and, at least, for providing opportunities to manage electronic mail from their homes.

4 DISCUSSION ON PERSPECTIVES

These results indicate that telework is not related to technological level of the home equipment. As we concluded 80% of users had a home computer, and of them 60% a telecommunications access. However, the use of teleconnection-based activities was very low. Huge growth needs are related to improvement of doing email in networked environment which means development of easier access methods and supporting organizational arrangements. The considerably high need to use local area networks of respondents' organizations and possibly intranets is also a clear finding of this study. Real virtual organizations are therefore still waiting to be true. It might require new perspectives to design and organize organizational processes.

The use of Internet-based services was also very low despite the logical assumption that business people might need those modern services. However, most of the needs were very basic in nature. It is also very obvious that the target group has very high family demands i.e. it means that telework need to be very efficiently organized and not consuming time for technical arrangements.

We can say that telework, as an emerging idea, is well accepted. We do not know what is the real motivation, for example, to invest in remote connections, such as servers, modem devices and finally even in home-based systems of teleworkers. It seems that if company pays, it is OK. Otherwise it seems to be too expensive, if you are not entrepreneur or working mainly from your home office.

One of the findings is also relevant i.e. quite many members of families are using the computer system for seemingly different purposes. It might mean that the computer is in heavy use and opportunities to use it for part-time or even full-time telework is impossible without struggles.

Further research need to be focused on case studies of telework arrangements. This survey provides a good starting point to examine both technological and social issues of adopting telework practices in Finnish organizations. More focus should be also put on different categories of work and organizational positions.

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Factors affecting the take-up of teleworking in the UK

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Abstract

This paper comprises a case study analysis of one major telecoms company employing 161 teleworkers in the UK and across continental Europe.[1] The company has an average growth rate in teleworkers of 10% per month compared to an average growth rate in European staff of 2% (97-98). The paper discusses factors affecting the take-up of teleworking in the UK as compared to continental Europe. In the UK the take-up of teleworking in general follows an socio-economic pattern favouring urban rather than rural areas. However, findings from the case study organisation demonstrate that certain socio-cultural factors may be also be important in predicting the take-up of teleworking within particular organisations. The paper is largely descriptive in its outline of development of teleworking in the UK but the aim is to identify possible linkages and trends to illuminate the case study analysis from a social dynamic perspective.

Teleworking in the UK.

Teleworking in the UK appears to have been a matter of evolution not revolution. Working practices are changing as a result of the increased use of ICTs but predictions heralding a massive take-up of teleworking have not been realised, so far! Gillespie et al (1995) in their review of telework in the UK state: "For almost as long as the [telework] concept has been around, its promoters have been claiming it is on the threshold of a dramatic expansion; and, perhaps strangely, such predictions seem only to have intensified in the face of stubborn reluctance of telework, as measured in various ways, to grow at more than a modest incremental pace."

However, predictions are that there will be 10 million teleworkers in the UK by the year 2010 (British Telecom, 1995) and currently the UK appears to have more teleworkers than any other European country.[2] The most up-to-date figures on the incidence of teleworking in the UK come from the Labour Force Survey (1997).[3] Here telework is defined as people who: work in their own home or use their home as a base; have worked at least one full day at home in the reference week and used a telephone and computer for the work done at home. The emphasis of the Labour Force Survey is

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[1] Please note that the case study research is ongoing and preliminary results will be presented at the workshop.
[2] Based on mainly 1994 figures reported in the EC Status report on European Telework, 1997.

thus on home-based teleworking and Huws (1998) points out that there is still no reliable source of information in the UK about the prevalence of forms of teleworking which take place on non-domestic premises. In addition, comparison of data with other studies is still hampered by the range of definitions of teleworking used. It is worth though

Table 1.

The *Labour Force Survey,* 1997, found:

- There are around 987,000 people who are teleworkers in their main job in Great Britain;
- Around 70% of these are male;
- Teleworkers make up around 4% of all in employment (excluding those on Government Schemes);
- Around a third of all people who are teleworkers in their main job work in the Banking, Finance and Insurance sector;
- Around one in six people who are teleworkers in their main job work in Public Administration, Education and Health;
- Almost 70% of people who are teleworkers in their main job are in three occupational groups -. Managers and Administrators; Professionals; and Associate Professional occupations

Source: Labour Force Survey (1997), Office for National Statistics.

recalling the main findings from prior research undertaken in the UK in order to set the agenda for this paper.

The *Teleworking in Britain* research conducted for the Employment Department by Huws (1993) defined teleworkers as: people who spent at least 50% of their time working from home; who had worked for the employer for at least 10 days in the previous months, who used both a telecommunications link and a computer in order to work and whose managers said they would be unable to work in this way without the technology. This study found that of 1,003 employers, surveyed at random, 58 had "genuine" teleworkers. Overall this provided an average of some 6% of employers using teleworkers. The research also found that teleworking was most likely to be found in the business and financial services sector and in public services. Employer and employee attitudes were also investigated using an in-depth survey of a representative sample of managers of 115 groups of teleworkers and 20 in-depth case studies of teleworking employees. Advantages and disadvantages of introducing teleworking are noted in table 2.

Apart from the positive benefits of teleworking identified by participants clearly both employer and employee shared concerns about the implications of telework in practice. Subsequent research appears to have focused in particular on issues of managerial control over a remote workforce. For example, Haddon and Lewis (1994) found managers expect to spend more time controlling teleworkers than conventional on-site workers; and Gillespie et al (1995) found potential managers of teleworkers often expressing

concern about such lack of control. Managers who have had experience of managing teleworkers tend to be more positive about their role but managers unable to adopt the more sophisticated and 'hands-off' style that is deemed necessary to support teleworkers may be more resistant to the new ways of working.

Table 2.

Managerial attitudes toward teleworking	Teleworker attitudes
Advantages:	
cost reduction; greater flexibility; space saving and relocation avoidance; possibility of employing staff with child-care responsibilities.	flexibility especially in the context of family commitments; avoiding commuting or work related travel;
Disadvantages:	
difficulty of managing teleworking schemes; communication difficulties; and social isolation of those employees.	social isolation; communication difficulties; blurring of boundaries between work and home life; sense of insecurity about jobs and career prospects; insufficient space to work.
Source: Huws, Employment Department, 1993.	

IRS Employment Trends (1996) examined UK company practice based on questionnaire responses from 70 companies. Some 50 companies used teleworkers, either: home-based teleworkers who work away from the office for a significant part of the time; nomadic teleworkers, such as engineers or sales staff, who are normally office-based, but use telecommunications devices to keep in contact with the office or to increase independence; and ad hoc teleworkers, who use telecommunications links to work at home under certain well-defined circumstances, or who work at home occasionally.

Practice of teleworking varied widely between the companies with some teleworkers not required to attend the company premises at all, and others attending for three or more days per week. The main reasons provided for the take-up of teleworking were: staff request; illness or disability; maternity or family reasons; cost reduction; overcrowding; flexibility; commuting stress. 42 of the companies expected to use or expand the use of home-based teleworking. 20 companies in the original sample did not employ teleworkers. The main reasons for this are listed in the table 3.

Table 3.

Reasons for not using teleworking:
• lack of team communication;
• inflexibility in meeting deadlines and attending meetings;
• lack of cohesion and control;
• lack of adequate infrastructure;
• unsuitability of the work performed;
• investment costs too high;
• loss of corporate culture; and
• isolation of the workforce.
Source: IRS Employment Trends, 1996:4

What is of particular interest to note from the IRS survey is that perceived lack of control is just one of the reasons identified by companies for not introducing teleworking. Nevertheless, management practices and prejudices are still regarded as one of the greatest barriers to the development of telework (Suomi, 1997).

Huws et al (1996) continues to produce what is probably the most comprehensive ongoing research on different forms of teleworking in the UK drawing upon employer surveys, anecdotal evidence from experts, and in-depth cases. Part-time home-based teleworkers were found to involve mainly senior professionals and managers living fairly close to their normal place of work. Fully home-based teleworkers were found to be in low paid work and undertaken mainly by women in rural areas. Freelance teleworkers were based in urban areas but often relocated when telecommunications links allowed. Mobile teleworking was considered to be extremely low. Collective teleworking (call centres, paper less factories) was found to be a largely urban phenomena.

The UK now has an extensive network of telecottages and telecentres, mainly in smaller towns and rural areas[4]; and telecoms and IT companies have been active in promoting the idea of teleworking.[5] Nevertheless, there is a lack of in-depth qualitative studies addressing all forms of teleworking. Bibby's (1995) case study research is a notable exception but will not be reviewed here, as it is not central to this thesis. Stanworth and Moon (1997) published the results of in-depth interviews of 14 managing editors in the UK who directly supervised the work of home-based freelance teleworkers, in the publishing industry (see table 4). The growth in freelance teleworking appears to have

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[4] See the Telework, Telecottage and Telecentre Association website: http://www.tca.org.uk
[5] Status report on European Telework, 1997, EC.

Table 4.

Comments from the managers of freelance teleworkers included:

- "There is no doubt about the difference in cost between paying a home-based freelancer just simply for the work they do and a full-time in-house salary, with all the incidental expenses that entails (NI, sickness, holidays, superannuation etc.) and, of course, providing office space in a costly location…"
- "As far as using freelancers is concerned, personnel don't regard that as employment. That's simply buying in goods and services...if we're paying an outside printer for work we used to do in-house, it's just the same as far as they're concerned."
- "People write in and obviously you look at their CVs and then you might give them a test of some kind or send out a fairly straightforward job so that you can assess how good they are. We like the sense of control basically."
- "The regulars are people who never foul up, who never make a mistake. This requires qualities such as pedantry, conscientiousness, tact, budgetary awareness and dependability in relation to meeting deadlines".

Source: Stanworth and Moon, 1997.

arisen from economic factors in the industry more so than driven by the technology. The rationale for employing these teleworkers was clearly cost and quality driven but concern over techniques of control prompted the authors to discuss the ethical issues involved in managing at a distance. This focus builds upon the study by Moon and Stanworth (1997) concerning human resource and ethical implications of teleworking; and maps concerns raised by trades unions in the UK such as BIFU and MSF. [6] And Huws et al (1996) concludes that the impact of freelance teleworking will remain on a small scale unless mechanisms can be developed for supporting networks of communities of freelances or small businesses.

Factors influencing the take-up of teleworking.

Huws et al (1996) were able to breakdown the typical composition of teleworkers in the UK and assess their geographical distribution. The purpose of the study was to assess over the next ten to fifteen years the likely social and economic implications of the trends identified. The main findings are included in table 5. Huws et al conclude that critical to taking advantage of the opportunities afforded by teleworking is: the development of high-capacity telecommunications networks; training, especially for the self-employed; and support networks, including market support. Furthermore, in an adjoining report, telecottages and telecentres were identified as having an important role to play in increasing awareness of the potential impact of new technology on rural communities. Not least of all because of the level of frustration that may exist if there is user demand without the necessary technological infrastructure.

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[6] See, for example, The Best of Both Worlds: Teleworking, a Trade Union Perspective, MSF.

Table 5.

Geographical distribution of teleworking in the UK:

- London and south central England: professional, technical or managerial.
- Peripheral rural areas: mainly women, low paid.
- Middle England: freelance, skilled
- Non-rural locations: mobile.
- Industrial urban areas: back-office functions, low paid.

Source: Huws et al, 1996, Rural Development Commission.

Bibby (1995) [7]recognises that grant aid has been instrumental in the establishment of call centres; and notes that the majority of telecottages had received start up funding from development agencies or local authorities. However, the real influencing factors on the take-up of telework appear to be at the socio-cultural level, especially the impact of "supportive" and "resistant" organisations. In fact, Huws (1993) found that home-based working tends to be reserved for fully socialised individuals, fully trained and largely self-sufficient. And Huws et al (1996) found resistance from managers in the organisation who perhaps felt threatened or unable to give up control over remote staff.

Other factors though which also appear to affect the take-up of teleworking include the lack of awareness from organisations as to the potential for teleworking. This may be due to technological ignorance or naivety about potential benefits. For example, many organisations in the UK are apparently unaware of the training or educational qualifications that are now available in teleworking such as NVQs (Orme, 1998). Knowledge and acceptability appear then to be significant factors in the take-up of teleworking especially in the SME sector.

In fact, Orme (1998) hypothesised that the factors affecting the prevalence of teleworking in the UK would be: the level of awareness of the relevant technology; the perceived suitability of a job for teleworking; being amenable to the idea of teleworking; having access to the means of teleworking; and the balance of benefits over disbenefits expected to accrue from teleworking. Orme contacted 39 businesses and found through questionnaire and interview data a number of perceived advantages and disadvantages from teleworking (listed in table 6 in rank order with the most frequently mentioned first).

Two businesses had tried teleworking and discontinued it. In one case an expanding customer base warranted the relocation of the teleworkers to a new branch office; in the other business it was felt that managers had undermined the policy of encouraging telework. Other companies had not tried teleworking but did have a positive attitude toward it. One company felt there was a problem in digitally capturing detailed technical reports and books of specifications but that when a solution appeared it would investigate the use of teleworking; another was amenable but stated that no member of staff had put in a request.

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[7] See Bibby on: http://www.eclipse.co.uk/pens/bibby/telework.html

Table 6.

Employer perceptions of teleworking:
Advantages:
• improved quality of life;
• improved customer service;
• cost savings;
• increased productivity;
• recruitment and retention of staff;
Disadvantages:
• difficulties of managing and controlling remote workers;
• lack of trust of employees;
• the cost of training and equipping teleworkers.
Source: Orme, 1998.

It appears then from prior literature that there is a need to delineate the socio-economic factors and the socio-cultural factors influencing the take-up of teleworking. Qvortup (1997) provides a socio-cultural explanation for the development of ICTs in Denmark, he states: "For me the basic explanation is not primarily technological, but rather ideological and organisational. Today in Denmark telework is associated with flexibility and self-organisation. Thus, telework is seen as one element in the general change of attitudes in welfare society, from an emphasis on rights, equality and bureaucracy, to an emphasis of possibilities, flexibility and self-determination." Thus so-called "network cultures" are alien to many individuals used to traditional organisational forms; and there is likely to be fear of the unknown, especially in industries where knowledge is the basic resource. Telework may then be considered as one element in the formation of new socio-cultural values: "Those trends of development hiding behind the label of "telework" point in the direction of new forms of organisation, more individual independence and responsibility in working life, greater flexibility in the organisation of work, and new forms of co-operation and management." (Qvortrup, 1997).

Orme (1998) identifies opposition to telework on the basis of perceived loss of control; not knowing how to motivate remote workers; apparent high cost; low suitability; isolation; health and safety; lack of trust. For organisation set to continue with traditional work forms then these problems may not be significant; but for organisations wishing to adapt to new ways of working then there are significant socio-cultural problems to be overcome. See table 7 for comments made by managers in opposition to telework.

Table 7.

Comments opposing teleworking included: • "I feel I can exercise control better in a central office. People want to work together, not alone. • I do not know much about teleworking but I do not think it would work for us. Our staff is all sales people and their motivation would flag if they worked at home. • It would be too expensive. I wouldn't trust them to work from home. I don't know very much about it. • This method of working is unsuitable for the financial services sector but I know very little about it. • Our administration database is not set up for remote access. Information about teleworking has not been investigated because we do not intend to work that way. People would be isolated at home. We could not assess their health and well being if they worked at home. Some employees would skive." *Source: Orme, 1998.*

Further research.

The author of this paper would suggest that four approaches should be investigated in overcoming resistance in organisations to the idea and nature of teleworking. The first approach is *descriptive* and encourages the development of cases and models to describe how telework works in practice. The second approach is *instrumental* and calls for more evidence to demonstrate the success of teleworking as compared to other organisational forms. The third approach is *normative* and highlights the need to consider the consequences of teleworking for those involved and for society in general. The fourth approach is *managerial* and highlights the need for changes in managerial thinking, such as the development of values, techniques and tools appropriate for the management of teleworking.

Rogberg (1997) reinforces this recommendation by recognising the need to delineate telework theory from telework practice and by having theoretical, normative, and empirical foci for researchers. The following quote by Stanworth (1997) sets the scene for the UK and continental European comparison of teleworking practice for the case study organisation highlighted in this paper. Stanworth states: "The UK may have a greater degree of strategic choice because of its unique position between continental Europe and the USA. It shares with Europe higher union involvement but is not in tune with full social partnership (even with a change of government). There are strong cultural links with the US and a sharing of the belief in 'the right to manage', but at the same time a much greater investment in public services and more company regulation."
What follows is a socio-cultural comparison of the take-up of teleworking for one major telecoms company in the UK and continental Europe (see table 8).

Table 8.

Case study organisation. The company is a leading global provider of communications network solutions with 1997 consolidated revenues of US$15.5 billion. The company in North America, Caribbean and Latin America, Europe, the Middle East, and Asia/Pacific provides network and telecommunications equipment and related services. Products and services are also provided to the telecommunications and cable television industries, businesses, universities, governments and other institutions world-wide. The company has approximately 73,000 employees world-wide with 11151 in continental Europe and 7593 in the UK. There is a long tradition of technological innovation and state-of-the-art design of advanced products, systems, and services that have helped shape the very nature of modern communications. The corporation's aggressive pursuit of technology advancement is rooted in a commitment to create leading-edge product and network solutions that provide added value and competitive advantage to their customers. World-leading expertise in a broad range of technologies and applications places the company at the forefront of communications technology development. Today, the corporation's mission is to be the leading architect of global communications networks. The company is aiming to have 10% of the North American workforce telecommuting by the end of 1998. As of May 1998 there are 3474 teleworkers in N.America and 161 in Europe. Increasing the number of full-time telecommuters is regarded as one more option for cost reduction. Full-time telecommuters provide an annual net cost savings of $4-6K, depending on their location's real estate costs. The ongoing yearly savings for 3,000 full-time telecommuters is over $15M! Additionally, there is a one-time cost avoidance of $45M for new building costs! Telecommuting also reduces the necessity for in-office moves (annual average $1.5K per employee), relocation (average $100K per employee), and hiring and training costs ($33,000 per new employee). Additionally, a number of other driving forces, such as increased employee satisfaction and productivity, have encouraged the promotion of the telecommuting initiative. Telecommuters scored 10% higher than company staff overall on the Gallup employee satisfaction survey. They also scored 21% better on retention; meaning telecommuters are 21% less likely to leave. This is a substantial cost avoidance for recruitment, productivity, and training. Full-time telecommuters do not require a standard dedicated onsite space, but will have available to them a variety of alternative office environments to use when onsite, including Business Centres which are shared areas designated by their department or line of business, etc. While most full time telecommuters spend approximately 3 to 4 days a week away from the office, they are encouraged to come into the office 1 to 2 days a week for face-to-face meetings with their manager or co-workers. Managing telecommuters requires the same strong management practices utilised in managing on-site employees. All managers should be setting expectations and objectives, reviewing progress based on deliverables, and providing feedback for their employees no matter where they work.

In short, telecommuting provides economic, social and environmental benefits to company, the employee and the community. Staffs are challenged to review this scenario and decide if it is plausible for a portion of their organisation. For example, it may be feasible to have part-time telecommuters that are out of the office three days a week. Encouragement is provided through significantly subsidising the up-front cost of telecommuting, so those departmental managers can more easily participate, and start the savings cycle earlier.

Interested staff are asked to carefully read the Telecommuting Policy Document and the
Telecommuting Guidelines provided; discuss telecommuting with their manager; and to consult HR, if required. Use of the web-site is encouraged to research and review telecommuting; there is the Health & Safety and Security checklist; and there is an information line available about the programme. Once the application procedure is completed a new contract is issued. There is a 20-day migration programme during which home data and phone line(s) are procured and terminal adapter equipment and phone set. After the setting up of a log-on account and assignment of new addresses the user is advised to select a printer and furniture (from company recommendations). Finally, the PC is "certified" before the employee goes home, and their move mutually arranged. They are now a teleworker!

Sample reactions from UK staff:

" The excitement of becoming a home worker soon wears off, but it is an excellent way of working" - full time teleworker.

" I've done it and enjoyed the benefits but I wouldn't do it again" - moved back to the office to re-establish links with colleagues

"Now that I've got my teleworking equipment installed I can be at work
whenever I need to be." - Part time teleworker.

More in-depth reporting of the results and analysis will be presented at the workshop.

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Notions from the home : changes in household activities due to telecommuting

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Abstract

Telecommuting will affect domestic division of labour and the content of activities within the home. When people start working at home they redefine the arrangements they have routinely operated for handling a broad range of daily household tasks. Men and women working from home report that they carry out more household tasks than before, partly because their proximity means that they more readily see the needs and undertake the tasks, and have more time, or more control over the structuring of their time.
From interviews and survey data, the paper examines the extent of activity change and how these changes vary between male and female teleworkers, and for households in different situations. This paper provides a theoretical framework to analyse the changes when people start telecommuting. It is hypothesized that women with traditional views on the domestic division of labour will be confirmed in this traditional division, whereas in households with a shared division of labour, telecommuting might be an important factor in further development of this domestic pattern.

Introduction

Up to now not many researchers in the field of telecommuting have been concerned with the effects of working at home on everyday life, leaving aside some good exceptions.[1] In my research[2] the focus is on the division of labour within the household of the teleworker, in particular the division of domestic labour. Domestic labour comprises: strictly domestic duties (care for meals and dishes, cleaning the house, doing the laundry and ironing), care of children and other members of the household, and shopping.[3] The theoretical framework for this research is derived from the home economics

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[1] For instance the articles of Mirchandani, Haddon and Büssing in: Paul Jackson and Jos van der Wielen, Teleworking: international perspectives; from telecommuting to the virtual organisation (1998).

[2] The content of this paper is part of a doctoral research at the Department of Household and Consumer Studies, Agricultural University of Wageningen, the Netherlands.

[3] De Hart (1995).

model of Zuidberg, in which household activities are related to the composition of the household, the resources available and the standard of care. The output of these activities is the level of care and, in this study, two aspects of the level of care are examined, both in relation to telecommuting:[4]

1. the external labour division, i.e. the division between the household and the market. This relates to paid and unpaid labour, and to money spent on goods and services as against self-sufficiency;

2. the internal labour division: the division of household tasks between members of the household, in particular the division between man and woman; and the way this labour is executed (amount and content of domestic labour).

The assessment of this outcome determines the well-being of the members of the household. If the level of care does not correspond to the standard of care, people use strategies to reconcile the standard with the level, either by adjusting the standard, or by changing daily routine.

The relation between the above-mentioned aspects of the research can be visualised in the scheme below.

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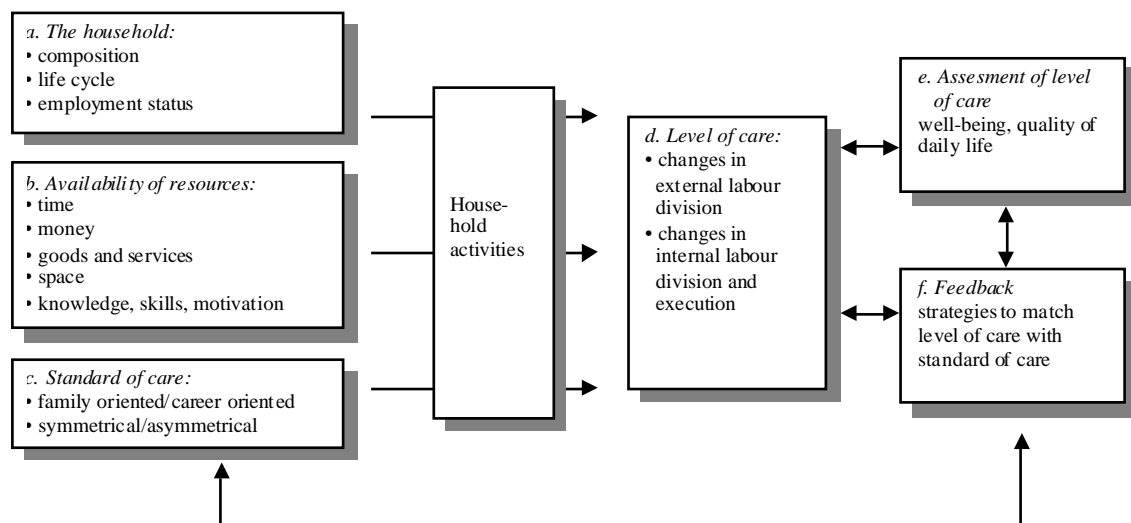
[4]   Derived from Zuidberg (1981), Van Dongen (1993).

It is expected that changes in level of care caused by telecommuting differ according to household characteristics, resources and standards of care. In family oriented, asymmetrical households, in which the man is the main breadwinner and the woman first and foremost housewife and mother, it is plausible that women perform more household tasks as they or their husband start working at home. Families with a more symmetrical division of labour, use telecommuting as a strategy to realise this practice.

In this paper the aspects of the model and the above mentioned assumptions are elaborated and illustrated with results of interviews, a focus group discussion and a survey, carried out in 1996.[5] From January through March 1996 I interviewed eight telecommuters and some of their partners, and arranged a focus group discussion with another eight. Fourteen of these respondents were women, mainly because I recruited them via a women's magazine. Both the interviews and the group discussion focused on household activities, child care, time management and use of room. Differences between men and women were also a topic. There was no strict questionnaire for the interviews nor for the group discussion; the mentioned items served as a guideline.

In the summer of 1996 market research company IDC-Benelux performed a survey on computer property and use among 1000 Dutch households. In this survey questions were inserted about telecommuting. These questions were based upon the findings in the interviews and the group discussion. In the survey two important distinctions were made. First, there is the difference between those people who work at home and those who do not; this second group is divided in people who want to work at home, and people who do not want to do so. The second distinction is between main breadwinners and other income earners in the household. It appeared that there are significant differences in motives and wishes between main breadwinners and others.

In addition to the survey I interviewed experts in the field of telework: researchers, representatives of industry, government (both national and European) and labour union. The outcome of these interviews serves as background information. The qualitative data below stem from the interviews and focus group discussion, and from literature. Quantitative data result from the IDC-survey.

A. The household

The amount and content of domestic labour is very much related to the composition of the household. Households with (small) children spend more hours on domestic labour than households without children. Because of the impact of children on domestic labour I want to focus the research to families with children living at home. Most of the participants of the interviews and the group discussion answered this criterion. Only one person was single and lived alone. Others lived with a partner of opposite sex, the age of their children varying from zero to mid twenties. One of them had no children living at home anymore, but took care of her granddaughter every day. In the survey almost half of the households comprised children under eighteen.

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[5]   Casimir (1996), Vernooij en Casimir (1996), Casimir (1997).

The nature and extent of paid labour and the percentage of paid labour done at home can be seen as an attribute of the household as well. In the interviews and survey most tele-commuters (77%) work at home less than twenty hours per week. Full-time home-workers are an exception, two days is mentioned as an ideal amount.

In literature flexibility in time is regarded as one of the big advantages of telecommuting. The extent of flexibility and autonomy in time budgeting is related to the type of work. A telephone operator is hardly flexible, a professional member of staff is highly flexible. The level of education and income are indicators for this, but not exclusively so. Higher level jobs seem to offer more autonomy and flexibility than those at lower level. However, some administrative tasks are not time-bound and some management jobs are. In my interviews and group discussion all respondents could plan their own work. In the survey this question was not asked.

B. Resources

Households have resources available: human capital and non-human resources. The latter can be divided into: time; money; goods and services (technical devices, software, infrastructural facilities; accommodation). Human capital relates to knowledge, skills and motivation, and, for instance, the disposition of a person that enables him or her to work at home. In the following subsections these resources are discussed in relation to telecommuting.

Time

Time is perhaps the most important resource, but also the most difficult to define. Time can be interpreted as a physical quantity, but is also a social construction. De Hart calls time a basic dimension of individual and social reality The rhythms of individual lifes constitute the rhythm of the collective life, which in turn rules and comprises individual lives. Different societies use different time systems, with a diverging duration of a week, dependent on the rhythm of local markets and regional economic situation. The current time system relates to the social structure and mirrors social changes.[6] Time seems to become of growing importance. According to Lyon and Colquhoun modern societies even are obsessed with the mastery of time: "The need to co-ordinate activities in time, and accomplish tasks with ever greater speed, has permeated virtually all aspects of everyday life."[7] They put forward many examples of the importance of time in the private sphere, and of time and speed as a selling argument. But they also describe the paradox: whereas speed and time become a dominant factor in everyday life, powerful technologies allow for the manipulation of time. Video recorders, microwave ovens, word processors, answering machines save time or enable us to watch programmes and answer telephone calls at a time it suits us. "...Recent moves towards a 24 hour society are as much an expression of our inability to wait for tradi-

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6   De Hart (1995), p. 39.
7   Lyon and Colquhoun (1998).

271

tional opening hours as they are a measure of our technical and commercial sophistica-
tion."

This very paper shows how time as a social and historical dimension relates to individu-
al time and family time. Thirty years ago it would not have been written, because tele-
commuting hardly existed.

Time can be regarded as something people have or have not, to a high degree dependent
on other activities like employment, but time is also a matter of priority: how much
time do people want to spend on something. The amount of time needed for domestic
labour is related to standards of quality, but also to knowledge, skills, and organisational
talent. A skilled person needs less time to perform a task than someone who is not
skilled nor experienced.

Time is most influenced by telecommuting. Not only the amount of time available can
change (mainly by saving commuting travel), but also the moments of time on which the
telecommuter is available for other activities.

In general, women spend more time on household activities then men. This is in the
Netherlands in 1990 averaged 26.6 hours per week, against 10.4 by men. Young women
without children spend only 17.4, women of whom the youngest child is under five
years old spend 47.1 hours per week. Women with paid jobs spend less time on house-
hold chores than women without paid jobs. Full-time housewives with a working part-
ner spend 40 hours a week on housework, care of other members of the household and
shopping. Their male partners spend only 10 hours. Women with jobs, where the part-
ner also has a job, spend 28 hours. When their partner is unemployed, they spend only
17 hours per week. This is the only situation in which men spend more time on house-
hold activities than women. The unemployed men with a working partner count for 20
hours a week.[8]

When people start working at home, they save commuting time. Some of the interview-
ees report that they also save time on *grooming*, like dressing up, drying their hair or
knotting a tie. The time saved is spent on work, but also on household chores. Some of
the women feel embarrassed to have paid domestic help when they are at home and
choose to spend more time on cleaning the house. Most of the women, and some men,
report specific tasks that are done *in between*. Doing the laundry and the dishes are
mentioned in this respect. Half of the female respondents report that they spend more
time on the house and the children, not so much because there is more time available,
but mainly because they happen to be there. Children ask to have lunch at home
"...because you are at home anyway." Paid work is shifted to the time the children are
asleep or the partner is available to take care of them. Here not only the quantity of
time counts, but also a more qualitative aspect of time, i.e. the points of time the tele-
commuter is available.

Money

Money is an aspect of all paid labour, not only of telework. I confine myself here to
expenses, savings and reimbursement of expenses related to telework. Schop lists the

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[8]   Figures derived from De Hart (1995), p. 75, 193.

272

following categories, where costs or savings can be encountered, or for which employers may grant allowances:

• technical devices
• work space (possibly renovation, furnishing, use)
• energy/electricity
• communication
• commuter traffic
• child care

Next to these, teleworking can effect household expenses in a more indirect way. The above mentioned refraining of paid domestic help is an example. Others report that tele-commuting gives them the possibility to take part in activities during the day, for instance outdoor sports, which also influences their budget.[9]

Telecommuters highly agree on the issue of child care. They all state that concentrated working is not possible with children around you, and that therefore as much child care is needed as when working outside the home. But in the course of the interviews this point of view is differentiated: children are coming home for lunch, parents work while children are sleeping, a mother works while her grown-up, handicapped son is around the house, a second mother works while her children are ill in bed. They all save money on day-care, lunch at school, baby-sitters and other services.

Telecommuters save travel expenses, but they also miss some benefits in this respect. A leased car or a seasonal ticket for public transport is not profitable for their employer, when they work at home more than one day.

There are great differences in the way employers deal with reimbursements. Direct costs of telecommunication are paid by most of them. It is common that technical devices as computer and accompanying software, printer, modem, fax machine, answering machine, or a photocopier, are provided by the employer, if clearly needed for the job. Some of the interviewees have their own computer. The possession of this PC facilitated working at home, and hence influenced the decision to do so.

Although working at home involves energy costs - heating, electricity, but also coffee, which, in most offices, is offered by the employer - hardly any employer pays an allowance for that. There are exceptions, though. The secretary of a co-operation of building contractors gets a rent for her room paid. Some larger firms have had discussions with the Dutch Treasury about allowance levels. If they pay too much, the employee is taxed for it.

Some of my interviewees never raised the question. They save money and time on commuting and feel highly privileged by working at home. Hence they do not want to disturb the relationship with their employer. Some of them had never thought of asking, they did not realise before that teleworking is also beneficial for their employer.

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[9]   Schop (1998).

Goods and services

Computers and software are, of course, a matter of money, but also of availability. Sometimes people like working at home because they have better facilities there, like a faster PC or an Internet connection. In other cases the facilities in the office of the employer are better, for instance a high quality printer, an Internet connection (or a faster Internet connection than at home), a photocopier and the availability of a help desk or colleagues who can assist with hardware and software problems. In this respect the proper installation of a fax machine is mentioned more than once; especially how to let it pick up faxes during the night, without waking up the whole family.

Accommodation

In post-war Netherlands, and in particular the last twenty years, there has been a considerable increase in geographical mobility. Compared to former migration patterns the motives have changed. In the last century and shortly after the war, economic reasons prevailed. People moved to the cities because of better employment opportunities. Nowadays the migration is mainly because of houses and housing conditions. The increased radius of action of employees created by car ownership has enabled this.[10] Prices of houses in the urban areas also play a role here. And because more women have jobs in comparison with twenty years ago, female partners are less likely to move unquestioningly when their male partner is appointed somewhere else.

Communication technology makes work even more independent of place. As a result of this, the place is increasingly important for the worker him- or herself. Nice surroundings, a good school for the children, a pleasant house were arguments for my interviewees to stay in one place when the job moved to another, or to move to the countryside and keep the job in the city.

Teleworkers need room to work. One of my interviewees works in the living room, all the others have a separate study. Sometimes this is shared with their partner, most of them prefer a room for their own. The room has to be functional, with a good desk and chair and sufficient connections for electricity and telephone. Often the room was already available, when the person started working at home. In one case the availability of a working room was one of the conditions when buying a new house. In another case a considerable renovation was carried out, in order to rebuild a garage into a study. The others limited themselves to refurnishing.

Telework means that room is withdrawn from other use. Although this sometimes required a discussion with other members of the family, by the time I interviewed my respondents their situation was stabilised. They had all arranged a space for themselves where they could do their work relatively undisturbed.

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[10]   De Hart (1995), p. 31.

274

Human capital

Perhaps the main resource in a household is human capital: the skills, knowledge and motivation the household has to its disposal. Some skills save time, others save money. Some people can do a task in half the time, others very much like or dislike certain chores. These factors obviously effect the way the domestic labour is carried out and will be divided, but they also effect the division between paid and unpaid work. After all, human capital determines the opportunities on the labour market.

People who work at home need to be self-motivated and self-disciplined; they must be able to work alone, in their own speed. And of course they need to have enough skills to master the equipment and software they work with. The people I spoke to had these requirements at their disposal, although some of them complained about the absence of colleagues to consult and a help desk near at hand. Sceptics note that the results of telework projects are so promising, because failed projects are never reported and the people who are not able to perform well are already called back to the office.

C. Standard of care

Households do have opinions concerning the way the housekeeping should be performed. They have norms and values about the quality of the daily care, and about the division of tasks among the members of the household. Following Droogleever Fortuijn, it is suggested there are two interrelated dimensions in the normative context of a family. The first dimension is the attitude towards paid and unpaid labour; the second is the attitude towards labour division.[11]

Attitudes towards paid and unpaid labour

Droogleever Fortuijn introduces the concept of self-sufficiency, which indicates to what extent a household is career oriented or family oriented. Do they purchase as many goods and services on the market as possible and spend most of their time on paid labour, or do they emphasise self-consumption and spend as little time to paid labour as possible. She defines the *careerists* as households in which household activities and child care are arranged around the paid labour of both partners. *Familistic* households focus on self-sufficiency and arrange the paid labour around household activities and child care.[12] Part of the careerists are also monetarists: they spend money on goods and services to fulfil their domestic needs.

Qvortrup calls the career-oriented the ones who live to work and entitles the family-oriented as the *'wage earners'*: the ones who work to live. He adds a third group: the self-employed. He argues that the form of work is closely related to the whole life form. Thus, all three categories can be defined by the way work and leisure time are related. The family-oriented wage earners place leisure time above work, career oriented households prize work above leisure time, whereas self-employed people are very reluctant to draw a line between working hours and leisure time. They cherish other values, such

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[11]   Van der Lippe (1993); Droogleever Fortuijn (1993); Van Dongen (1993).
[12]   Droogleever Fortuijn (1993), p. 25.

275

as running their own farm or firm, and they do not experience any significant conflict between family life and working life.[13]

A different way to describe people's relation to (paid) work comes from Vogel. She distinguishes time oriented and task oriented labour. The pre-capitalist production of goods and services by self-employed is typically tasked labour. Timed labour is the dominant form in capitalism. But career oriented people often experience their labour as task oriented, even when they formally work for a specified amount of hours. It is clear that the wage earners are mainly trading time for money.[14]

Kloek applies Vogel's view on the division of paid and unpaid labour: "The work of the breadwinner is paid and his work is restricted in time; the housekeeping of the house-wife is unpaid and unlimited in duration."[15] Domestic labour can be seen as a remnant of the pre-capitalist, task oriented family, in which all work was part of family life. In traditional families (i.e. families with a traditional labour division), time hardly is an issue: the housewife and mother is available 24 hours a day, 365 days a year. Tasks have to be performed, but are not measured in terms of time or costs.

This vision contrasts with that of Lyon and Colquhoun, who think time becomes more and more important in everyday life.[16] Although the private sphere is in essence task oriented, time becomes ever more important there, not only imposed by advertisement and media, but also by the relation between work and home. Lilian Rubin reported already in 1976 that women with paid jobs were more efficient in their time management, than women who did not work outside the house. *"I was better organised at home when I worked,"* one of her interviewees said.[17]

The different visions can be summarised in the diagram below. The upper part of the scheme represents a task oriented attitude; the lower part a time oriented. Household labour is represented on the left, paid labour on the right. Family oriented households have a task oriented attitude towards domestic labour. They can be found in the upper left quarter of the diagram. These might be (but are not necessarily) the same house-holds, that have a time oriented attitude concerning paid labour: the wage earners, the ones who trade time for money on the labour market. Families with a time oriented atti-tude concerning domestic labour are the monetarists: the ones who buy consumption goods and services on the market. In many cases this goes with a careerist attitude to-wards paid work.
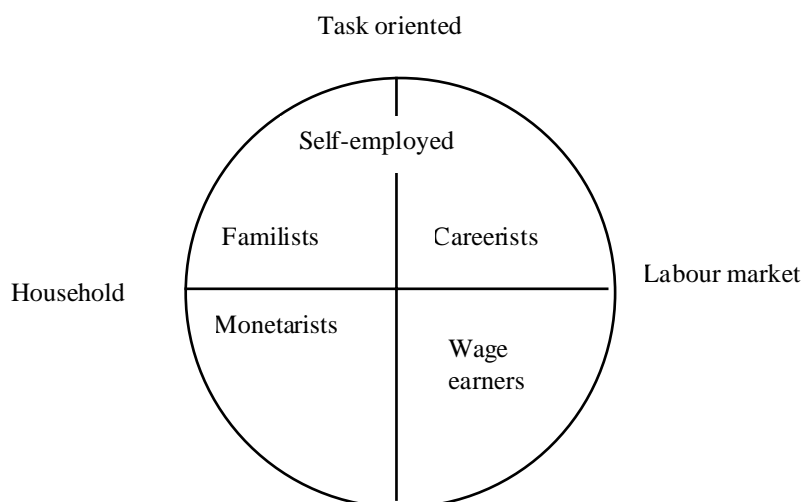
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[13] Qvortrup (1988), p. 31-32.
[14] Lise Vogel, 1987, cited by Kloek (1989), p. 45-47.
[15] Kloek (1989), p. 49.
[16] See the paragraph about time (page 271).
[17] Rubin (1976), p. 165.

Task oriented

Self-employed

Familists   Careerists

Household   Labour market

Monetarists

Wage earners

My assumption is, that both the attitude towards domestic labour and to paid labour change, when the two spheres move closer to each other as people start working at home. Telecommuters might acquire a more task oriented and less time oriented attitude towards their paid labour, because this labour is performed in the domestic sphere, which is more task oriented in itself. Time becomes less important, one does not need to hurry, to be ahead of the traffic jam, to be in time for dinner, to catch a train on time. Working late does no longer include an empty unpleasant building, or an unsafe bicycle ride to a deserted railway station. Work is not so much squeezed in measured unities. For a matter of fact, this goes very well with changes that are reported from telework managers: the work itself has to be defined in terms of output, and not so much in the amount of time that is spent on it and presence of the worker at the work place, like traditional managers were used to.

Vice versa, introducing work in the domestic sphere could change the attitude towards paid labour as well. The idea that telecommuting brings back the old productive family[18] is true in this respect that working at home strengthens the task orientation of the paid labour.

There is, however, a relation with the extent of autonomy of the teleworker. Telephone operators for instance still do very time-bound work. It is plausible that their attitude towards work is also time oriented; they are typical 'wage earners' who work to live. Money is more important than job satisfaction. Schop's interviews support this assumption. She found that her interviewees were not very much interested in the costs of telecommuting and the reimbursement of expenses by their employers, except for the one who had a job as a telephone operator.[19] Teleworkers with little autonomy are more time oriented and therefore more interested in costs and direct benefits of the job. Of course the level of income influences their interest in money, but others with low incomes do not emphasise this aspect as much. They experience more secondary benefits of working at home.

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[18]   Terreehorst (1994) introduces in this respect the term *farm model*.
[19]   Schop (1998).

The attitude towards career and family is gender biased. Women put forward more family oriented motives to work at home than men. Only ten percent of breadwinning homeworkers think *gaining time to spend on household and family* is an important argument for working at home. The answers of the second income earner in a family, mainly women, were different: here 30% think family is an important or very important reason to work at home.[20] This brings us to the second dimension: the attitude towards labour division.

Attitudes towards labour division

People develop an ideology, partly from experiences in their youth - sometimes following the norms and values of their parents, sometimes reacting against them -, partly related to the possibilities they have. In the traditional ideology a man has more power and his career is more important than the career of his wife, he should be more intelligent and earn more money than she. Women are expected to do the housekeeping and care for the children. A modern ideology distinguishes more egalitarian opinions, which results in a more symmetrical division of labour. Although Oackley's words, cited by Wheelock, are still valid: "Modern marriage may be characterised by an equality of status and 'mutuality' between husband and wife, but inequality on the domestic level is not automatically banished."[21]

In all the families I interviewed, the men did household chores, varying from making coffee while working at home to caring for the children when his wife was working at home. All the female interviewees mentioned their final responsibility for children and housekeeping. Some complain about that (*"I am always the first to see that things have to be done"*), but they all add: *It is my own fault, I do it myself.*

If time budgets are an indicator for opinions, Dutch households are not very egalitarian in the domestic sphere. Although the percentage of married women with a paid job raised rapidly the last twenty years, and although men's participation in domestic activities has increased, women still spend, on average, three times the hours on unpaid work than men.[22]

The two dimensions of standard of care

Summarising the paragraphs above, I discern two dimensions in the standard of care:
1. attitudes towards paid and unpaid work: families are either task or time oriented towards career or family;
2. division of labour: families are either symmetrical or asymmetrical.

Both dimensions can be seen as a continuum. Task orientation and time orientation are the two extremities of the first dimension, symmetry and asymmetry are the ends of the second dimension. Both dimensions relate to the external and the internal labour division. The external labour division concerns the interaction between paid and unpaid

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[20] Casimir (1997); Vernooij en Casimir (1996).
[21] Wheelock (1990); Oackley (1975); Hochschild (1990), p. 31-32.
[22] De Hart (1995).

labour, between market and private sphere, between self-consumption and outsourcing. The internal labour division is the division of household tasks between members of the family. When work and domestic sphere come physically closer to each other, it is plausible that also the attitudes towards paid and labour move in each other direction.

D. Level of care

The result of household activities is the level of care: the way people actually arrange their everyday life, the way they divide work between market and home, and among members of the household. Caring arrangements often are changed when major events, for instance life course transitions, occur. The birth of the first child is such a major event and marks a redistribution of paid and unpaid labour and of labour inside the home. Starting to telecommute can be seen as a similar major event. A complicating factor is, that in many cases this event does not occur on its own. Often other circumstances change at the same time. A child is born, or the person takes up a new job, or moves to a distant city, or his or her firm amalgamates with another firm and the office moves to somewhere else. In some cases the current job was the first job, as a result of which the life style had to be rearranged anyway.

The level of care is the outcome of household activities, the input of which is the household (including life cycle, gender of the teleworker and employment status), the resources (time, money, goods and services, human capital) and the standard of care (family or career oriented, symmetrical or asymmetrical). Next to that, external factors like opportunities on the labour market and availability of jobs, play a role in the final outcome of the labour division process. Those factors, though important, are not subject of my research. In the following paragraphs, two aspects of level of care are considered: the external and the internal division of labour.

External labour division

Telecommuting can have a direct influence on the division between paid and unpaid work whereas it opens job opportunities that were formerly not available or not acceptable. In families with special circumstances like ill or handicapped children, or in surroundings with little opportunities for child care, working from home seems sometimes the only possible way to perform a paid job. One male interviewee started working from home to spend more time with his handicapped daughter. However, he could not concentrate on his work while doing so, and subsequently he arranged to work part-time. Here is a rare case in which telecommuting initially offered an opportunity to get acquainted with a part of life, that proved to be valuable, and finally lead to a change in external labour division, without telecommuting, though.

More highly educated women are on average more career oriented than women with little education.[23] Consequently, highly educated women might apply more career oriented motives to work at home, than others. On the other hand, it is conceivable that they mention family oriented motives because they want to continue their career and

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[23] Droogleever Fortuijn (1993); De Hart (1995), p. 104.

yet have children. My interviews gave indications of the validity of this assumption, and also some results of the survey point in that direction.

External labour division also relates to the extent of *monetarisation* of the household, which means the division between purchased consumer goods and services and home production. The assumption is plausible, that families with home working members spend less money on child care and baby sitting, fast food, and paid domestic help. This is suggested by remarks of interviewees: *"When the children were smaller, I was glad to work outside the home. Otherwise I would have let them lunch at home, which takes an awful lot of time."* One of the respondents sent away her cleaning lady when she started working at home. *"I was at home anyway, so I thought I could easily do it myself."*

The separation (or mingling) of paid and unpaid labour is a point of attention for most respondents. Telecommuters have to guard the boundaries of work and leisure. I will come back to this later.

Internal labour division and execution

Many telecommuters, in particular female telecommuters, report changes in the execution and division of household labour when they start working at home. Teleworkers tend to do more often a smaller amount of errands, opposed to the once a week *one-stop-shopping* they used to do when working outside the home. Most teleworkers, especially women, do more in the house, because they are confronted with dishes and laundry, which they do in between. Of course, there is more to do too, because the house is used more intensively. And family members expect the homeworker to do more: *"When you are at home, could you..."*

Women seem to be more susceptible to the expectations of others than men. They report difficulties in concentrating on their work, when children are around and ask for attention. Men do not automatically pick up household tasks when working at home. There are two factors that encourage men to perform more household tasks. One is the need for it, for instance when their wife has a job outside the home and paid child care is too expensive.[24] The other is their motivation. If they really want to take care of their children they will more readily engage in household tasks. Several of my female telecommuting interviewees had husbands who took care of the children when they were working.

Thus the division of domestic labour between men and women changes in different directions, dependent on the employment situation of man and woman and of their opinions and attitudes towards household tasks.

1. Female telecommuters tend to do more domestic labour than women with jobs outside the home, unless their husband is deliberately taking up more household tasks.
2. Male telecommuters do not do more domestic labour, when their female partner has no paid job or only a small job.

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[24] In her research among unemployed men with employed women in Britain, Wheelock (1990) found changes in the division of domestic labour in a non-traditional direction, dependent on the amount of hours the woman is employed.

3. Male telecommuters do perform more domestic labour, when their female partner is having a job outside the home.

More research is needed to elaborate these issues.

E. Well being: the quality of life

In my research I consider the evaluation of the quality of daily care in relation to telecommuting. Effects of telecommuting for the employer, the management or the quality of job performance is the field of other researchers. Within this limited perspective, telecommuting is in general evaluated as positive, although many remarks about the disadvantages are made. The increasing amount of domestic labour for women is sometimes experienced as negative: *"Before I worked at home my husband walked the dogs; now I am always doing it."* Or: *"We made some good arrangements about the division of tasks, but since I am at home so often, these are more and more neglected. We should discuss this again."* Both remarks were followed by the admission that it is their own fault that things went in this direction, or that they do not mind so much.

Some of the interviewees regard telework as the best of two evils. *"I rather would work outside the home, but the good thing is that you can shift your work easily to another point of time, in case of an emergency. There seems to be an emergency every week."*

Many are very pleased with the fact that they can combine the good things of both worlds: the combination of being an employee and a parent is made more easy by the possibility of telecommuting. It diminishes stress. One man (no children) stated: *"Household labour is a good cure for stress."* He does the dishes or starts hoovering, when he gets stuck with his work.

F. Feed back: strategies to cope

When the outcome of activities (level of care) does not correspond with expectations (standard of care), people apply different strategies to bring these into line.[25] These strategies can be of a practical nature, like changing working conditions or available resources. An extra telephone line, fax or answering machine can separate private calls from business communication. Some strategies are more or less a mental exercise, as Hochschild reports. Women display gratitude, because their husband is not as bad as the others. Or they proclaim the myth that their husband is doing half of the homework, while he is only cleaning his own miniature trains. In most cases, the organisation of the daily activities is reconsidered. Rules and agreements about labour division or the use of resources are formulated. Often the admission to the PC is subject to strict rules (with priority for the teleworker). Sometimes families make appointments about the use of the telephone: no private calls during working hours.

As said before: telecommuters have to manage the boundaries between work and non-work.[26] Working at home aggravates the feeling that the work is never done. Twenty-

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[25] See: Hochschild (1990) and Wheelock (1990).
[26] See: Jackson and v.d. Wielen (1998), part 2: Understanding and manageing boundaries in telework (p. 93-166). The four dimensions of the work-non-work boundaries (spillover, cross-over, compensation and segmentation) are derived from the Familytel Group, Lewis and Hootsman (1997).

five percent of the teleworkers in the survey give rise to this feeling. On the other hand, while working at home, household tasks impose themselves upon the teleworker. The dishes are sitting on the kitchen sink, asking to be washed, the laundry is waiting for treatment. We call this *spillover* from one sphere to the other.

Whereas spillover has a negative connotation, the tuning between the two spheres can also be experienced as positive. That is the case when knowledge and skills, acquired in one sphere, are used in the other and benefit others. For instance, skills that are opportune in volunteer work or helpful for children's school work. Or, when the regular confrontation with paid work increases the knowledge and understanding of other members of the family (*cross-over*). Many of my respondents use their work equipment for private activities, like home work of children, appointments for and minutes of meetings, telebanking, or fax and e-mail communication with distant relatives.

The performance of household activities can lessen the work stress or vice versa. Competence in the work sphere can make up for pressure at home (*compensation*). Most families however, want to keep work and private separated and try to avoid too much interaction, both in time and in space (*segmentation*). To get enough work done on one hand, and to guard themselves against too much work on the other, they write down the exact amount of hours worked, use fixed time schedules and a fixed place to work. The study serves as an office, separated from the rest of the house. Thus telecommuters reproduce the traditional labour division between paid and unpaid work.

Segmentation is used by career oriented families to prevent the private sphere to intrude into the work sphere, and by family oriented households to keep the work outside the private life. Segmentation is not only useful for the telecommuter him- or herself. It makes clear to others when this person is working, which means that it is also is clear when he or she is free.

Further research

This paper evokes more questions than it gives answers. The following topics were touched upon:

- will domestic labour become more time oriented under the influence of telework, and/or will paid work become more task oriented within the structure of the home;
- to what extent do housing conditions or surroundings stimulate telecommuting;
- is money (both expenses and allowances) of more importance to time oriented wage earners than for task oriented career makers and is here a relationship with income and autonomy;
- do highly educated women have family oriented motives to work from home;
- do telecommuters spend less money on child care, domestic help and fast food;
- do telecommuters go out more often for a smaller amount of errands and are they likely to do less one-stop-shopping;
- do female telecommuters spend more time on domestic labour when working at home than when they have a job outside the home;
- do male telecommuters perform more domestic labour when their female partners work outside the home;

- is there an increasing amount of male telecommuters who want to be involved in domestic labour and child care and who use telecommuting as a strategy to do so.

All the above questions touch the relation between household characteristics, resources and standard of care on one hand, and the evaluation of the level of care and the strategies to cope with possible incongruities on the other. To find the answers, more research is required. Therefore, a survey is planned in the fall of 1998.

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Software Solutions
for Telework Activities Improvement

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Abstract

The paper is intended to be an overview of some modern software products that can be used in the framework of a telework platform, according to the specific of the its activity.

After an introduction reminding some basic concepts of telework, a model of the structural levels of teleworkers (from the point of view of their contribution to the managerial activity) and their functions is given. Some software solutions (types of applications and concrete products) are proposed for each category. A short presentation is done for recommended software solutions (such as: Netscape Communicator, Lotus Notes, Oracle InterOffice, OLAPs etc.). An own solution, based on the WWW Internet service and Java techniques and intended to be suitable for three categories of teleworkers (executives, middle manager, general manager), is presented.

A final paragraph focuses on another important category of teleworkers, those with disabilities.

Telework related aspects have been discussed since the early seventies, driven and pushed by the rapid progress of information technology. The early scenarios linked telework to routine home-based work, typically done by women. Experience has proven something else so today discussion rather seems to focus on the potential for caring out highly qualified professional working process.

Highly qualified work has a social as well as a professional dimension. [3]

In this context, we can identify a number of selection criteria for the activities that could be done as telework:

- to involve especially intellectual work;
- can be done individually - has a great deal of autonomy;
- to need minimum supervision, the teleworker has the possibility to take a range of decisions;
- has a quantifiable result of his work;
- their performance has to be easy to appreciate;
- don't ask of expensive and many equipment.

Software products recommended to develop the main professional activity are:

- for document edit:
    - ⇒ text processors;
    - ⇒ graphic products;
    - ⇒ spreadsheets;
    - ⇒ desktop publishing products;
- for the assistance of the design activity: CAD like products;
- for the information: DBMS.

We can mention, on the first sight, categories of collaborative activities
- services for inter-persons communications:
    - ⇒ e-mail and bulletin boards;
    - ⇒ GroupWare;
    - ⇒ Videoconferences.
- services decision and workflow support:
    - ⇒ argumenting instruments - especially for asynchronous communication;
    - ⇒ "meeting rooms" the difference between the videoconferencing and meeting room is that in this case a description of the discussions are kept written;
    - ⇒ whiteboards;
- services with applications used in common:
    - ⇒ personal computers used in common;
    - ⇒ concurrent editors;
    - ⇒ instruments for the concurrent edit of the structured documents;
    - ⇒ correlating scheduling;
    - ⇒ collaboration systems with thin interface (e.g. WWW forms).

Each of them has advantages and disadvantages, is more or less suitable for one specific activity. For example E-mail is characterised by:

Advantages:
- speed - allows for an instant response;
- direct - goes to the people who matter;
- effective way of talking across time zones.

Disadvantages:
- abused;
- no substitute for talking face to face;
- can delay decision - making as people keep asking questions or raising issues (phone calls cover a wider rage of topics and issues);
- no control over how many are received;
- they are distracting, especially if the computer bleeps every time a message arrives.

The management of the information used by many teleworkers is characterised by:

- the granularity of the accessed information;
- the periodicity of the update of the existing information.

Security concepts investigates the following aspects:
- autentification;
- password protection;
- local validation and call security;
- authorisation (access control).

Typical dialogues with interactive computer systems contain a great deal of repetition. Frequently used actions (commands, menu items) and objects (file names, mail addresses, icons) are a very small subset of the available option.

System designers have taken several measures to reduce repetition, including use of short commands, abbreviation processors, command completion facilities, and macro recorders, but these often meet with resistance from their audience.

Suppose the system could automatically form a model that adapts to what the person is currently doing. An underlying assumption is that what has been done before will most likely be done again.

There are several ways to construct such a model:
- the system automatically builds it by capturing previous actions; it predict the entries based upon the previous interactions;
- the user teach the system with explicit instructions;
- the user provides the system with example of the task; the system automatically structures the demonstrated solutions into a model that applies to the more general task.

There are several interesting predictive systems like:
- reactive keyboard - uses the variable length predictive model (PPM - prediction by partial matching);
- adaptive menus - menu hierarchy recursively split into equal probability ranges;
- workbench:
  $\Rightarrow$ reuse facility based on empirical study of how people repeat their activities on computers;
  $\Rightarrow$ organisation facility based on concept of situated history;
- auto programming calculator - specialised keypad; emulation of simple calculator;
- metamouse explanation based learning by analysing actions to infer constraint.
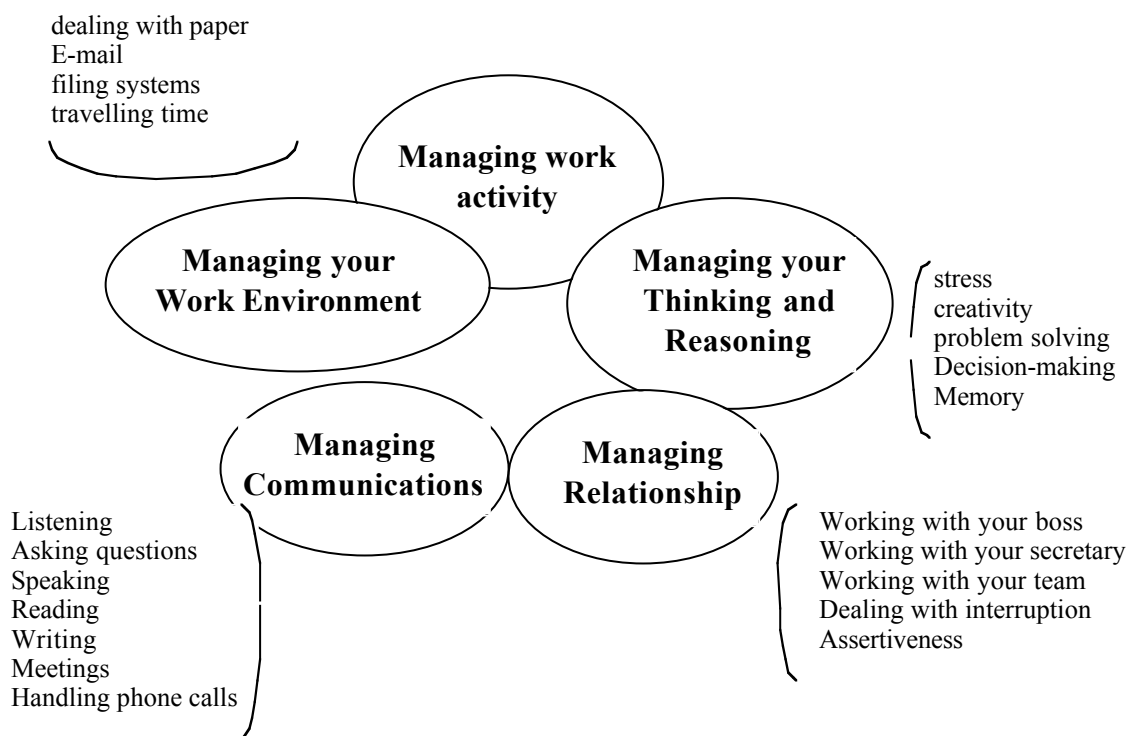
Taken into account all this aspects of the telework activities we try to do a representation of the structural levels of teleworkers (from the point of view of their contribution to the managerial activity) and their functions:

• **executives**	· collaboration functions;
	· reporting functions;
• **project managers:-**	· tasks scheduling functions;
also called middle	· collaboration functions;
managers	· "feedback" functions -based on the opinion of the customer they have to take suitable decision;
	· planning human and material resources functions;
	· workflow design;
	· control functions.
	this category are also included a group of managers: "know-how managers", persons that, without a strict organisational authority, affect and influence the job of others; they are sources of knowledges and ability.
• **general managers,**	· analysis, predictions, evolution at a macro-eco-
directors:	nomic level.

To manage time effectively calls for skills in a number of areas.
Like in the model (Fig.1) these are the ability to manage work activities, thinking and reasoning, relationships, communications and the work environment.

dealing with paper
E-mail
filing systems
travelling time

Managing work activity

Managing your Work Environment

Managing your Thinking and Reasoning

stress
creativity
problem solving
Decision-making
Memory

Managing Communications

Managing Relationship

Listening
Asking questions
Speaking
Reading
Writing
Meetings
Handling phone calls

Working with your boss
Working with your secretary
Working with your team
Dealing with interruption
Assertiveness

The model of activities which have to be managed in the work process [2]

Depending on the position in the decisional chain of the teleworker, every activity from the model is more or less active (e.g. for an executive person the problem solving aspect is more active than the decision making).

Taking into account all these aspects I propose some software solution for each category. The levels are not very well delimited, so the software is not dedicated exclusively for one category.

Software companies develop integrated packages Internet oriented with groupware caracteristics: E-mail, NNTP, file transfer.

The next set of Internet standard including Lightweight Directory Access Protocol (LDAP), Secure Multipurpose Internet Mail Extension (S/MIME), Internet Message Access Protocol (IMAP), Java and Internet Interoperable ORB Protocol (IIOP) - will go to the global Internet GroupWare era.

Other integrated commercial solutions are:

1.   Netscape solution for GroupWare [8]

Netscape bought from Collabra Software Company the conference software for GroupWare named Collabra Share and integrated it in his new software versions for the client and for the server.

1. Client component for GroupWare - Netscape Communicator

Starting with version 2, Netscape Navigator has a lot of applications like e-mail reader, news reader and browser. This kind of applications is a functional GroupWare platform. The collaboration between two users could be private because the discussions between them could use a protected channel of Secure Sockets Layer (SSL).

Improvements introduced by Netscape Communicator

- it provides a directory search option that uses new addresses book shared by E-mail clients and news reader and calendar;
- with S-MIME mailer from Communicator we can send a message which is encapsulated and digital signed;
- conferences that use local NNTP allow users to gather knowledges and to change opinions.

The tendency is now to provide more intelligence to the client, using the plug-ins method and the Java and ActiveX components. Using LiveConnect software, Netscape integrates plug-ins Java and JavaScript with browser.

In the future Netscape want to integrate all clients and server IFC (Internet Foundation Classes - Java classes) in CORBA (Common Object Request Broker Architecture) interfaces.

2. Server component for GroupWare

Netscape Enterprise server is a WWW high performance and security server for the creation, administration and intelligent distribution of the information over the Internet and Intranet. It is an open platform for the development and administration of the applications using tools based on programming languages Java and JavaScript.

Also, it includes capabilities for searching and retrieving information from databases and full text format documents.

Netscape Enterprise 2.0 could be extended using C/C++, JavaScript or Java.

2. Lotus Notes [8]

Lotus Notes (version 4.6) is a client-network software solution that accesses the needed information in an easy to use environment and that tightly react with desktop applications, extends the functionality of Web browsers and assures a new navigation model for e-mail, Web pages, applications and personal calendar/scheduling.

The product contains:

- desktop utilities (SmartSuite and MicrosoftOffice);
- Microsoft Internet Explorer;
- a new navigation task orientated schema that improve the productivity of the user;
- contact management;
- POP3 for Internet E-mail.

It is a family of products that combine three essential technologies: a robust and innovative client/server messaging, GroupWare and Internet.

The main facilities provided by the product are:

- calendar and scheduling for the company (e-mail, meeting planning, time management);
- Internet Web browser;
- facilities for mobile teleworkers: the replication and synchronisation of the information from any servers;
- split the screen in three windows for simultaneous views of documents, directory etc.;
- agent builder;
- hierarchical directories;
- the possibility to create links to databases, documents, applications, Web pages;
- personal signature - for the security reasons.

3. Oracle InterOffice

Oracle InterOffice is one of the tools designed to conduct vital business activities. It is an open, scalable environment that enables integration of existing corporate data stored in relational databases plus the capability to develop new collaborative applications, both within the corporation and on external networks such as the Internet, wireless networks, and corporate Intranets. Such applications can be built using any tool supporting MAPI, OCX/ActiveX, OLE, ODMA, C/C++ or the World Wide Web.

Oracle InterOffice builds on Oracle's core competency - its enterprise-wide relational database technologies of Oracle 7 [4]

Users communicate and share information by connection to shared databases - either single database hosted on central servers in a single location or replicated databases hosted on multiple networked servers in different locations.

Oracle InterOffice includes the additional programming services to interconnect heterogeneous clients, such as Web browsers, POP3, IMAP4, SMTP, MAPI E-mail clients, Visual Basic desktop applications, PDA's and smart phones.

Oracle InterOffice encapsulates:

- messaging;
- calendar/scheduling;
- directory;
- document management;
- Workflow service.

1. The InterOffice Messaging Server

InterOffice provides full messaging capabilities - including:

- sending and receiving e-mail with attachments;
- saving messages to a local disk;
- sorting messages according to various choices;
- organising the messages into hierarchical folders;
- hold conversations on line;
- see the reply sequence of messages on a specific topic;
- view and manage all the documents;
- keep track of version when there is more than one writer per document.

The InterOffice Messaging server is written as a database application residing in the database, so feature like parallel processing and management of a large number of simultaneous users is built in. The product provides full access to a great deal of information sources that the user can share within their group. It functions like a backbone for modern work processes. Realised in client-server architecture, InterOffice run on different hardware platforms, operating systems and networks to assure the technology.

```
    SMTP/MIME        PROFS/          X.400         MHS
                    Ofice Vision
```

SMTP/MIM	PROFS/OfficeVision	X.400	MHS

Oracle InterOffice

Oracle Universal Server

```
      PC          Network        Macintosh        PDA
                 Computer
```
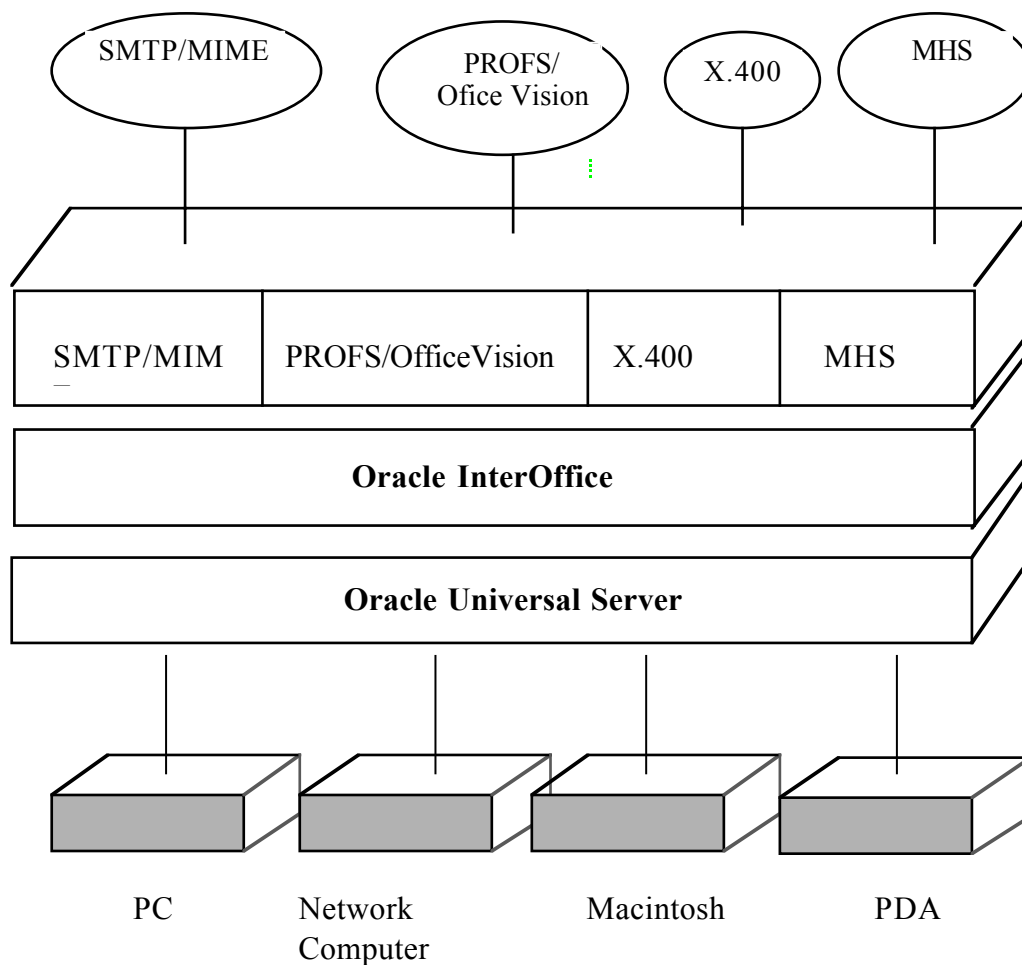
Directory services access the directory information. The user can choose a class to view and then supply a filter based on class attributes.

Oracle InterOffice provides full scheduling features:

- different schedule views (daily view, weekly view, monthly view);
- event operations (create new event, open event, delete event, move event, write an event to file system).

2. The InterOffice Document Management Server

The InterOffice Document Management Server is designed to allow virtual enterprise workgroups to integrate document- and message-based multimedia information into their process.

It provides the following features:

- organising, searching, versioning the documents;
- provides facilities for creating, organising, accessing and managing shared documents or information objects (word processing documents, spread-sheets, multimedia documents, images, electronic forms, video clips);
- manages the structured catalog information, known as attributes, and the content of the document;

293

- supports the notion of "inheritance" of class definition - very convenient when many documents have some common attributes;
- uses a "check out check in" protocol to manage modifications made to documents;

3. The InterOffice Workflow Server

InterOffice offers an integrated dynamic graphical workflow allowing end users to easily design and build ad-hoc process workflow. Through the environment, end-users can also monitor workflow processes and dynamically modify a process while it is running.

In order to produce a cheaper and more suitable solution for improving the teleworkers activity, we have designed an own application. It can be used by any of the three category of teleworkers (executives, middle manager, general manager) but it is dedicated to the second category, taking into account the function which have to complete the persons that belongs to this category.

The application is design to exploit the Internet power and the functionality of Java applets to allow the real on-line or off-line collaboration. It supports virtual team, geographically dispersed, so that they can use knowledge and data in common projects, no matter where they are.

The architecture is Internet like, where the client can access different servers. It is a WWW page where any entry is a Java applet - to be platform independent. The application clients have to choose the server where they contact and the group. Once connected they can communicate with one or more partner.

There is also included on-line and off-line collaboration (like e-mail and news)

All the clients designed and implemented are conform with corresponding standards to assure the compatibility with other existing servers (the client can connect to our server or to other server from Internet).

The available applications are:

- chat - an application that facilitates "writable" discussions between the members of the group, on one subject;
- audio chat - similar with chat, the difference is that there are direct discussions (sending the voice through the network);
- text editor;
- annotation and modifications in Web pages - it is a HTML browser with the possibilities to concurrently comment and mark Web pages;
- whiteboard;
- presentations - display the same page on all the screen (the presentation page); the mouse (or any other point device) movement is replicated on each screen too (to follow the presentation);
- workflow - the application allows the user to build reused templates for the processes; the design phase is RAD (Rapid Applications Development) like one in a graphical interface; it is possible to view (graphically) the current

status of the process, and it is possible to dynamically edit, if the user has the necessary rights (he can edit the activities and the transitions);

- correlated scheduling;
- WWW session;
- spreadsheet;
- email, ftp, telnet, news;
- fax, voice mail, pager, PDA

Other commercial software solution dedicated, mainly for the third category of tele-workers (general manager category), taking into account their main activity concerning the decision maker support, are:

1. OLAP - Oracle Express, SAS, Comshare

OLAP enables better informed decision making. Unlike spreadsheets that provide limited two-dimensional views of data, OLAP applications present application in a multi-dimensional view. Decision-makers look at their business multidimensional and need to uncover business trends and anomalies by studying various data and market drivers.

OLAP products enable better decisions through powerful analytical tools that deliver information to the end users and offer capabilities to turn that information into core knowledge they can use to support better decision making. [5]

Some companies (and their products) that produce OLAP solution are:

- Comshare (Decision);
- Pilot Software (Pilot Lightship);
- Arbor Software (Essbase);
- SAS (The SAS System);
- Oracle (Express).

We will try to do a short presentation for three of them.

1. **Comshare Decision** is enterprise decision support software that allows you and other decision-makers flexible access to the information you need, when you need. Decision is assigned for middle managers, directors, executives, everyone who needs to work hands-on with business information to make better-grounded business decisions.

Decision is a client/server customizable application for a range of business solutions such as sales reporting and analysis, product profitability reporting, P&L analysis and reporting, enterprise budget reporting, critical success factor and key performance indicator reporting, and performance analysis and reporting.

Decision Desktop is the client side of this client/server software, designed to provide end users with support for the decision making process. It's also design to allow developers to produce quickly highly functional applications like:

- performance analysis;
- sales and margin planning;

- sales and marketing analysis;
- product and customer profitability analysis;
- financial reporting analysis;
- budgeting.

Decision Desktop is designed for rapid applications development and provides a predominantly script-free application building environment.

For end users, Decision Desktop's interface presents business intelligence in five ways:
- graphically, with charts;
- geographically, with an integrated mapping system
- visually, with colour -coded exception reporting
- analytically , with ad-hoc queries and calculations
- proactively, using Comshare's innovative Detect and Alert.

2. **The SAS** Technology for Business Intelligence enables better decision making by giving business users quick, unlimited views of multiple relationships in large quantities of summarised data.

SAS Solution Components:
- SAS/MDDB Server
- SAS/EIS (Executive Information System)

SAS/EIS software takes advantage of object-oriented applications development (OOAD) technology by allowing you to use blocks of already existing code to build new, customised applications. Ready-made objects that represent complete parts of applications can easily be assembled into complete systems without need for programming.

The software offers a wide range of business reporting objects, providing a choice of styles for dynamicdisplay and interactive analysis. The business reporting objects include:
- multidimensional data viewer;
- organisational chat;
- comparison report with horizontal bars - combines text and graphics to instantly display tabular data on graphical displays;
- expanding report - delivers a complete overview of data with graphics;
- overlapping bar report - enables different data sets to be presented together;
- multicolumn report.

The flexibility and power of OOAD and the fully customised applications allow you to improve productivity, reduce costs, and maximise resources across your organisation. [6]

3. **Oracle Express** allows companies to employ an integrated decision support strategy through-out their organisation. The key features of the integrated Express environment are the following:
- comprehensive decision support functionality;
- easy to use tools - Express tools use a consistent interface;

- integration of all corporate Data Stores - the Express database can integrate data from disparate systems- relational, legacy, or external;
- open environment.

Oracle OLAP Delivers Business Benefits are:

- maximised profitability - locate profit centres (customer segments, geographical locations, product groups) and allocate the required resources that render the greatest return;
- improve productivity - it relieves the information consumer from relying on other departments for their decision support needs;
- reduce costs - it offers pre-built targeted applications, so it reduces the costs associated with developing comparable functionality;
- increased market effectiveness - it delivers responses to "what-if" scenarios with unprecedented functionality;
- increased customer satisfaction - it help companies to improve decision making and better understand their customers preferences;
- increasing return on investment - it offers a set of products that result in low-cost implementation, maintenance and administration; benefits such as access to content rich and precise information, quicker delivery of information, improved organisational response to market demands led to the return on this investment;
- risk management - provide more precise information and control and less risk in the decision making process.[5]

Another category of person that can benefit by the advantages of the telework, maybe the most important category are the persons with disabilities.

For this category a distinction can be made between the use of computer based technology as prostheses to alleviate the effects of disabilities and adaptation of human-computer interface to make them accessible to users with disabilities for mainstream use in work, education and leisure.

Common sense shows us that every human being has a set of abilities and characteristics, some of which can be decribed as "ordinary" and some which are extra-ordinary. Those who are categorised as disabled simply have some functionalities which differ from the average.

In this sense, predictive systems should be viewed as a prosthesis that could fit both general and special needs. [1]

But, a number of elements related to the work cannot be performed at a distance, because of limitations inherent in mediated communications. This indicates that the informants see in advanced computer communication a lack of many of elements that face to face interactions characterised by. Where confidence, or great complexity are concerned, face to face contact is emphasised as preferable. The best solution is to be a teleworker some days on a week, for those activities that have a great deal of autonomy, and goes to the workplace the rest of the week. It's a general opinion that more than three days on teleworking a week seem problematic. Exceptions are the persons with special

needs, mainly those with disabilities. I also make the point thought that a prerequisite for telework is frequent presence at the workplace. [3]

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How awarded technology helps to introduce and apply teleworking

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Abstract

In 1997 Siemens Austria won the European Telework Award for providing the technology for different teleworking projects. TCV - Telecommuting Voice - offers the user an one number service. Independent of his current location he can use the same number for his phone calls. The SMC solution is the technology for teleworkers who come into an office with desk sharing. This technology allows to use a different workplace everyday without any drawbacks. The ICF - Interactive Call Forwarding - is well appropriate for mobile people who have to change their preferred target device several times a day. These three technologies help to improve the availability of teleworkers which is very essential for the acceptance by colleagues, managers and customers of the teleworkers.

When Siemens Austria was honored with the European Telework Award in the category technology three very different approaches were summarized. Although the technological solution was different, the key advantage for these three solutions was identical. All these solutions and also the projects applying the technologies tried to improve the availability of the teleworkers. These projects use different types of teleworking and therefor need different technological approaches. Each of these technologies will be presented together with a short description of its application and of the feedback we have received from the teleworkers and their colleagues.

TCV (**Tele**Commuting **V**oice) offers an user-friendly teleworking service, which gives the teleworker remote access to important PBX (**P**rivate **B**ranch e**X**change) features. Since it is network-independent, TCV enables the teleworker to use selective functions in the analog and digital dedicated network as well as in the mobile network (GSM). This ensures that even users who travel extensively, e.g. those employed in Management, Sales and Service, can benefit from increased contactability. Test mechanisms such as the "firewall" function guarantee protection against misuse of features by unauthorized users.

- Teleworking in the dedicated network and mobile teleworking are supported by one network-independent service.
- Teleworking features support both the teleworker at home and the mobile teleworker: "commuters" and "travellers".

- Teleworkers at home have access to their familiar office resources; Sales and Service personnel can clear their job orders whenever they want; Managers can call up the latest information before and after business trips - and all of them can be contacted as easily as if they were in the office.

Teleworking thus increases productivity by ensuring that employees are contactable regardless of their whereabouts.

TCV offers users an **"One Number Service"**, which means they are always contactable at the same number.

Summary of features:

- Remote controlled call diversion (via analog network, ISDN or GSM)
    Call diversion to an external telephone number
    Call diversion to another internal telephone number
    Call diversion to the VoiceMail box
- Remote callback request (via analog network, ISDN or GSM)
    Callback on ring no answer
    Callback if station is busy
- Remote display of new VoiceMail messages
    If there is a new message in the VoiceMail box, a pager or SMS
     (Short Message Service) is notified.

TCV is an available product which can be purchased and it is also used for about 500 Siemens people in Germany and Austria which participate in our Siemens telecommuting field trial. Very interesting is the origin of TCV: About five years ago a key programmer of our department told us that he would probably look for another job very soon. Because of personal reasons he did not want to continue commuting every week. In the discussion with him we found that he rather wanted to keep his job at Siemens if the necessary commuting could be reduced. Together we created the idea of teleworking. With an ISDN line it was possible to access the company's data network. His phone at the office could be forwarded to his teleworker's phone at home. The first weeks started quite well for him but there was one big disadvantage: He needed to ask the colleagues in the office to change the call forwarding to the voice mail server in the office and to change it back to his home. Very soon he and his colleagues had the idea to develop a solution to control this call forwarding from remote which resulted in the product TCV.

The feedback for TCV is very positive. Both the mobile people (or teleworkers) and the callers are satisfied with this product because it provides an easy interface to control your „one number service". Since availability is essential the introduction and use of TCV helped to get the acceptance of his colleagues and of our customers for his new way of working. The experience with TCV showed that a lot of arguments the opponents of teleworking like to use were caused by drawbacks in the availability of

the teleworker. Once he can be reached via TCV one number service this argument is no longer valid. The teleworker or the mobile worker is very satisfied with the indepence of availability regulations and the independence of his colleagues help he gets by using TCV.

The SMC desk sharing solution is the technology for teleworkers who come into an office with desk sharing. Every user gets a virtual telephone number - which is not assigned to a specific phone - and a PIN. Any phone within the company can be used to make or get calls. The user only has to enter his PIN or put his chipcard into a phone. The virtual number is automatically forwarded to the physical phone where the user is logged in by SMC. Once logged in all calls are directed to this physical device.

Charging and class of service apply to the virtual number and not to the physical phone. The user has his personal keyset and all the personal features on that phone. Incoming calls can be taken at the physical phone where the user is logged in. Calls which are not answered are automatically forwarded to a prior defined destination (e.g. voice mail system or attendant). Different destinatons for internal or external callers can be used. The time after a call is forwarded can be configured. Chaining of call forwarding is possible. After logging off, the virtual number is automatically forwarded to a default destination by SMC. If a user is not logged in, all incoming calls are forwarded to a default destination (e.g. voice mail system or attendant) depending on the type of call (internal, external).

Summary of features:

- Call forward from virtual number to physical phone will be set after login
- Call forward for virtual number to different destinations
- Call forward on no reply for virtual number to different   destinations
- Call forward from virtual number to default destination will be set after logoff

This technology allows to use a different workplace everyday without any disadvantages like login accounts in computing. SMC is used as desk sharing system for alternating teleworkers in an important international software company. It is installed more than 30 times in several European countries and there are over 1000 participants. It runs since September 1996. The feedback we got from this solution was absolutely positive. This company introduced a full desk sharing concept. Within this concept the SMC is only one small part but it cannot be neglected. It was easy to share Workstations or PCs since there is an account system with personal logins. The teleworker keeps all his personal settings once logged in. For the hardware they can use trolleys but very often there are no personal settings for the phone possible. With SMC this is not true any longer, the teleworkers keep their personal settings on the phone quite like their personal screen saver on the PC. The remaining resistance of critical teleworkers is reduced to arguments like „After each break I have to think very hard where I am sitting today" or „Now I have to take my family's photo from the trolley in the morning and I have to put it there in the afternoon again". The company is able to

provide the same comfort on every phone for every teleworker and the teleworker does not loose any of his features compared to non-teleworking colleagues.

The feature Interactive Call Forwarding (ICF) allows to forward calls from an originally called party to 15 further destinations at maximum - according to configured targets and delay times. The feature Selective Call Forwarding allows to handle different callers (for example internal vs. external callers) with different call forwarding chains. The configuration may be modified at any time - also during call distribution is active.

General Functionality of Interactive Call Forwarding: An originally received call will be routed according to configuration data of ICF targets and delay times. General Functionality of Selective Call Forwarding: Each ICF header party has two predefined, main ICF groups. One to handle the internal calls and the other to handle the external calls. These groups can be deactivated but cannot be deleted. The user of an ICF header party can define further caller-subset groups to handle different callers. The caller-subsets are defined by call number prefixes (if the ICF application gets the number of the caller). If a caller-subset prefix matches to a caller number, the application chooses the ICF group of this caller-subset. If more than one group matches, the application chooses the group with the longest prefix.

Reasons for Interactive Call Forwarding:

- ICF Header Party/ICF Target is busy
- If an ICF Header Party/ICF Target is busy (in call state or phone ringing state) the call is routed immediately to the next configured ICF Target - the configured delay time will be ignored in this case. If the ICF Target was the last target in the ICF group, the call is rerouted to the first ICF Target in the group.
- ICF Header Party/ICF Target is free but does not take the call
- If an ICF Header Party/ICF Target is free and does not take the call within the configured delay time for the next target the call will be routed to the next target.

Summary of features:

- Interactive Call Forwarding to forward calls from an originally called party
- Selective Call Forwarding to handle different callers

The ICF - Interactive Call Forwarding - originally was not intended as a means for teleworking. But it very soon was applied in several European countries mainly in banks and at Siemens itself for mobile people. Most of these people were mobile within the company site or even real mobile people visiting plenties of costumers. The advantage of this feature for the teleworkers mainly results in the difficulty that these people always have to set their call forwarding once being mobile. Sometimes there is no time to think of this necessity, sometimes they really forget it. Also the possibility to differentiate the call handling for several callers helps them (only very important callers may disturb them at costumers). We got a positive feedback from the users of the feature, the only disadvantage is that in case of a longer calling chain the caller has to wait longer until the call is answered. But the call will be answered and is not lost. Some of the current users are alternating teleworkers and they have their office phone, their home

phone, their mobile phone and the voice mail service in their chain. In case of forgetting to set the call forwarding they will be reached, whereever they are.

These three technologies help to improve the availability of teleworkers which is very essential for the acceptance by colleagues, managers and customers of the teleworkers. They are also a contribution to the acceptance of such new workplaces by the teleworkers themselves because the disadvantages compared to fixed workplaces are eliminated. The next product Siemens presents in this scope is the remote office phone at home: Connected via ISDN the teleworker can use the identical phone at his home office, identical in hardware and features to the office phone. Combined with the SMC desk sharing concept he is able to log in at home as well as in the office. This allows the best telecommunication concept for teleworking: logins in data network and login to the personal PBX features. The main advantage of all these solutions is the improved availability.

The advantage of introducing teleworking solutions is that it helps to keep availability on a high level or even improves availability compared to former ways of work. Especially the experience with our own very first teleworker showed that teleworkers have to meet the demands for availability of their critical colleagues and of their critical costumers. On the one hand such solutions help you in introducing and applying teleworking because of the partners' needs. On the other hand these solutions meet the teleworker's own needs to have a full working equipment staffed with the best tools. The teleworker has to compete with a lack of information because in an office there is also a stream of informal information. Therefor you have to give them the best possible tools for the „normal" information. The example of the desk sharing concept also showed that there is a need for complete solutions, not just for a tool set. It is very essential to fit all these tools in a good concept consisting of a lot of peaces. Within such a framework each of the illustrated tools can contribute. And the benefit of this contribution is honored by the teleworkers as well as by their partners.

The result of some years experience in both development of technologies and application of them for teleworking is that there are some main factors for successful teleworking. Two of them are related to availability and technology

- The most important factor is that teleworkers have to be available at least as good as colleagues in the office. This availability is true for all relevant media (phone, fax, e-mail, etc.).

- Teleworking environment should provide at least the same comfort compared to a non-teleworking environment for both the teleworkers and the non-teleworking colleagues.

If these factors are considered in the design of the teleworking solution and for the definition of the goals the teleworking initiative should mean progress for all, the company, the employees (teleworkers and colleagues), their families, the national economy and nature.

An exploration of teleworker - manager relationships

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Introduction

Most contemporary management theories assume that the manager and their employees will be interacting physically (most of the time) within a given workplace locale. For example, from Human Relations theory through to Human Resource Management theory, the importance of **social** contact between employees and their manager has been highly stressed. Telework, since it departs from this existing arrangement, now challenges us to explore new ways of thinking about and organising how managers and their employees work together at a distance.

The research outlined in this paper sets the stage for an empirical investigation of telework by highlighting the significant interactions that ought to occur between the teleworker and their manager as they develop their working relationship. A model has been drawn up which provides a framework for exploring the development of this teleworker – manager relationship. In applying this framework this research will particularly examine the respective teleworker's and manager's ways of thinking about their relationship as built upon considerations of trust, commitment, autonomy, performance, authority, control, and support.

Theory development

Overview

Much of the empirical research on telework has taken a very pragmatic and economical focus and examined the cost and benefits of introducing telework, to both the individual and the organisation (see Tables 1 & 2).

Table 1 Summary of empirical research on benefits of telework

Benefits of telework	Reference
recruitment & retention of staff	Zeytinoglu (1994), Skyrme (1994), Weijers et al. (1992)
increased productivity (including less sick leave)	Ramsower (1985), Bailyn (1988), DIR (1996), DuBrin (1991), RTA (1995), Weijers et al. (1992), Zeytinoglu (1994), Skyrme (1994), BT's Inverness Experience (1994), Tamrat et al (1997)
increased satisfaction*	Bailyn, DIR (1996), RTA (1995), Tamrat et al (1997), *DuBrin (1991) found no difference in satisfaction
higher motivation	DIR (1996), Weijers et al. (1992), PATRA (1996)
reduced travel time	DIR (1996), RTA (1995), Weijers et al. (1992), BT's Inverness Experience (1994)
reduced stress	DIR (1996), RTA (1995), BT's Inverness Experience (1994)
increased flexibility	DIR (1996), RTA (1995), Weijers et al. (1992), BT's Inverness Experience (1994), Skyrme (1994), PATRA (1996)
better organisational skills	RTA (1995)
increased self esteem	RTA (1995)
increased customer service	Weijers et al. (1992), Zeytinoglu (1994), BT's Inverness Experience (1994)
greater autonomy	Weijers et al. (1992), Tamrat et al (1997)
more family time, improved home life	Weijers et al. (1992), BT's Inverness Experience (1994), RTA (1995)
reduced costs (eg office space, travel expenses)	DIR (1996), Weijers et al. (1992), Zeytinoglu (1994), Skyrme (1994), BT's Inverness Experience (1994), RTA (1995)
increased staff loyalty, commitment	Zeytinoglu (1994), Huff, Sproull & Kiesler (1989, cited in Sproull & Kiesler, 1991)

Table 2 Summary of empirical research on costs of telework

Costs of telework	Reference
problems with defining output & quality standards	Judkins (1988)
reduced feedback, reduced access to supervisors	DIR (1996), RTA (1995)
training costs	Weijers et al. (1992)
reduced communication (particularly informal communication)	Ramsower (1985), Hamilton (1987), DIR (1996), Weijers et al. (1992), Davenport (1995)
reduced career opportunities	DIR (1996), Weijers et al. (1992), Tamrat et al (1997)
technology problems (& increased time to repair equipment)	DIR (1996), BT's Inverness Experience (1994)
higher expectations regarding work output	DIR (1996)
reduced supervisor support, reduced quality of supervision	BT's Inverness Experience (1994), Tamrat et al (1997)
isolation	Weijers et al. (1992), BT's Inverness Experience (1994), Tamrat et al (1997)
extra equipment	Weijers et al. (1992)
lack of involvement with company	Weijers et al. (1992), Tamrat et al (1997)
increased monitoring	Ramsower (1985)
problems with office based staff	Judkins (1988)

Furthermore, Sahay (1997) points out that telework has been understood and treated in the mainstream literature as either a dependent variable or an independent variable. For example, when taken as a dependent variable telework is often viewed as an outcome of

the changes in technology itself. When taken as an independent variable, research has examined the effect of telework on human communication or organisational structures.

A diagram was developed by grouping empirical data into key categories. Possible relationships between these categories were then established (see Figure 1).
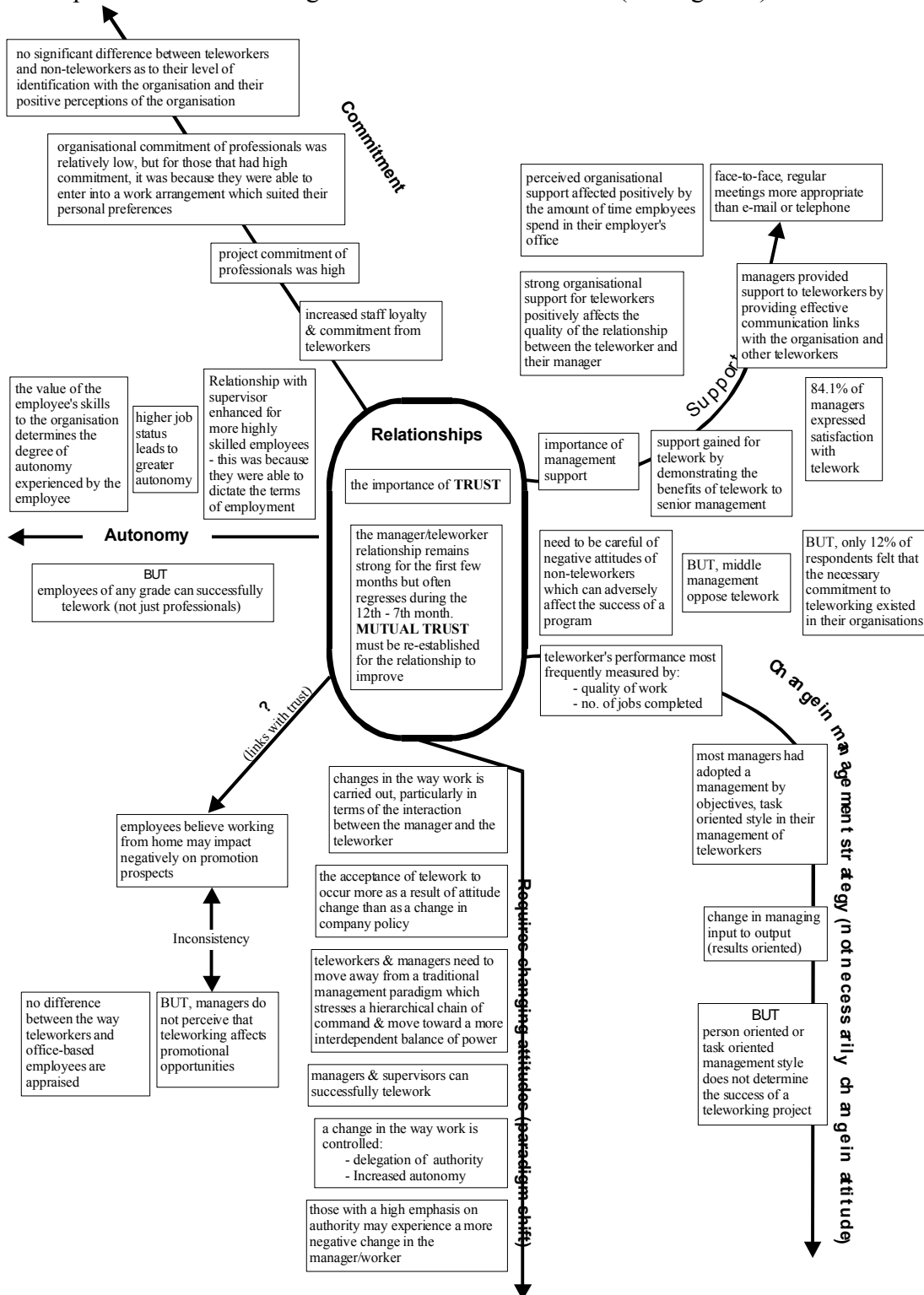

Figure 1 Key Categories – working diagram

Theoretical Framework

The above diagram (see Figure 1), and ideas derived from preliminary interviews (see Research Method) were next used to develop a theoretical framework for ongoing research (see Figure 2). The process used to develop the framework involved combining categories from Figure 1 with interview material, and examining the possible relationships and ordering between these categories.

The framework proposes that (1) the initial telework relationship is governed by classical management theory dictates, whose operations when satisfied by both parties (2) then turn towards making work relationships that are more co-determinate, at the end of which (3) a new work paradigm for telework will emerge from the accumulated experiences of how the teleworker and their manager successfully forge their working relationship at a distance.
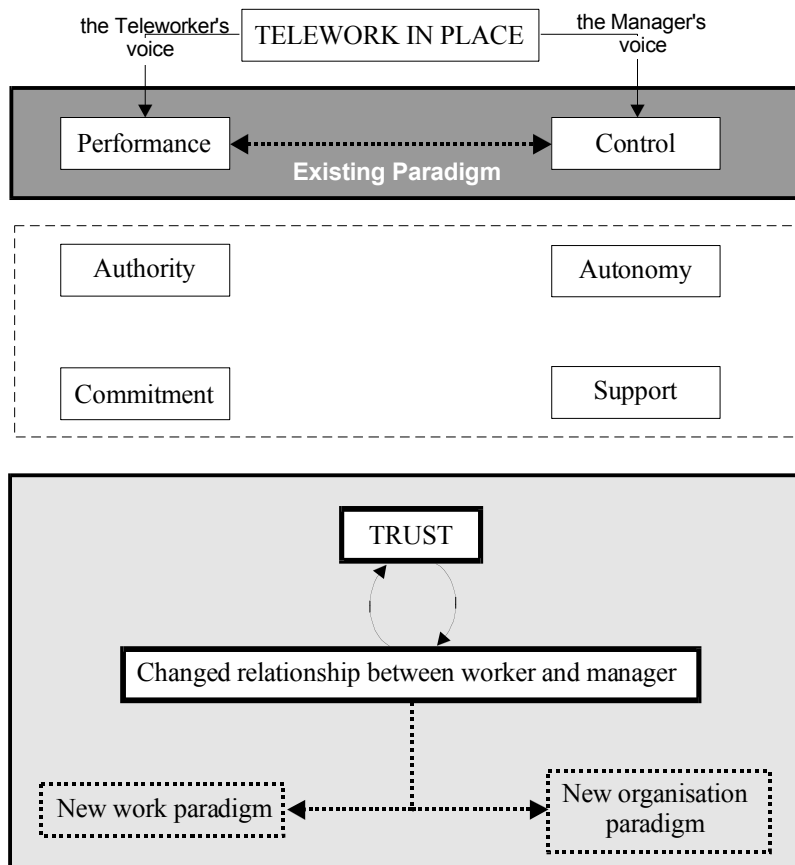
Figure 2 A framework for the development of the telework relationship

The framework above depicts the voice of the teleworker (left hand side) and the voice of the manager (right hand side) as metaphors in that each will be "speaking" to the other every step of the way through their work relationship development. Initially, Performance and Control measures are not explicitly spoken out as these are still bounded by their organisation's existing requirements for all of its *in situ* workforce including its teleworkers. Performance is implicitly heard in the voice of the teleworker, however, in

307

wanting to prove that they are able to effectively produce to the their organisation's standard but in a telework situation. Similarly, control is implicitly voiced by their manager as expression of a major function of management itself.

The next level involves the process of the teleworker and their manager negotiating the questions of Authority, Autonomy, Commitment and Support in their work relationship. The ordering of this process and the linkage between the four questions is not clear from the literature and will be fully investigated in the field study.

The third level of the framework focuses on relationship maintenance and highlights the importance of Trust.[1] Perin (1991:261) argues that employers "equate trust and co-presence" and view "self-management as the repudiation of their inspectional and disciplinary rights." Perin's research suggests that teleworkers and their managers will need to develop new meanings for work and organising as existing constructions are unlikely to sustain telework in the long term. In the framework it is proposed that Trust in a telework relationship will finally be gained as a function of the successful resolution of the questions from the process level and the acceptance of the newly forged work relationship. New work and organisational paradigms will then be revealed as a result of the interaction between trust, the changed relationship and the effects of teleworking behaviours themselves.

Research Method

The concepts for the study have been developed from:

- the literature on the future of work (telework literature, generally, being a subset of this literature)
- discussions conducted with employee relations managers from Australian-based organisations with telework arrangements in place for some of their employees (see Table 3)
- interviews with teleworkers

Combining literature and interview material

An iterative method was used which involved reading the literature on telework and using ideas from the literature to guide the preliminary interviews. The preliminary interviews that were conducted were used in terms of:

- gaining an overview of teleworking in Australia eg reasons for organisations introducing telework, who is able to telework and why, etc.
- establishing contacts with organisations and the possibility of gaining future access for an extensive investigation
- developing initial concepts eg the importance of trust in the telework relationship

The organisations used in the preliminary stage of the research were identified by various sources including newspaper reports, conference programs, and referrals.

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[1] A key issue that unfolds in the research on telework is the notion of trust (Perin, 1991; Davidow & Malone, 1992; Handy, 1995; Tolbert & Simons, 1997).

Table 3 Interviews conducted at these organisations

Organisation	Industry	Size	Estimated no. of teleworkers
American Express	Credit Card & Travel Arrangements	1,250[*]	5
AMP	Insurance	12,153[*]	10
Ampol	Lubricating Products	115[†]	Unknown
Australian Securities Commission	Auxiliary Services to Business	1,500[†]	12
BHP	Steel Products	Unknown	6
Ernst & Young	Corporate Advisory Services	2,167[†]	20 (in Sydney)
Hunter Valley Research Foundation	Market Research	16[†]	2
Lend Lease	Property Development & Management	4,516[†]	6
Nortel	Telecommunications	270[†]	Unknown
Pacific Power	Energy	1,300[†]	10
Telstra	Telecommunications	73,300[†]	3[‡]
Westpac	Finance	33,000[†]	Unknown

Ongoing Research

The next stage of the research will involve gaining access to organisations that have telework arrangements in place. Cohorts of managers and teleworkers will be interviewed over a period of 6 months. An initial interview will be conducted with the teleworker and their manager together to explain the nature of the research, how they will be involved and to gain their commitment to all facets of the research program. The initial combined interview will then be followed by a regular series of separate one-on-one interviews with teleworkers and with their managers for the duration of the field study. Combined interviews will also be held from time to time to enable collective feedback and joint scrutiny of the data accumulated to that time. The theoretical framework will guide the interviews.

Interview data will be analysed and key qualitatively derived categories developed from the data. The NUD*IST computer program will be used to assist with the study of the relationships between these key categories and the framework concepts. This material will be used to further develop a grounded theory regarding the formation of the teleworker-manager relationship when made at a distance.

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[*] Source: Business Who's Who of Australia, 1995
[†] Source: Kompass Australia, 1998
[‡] Telstra is also undertaking a telework trial which involves more teleworkers

THE NATURE AND SCALE OF TELEWORKING's TRAVEL DEMAND IMPACTS: INSIGHTS FROM A U.K. TRIAL

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Abstract

This paper reports on the findings from a U.K. teleworking case study which was conducted as part of the European DG XVII THERMIE project ENTRANCE. It is believed to be the first detailed before-and-after study of its kind in the U.K. Over 150 organisations were approached to recruit study participants. A total of 24 teleworkers from 4 organisations subsequently took part in a teleworking trial. A detailed monitoring and evaluation exercise aimed to determine the behavioural, energy, environmental and economic impacts of teleworking. In conjunction with the trial, a retrospective study was conducted. Information from a number of additional established teleworkers was collected to determine whether the impacts observed from the trial were likely to change in the longer term. A follow-up questionnaire was also administered to trial participants one year after the trial to assess the longer-term effects of the trial. This paper addresses the findings concerning the potential travel impacts of teleworking.

Questionnaire interviews, self-completion questionnaires and seven-day travel diaries were used to collect information from participants during a one-month before stage and a six-month after stage (during which participants had the opportunity to formally telework for the first time). This study has considered homeworkers and has not therefore addressed alternative forms of teleworking such as the use of telecottages or mobile working. However, with regard to travel impacts, homeworking is arguably of most interest since it represents a potential substitution of the commute trip.

Many of the findings from previous studies outside of the U.K. are reinforced. In particular it is found that homeworking is practised on a part-time basis (typically one day per week). This highlights the importance of estimating the proportion of the workforce teleworking on any given day rather than simply estimating the number of people who

practice teleworking. The latter will not provide sufficient information to assess the potential aggregate impacts of teleworking on the transport system. Awareness and education are key factors in the promotion of teleworking uptake. Employers must endorse and support teleworking as an accepted working practice if teleworking staff are to take full advantage of its benefits.

1. INTRODUCTION

Travel demand is derived: a trip is made to participate in an activity at the destination. Many activities involve exchange of information. Hence physical travel often results from the need to exchange information. Further to the rapid developments in computing and telecommunications in recent years the opportunities now exist for information exchange without physical travel. The participation in activities remotely using telecommunications has resulted in the practice of teleworking, teleshopping, telebanking, tele-education, telemedicine and even telejustice. The use of teleservices has clear potential to contribute to travel demand management in the most effective way by removing trips. Of all the teleservices, teleworking or more specifically telecommuting has greatest significance for transport with the removal of commute trips leading to a potential reduction in peak period travel demand.

This paper considers the key issues associated with the potential travel demand impacts and their magnitude resulting from teleworking in the context of a UK case study. The study was part of the European DGVII project ENTRANCE (ENergy savings in TRANsport through innovations in the Cities of Europe). The paper considers explicit travel impacts but in addition addresses attitudes and motivations that will implicitly impact on travel by virtue of their effect on the adoption of teleworking.

2. DEFINING TELEWORKING

The term teleworking has a number of connotations and it is important to determine the meaning of the term implied in this paper.

At its extreme, teleworking is typified by a scenario in which the individual lives and works in a remote location and business is conducted when necessary through the use of tele-communications. There are, however, a number of more moderated forms of teleworking. Teleworking does not exclusively imply working from home, nor does it necessitate being practised on a full-time basis. Although the use of computers, fax-modems etc. is increasingly common it is not a precursor for teleworking. It can be broadly inferred that teleworking means any work that is conducted remotely from the office or conventional place of work. Hence teleworking can include work at home, on the train, in hotels or in community workcentres (telecottages).

However, if travel demand impacts are the principal consideration then a more targeted interpretation of the term can be applied. Research in the United States generally uses the term telecommuting to describe what European research typically refers to as tele-

working. Nilles (1991) makes a clear distinction between the two terms: teleworking concerns the alternative to work related travel, whereas telecommuting is a subset of teleworking and concerns the alternative to the daily commute to and from work. The principal benefit of teleworking is the potential reduction in peak period travel demand. Hence this study, in accordance with most other transport related studies of teleworking, considers the practice of telecommuting. The precise definition of a teleworker as considered in this study is as follows:

> *"A company employee working from home on a part-time basis in conjunction with working at his or her normal workplace."*

3.　CASE STUDY BACKGROUND

The ENTRANCE project considered a number of applications intended to reduce transport related energy consumption and emissions. Applications included compressed natural gas powered buses and a hybrid diesel/electric bus, a public transport priority scheme, route and parking variable message signs, a cycle pool scheme and teleworking. Teleworking was unique in terms of the prospect of reducing travel demand. All the other applications dealt with measures to mitigate the consequences of travel demand, i.e. congestion, pollution and energy consumption. This paper does not consider the energy and emissions impacts of the trial but such impacts are closely related to changes in travel demand. Emissions impacts of teleworking have been considered elsewhere (Henderson et al, 1996). Key determinants of changes in emission levels are vehicle miles travelled (VMT) and the number of cold-starts.

The teleworking application took the form of a trial in which company employees were given the opportunity to telework for the first time. Changes in behaviour, attitudes and travel demand were observed. The application sought to identify individuals who either lived or worked in the Southampton area. The City of Southampton is a major port located in the county of Hampshire on the south coast of England. It has a population of 200,000, and is served by the national motorway network and has good rail links.

4.　METHODOLOGY

All major employers in the Southampton area were approached to recruit participants for the trial and a telemarketing campaign approached a further 100 smaller employers. The securing of a sample of participants for the teleworking trial was in itself an informative exercise in terms of assessing the potential levels of adoption of teleworking as a working practice. This is discussed later. Recruitment resulted in a trial sample of 24 individuals from 4 separate organisations.

The trial consisted of a 1-month 'before' stage prior to the introduction of teleworking followed by an 'after' stage of 5-6 months during which participants had the option to telework. No stipulation was made by the project concerning which and how many

days of the week participants should telework. A number of survey instruments were used in the monitoring of the trial to collect detailed information concerning travel and socio-economic characteristics of the individuals, together with information on their motivations, attitudes and behaviour.

At the beginning of the 'before' stage a structured questionnaire interview was conducted to collect subjective information concerning the motivations, aspirations and opinions of each participant. Factual information concerning each individual was collected using a mailback self-completion questionnaire. Participants were then asked to maintain a daily record of travel for 4 consecutive weeks. A travel diary was used to collect information concerning all trips made by a participant while a vehicle log recorded all trips made by any household member using the participant's normal 'travel-to-work' vehicle. The latter aimed to determine whether other household members would make use of the vehicle on teleworking days.

During the 'after' stage, travel diaries and vehicle logs were completed for a series of 7-day periods. At approximately monthly intervals a 7-day period was identified in which teleworkers expected to have the *opportunity* to telework (i.e. circumstances such as periods of leave were deliberately avoided). This enabled a limited longitudinal profile of travel behaviour to be recorded during which participants would be becoming accustomed to teleworking. For some this may have entailed major changes in lifestyle and travel patterns. At the end of the 'after' stage a self-completion questionnaire and interview questionnaire similar to those in the 'before' stage were implemented. A self-completion questionnaire was also issued to a colleague of each teleworker to determine the impact more generally of teleworking in the workplace.

Although the trial provided a rare opportunity to conduct a longitudinal study of teleworking, the timescale of the study was nonetheless short. Early teleworking behaviour may not be representative of longer term behaviour. To enable an element of extrapolation on the timescale, a 'retrospective' study was conducted. A number of established teleworkers within the same classification of teleworker considered in the trial were issued with a self-completion questionnaire. A total of 21 completed questionnaires were returned from a sample of 33 teleworkers. This enabled qualitative information to be collected concerning how impacts identified during the 6 months of the trial were likely to change over a further 6-18 months.

Study	Sample size	Before?	After?	Travel diaries?
ENTRANCE	**24 (+21)**	✔	✔	**7 days**
State of California	73	✔	✔	3 days
Puget Sound	63	✔	✔	2 days
Netherlands	30	✔	✔	7 days
Southern California Association of Governments	18		✔	partial day
San Diego	34		✔	partial day
Arizona/AT&T	99		✔	
Bell Atlantic	50		✔	
State of California Review Evaluation Branch	15		✔	

Table 1. Sample sizes and methodologies for ENTRANCE and previous studies (adapted from Mokhtarian et al, 1995)

Hampshire County Council (UK ENTRANCE project leader) provided some further funding to administer a follow-up questionnaire one year after the trial. This enabled further insights to be gained from the trial participants. The questionnaire sought to explore whether behaviour and attitudes had changed since the trial and to what extent the absence of a formal trial had influenced teleworking practice. The findings from this element of the work are discussed separately later in the paper.

Mokhtarian et al (1995) provide a useful opportunity to set the standing of this trial into context. They reviewed 8 teleworking studies that they considered to be the best efforts to date to analyse the travel and travel-related impacts of telecommuting. Table 1 summarises these studies and also includes the ENTRANCE trial. This trial has a slightly smaller sample size than some of the studies but is of the same order of magnitude. Nonetheless, it represents one of the most comprehensive and detailed methodological approaches and indeed provides a much needed insight into teleworking in Europe with only one other notable study existing outside the United States.

5.   RESULTS

5.1   Sample Characteristics

The sample was made up of participants from 4 organisations: the Automobile Association (AA), The British Broadcasting Corporation (BBC), Gifford & Partners (civil engineering consultants) and Hampshire County Council (HCC). The potential diversity of activity arising from 4 organisations is somewhat reduced in terms of the individuals in the trial. When questioned, 70% of the sample classed themselves as senior or middle management.

	no car	one car	two cars	three or more cars
ENTRANCE trial	**0**	**25**	**67**	**8**
National average (1994) *	32	45	20	4
National average for highest quintile income households (1993/95) *	6	46	41	8

*Table 2. Comparison of household car ownership levels (%)   *(DOT, 1996)*

Only one of the participants travelled to work by train, all the rest travelled by car. The substitution of teleworking for a public transport trip derives little or no travel demand benefit. Indeed if a substantial proportion of teleworkers were public transport commuters then it might be argued that peak period patronage would be reduced which in turn could threaten the economic viability of running certain services. Selection of teleworkers for the trial had no stipulation regarding travel-to-work mode. The resulting travel-to-work mode split of the sample is unsurprising given that 70% of journeys to work are by car in Great Britain (DETR, 1997). A total of 9 participants, including all 7 of the AA participants, had company cars. The average commute distance for all participants was 38 km with a range of 8-120 km. The mean journey time to work was 36 minutes with a range of 10-75 minutes. This compares with the mean time taken to travel to work in Great Britain of 24 minutes (DOT, 1996). It has been recognised elsewhere that early adopters of teleworking, indicative of the teleworkers in the trial, tend to have longer than average commutes (Mokhtarian et al, 1995) (Gillespie et al, 1995) (Gray, 1996).

The mean number of drivers per household per car owned was 1.26. Household car ownership levels for the trial sample are notably higher than the national average even when the national average is considered for the highest income households (Table 2).

5.2   Tripmaking

Travel diaries and vehicle logs recorded tripmaking for a total of 599 teleworker-days in the 'before' stage and 533 teleworker-days in the 'after' stage. 7-day travel diaries and vehicle logs enabled any shift in tripmaking between weekdays and weekends to be observed. It was found however that teleworking was used exclusively as a substitute for weekday commuting with no teleworking days recorded at weekends, as shown in Table 3. Table 3 indicates a small amount of weekend working in the absence of teleworking. This concurs with the survey findings that only 4% of the participants do some work every weekend with 58% doing this only once or twice a month. There is therefore no evidence from the trial to indicate that teleworking causes any shift of commute trips from weekdays to weekends or that weekend commute trips are removed by teleworking.

survey	commute	work-related	other	total
'before'	0.1	0.1	3.6	3.8
'after' – non-teleworking days	0.1	0.9	3.0	4.0
'after' – teleworking days	-	-	-	-

Table 3. Average trips per day per teleworker at weekends

survey		commute	work-related	other	total
'before'	journeys/day:	1.5	0.8	1.4	3.6
	km/day:	51	24	45	120
'after' - non-teleworking days	journeys/day:	1.4	0.7	1.2	3.3
	km/day:	48	25	25	98
'after'- teleworking days	journeys/day:	0.2	0.2	0.8	1.2
	km/day:	8*	6	12	26

Table 4. Average teleworker weekday travel (* includes trips that may have been made from home to work on "work" purpose)

Table 4 summarises the weekday tripmaking of the sample. The number of commute trips per day on non-teleworking days in less than 2. This reflects a methodological complication. When a participant's return trip from work is part of a trip chain perhaps including a meeting or a personal matter then the trip is no longer classed as a commute trip but as a 'work-related' or 'other' trip. However, the principal travel-related benefit of teleworking is self-evident with a substantial reduction in both the number of journeys per day and the travel distance per day on teleworking days. The reduction in 'other' trips made on average by the teleworkers on both teleworking and non-teleworking days in the 'after' stage is considered later.

5.3 Part-Day Teleworking

The principal travel demand benefit of teleworking is the removal of the commute trip. The possibility exists however for individuals to telework for part of a day and also to travel into the office. Almost 70% of the trial participants and 50% of the retrospective study teleworkers indicated that they had sometimes teleworked part days. Of the 70% of trial participants, 44% specifically mentioned the need to attend meetings as one reason. Parking availability at work did not inhibit this practice. 96% of the sample could readily park at work regardless of the time of day.

Part-day teleworking did not occur on a regular basis and was generally avoided. It does however highlight a limitation of teleworking as a travel demand measure since those most suited to teleworking (i.e. self-disciplined, motivated managers) are also those with most demands on their time and those least likely to secure whole days away from the office. Nonetheless, even when part-day teleworking did take place it removed

one or both of the commute trips from the peak periods. In this sense it serves a valuable role in peak-period travel demand management, through effectively peak-spreading.

5.4   Non-Commute Travel

On a teleworking day the normal travel-to-work vehicle will be at home. This presents the possibility of other household members using the vehicle. If another worker in the household used the car for commuting this would simply be the replacement of one car driving commuter by another, and, if he or she had formerly used public transport, would be a mode shift from public to private transport. If the free car was used instead by a non-working member of the household then this could increase trips in the off peak period, for example, a partner could make more shopping trips to the city centre. However, peak-period trips might still be made if other trips such as the school-run had previously been chained into the commute trip.

When asked if the normal travel-to-work vehicle would be available for use by other household members on a teleworking day, 87% of participants indicated that this would not be the case. Of these, 67% gave the reason that other household members eligible to drive had their own cars. Table 5 confirms that this was the case in practice with no evidence from the vehicle logs that tripmaking by other household members has been increased by the availability of the travel-to-work vehicle at home. Table 4 showed that 'other' travel by the teleworker has also not been increased by teleworking, indeed the reverse appears to be the case with a reduction in 'other' travel.

In this trial it has consequently been found that non-commute travel did not increase. Other studies have also found that no increase in 'other' trips takes place (Kitamura et al, 1990) (Hamer et al, 1991). The high household car ownership level associated with early adopters of teleworking who are monitored in trials is perhaps a critical factor. More widespread adoption among those with lower household car ownership may result in some increase in the use of the travel-to-work vehicle for other tripmaking.

survey	commute	work-related	other	total
'before'	0	2	9	4
'after' – non-teleworking days	0	0	4	1
'after' – teleworking days	0	0	7	3

Table 5. Average travel-to-work vehicle trips per day made by other household members (%)

5.5   Work-Related Tripmaking

Hepworth and Ducatel (1990) expect teleworking to result in less commuting from the suburbs to the central city and more journeys to work within the suburbs with workers

travelling from suburb to suburb to interact with other homeworkers. One instance of this happening was cited by a trial participant: *"once a teleworking colleague came round to my house and we worked together for a day"*. This points towards a more subtle potential travel impact of teleworking. Suburb to suburb tripmaking is less likely to be supported by public transport that has evolved and is dependent upon suburb to centre tripmaking.

Not all work is office-based even in the absence of teleworking. 52% of the trial participants indicated that their home was nearer than the workplace to some places visited during the course of their work. Of those half indicated that they had positively exploited this in terms of trip-making - e.g. *"Particularly when travelling to London, I'll not go to Southampton to catch the train, but go to a station that's more convenient for me. That's also a cost and time saving"*. This reduction in business related VMT will offset part-day teleworking VMT. Indeed some part-day teleworking will be linked with work-related travel that does not involve a commute to the workplace.

5.6 Residential Relocation

Short term changes in travel behaviour and demand can be assessed in a teleworking trial. However longer term impacts of teleworking can also be profound. Niles (1994) considers that the ongoing deployment and use of telecommunications had been a cause of suburbanisation in the United States. Teleworking enables longer commute distances to be compensated by a lower frequency of commute trips. Consequently teleworking has been considered as an influential factor in residential relocation (Nilles, 1991) (Mokhtarian, 1991) (Mokhtarian et al, 1995).

Trial and retrospective teleworkers were asked whether, in a house move, they would be more likely to live further away from their workplace than if they were not teleworking. This provoked a mixed response, with no clear indication of the magnitude of the implications from the responses. Nonetheless, 26% did consider it would influence any future house move decision. 3 people, having indicated either 'no' or 'don't know', indicated that teleworking would perform a permissive role rather than a deterministic role in any such house move: *"Not necessarily, but it would give me the option. It would make my family more flexible. For example if my husband were to get a new job, it would make the circle of where we could live a bit larger, say if I lived 40 miles away and came in two times a week - that's possible - but if I had to come in every day it wouldn't be. I wouldn't choose to live further away."*; *"Not more likely but it would be more possible"*; *"At the moment we may buy our home, we may not, and we're very settled. At the moment teleworking is just a trial. If it becomes permanent it might become a factor, but I don't think it would be top of the list."*

In the retrospective study a higher proportion felt that they might live further away. In fact 2 teleworkers had already put this into practice: *"I do live 100 miles from the office - I couldn't manage that if I wasn't teleworking"* (3 days/week telework); and *"Have*

already moved to a more desirable area further away from work" (2 days/week tele-work). Hence teleworking will, in some cases, promote longer commute distances through either residential relocation or job relocation that might not have been possible without a reduced number of weekly commute trips.

5.7   Frequency

The average frequency of teleworking for the trial participants was 1.4 days/week and for the retrospective study teleworkers was 1.7 days/week. The higher figure for the retrospective study suggests that familiarity with teleworking as a working practice leads to a higher frequency. However, this may be because many of the retrospective teleworkers had IT related jobs that did not require the same degree of face-to-face contact as the trial participants. These figures concur with comparable figures from other sources. In the United States, on average, telecommuters telecommute 1.2 days/week (Smart Valley Inc., 1996). Frequencies for specific telecommuting programs are higher with an average of 1.8 days/week (Rathbone, 1992).

These findings reinforce the status of teleworking as a part-time flexible working practice. As a part-time practice teleworking is not considered a problem in terms of its effect on interaction with colleagues. Colleagues of teleworkers were asked what frequency of teleworking they would find acceptable. Only 1 colleague would find a teleworking frequency of 2 days/week unacceptable. 56% of colleagues would find up to 3 days/week teleworking by their colleagues acceptable.

In terms of the magnitude of travel demand impacts of teleworking it is necessary to determine both the average frequency of teleworking and the adoption level. The percentage of the total workforce teleworking on a given day is the product of the percentage of the workforce who are teleworkers and the average frequency of teleworking. A notable example of where adoption level alone without an indication of frequency can be misleading is the Pacific Bell company. It was praised for the high proportion of its employees who were telecommuters, until closer inspection revealed that the statistics included people who worked at home for only 1 day a month (Gray, 1996).

5.8   Adoption Levels

Obtaining an accurate figure for the percentage of the total workforce that are teleworkers is exacerbated by the conflicting definitions of teleworking and by the fact that teleworking is often practised informally (Nilles, 1988). According to a report by Smart Valley Inc. (1996) unofficial telecommuters (in the United States) outnumber official telecommuters by 2-5 times. In the ENTRANCE trial, 62% of the participants had worked at home for at least a week during the year prior to joining the trial. Although the associated frequency of working at home is very low the majority of the participants on the trial were arguably unofficial teleworkers before joining the trial. Indeed one of the teleworkers commented with reference to the trial that *"I'd done*

something similar before but it wasn't called teleworking" highlighting the misinterpretation of the term.

Further to a recent report for the U.K. Government (Huws, 1996) additional questions have now been added to its Labour Force Survey. The Spring 1997 Survey (ONS, 1997) estimates that there are 987,000 homeworkers in Great Britain, representing 4% of total employment. The Survey's definition of a homeworker was an individual who worked at least 1 full day at home in the reference week. The survey noted that over 30% of employed teleworkers are in the service industries of banking, finance and insurance. This raises the issue of what percentage of total employment has the potential to adopt telecommuting. Manufacturing industry in particular is unlikely to respond to the same extent as the service industries.

Although the small scale of this study does not lend itself to an extrapolation or estimation of future adoption levels for teleworking in the U.K., the study did provide an informative insight into the factors that are likely to govern such adoption levels. The adoption of teleworking depends upon the desire of an employee to telework and the consent of the employer for the employee to do so. Figure 1 summarises the benefits of teleworking cited by the study participants. The categories have been identified following responses from the participants with no preconceived response categories. The 4 most frequently cited benefits in all of the survey stages ('before', 'after' and retrospective) are: the opportunity to better address family and personal issues; the opportunity to work without interruption or distraction; increased flexibility and commute trip related benefits.

A range of disbenefits for the teleworker were also cited, although only reduced social contact was mentioned by a substantial proportion of teleworkers. The relative magnitudes of the benefits and disbenefits cannot be directly assessed. However, given that all but one of the trial teleworkers wished to continue teleworking at the end of the trial it can be inferred that the benefits clearly outweigh any disbenefits, particularly when teleworking is practised on a part-time basis.
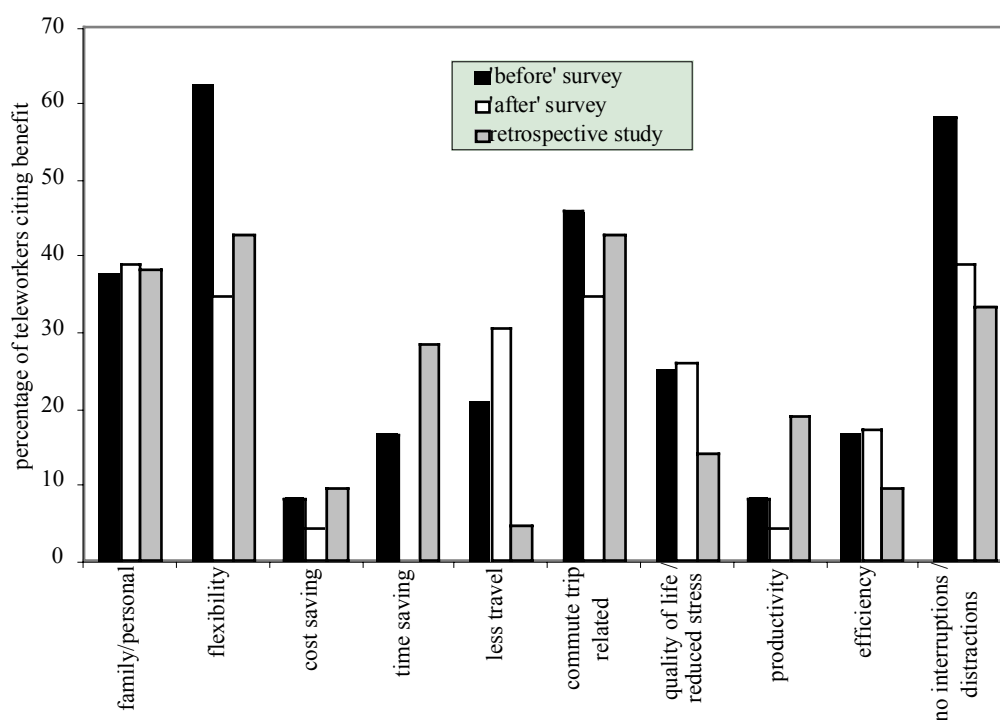
Fig. 1. Perceived benefits (commute trip related category is an aggregation of the cost saving, time saving and less travel categories).

Participants were asked what benefits and disbenefits they saw for their employers from teleworking. Over 80% of the trial participants and 60% of the retrospective study participants cited improved employee productivity/efficiency as a benefit. Managing from a distance was considered to be the principal disbenefit. These findings concur with the findings of Forsebäck (1995) who observed that while in 1985 one of the most important obstacles to adoption of teleworking was the high IT cost, this has now dropped in importance to be replaced by the difficulty in managing from a distance and inadequate knowledge of what teleworking really is. Indeed in this study it is interesting to note that in the 'before' stage 15% of participants perceived there to be no disbenefits from teleworking. In the 'after' stage this figure doubled to over 30%. Awareness of what teleworking means and the benefits it can deliver is a key issue to consider if adoption levels are to be increased. Education and awareness, concerning teleworking, for both employers and employees must be encouraged.

The recruitment process to secure participants for the trial provided some measure of the potential extent of teleworking adoption in the Southampton region (based on the current state of awareness). Over 150 organisations were approached of which only 4 major employers chose to participate. For the 41 major employers approached, reasons for non-participation were obtained. Three distinct groups of non-participating organisations existed: those who expressed an interest in teleworking but decided that their organisation was not suitable for teleworking (14); those who believed that teleworking would play a role in their organisation in the future but did not see it as currently ap-

323

propriate (11); and those that were already involved with teleworking at various stages of implementation/evaluation (5). The five organisations in the last group are an encouraging sign for adoption levels amongst major employers. Nonetheless these recruitment findings alone suggest that uptake of teleworking is likely to be evolutionary rather than revolutionary and concur with the observations of others (Korte et al, 1994). Indeed there is likely to be a maximum penetration of teleworking into the workforce. The teleworkers in this study are predominantly managers who are self-disciplined and highly motivated and who require uninterrupted time away from the office. Many individuals and indeed job descriptions will never be suited to teleworking. Handy and Mokhtarian (1996) assume that the maximum penetration in the United States is 40%.

6. FOLLOW-UP FINDINGS

A follow-up questionnaire survey was conducted 12 months after completion of the ENTRANCE teleworking trial. The questionnaire revisited some of the issues highlighted earlier in this paper. It was also intended to explore the extent to which the removal of the discipline and structure of a trial environment had influenced behaviour and activity.

Of the 24 teleworkers, 3 had changed employer and were not traceable. Of the remaining 21 trial participants who were contacted by phone, 15 indicated they were still teleworking and 12 returned a completed questionnaire.

7/12 respondents were teleworking as much or more than during the trial. Reasons given for teleworking less often concerned staffing pressures that demanded an office presence. 8/12 respondents had continued, since the trial, to telework part-days although on average this affected less than 1 in 3 teleworking days. None of the respondents had been able to reduce the level of part-day teleworking since the trial. Most respondents whose teleworking had reduced since the trial indicated the removal of the discipline and commitment of the trial as a reason. There were several indications that there was a greater acceptance of teleworking by colleagues however some envy or resentment was still sensed and found to be irritable. Only one of the respondents, who planned to work away from the office virtually full-time, considered himself an official teleworker. Almost all the others felt that they were recognised as someone who 'works at home'.

In travel demand terms if teleworking levels are likely to have a significant impact then it will be important to determine the distribution of part-time teleworking levels during the week. If particular days of the week are favoured then travel demand benefits will be heightened on those days. Only 3/12 respondents teleworked on the same day(s) each week. There was no consensus on which days teleworking took place. However, when asked to indicate preferred days of the week all but one of the respondents effectively avoided Mondays and Fridays suggesting that the spread of teleworking activity at an aggregate level may not be even. However, the majority were not able always to

telework on their preferred days with reasons concerning unpredictable patterns of work and 'fitting in' with other work commitments.

Respondents in general felt that the level of support provided by their employer had changed very little since the trial. Only the BBC appeared to have taken steps beyond the trial to positively develop teleworking as part of its working practices, having also been the most proactive during the trial. BBC respondents were teleworking as much or more than during the trial. Their office space had been reallocated, effectively introducing hot-desking, and they had full technical support for homeworking. With an increased level of teleworking a monthly 'base-day' had been introduced to ensure staff met more regularly. Only the BBC had increased the number of teleworkers (within the Department(s) concerned) since/as a consequence of the trial.

Many of the respondents have most of the communications facilities they use at work also at home and there was no instance of a respondent indicating that what they considered an essential facility for effective teleworking was not available at home. Figure 2 shows the IT provision. This reinforces the view that IT and its cost is no longer a major barrier to homeworking.
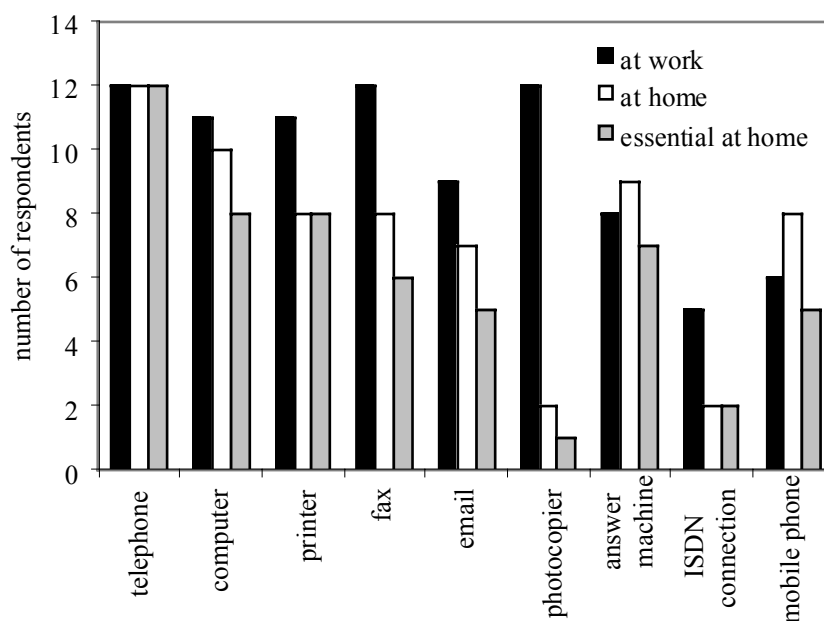
Fig. 2. Access to technology for working and homeworking

Respondents were asked to rank 8 benefits of teleworking based on their continued experience (Figure 3). This may be compared to earlier results (Figure 1). The ability to concentrate on work without interruption and thereby improve productivity and effectiveness is clearly a highly valued attribute of teleworking. The saving in commute time may also be interpreted as a further benefit which allows an individual to be better at his or her job.

Respondents were asked once again about residential relocation. Only 2/12 felt that in a future house move they would be more likely to live further away from their workplace because they are teleworking. Others explained that they already lived far enough away from work or were happy with where they lived. This reflects their status as 'early adopters' with long commutes. Rather than residential location being reconsidered as a consequence of teleworking, teleworking has been considered as a consequence of residential location/proximity to the workplace. Reduced weekly commute distance afforded by teleworking is a benefit and is not seen as something that should necessarily be 'traded-in' for a different and presumably better residential location.
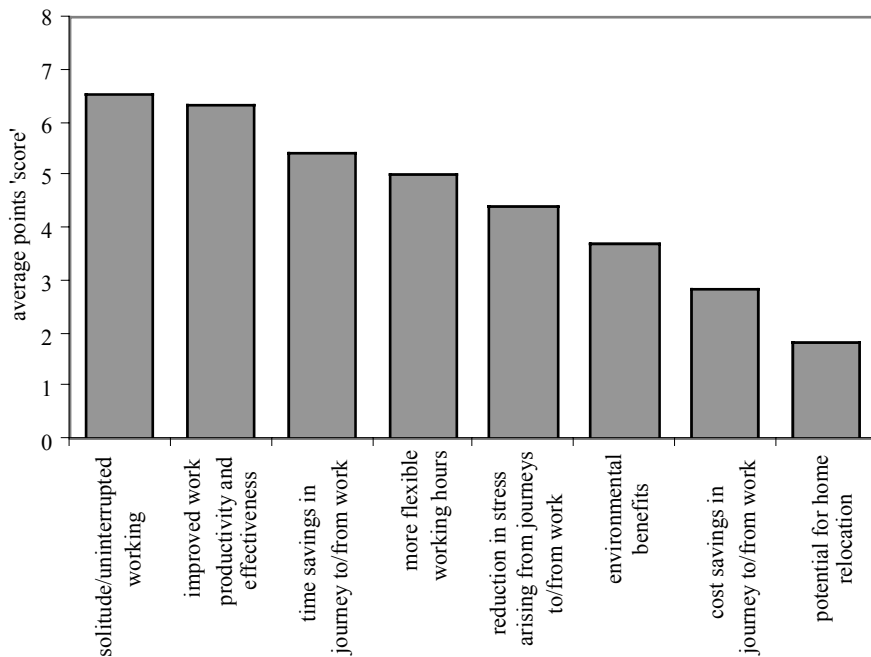

Fig. 3. Relative importance of teleworking benefits (8 points = ranked first, 1 point = ranked last)

The questionnaire concluded with 5 statements to which respondents were asked to react. The results are shown in Table 6.

statement	strongly agree	agree	disagree	strongly disagree
My understanding of teleworking has changed having experienced it first hand.	3	7	1	1
I am now more positive about its benefits.	6	5	1	0
If employers and employees were properly informed, more people would telework.	2	9	1	0
I work more hours now than before I began teleworking	2	4	6	0
My company gets more out of me as a result of my teleworking.	5	7	0	0

Table 6. Distribution of response by 12 teleworker respondents to statements shown

It is questionable how representative responses from such a small sample might be. However, the responses endorse the view that first hand experience improves awareness and understanding concerning teleworking which is essential to promote the uptake of teleworking. Not surprisingly all respondents believe themselves to be more productive.

Of the 6 trial participants who were no longer teleworking, 3 provided some feedback. None of them felt unable to work productively at home and all of them still worked at home occasionally. Reasons for discontinuing were a change of employer, increased office-based commitment and a preference to be in the office.

7. CONCLUSIONS

The results from this study remain, to some extent, a reflection of behaviour and opinion associated with a small sample of individuals. Their characteristics might be classed as atypical of the population at large with above average income, commute distances and household car ownership levels. Nevertheless, the study has provided a valuable insight into the potential impacts of teleworking. With very few similar studies having been conducted outside the United States it is relevant to note that many of the results substantiate findings from other studies.

Teleworking in this trial has been found to be a successful working practice for the individuals involved but the frequency of teleworking (as defined in this study) looks set to remain at 1 or 2 days per week typically. A number of travel demand impacts, in addition to the removal of peak period commute trips, have been evident during the trial. These include notably the practice of part day teleworking and some clear indications that residential relocation can be influenced by teleworking. However, while both these

impacts may substantially offset the reduction in travel distance achieved by teleworking 1 or 2 days per week, they still produce a reduction in the number of weekly commute trips during the peak periods. Teleworking is not a panacea for congestion resulting from rising travel demands. It provides clear short term benefits particularly in reducing peak period travel demand. However the scale of such benefits is dictated by the percentage of the workforce teleworking on a given day. It might be argued that if adoption levels rise then appreciable reductions in peak period traffic achieved in the short term will be countered in the longer term by latent demand. It appears that unofficial teleworking is widespread albeit with a low associated frequency for any given individual. Using figures quoted in this paper, if 4% of the workforce are homeworkers but they only work at home for 1.2 days per week on average, then less than 1% of the workforce, on average, are working from home on a given day. Existing teleworking has not made an appreciable impact on the problem of congestion in many urban areas in the United Kingdom and its potential success is therefore reliant upon a marked increase in teleworking uptake.

The recruitment process suggests that teleworking uptake will be evolutionary rather than revolutionary. A substantial proportion of major employers approached believed themselves unsuited to teleworking. It is questionable whether this is strictly true in all cases. In some or even many cases a misconceived understanding of teleworking or a reluctance to contemplate a revised working process or schedule that could accommodate teleworking may be precluding teleworking from being considered. The teleworking trial gave individuals the opportunity to experience teleworking first hand and thereby dispel misconceptions. With employer consent for trial participation, individuals were able to officially telework with the justification of being part of a trial. Once the trial environment was removed, in many cases the teleworkers were isolated in their organisations and exposed to the pressures and constraints of a working environment that was not structured to accommodate teleworking. For teleworking to be a success it must be endorsed and promoted by the employer. Without a critical mass of acceptance or practice of teleworking in an organisation then individuals who do telework are subject to prejudice and constraint that prevent teleworking being pursued to its full advantage. Teleworking may be seen by many as a privilege that can be abused by individuals. However for the participants of this study the main achievement was increased productivity which is both a benefit to the wellbeing of the employee and to the employer.

Promoting first hand experiences and raising awareness and education regarding teleworking and how best to exploit it must be more vigorously pursued if adoption levels are to be increased. Only then will the value of teleworking as a tool for travel demand management be increased to a significant level.

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The external effects of telecommuting: the cases of Belgium and Brussels

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Abstract

The effectiveness of policies to reduce the external effects of transport (congestion and pollution) is often limited. In order to improve effectiveness, a combination of different policies, including, inter alia, expanded and higher quality public transit may be advisable. However, such policies require substantial resources which government agencies often cannot afford to spend. In addition, these policies may require several years before they result in a decrease of external effects. The present paper reviews the potential of teleworking as a proactive solution for reducing both traffic congestion and vehicle emissions. The following elements are discussed: the concept of telecommuting/teleworking, the present status of telecommuting/teleworking in Belgium and projections of telecommuting/teleworking penetration levels in the future. An estimate is also given of the possible reduction of commuter trips associated with the growth of telecommuting/teleworking in Belgium as well as Brussels. Finally an attempt is made to calculate the impact of the reduction in commuter trips on vehicle emissions in Belgium and Brussels. In order to obtain better estimates of telecommuting/teleworking penetration levels and the impact on traffic congestion and emissions more accurate data are needed which, at present, are not available.

1. Introduction : teleworking/telecommuting as a congestion and vehicle emission reducing policy tool

The external effects of road transport in Belgium and Brussels increase every year. The effectiveness of policies to reduce these effects is often limited. In order to improve effectiveness, a combination of different policies, including, inter alia, expanded and higher quality public transit may be advisable. However, such anti-congestion policies require substantial resources which government agencies often cannot afford to spend. In addition, these policies may require several years before they result in a decrease of conges-

tion and vehicle emissions. This problem of external effects is therefore approached from a proactive perspective in this paper, namely by proposing teleworking/telecommuting as a solution.

The implementation of telecommuting/teleworking on a large scale could have a significant effect on road congestion and the emission of pollutants. Telecommuting/teleworking is obviously not a panacea for solving the current congestion and pollution problems. But significant results may be achieved, especially in combination with complementary policies such as road pricing to cope with latent demand[1]. Telecommuting/teleworking as a strategy for reducing travel demand is attractive for several reasons:

(1) telecommuting/teleworking, if implemented, has an immediate effect on demand;

(2) telecommuting/teleworking is relatively inexpensive to implement;

(3) telecommuting/teleworking increases personal choices rather than restricting them;

(4) telecommuting/teleworking has an impact on a variety of social, economic and ecological characteristics of society (Sampath, Saxena and Mokhtarian, 1991):

    (a) social aspects: telecommuting/teleworking offers the possibility to improve the integration of family life and work. The integration of disabled persons is also facilitated;

    (b) economic aspects: a well-designed telecommuting/teleworking project may result in a variety of benefits: increased productivity, a reduction in office space and overheads, facilitation of recruiting and the retaining of staff, reduction of absenteeism and higher quality customer services;

    (c) ecological aspects: as the penetration level of telecommuting/teleworking rises the positive impact on congestion, air quality and the development of rural areas increases.

Telecommuting/teleworking is especially interesting for urban areas such as Brussels. Brussels represents an ideal setting for the implementation of telecommuting/teleworking. According to data of the Belgian Employment Department, 85 percent of the Brussels workforce is employed in the service sector. Jobs that are suited for telecommuting/teleworking are mostly situated in the service sector or the service activity component in the manufacturing sector. In addition, Brussels is characterised by high congestive and pollution levels resulting from the daily influx of workers commuting by car from outside the city.

In order to assess the impact of telecommuting/teleworking on road congestion and pollution reduction, telecommuting/teleworking must be clearly defined. In our research we define telecommuting/teleworking as the partial or total substitution of telecommunications and/or computer technology for the daily commuting to and from work (Handy and Mokhtarian, 1996).

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[1] This concept refers to individuals who used public transport or soft modes to travel in the past but now use private vehicles due to a reduction in road congestion.

2. Current number of telecommuters/teleworkers in Belgium and Brussels

At present no statistical data exist on the number of telecommuters/teleworkers in Belgium nor on the number of telecommuters/teleworkers in Brussels. However data concerning the number of homeworkers is available. These data reflect both an underestimation and an overestimation. An overestimation because these data include individuals for whom the work and home environment are identical (for instance domestics workers and farmers). These individuals are not considered telecommuters/teleworkers because no reduction of a commuter trip took place. The data about homeworkers also constitute an underestimation because people employed in satellite offices or local telework centers are not included (Handy and Mokhtarian, 1996)

According to data of the National Institute of Statistics the total number of homeworkers in Belgium represents 628,029 persons or 16.56 percent of the Belgian workforce. A number of corrections was applied to obtain an approximation of the number of telecommuters/teleworkers in Belgium. The first correction consisted of eliminating a number of sectors, characterized by activities, which, in principle are not suited for telecommuting/teleworking or where the home and workplace are mostly identical. Through the second correction only those occupation classes generally viewed as well suited for telecommuting/teleworking were included, namely : Executive, administration, managerial; Professional specialist; Technicians and related sales and Administrative support. Finally the self-employed were removed from the number of homeworkers. The result is an estimated penetration level of telecommuting/teleworking of 3.97 percent for Belgium. This figure should be viewed as a rough approximation which only has an indicative value. For Brussels the same penetration level estimation was assumed.

3. Prospective number of telecommuters/teleworkers for Belgium and Brussels

To estimate the future number of telecommuters/teleworkers, trend analysis can be used. For this type of analysis the estimation of the current growth rate of the number of telecommuters/teleworkers is essential. This type of data is unfortunately not available for Belgium nor for Brussels. Still this analysis can be applied because telecommuting/teleworking can be considered as a new commuting technology. According to the literature, the adoption of a new technology usually follows an S-curve. The shape of the S-curve is determined by the maximum penetration level and the growth of the number of telecommuters/teleworkers. The equation of the S-curve has the following form (Blackman, 1974):

$$\ln [P / (M - P)] = c_1 + c_2 \times t$$

with:
P = the current penetration level
M = the maximum penetration level

t = current year (initial year t = 0)
c_1, c_2 = constants

Based on the assumption that 50 percent of the workforce consists of 'information workers' and that 80 percent of those workers are potential telecommuters/teleworkers, Nilles concludes that the maximum penetration of telecommuting/teleworking is 40 percent (Nilles, 1988). In the case of the Brussels' and Belgian workforce, it appears that the activity classes ISCO 1 (Executive, administration, managerial), ISCO 2 (Professional specialists), ISCO 3 (Technicians and related sales) and ISCO 4 (Administrative support) represent 56.1 percent of the Belgian workforce and 72.9 percent of the Brussels' workforce. Hence, the assumption of a penetration potential of telecommuting/teleworking of 40 percent is justified for Belgium and Brussels and may even represent an underestimation. Those four activity classes can roughly be viewed as including all 'information workers'.

In this context, the following comments can be made:

(1) this group is bound to grow during the years to come due to the development of more powerful information technologies;

(2) some of the workers identified as non-'information workers' may still be able to telecommute/telework part-time. For instance a chemist working in a lab may be very location-dependent for the execution of his/hers tests but he/she may still be able to perform certain tasks at home such as writing reports.

(3) not all 'information workers' will telecommute/telework, namely if their job is not well suited for it or if they don't consider it as an option.

To calculate the future penetration levels of telecommuting/teleworking in Belgium, the results described in the previous section were used, namely a current penetration level of 3.97 percent for Belgium. Four scenarios were contemplated, reflecting four different yearly growth rates of telecommuting/teleworking, namely 2 percent, 5 percent, 10 percent and 20 percent (Table 1 and Table 2). In the past decade, the number of telecommuters/teleworkers in the United States grew with 2.81 percent on a yearly basis (Handy and Mokhtarian, 1996). A similar, yet somewhat lower growth rate, was applied to the Belgian situation in the pessimistic growth scenario of 2 percent. The United States growth rate of 2.81 percent is possibly an underestimation because only those telecommuters/teleworkers who telework at least 3 days a week were included (here, it is assumed that telecommuting/teleworking involving less than three days per week may actually have grown faster). For the Belgian case a growth scenario of 5 percent per year was used. The current penetration level of telecommuting/teleworking in Belgium is lower than the United States one. A catching up by Belgium therefore seems plausible. In addition, the growth rate of 5 percent was doubled twice which resulted in growth scenarios of 10 and 20 percent on a yearly basis reflecting hypothetical outcomes of public policies and management strategies promoting telecommuting/teleworking. The calculations weren't made separately for Brussels and Belgium because for both geographic areas the same penetration level was assumed, leading to an identical outcome in each case.

Table 1: Calculation of the parameter values for Belgium

| 1996-1997	1996 adoption	M - P	1997 adoption	M - P	c1	c2	F
20%	0,0397	0,3603	0,0476	0,3524	-2,2056	0,2046	0,4
10%	0,0397	0,3603	0,0437	0,3563	-2,2056	0,1064	0,4
5%	0,0397	0,3603	0,0417	0,3583	-2,2056	0,0543	0,4
2%	0,0397	0,3603	0,0405	0,3595	-2,2056	0,0220	0,4

Source: own calculations

Table 2: Forecast of the penetration of telecommuting/teleworking in Belgium (%)

Growth	1996	2001	2006	2011	2016	2021	2026	2031	2036	2041
20	3,97	9,38	18,41	28,14	34,73	37,93	39,23	39,72	39,90	39,96
10	3,97	6,32	9,68	14,08	19,22	24,47	29,13	32,81	35,44	37,19
5	3,97	5,05	6,38	7,97	9,85	12,00	14,39	16,98	19,67	22,37
2	3,97	4,38	4,83	5,32	5,84	6,42	7,03	7,69	8,40	9,15

Source: own calculations

From Table 2 the conclusion can be drawn that starting with the present penetration level of 3.97 percent and a 20 percent yearly growth of this figure, the maximum penetration will be reached in 2021 i.e., after 25 years. If a 10 percent yearly growth rate occurs, approximately the same penetration level will only be reached in 2041, i.e. after 45 years. The lower yearly growth rates, namely 2 percent and 5 percent lead to that maximum penetration level, respectively after 200 years and 85 years.

Figure 1: The evolution of the penetration of telecommuting/teleworking according to different growth scenarios for Belgium
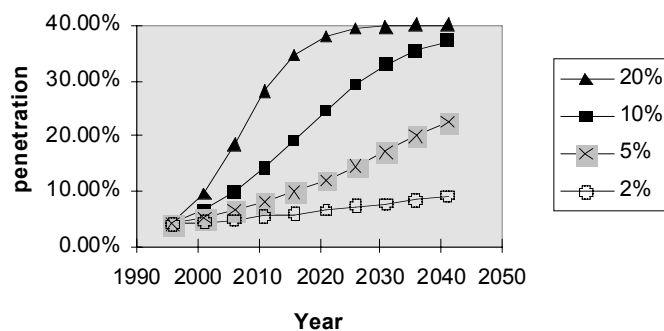
Source: own calculations

If more statistical data were available concerning the growth of the penetration levels of telecommuting/teleworking it would be possible to determine which of the scenarios

above is the most realistic one. It is clear that policies promoting the implementation of telecommuting/teleworking may influence the likelihood that specific scenarios will take place in practice.

4. Impact of telecommuting/teleworking on transport congestion

The main effect of telecommuting/teleworking on mobility is the reduction of commuter trips during peak hours. It may also influence non-work related trips. The effect on non-work related trips may be positive (for instance increased use of public transport or the bicycle) as well as negative (for instance the termination of car-pool initiatives) (Bernardino, Ben-Akiva and Salomon, 1992).

The method developed by Lam and Olszewski (1996) was used to gain insights into the daily reduction in trips in Belgium and Brussels resulting from telecommuting/teleworking. This method only considers work-related trips and assumes that the modal split for prospective telecommuters/teleworkers is identical to the modal split for other employees. The method of Lam and Olszewski gives an estimation of the reduction in motorized round commuter trips and vehicle round commuter trips caused by a specific penetration level and frequency of telecommuting/teleworking. The analysis requires the following steps to be taken:

(1) determination of the total number of daily motorized round commuter trips for Belgium and Brussels.
(2) determination of the total number of daily vehicle round commuter trips for Belgium and Brussels.
(3) determination of the daily reduction in the number of trips caused by the implementation of telecommuting/teleworking in Belgium and Brussels.

(1) *Determination of the number of daily motorized round commuter trips (= M)*
The total number of daily motorized round commuter trips including both private and public motorized trips:

$M = B \times t$
B = the workforce
t = the average number of motorized round commuter trips per employee per day.

The coefficient t is lower than one because absences on account of strikes, leave and sickness need to be taken into account. In addition, employees who walk to work or who are self-employed (which means they mostly work where they live) should not be included in the analysis. The first step in the calculation of the t coefficient consists of determining the correction for strikes, leave and sickness. Starting from an average of 22 work days per month, a Belgian employee would supposedly work 264 days a year. But every Belgian employee is entitled to a least 22 vacation days and 11 public holidays. A Belgian employee thus has at least 33 days of leave a year. The same conclusion can be drawn for Brussels. Based on data of Deliege (1993) the average number of sick days for a Belgian

employee can be calculated. On average a Belgian employee is sick 7.7 days in one year. We assume that the health pattern for the Brussels' employees is the same as for the Belgian employees. For the calculation of the number of strikes per employee, data of the 'Statistisch jaarboek van België' (1992) were used. A total number of 153,706 days of strike were registered for the Belgian workforce or 0.004 days for every employee. This percentage was also adopted for Brussels. This suggests that on average an employee does not work 264 days a year but 223.3 days a year (264 - 33 - 7.7 - 0.004) and this results in a correction of t towards 0.8458 (the number of actual work days as compared to the number of official working days). The removal of the self-employed is the second correction to be made. It appears that 13.57 percent of the Belgian employees is self-employed. This results in a correction of t for Belgium towards t = 0.7310. In Brussels, 17.08 percent of the employees is self-employed. When the correction for sickness, leave and vacation is combined with the correction for self-employed for Brussels a t of 0.7013 is found (Enquête naar de beroepsbevolking, 1996). A number of 5.3 percent of the trips of the active Belgian workforce and 4.9 percent of the trips of the active Brussels workforce are performed walking (Volks- en woningtelling, 1991). This last correction results in a coefficient t of 0.6922 for Belgium ($t_{Belgium}$ = 0.6922) and a coefficient t of 0.6670 for Brussels ($t_{Brussels}$ = 0.6670). The workforce amounts to 3,794,552 individualsin Belgium ($B_{Belgium}$ = 3,794,552) and 628,736 in Brussels ($B_{Brussels}$ = 628,736). This results in a total number of daily motorized round commutter trips of 2,626,589 for Belgium ($M_{Belgium}$ = 2,626,589) and 419,367 for Brussels ($M_{Brussels}$ = 419,367).

(2) *Determination of the number of daily vehicle round commuter trips (V)*
The number of daily vehicle round commuter trips only includes the motorized round commuter trips that take place with a private vehicle and this number is also corrected for car-pooling.

$$V = (B \times t \times p) / O = (M \times p) / O$$

p = the number of trips performed with private vehicles expressed as a percentage of the total number of motorized trips
O = the average vehicle occupation

For 86.53 percent of the traffic in Belgium, private transport is used ($p_{Belgium}$ = 0.8653) (Algemene Verkeerstellingen, 1995). This percentage is also used for Brussels ($p_{Brussels}$ = 0.8653). The average vehicle occupation in Belgium is 1.44 persons per vehicle ($O_{Belgium}$ = 1.44), while for Brussels this is 1.29 persons per vehicle ($O_{Brussels}$ = 1.29) (Algemene Verkeerstelling, 1995). Consequently the number of vehicle round commuter trips amounts to 1,578,325 in Belgium ($V_{Belgium}$ = 1,578,325) and to 281,301 in Brussels ($V_{Brussels}$ =281,301).

(3) *Determination of the reduction in trips caused by the implementation of telecommuting/teleworking*

First the reduction in the number of motorized round commuter trips is assessed (M_r).

$M_r = M \times a \times f$

Then the reduction in the number of vehicle round commuter trips is computed (V_r).

$V_r = V \times a \times f$

a = the penetration level of telecommuting/teleworking
f = the average frequency with which one telecommute/teleworks, in the context of a five
    day workweek.

With regard to the penetration level of telecommuting/teleworking in Belgium, data obtained from the application of the S-curve for 1996, 2011 and 2021 for a low yearly growth rate of 5 percent and a high yearly growth rate of 20 percent were used (see trend analysis). For Brussels, the same data as for Belgium were used. At present no data exist on the frequency of telecommuting/teleworking in Belgium and the Brussels-Capital Region. The frequency in the United States is estimated at 2 days per workweek (Handy and Mokhtarian, 1996) and Olszewiski and Lam also estimate the frequency in Singapore at 2 days per workweek (Olszewski and Lam, 1996). For the Netherlands, the frequency has been estimated between 1 and 1.5 days per workweek (van Reisen, 1997). In the Belgian situation is likely to be comparable to the Dutch situation, the average frequency for Belgium and Brussels is assumed to be 1.5 days per workweek and this frequency is used in the context of a five day workweek. The results of the calculation of the daily reduction of motorized commuter trips and vehicle commuter trips is visualized in Table 3 for Belgium and in Table 4 for Brussels. The total number of daily motorized and vehicle round commuter trips is assumed to be constant for the three points in time.

From Table 3 it can be concluded that if telecommuting/teleworking reaches a significant level the impact on traffic externalities will also be significant. According to the model used, a penetration level of telecommuting/teleworking of 37.93 percent would lead to a reduction of the number of commuter trips with 11.4 percent per day or 179,598 vehicle round commuter trips and a penetration level of 12 percent would result in a decrease of 3.6 percent in commuter trips or 56,820 vehicle round commuter trips.

Table 3: Daily reduction in trips caused by the implementation of tele-commuting/teleworking in Belgium

	Penetration level of telecommuting/teleworking increases yearly with 5 percent			Penetration level of telecommuting/teleworking increases yearly with 20 percent		
	1996	2011	2021	1996	2011	2021
Penetration level of telecommuting/tele-working with regard to the Belgian' workforce	3.97%	7.97%	12.00%	3.97%	28.14%	37.93%
Motorized round com-muter trips (M) and the penetration level of telecommuting/tele-working is 0%	2,626,589	2,626,589	2,626,589	2,626,589	2,626,589	2,626,589
Vehicle round com-muter trips (V) and the penetration level of telecommuting is 0%	1,578,325	1,578,325	1,578,325	1,578,325	1,578,325	1,578,325
Reduction in the mo-torized round commuter trips (M_r) due to a cer-tain penetration level	31,283	62,802	94,557	31,283	221,737	298,880
Reduction in the vehicle round commuter trips (V_r) due to a certain penetration level	18,798	37,738	56,820	18,798	133,242	179,598
Reduction in the mo-torized round commuter trips expressed as a per-centage of the total number of motorized round commuter trips	1.2%	2.4%	3.6%	1.2%	8.4%	11.4%
Reduction in the vehicle round commuter trips expressed as a percent-age of the total number of vehicle round com-muter trips	1.2%	2.4%	3.6%	1.2%	8.4%	11.4%
Source: own calculations						

An estimate of the monetary value (MV) of the reduction in congestion per work day due to a daily reduction in vehicle round commuter trips caused by a specific penetration level of telecommuting/teleworking (Table 4) can be given for Belgium based on following calculation:

$MV = V_r \; x \; L \; x \; C$

V_r = the reduction in the vehicle round commuter trips (V_r) due to a certain penetration
    level

L = the average length of a round commuter trip in Belgium. Here, the estimate of Van
    Hecke (1998) is used, namely 35.2 kilometer.

C = The congestion cost per vehicle kilometer. Here, the calculations of De Borger,
    Swysen, Ochelen and Proost (1997) for non-urban transport were used.

Table 4 indicates that a penetration level of telecommuting/teleworking of 12 percent
may lead to a daily gain of 1,562,050 ECU and that a penetration level of 37.93 percent
could lead to a daily gain of 4,937,364 ECU per day.

Table 4: An estimate of the monetary value (MV) of the reduction in congestion due to a particular daily reduction in vehicle round commuter trips caused by a particular penetration level of telecommuting/teleworking in Belgium						
	Penetration level of telecommuting/teleworking increases yearly with 5 percent			Penetration level of telecommuting/teleworking increases yearly with 20 percent		
	1996	2011	2021	1996	2011	2021
Penetration level of telecommuting/teleworking with regard to the Belgian workforce	3.97%	7.97%	12.00%	3.97%	28.14%	37.93%
Monetary value of the reduction in congestion per work day due to a particular penetration level in ECU	517,780	1,037,462	1,562,050	517,780	3,662,982	4,937,364
Source: own calculations						

A similar conclusion as for Belgium can be drawn for Brussels concerning the reduction
in round commuter trips (see Table 5). An estimate of the monetary value (MV) of the
reduction in congestion due to a particular daily reduction in vehicle round commuter
trips caused by a particular penetration level of telecommuting/teleworking (Table 6)
can be given for Brussels based on the same equation as for Belgium but using the cal-
culations of De Borger, Swysen, Ochelen and Proost (1996) for urban transport and the
calculation of Van Hecke (1998) of the length of a round commuter trip in Brussels,
namely 22.4 kilometer. Table 6 indicates that a penetration level of telecommut-
ing/teleworking of 12 percent may lead to a daily gain of 314,634 ECU and a penetra-
tion level of telecommuting/teleworking of 37.93 percent could lead to a daily gain of
994,481 ECU per work day.

	Penetration level of telecommuting/teleworking increases yearly with 5 percent			Penetration level of telecommuting/teleworking increases yearly with 20 percent		
Table 5: Reduction in trips caused by the implementation of telecommuting/teleworking in Brussels						
	1996	2011	2021	1996	2011	2021
Penetration level of telecommuting/teleworking with regard to the Brussels' workforce	3.97%	7.97%	12.00 %	3.97%	28.14 %	37.93 %
Motorized round commuter trips (M) and the penetration level of telecommuting/teleworking is 0%	419,367	419,367	419,367	419,367	419,367	419,367
Vehicle round commuter trips (V) and the penetration level of telecommuting/teleworking is 0%	281,301	281,301	281,301	281,301	281,301	281,301
Reduction in the motorized round commuter trips (M_r) due to a certain penetration level	4995	10027	15097	4995	35403	47720
Reduction in the vehicle round commuter trips (V_r) due to a certain penetration level	3350	6726	10127	3350	23747	32009
Reduction in the motorized round commuter trips expressed as a percentage of the total number of motorized round commuter trips	1.2%	2.4%	3.6%	1.2%	8.4%	11.4%
Reduction in the vehicle round commuter trips expressed as a percentage of the total number of vehicle round commuter trips	1.2%	2.4%	3.6%	1.2%	8.4%	11.4%
Source: own calculations						

	Penetration level of tele-commuting/teleworking increases yearly with 5 percent			Penetration level of tele-commuting/teleworking increases yearly with 20 percent		
	1996	2011	2021	1996	2011	2021
Penetration level of telecommuting/teleworking with regard to the Brussels' workforce	3.97%	7.97%	12.00%	3.97%	28.14 %	37.93 %
Monetary value of the reduction in congestion per work day due to a particular penetration level in ECU	104,831	208,969	314,634	104,831	737,791	994,481

Table 6: An estimate of the monetary value (MV) of the reduction in congestion due to a particular daily reduction in vehicle round commuter trips caused by a particular penetration level of telecommuting/teleworking in Brussels

Source: own calculations

The tentative calculations above of the reduction of commuter trips in Belgium and Brussels and the monetary value of the reduction in congestion per work day due to a particular penetration level confirm the potential of telecommuting/teleworking as a policy tool to reduce traffic congestion.

5. Impact on transport pollution
An estimate of the actual effect of a specific penetration level of telecommuting/teleworking on pollution, expressed in monetary terms is provided below. In order to calculate the effects of telecommuting/teleworking on pollution, the impact on energy use must first be assessed.

Impact on energy use
Energy consumption is affected by travel speed as well as travel distance (Mokhtarian P., Handy S. and Salamon I., 1995). Up to a point energy effectiveness augments with the travel speed. Recent data on the number of private cars, the number of vehicle kilometers, the vehicle occupation rate and the length of the road infrastructure in Belgium and Brussels suggest that a substantial pressure exists on the present road infrastructure due to an increased demand for mobility. Hence, the travel speed is more likely to decrease than to increase in the future (Algemene Verkeerstelling 1995, 1997). Telecommuting/teleworking may have a direct impact on the travel speed if it is combined with a policy that copes with latent demand.
Telecommuting/teleworking eliminates the commuter trip. A study in the United States estimated a energy saving of 3.573 liter[2] per reduction in vehicle round commuting trip (Mokhtarian P., Handy S. and Salomon I., 1995). The energy savings in the Belgian and Brussels' cases can be calculated using the reduction in vehicle commuter trips obtained from the application of the Lam and Olszewski model. The results of this estimate are

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[2] The energy savings were initially expressed in gallons. One gallon equals 3.79 liter

visualized in Table 7. A maximum penetration level of teleworking/telecommuting of 40 percent leads to a reduction of 682,682 liters of oil per work day in Belgium and of 121,679 liters of oil per work day in Brussels.

Table 7: Savings in energy use resulting from various penetration levels of teleworking/telecommuting

	Penetration level of teleworking/telecommuting				
	5 percent	10 percent	20 percent	30 percent	40 percent
Reduction in number of vehicle round commuter trips in Belgium	23,883	47,767	95,537	143,300	191,067
Energy savings in liter per day for Belgium	85,334	170,671	341,354	512,011	682,682
Reduction in number of vehicle round commuter trips in Brussels	4,257	8,514	17,027	25,541	34,055
Energy savings in liter per day for Brussels	15,210	30,421	60,837	91,258	121,679
Source: own calculations					

Impact on air quality/emission of pollutants

A reduction in the number of daily commuter trips caused by the implementation of teleworking/telecommuting results in a reduction of the total emission caused by the vehicle activity (Hederson D., Koenig B. and Mokhtarian L., 1996). The impact of a particular penetration level of teleworking/telecommuting on air quality is influenced by a number of parameters such as: distance travelled by car, number of cold starts[3], number of hot starts, speed, type of vehicle and ambient temperature.

(1) distance travelled by car: the higher the distance travelled by car the higher the total emission volumes will be. A teleworking/telecommuting activity eliminates a commuter trips and thereby reduces the emission of pollutants.

(2) number of cold starts and number of hot starts: when a vehicle with a warmed-up engine is started it produces a lower emission of pollutants than a vehicle with a cold engine. Therefore if teleworkers/telecommuters were to make more unlinked trips this would actually increase pollution.

(3) speed: a U-shaped relationship exists between speed and emission levels. Up to 80-96 kilometers per hour the emission of pollutants decreases as the speed rises. Above 80-96 kilometers per hour the emission of pollutants rises again as the speed augments. In addition multiple accelerations and decelerations during a trip increase the emission of pollutants.

(4) type of vehicle: the emission of pollutants caused by vehicle activity varies with the type of vehicle. For instance the absence of a catalytic converter results in a higher emission of pollutants.

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[3] With cold start we mean that the vehicle's engine is cold. An engine is considered cold if it has been turned off for more than one hour for vehicles with a catalytic converter and four hours for vehicles without a catalytic converter.

(5) ambient temperature: The emissions generated by a cold start are highly correlated with the temperature of the surrounding air at that time. Cold starts caused by a trip to work early in the morning and late at night produce higher emissions than cold starts during regular day hours. Teleworking/telecommuting eliminates such early and late night commuter trips.

(Sampath S., Saxena S. and Mokhtarian P., 1991)

In the present paper, we only take into account explicitly the 'distance' and 'type of vehicle' parameters, because data on the other variables are not available. The speed issue is taken into account implicitly by assuming that telecommuting/teleworking will reduce traffic during peak time.

Road transport is the main cause of the emission of nitrogen oxides (NO_x), volatile organic compounds (VOC), carbon monoxide (CO) and particulate matter with a diameter of less then 10 microns (PM10). Road transport also contributes to the emission of sulphur dioxide (SO_2), tropospheric O_3 and carbon dioxide (CO_2). Troposheric O_3 is a secondary pollutant caused by the emission of VOC and NO_x. The effect of increased teleworking/telecommuting penetration levels on the emission of those pollutants is the subject of this paper. VOC and PM10 can cause cancer. NO_x, O_3, SO_2 and CO_2 may result in respiratory infections, chronic obstructive pulmonary diseases and asthma. O_3 has also a negative effect on the growth of vegetation and thus can lead to the exhaustion of the natural reserves. SO_2 is a soured component that affects buildings as well as the soil and water (B.I.M., 1994-1995-1996).

As an illustration of the possible effects of a specific penetration level of teleworking/telecommuting on the emission of pollutants, a rough calculation of the effect of a reduction in commuter trips is made for Brussels. For Belgium only the global monetary impact on the emission of pollutants was calculated due to the unavailability of data. For this calculation the following parameters were used :

(1) the reduction in the number of vehicle commuter trips for a specific penetration level of teleworking/telecommuting. Here, the data resulting from the application of the Lam and Olszewski model was used (see section 4).

(2) the emission factor per vehicle kilometer of NO_x, CO_2, VOC, CO, PM10 and SO_x in a peak period in Brussels and the global emission factor per vehicle kilometer in a peak period in Belgium for gasoline and diesel cars. Here, the calculations of Mayeres I., Ochelen S. and Proost S. (1996) were used for Brussels (see Table 8).

(3) an estimate of the average commuter trip in Brussels. Van Hecke (1998) estimated the average commuter trip in Brussels to be 11.2 kilometers or 22.4 kilometers for an average round commuter trip.

(4) the reduction in commuter trips divided over gasoline cars and diesel cars. Here, the percentage of each car type in the total car fleet was used. In 1996, the car flux was composed of 60 percent gasoline cars and 40 percent diesel cars (Febiac, 1997).

The following equation was used to determine the reduction in emission of pollutants for a specific penetration level of telecommuting/teleworking in Belgium and Brussels:

$$T_i = V_r \times L \times E_{iG} \times (G/G+D) + V_r \times L \times E_{iD+} \times (D/G+D)$$

T_i = the total reduction in emission for a pollutant i in a peak period on a particular day.

V_r = the reduction in commuter trips for a specific level of teleworkers/telecommuters

L = the average length of a round commuter trip

E_{ijG} = the emission factor for a pollutant i for a gasoline car

E_{ijD} = the emission factor for a pollutant i for a diesel car

G = number of gasoline cars in the total car fleet

D = number of diesel cars in the total car fleet

The impact of a specific penetration level of teleworking/telecommuting on emissions reduction in kilograms for Brussels can be found in Table 9. For the assessment of the monetary value of the impact of a particular penetration level of teleworking/telecommuting on emissions reduction (MVE) for Brussels the following equation was used:

$$MVE_i = T_i \times MVE/g_i$$

MVE_i = The monetary value of the impact of a particular penetration level of teleworking/telecommuting on the emissions of a specific pollutant i

T_i = the total reduction in emission for a pollutant i in a peak period on a particular day.

MVE/g_i = The monetary valuation in ECU per gram emission of a specific pollutant i

The results indicate that telecommuting/teleworking can have a significant impact on the external costs of air pollution. A maximum penetration level of teleworking/telecommuting of 40 percent will result in a decrease of the external monetary costs of 17,507 ECU per work day during a peak period while a penetration level of telecommuting/teleworking of 12 percent results in a daily monetary gain of 5,250 ECU. These relatively low amounts as compared to the congestion costs result from specific hypothesis on the valuation of atmospheric pollution as put forward by Mayeres I., Ochelen S. and Proost S.

Table 8: Specific emission factors for Brussels						
	NO_x	CO_2	VOC	C O	PM10	SO_x
Emission factors in g per vehicle kilometer (CO_2 in kg) during a peak period						
Gasoline cars	1.56	0.17	0.37	2.92	0.00	0.00
Diesel cars	0.20	0.14	0.02	0.33	0.07	0.13
Monetary valuation mECU[4] per g (CO_2 in kg)	13.8	7.72	2.95	0.01	83.19	95.21

Source: Mayeres I., Ochelen S. and Proost S., 1996

Table 9: Reduction in emission resulting from a specific penetration level of teleworking/telecommuting

	maximum penetration level of teleworking/ telecommuting of 40 percent						
	NO_x	CO_2	VOC	CO	PM10	SO_x	TOTAL
Reduction in emission in kg	768	119,469	174	1,425	21	39	-
Reduction in costs in ECU	10,598	922	513	14	1,747	3,713	17,507
	penetration level of teleworking/ telecommuting of 12 percent						
	NO_x	CO_2	VOC	CO	PM10	SO_x	TOTAL
Reduction in emission in kg	230	35,841	52	427	6	12	-
Reduction in costs in ECU	3,174	277	153	4	499	1,143	5,250

Source: own calculations

In order to calculate the monetary value (MVP) of the impact of a specific penetration level of telecommuting/teleworking on the total emission of pollutants per day in Belgium, the following equation was used:

$$MVP = V_r \times E_G \times L \times G/(G + D) + V_r \times E_D \times L \times D/(G + D)$$

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[4] MECU stands for 1/1000 ECU

V_r = the reduction in commuter trips for a specific level of teleworkers/telecommuters. For this purpose the data resulting from the application of the Lam and Olszewski model was used.

L = the average length of a round commuter trip in Belgium. Van Hecke (1998) estimated the average commuter trip in Belgium to be 17.6 kilometers or 35.2 kilometers for an average round commuter trip.

E_G = the total emission factor for a gasoline car in ECU per kilometer. Here, the calculations of De Borger B., Swysen D., Ochelen S. and Proost S. (1997) were used for Belgium.

E_D = the total emission factor for a gasoline car in ECU per kilometer. Here, the calculations of De Borger B., Swysen D., Ochelen S. and Proost S. (1997) were used for Belgium.

G = number of gasoline cars in the total car fleet

D = number of diesel cars in the total car fleet

From this equation follows that a maximum penetration level of teleworking/telecommuting of 40 percent will result in a decrease of the external monetary costs of pollution of 68,002 ECU per work day during a peak period while a penetration level of telecommuting/teleworking of 12 percent results in a daily monetary gain of 20,401ECU.

The results of the impact of teleworking/telecommuting on energy use as well as on air pollution are merely an estimate, but clearly suggest a positive effect on externalities.

5. Conclusions and research needs

Given that transport externality problems in Belgium and Brussels are increasing, the potential of telecommuting/teleworking as a congestion and vehicle pollution reducing policy tool merits further investigation. At present no statistical data are available on the number of telecommuting/teleworking individuals in Belgium and the Brussels-Capital Region. A rough estimation of the current number of telecommuting/teleworking individuals was obtained after performing several corrections on the data about the number of homeworkers in Belgium. As a result of these corrections a penetration level of 3.97 percent was determined for Belgium and Brussels. Trend analysis was used to predict the future number of telecommuters/teleworkers. The application of trend analysis to assess the number of telecommuters/teleworkers was made difficult by a lack of sufficient and/or accurate data. Then a rough estimation was made of the reduction in commuter trips that would result from the implementation of telecommuting/teleworking. An application of the Lam and Olszewski (1996) model suggests that a penetration level of telecommuting/teleworking of 37.93 percent would lead to a reduction of the commuter trips by 11.4 percent. This would lead to a monetary gain of 4,937,364 ECU per work day for Belgium and 994,481 ECU per work day for Brussels. Finally, an estimate was given of the impact of teleworking/telecommuting on energy use and air pollution. A penetration level of teleworking/telecommuting of 40 percent could lead to a reduction of 682,682 liter oil per work day in Belgium and of 121,679 liter oil

per work day in Brussels. A penetration level of teleworking/telecommuting of 40 percent will result in a decrease of the external monetary costs of pollution of 17,507 ECU per work day in Brussels and of 68,002 ECU per work day in Belgium during peak hours. The potential of telecommuting/teleworking as a congestion and pollution reducing policy tool should be investigated using more accurate statistical data. This is a prerequisite for a correct calculation of current penetration levels and frequency of telecommuting/teleworking and for a more accurate analysis of the impact of telecommuting/teleworking on traffic congestion and vehicle emissions.

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INTERFYS: Internet-based Professional Publication System for a Process Oriented Management of Widely Distributed Editorial Telework in the Internet

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Abstract

Today's business and research often requires the compilation of knowledge worked out asynchronously by different distributed knowledge holders through the consolidation in working documents. This is in general connected with diverse review and revise processes. Due to awkward paper based information flows and lacking in control this task is often characterized by exceptionally lengthiness, spontaneous, unsystematic work, high error frequency and lack of transparency which results in insufficient quality.

Coming from the initial goal of supporting a process oriented management of distributed editorial telework in the publishing sector - which is analogous to the problem outlined - INTERFYS is an innovative Internet based system concept for making such processes more efficient by applying the concepts of Workflow Management just using Web technologies. The paper explains and evaluates the conceptual and technical aspects of the System INTERFYS 1.0 which has just been realized and was presented on the CeBIT 1998 in Hannover.

1 From Online Presentation to process oriented dynamic Support of editorial Telework

INTERFYS, a project of the Institute for Information Systems, Münster (Germany), originates from working on innovative Online (Electronic, Internet) Publishing Concepts. The extensively leading market position of paper-based professional publications on the one hand and the missing profitability of existing online publishing systems on the other hand indicate that available Internet technologies are not used efficiently for publishing purposes in the scientific and professional domain. This situation is even more astonishing considering the obvious disadvantages of print publishing, e.g. the high costs of logistics (which do not have any value for readers), strongly limited search features, the lack of actuality and quality caused by inefficient review and publishing processes, limits of contents etc.

Against this background the initial goal of INTERFYS was the conception and realization of an innovative Online (Electronic) Publishing system, which supports editorial telework overcoming the severe disadvantages of print publishing.

The problems sketched above are not limited to the publishing sector, though. They rather concern one of the most fundamental subtasks of Knowledge Management which comes up very often in day-to-day business and research: The compilation of knowledge worked out by different distributed knowledge holders through the consolidation in working documents, e.g. project plans, business reports, presentation layers, product designs, idea sketches, announcements, telephone lists, reports, advertisements or research papers. Actually, over 90% of companies knowledge is - according to a study of the Gartner Group - stored in form of documents [Schneider (1995), p. 8].

Knowledge is today's key factor of sophisticated economies and dominant in companies and research institutes value chain. *Knowledge Management* therefore brings into focus all activities regarding production, reproduction, distribution and multiplication of relevant knowledge. This knowledge focus and the ability to create innovative knowledge in business and science is essential for progress and competitiveness and requires an efficient exchange of specialist knowledge. In view of economic and scientific speed up and globalization an effective Knowledge Management has to make the state of the art available. Thus it needs to use a long range, optimally a world wide exchange of specialist knowledge. In the context of consolidating knowledge in working documents it has to operate within a widespread net of knowledge holders and controllers who provide a customer oriented range of high quality documents, i.e. documents which can be used by recipients punctually, efficiently and profitably.

The consolidation related to the production and publishing of corporate and research documents is usually connected with diverse review and revise processes. These business processes are indeed analogous to editorial processes in the publishing sector; therefore they will both be subsumed under the term *editorial processes* in the following.

Editorial Processes show three core characteristics [see also Kirstein, Montasser-Kohsari (1996), pp. 88-89]:

1. The published documents - as the result of the editorial processes - are composed in division of labor, i.e. there are a number of authors, reviewers and editors involved which may work asynchronously and locally distributed all over the world. Moreover, there are utilized different application systems and data formats.

2. The Processes do not necessarily have to be set up ad-hoc from scratch for each new document individually. They rather often have a structure which is - possibly not formally - determined in advance and can be specified in process models.

3. The Processes are frequently executed, so that an optimization of the business process management would be profitable.

Managing collaboration (related to the first point) causes problems: Due to awkward paper based information flows and lacking in control conventional editorial processes are

often characterized by exceptionally lengthiness, spontaneous, unsystematic work, high error frequency and lack of transparency which results all in all in an insufficient quality.

Computer Supported Cooperative Work (CSCW) systems try to make collaborative business processes like editorial processes more efficient. Efficient cooperative work is first based on data integration. However, integrated systems do not only have to provide applications, data and documents for supporting single activities within editorial processes but need also to support the control of triggering activities. A corresponding organizational perspective of integration is given by the functional integration, i.e. joining activities together in process chains. In this context, process orientation has been discussed by generating numerous concepts like Lean Production, Total Quality Management, Supply Chain Management or Business Process Reengineering, which can be subsumed under the term *Process Management*. A very popular information technology dedicated especially to Process Management in terms of Office Automation are *Workflow Management Systems* [see also Bartholomew (1995)].

The characteristics outlined in point 2 and 3 do additionally indicate a high potential benefit derived from an automation using Workflow Management. Consequently, the INTERFYS project has not only been focussed only on static management of documents but on a workflow based dynamic process oriented support of distributed editorial telework within an Intranet.

2 Management of Editorial Processes - State of the Art

There are numerous products called "*Online Publishing System*". Generally, these Systems only support the presentation of hypermedial documents in the World Wide Web (WWW) and dynamic search functions. In most cases these documents are simple copies or extracts of articles published in print journals before [see also Kirstein, Montasser-Kohsari (1996); O´Reilly (1996)]. This way an informational surplus value can be offered, but the problems outlined above are not overcome. However, even pure Electric Journals (Magazines, e-zines) - although they cope with the problem of awkward and expensive paper based logistics - leave out the potentials supporting Process Management with information technology like Workflow Management Systems. On the opposite editorial work is mostly organized by divisions and not by processes, although it has been evaluated as harmful in numerous publications about Business Process Reengineering (BPR) [see for example Hammer, Champy (1993)]. Moreover, editorial work is often done in an individual way for each article disregarding the potentials of standardizing and automating the corresponding processes.

Workflow Management means "the automation of business processes, in whole or part, during which documents, information or tasks are passed from one participant to another for actions, according to a set of procedural rules" (workflow model) [Workflow Management Coalition (1996), p. 11]. It has become very popular in the commercial as well as in the research world. The development in this area is enormous [see also Fischer (1997); Geakopoulos et al. (1995); Jablonski, Bussler (1996), Lawrence (1997a); Sheth et al. (1996)]. Currently some Workflow Management Systems have already been upgraded by interfaces to the Web. However, the quality of web support varies strongly

from product to product. Only a few systems permit workflows to be initiated via WWW. Work list handling and workflow control from browsers are still seldom, too. For example STAFFWARE [http://www.staffware-inc.com/] and DIGITAL [http://www.digital.com/] provide workflow systems with relatively sophisticated support. workflow applications dedicated to an integrated support of entire editorial processes - from first submission to final publication within the Internet or any Intranet - are not known [see also Kueng (1997)].

3 Conceptual and Technical Aspects of INTERFYS

The first stage of the project already resulted in a productive system (INTERFYS 1.0) which was presented on the CeBIT 1998 in Hannover (Germany) and will be the platform for a pure electronic professional magazine for business information systems (for the present German-speaking). The system can be visited under http://interfys.uni-muenster.de/.

3.1 Systems Architecture

The system is realized in an innovative way integrating Internet, Data Management and Workflow Management. *Data Management* is related to data integration while *Workflow Management* supports controlling and monitoring of editorial processes. This Integration is realized exclusively by standard WWW system components, i.e. without using dedicated Workflow Management systems (see figure 1).
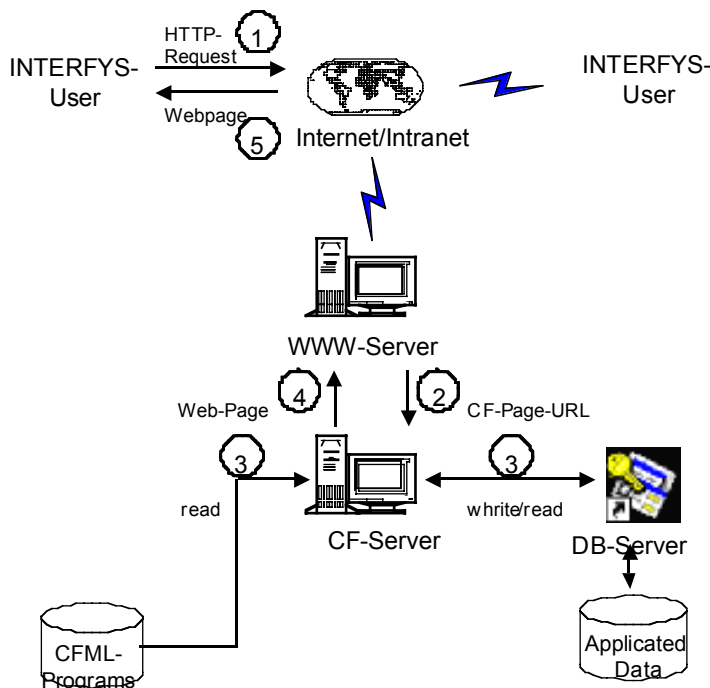

Fig. 1: Architecture of INTERFYS

Consequently, for reviewing, administrating, submission and reading of documents the system can be accessed solely via Web browsers which are used as telework workplaces from all participants in editorial process.

353

The core of INTERFYS is formed by a *gateway application*, which allows users to interact with the system, integrating browser, WWW server and Database Systems into a dynamic Web application. Each request submitted by the (teleworking) users Web browser (1 of figure 1) is transmitted to the WWW-server via http. It launches (2) a gateway function (3), which provides the results (for example through a query to the database (3)) which are transferred in HTML (4) and transmitted back to the browser (5).

The gateway application is realized with Cold Fusion™ from Allaire [Allaire (1997), http://www.allaire.com/]. Unlike other approaches, which are predominantly bourne shell scripts (Unix), batch files (Windows NT, 95), C or Perl programs linked to WWW servers via the Common Gateway Interface (CGI), Cold Fusion uses a proprietary server-side markup language (Cold Fusion Markup Language - CFML) that is a superset of HTML (Hypertext Markup Language), i.e. there are additional tags for a flexible programming language which is specially suitable for developing dynamic Web application.

3.2   Management of editorial workflows

Differently from prevailing Online Publishing systems INTERFYS takes into account that the characteristics of editorial processes outlined above implicate a high potential benefit derivable from process automation. Consequently, one goal has been a workflow based support of the entire editorial processes - from first submission to final publication.

According to its initial purpose INTERFYS supports the editorial process depicted strongly simplified through the Petri Net (P/T-Net) in figure 2.
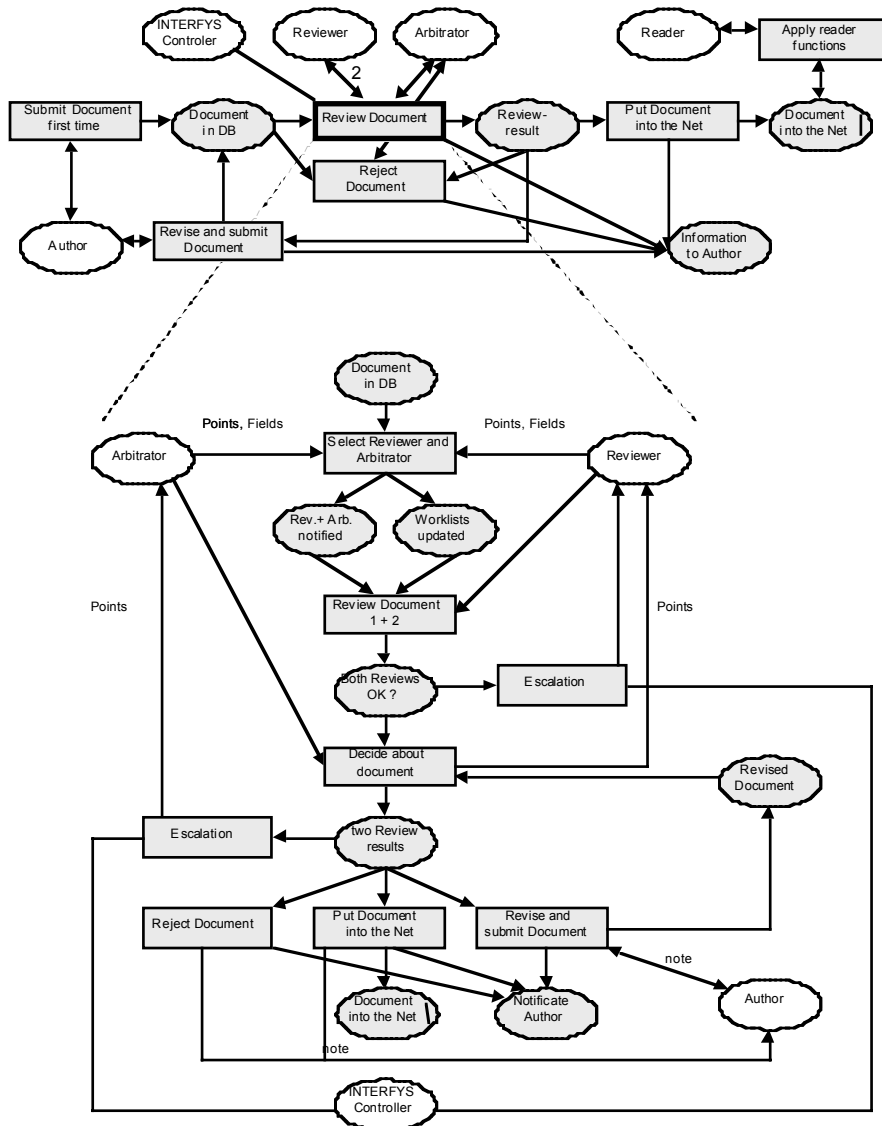
Fig. 2: Editorial process of a professional Online Magazine (strongly simplified)

Authors submit documents via a Web page authorizing themselves and triggering (simply by click) a FTP (File Transfer Protocol) upload of the authors document. The review is executed respectively by two reviewer and one arbitrator, who judges the document finally on the basis of the two reviews. The arbitrator and reviewer do neither know the author nor each other (double covered review). For ensuring the quality and faithfulness to deadlines there are numerous loops in the process structure.

Workflow Management intends the automation of process control in a way that maximizes the goals of Business Process Management (see table 1). In INTERFYS Workflow Management is not realized using a dedicated Workflow Management System but is implemented exclusively as CFML programs in the Cold Fusion Server. It could therefore be argued, that - because there is no workflow engine - INTERFYS has nothing to do with Workflow Management. The answer to this is that two constitutive criteria of Workflow Management are fulfilled here [see also Leymann, Roller (1997), pp. 102]:

355

1. There is realized an automation of process control executing core functions of Workflow Management:

- *Coordination of activities* - automation of the transition of single activities within an editorial process. The knowledge, which activity follows another, is handed over to INTERFYS completely (this approach is regarded as transactional or production workflow by some authors [Sheth, Rusinkivicz (1993); Georgakopoulos, Hornick, Sheth (1995), p. 126]). The workflow-based coordination of activities enables to reduce non-value activities like asking for information and supports learning effects.

- *Coordination of actors* - automation of editors deployment for the execution of process activities. In this respect tasks related to certain activities are assigned to editors depending on their knowledge and workload. Coordination instruments are the notification and synchronization mechanisms via work lists which can be handled solely through web browsers. This approach accelerates the identification of qualified personal and eliminates respective search activities (see fig. 3).

- *Coordination of data and application systems* - automated provision of the relevant data for the editorial work and triggering of the appropriate application system for reading, writing and printing via remote data and procedure calls respectively. The efficient provision of data is said to be one of the most important economical arguments for the implementation of Workflow Management systems [Fisher (1997), pp. 54].

- *Monitoring and controlling of process instances:* Automation of the extraction, comfortable graphical presentation of information referring to running and finished processes. Additionally there are realized automated warning messages, escalation workflows (see fig. 3).

2. There is a separation of task logic, i. e. of programs which support tasks referring to activities to be executed within workflows (individual text editors, FTP-Server, Web-Server, Mail-Server, Acrobat Writer™, Acrobat Reader™, see paragraph 3.3) and process logic, i.e. programs for automation of process control in the sense of the core functions of Workflow Management outlined. This is because the latter ones are implemented exclusively in the Gateway Server as a CFML programs.

Figure 3 shows exemplary how the first two workflow steps "Submit Document first time" and "Select Reviewer and Arbitrator" have been implemented using CFML.

A workflow activity "Submit Document first time" - and therefore a workflow instance - is triggered by authors in the way sketched above. The activity itself is automatically executed by the gateway program. It triggers the FTP-Upload and routes the relevant control data (date of submission, authors data, title, research domains etc.) to certain fields in the data base system. The upper part of figure 3 shows how the generic SQL statements are dynamically build using CFML language performing the needed database inserts. As an excerpt of the hole CFML module it is shown how the submission data-

base table an the authors/co-authors table is filled with the submitted data. Finally, the gateway program triggers the next activity "Select Reviewers and Arbitrator".
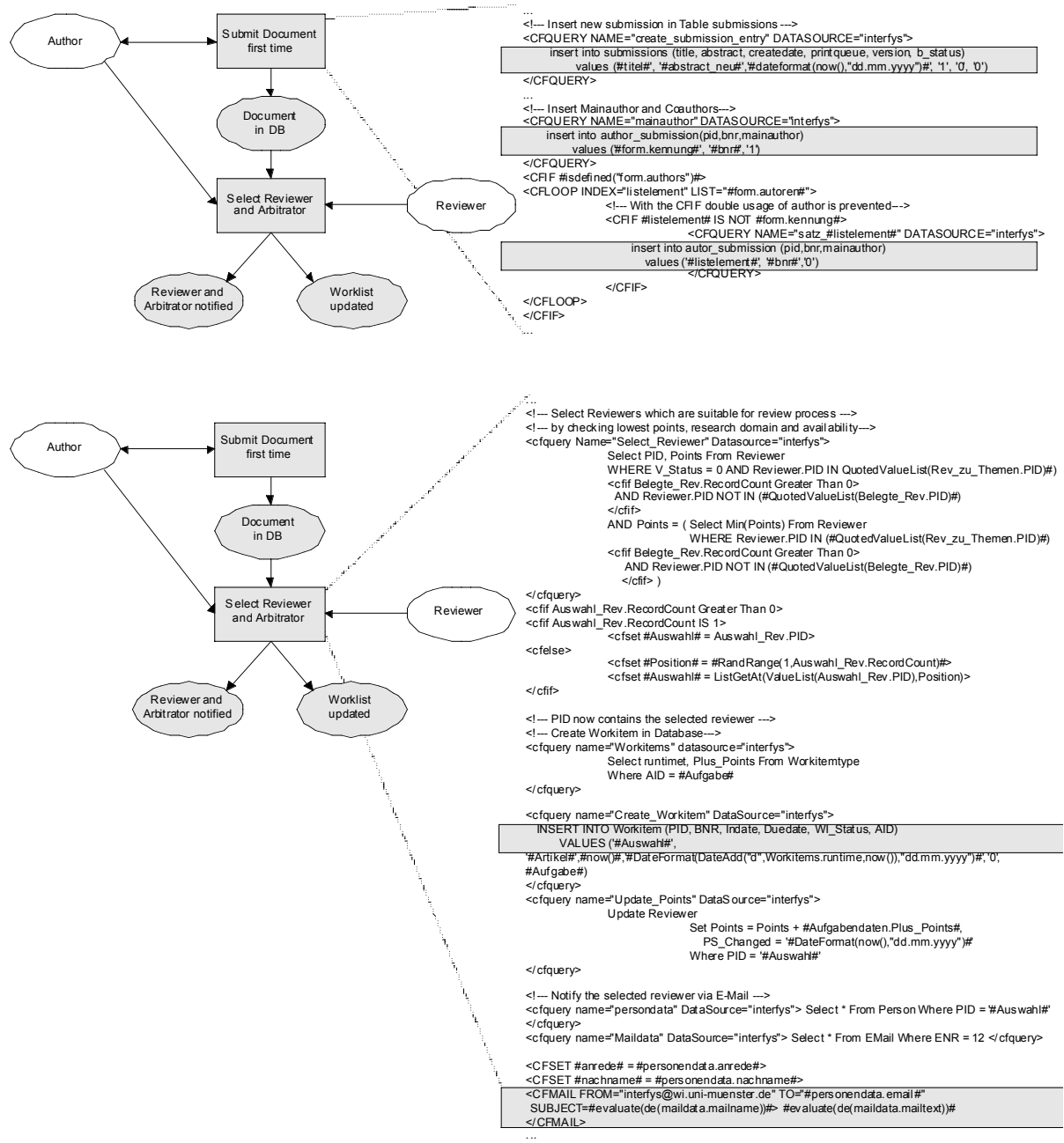

Fig. 3: CFML Implementation of workflow steps.

The first step of this activity is to determine the persons needed for reviewing and arbitrating. For this, the gateway program generates - on the basis of the research domain data (see above) - a SQL-Query which selects the persons with proper research domain and the lowest credit point score. In the second step a SQL-Statement generates a relationship between the key attributes of the article related data and the key attributes of

the selected personal data (Worklists updated, via "INSERT INTO Workitem"). Moreover, the mail server is triggered to send e-mails to the selected persons ("Reviewer and Arbitrator notified"). As shown above the same source code.

Already this example shows some key features of the gateway server concerning the Workflow Management functions:

- *workflow activities*, i.e. pieces of work that form one logical step within a workflow. They can be executed by invoked applications (e.g. an e-mail program) referenced by CFML-commands triggering these applications. Activities done by persons are defined by CFML-waiting loops reacting to events sent by the database system according to transactions as a result of corresponding activities (e.g. the gateway server is waiting for events of "submission" which follow the authors writing activities).

- The *logical workflow structure* is specified by simple sequence or if-then-else commands in CFML.

- For the INTERFYS system the *workflow enactment* (triggering) is a special kind of manual activity and therefore implemented using the same CFML-waiting loop technique.

- To *determine the state transitions* of workflow instances workflow relevant data (see figure 4), for example the event of finishing the transaction selecting the persons or the date of submission which determines if the review is in time or not, is used creating appropriate SQL-Statements.

- The same applies to workflow control data which *represents the dynamic state of workflows and activities*.

- Applications are invoked through CFML commands including appropriate rpc or dll.

- The *user interfaces* (see figure 5) for workflow participants (authors, reviewers/arbitrators, INTERFYS-controller) are realized through the cooperation of the INTERFYS-components as sketched in 3.1. The request of the work item pool through the INTERFYS-controller (simply made by a click in the Web browser), for example, is answered by a query referring to all documents having not been reviewed so far. Based on the result of the query an appropriate list is generated for the users Web browser. Moreover there are implemented some administrative functions for the INTERFYS-controller.

- Monitoring functions which track and report workflow events during and after workflow execution are realized through regular database system features. The request of states and reports is partly possible via Web browser.

- Escalations, i.e. procedures which are invoked if particular constraints or conditions are not met (in INTERFYS, when deadlines are not fulfilled) are triggered through automate checks of work items (articles) and their submission data. For critical workitems e-mails are sent to reviewers, arbitrators or the INTERFYS-controller respectively.

358

Hence, the gateway application acts as a controlling middleware, i.e. a layer between applications supporting activities and data which are needed for that. Exactly this is the characteristic of a Workflow Management System. While regular Workflow Management System usually provide graphic-based languages dedicated to define workflow types CFML is a purely textual languages for describing interactions between Web servers and data base systems.

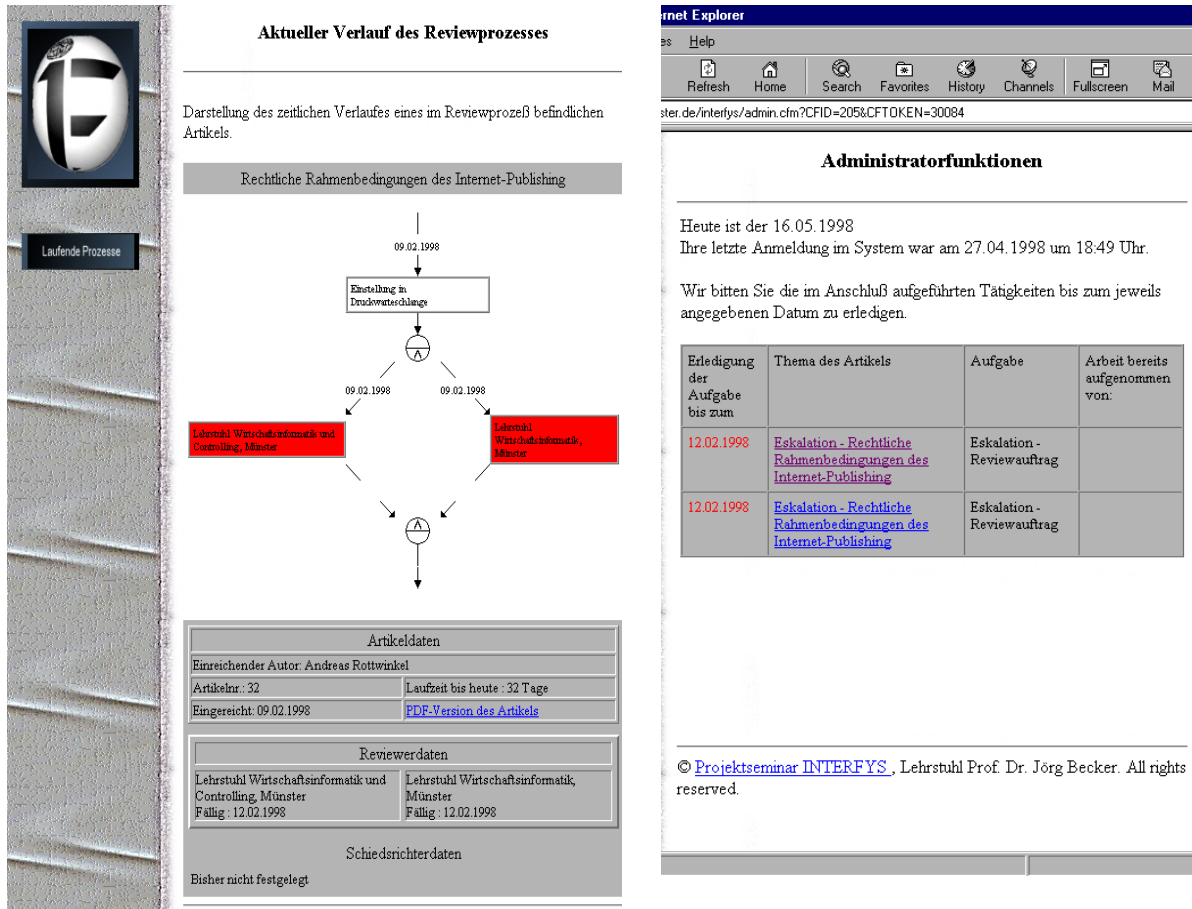**Fig 4**: Data Model of INTERFYS

359

Fig. 5: Monitoring and Worklist screen for an INTERFYS controller

Consequently there has been worked out a manual, which contains a set of CFML statements to realize elements of workflow definitions i.e. logical workflow structures (sequence, AND, XOR etc) role resulutions, remote function calls, monitoring etc (see fig. 3). The resulting subset of CFML forms a textual workflow definition language which can flexibly be used to specify different workflow types.

In table 1 some selected INTERFYS functions are matched with three goals of Business Process Management (of course, some of the functions would match with more then one goal) [Theuvsen (1996), pp. 74-75].:

BPM Goal	Functions of INTERFYS
Process Efficiency Optimization of process criteria such as processing time or the quality of process output.	• automated additional notification of workflow participants via e-mail • automated reminding via e-mail when missing interim deadlines • efficient exchange of views about single documents or topics through hierarchically structured discussion forums • high quality documents through widespread and unprejudiced collaboration of different participants from anywhere, who may keep anonymous to each other • securing the editorial Intranet through password-based protection mechanisms
Resource efficiency Efficient use of the resources available for the execution of processes	• assigning automatically documents to reviewers and arbitrators according to their knowledge and workload through the maintenance of personal data including a credit point system reflecting persons done and missed work items. • providing of documents to be reviewed with numbered lines and an electronic form to fill in review results.
Market efficiency The proper positioning of the supplier in its relation to intern or extern customers. This includes a reliable prediction of delivery times, transparent communication with suppliers and customers and optimized procurement and distribution processes.	• acceptation of nearly all word processor formats • ensuring faithfulness to deadlines through automated setting and control of time limits • ensuring an uniform graphical user interface (GUI) through the use of CFMP templates • providing the possibility of always making inquiries about the state of processes • authors and reviewer/arbitrators keep anonymous through the separation of their data from document content data • simple system maintenance and adaptability regarding different process requirements • comfortable graphical support of the INTERFYS controller (see fig. 3)

Tab. 1: Selected Workflow Management functions

3.3 Distribution of Documents

Once a document has finally been accepted it will be automatically transformed in PDF documents. These are hypermedia-capable documents which can be viewed inline through the Acrobat Reader™ from Adobe [http://www.adobe.com/]. The advantage of this format is its optical similarity with conventional paper documents. Because it is a kind of postscript format authors can determine the design of documents independently of Web browsers configurations which is still a weak point of online publishing documents via HTML. Moreover PDF documents can easily be printed properly, overcoming a second severe problem of HTML based documents. Table 2 comprises some distributive functions of INTERFYS.

Distribution Goal	Functions of INTERFYS
Inter, Intra and Extranets	Access of documents can be world wide or can be restricted by applying passwords, as they are already used within the editorial Intranet.
Simple Document Retrieval	Readers are offered comfortable *document search* functions referencing fields, headword and abstracts (full text).
Dynamic Contents	Through *versioning* utilities INTERFYS supports the publication of draft documents which are continuously updated or documents whose period of validity is limited.
Active Information	There is the possibility of being automatically informed about all new documents related to certain fields or headword through a *digest service*.
Feedback	Hierarchical structured *discussion forums* support the mutual exchange of views about single documents special fields.

Tab. 2: Selected distribution functions

4 Summary and Perspectives

Unlike prevailing Online Publishing systems INTERFYS does not only support the widespread presentation of documents but also improves the management of editorial telework processes with flexible IT support of process control. By increasing transparency and controllability of processes by systematic feedback control circuits, higher process and resource efficiency can be reached.

Currently there are just a few Workflow Management systems available which have the capability to work sufficiently in the context of web. But even in comparison to solutions based on such Workflow Management Systems, INTERFYS has three significant advantages [see also Lawrence (1997b)]:

- A Workflow Management system would be an additional component which is itself costly and does not have the functionality that let's the gateway server appear obsolete.

- Editorial processes are pretty simple and would utilize only a minimum of a functionality brought by Workflow Management systems. On the other hand specific requirements occur which these ones may have problems to cope with, like assigning one work item to exactly two workflow participants on the basis of a credit point system.

- INTERFYS is a very simple system which can probably be customized more easily then Workflow Management systems which due to their high functionality tend to be very complex. Especially because of the internet focus of the gateway system and the relatively simple workflow structure the implementation costs could be kept very low without using a dedicated workflow engine. Using an workflow engine would lead to more complex API programming and the advantage of graphical workflow modeling and the higher flexibility is not needed in the context of professional online publication systems.

Against this background INTERFYS provides a very powerful and cost efficient teleworking environment within the general context of process oriented knowledge consolidation in documents and Knowledge Management.

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NOVICE:
a solution for the awareness problem of mobile workers

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Introduction

Email as well as fax are increasingly being used to pass on information, including information about appointments (e.g. changes in time or place), the timing of which is critical. It is therefore essential to make the user aware of the **existence** of such messages (as well as of contents) and to make this information available even if the user is not online.

NOVICE, read as Notification of email via SMS and Voice, is a service which, within seconds, advises the recipient of the arrival of an email message. It fulfills this service by filtering out unimportant emails according to user specific profiles, then passes on some rough identifying characteristics, like sender and subject of the email, via Short Message Service (SMS) to any GSM mobile phone (a general treatment of GSM can be found in [2]).

NOVICE additionally enables the user to select individual emails and to listen to them by calling a voice mail system, which stores the messages as computer generated text-to-speech files.

The conceptual framework of NOVICE contributes to the collection of more general services known as 'unified messaging'. In the broader context of Computer Telephony Integration (CTI) 'unified messaging' represents an important research area targeting the more efficient management of information within heterogeneous messaging infrastructures.

Architectural Overview

The technical architecture of the system providing this service is schematically represented in figure 1. As a detailed technical description had been given in the project documentation [1], full descriptions of software and hardware components are not provided within this paper. In principle most components can easily be replaced by functionally equivalent ones from alternative manufacturers.

Exchange-Server

Basically, the NOVICE-system is designed as an 'add on' system to any messaging infrastructure already installed. But if there isn't a messaging infrastructure existent, the NOVICE-system itself can provide a fully functional mail server, as it is based on an underlying Microsoft Exchange Server architecture. In the version where all system components have been combined into a 'one box system', the complete scope of requirements within typical SME environments can be satisfied. When an existent message system is in place, a simple forward for any subscribed user of the NOVICE-service is all that has to be included on the regular mail host. As an option, some additional filters (e.g. using procmail) could be defined, freeing the NOVICE-system to deal with unimportant listserver mail or junk mail (spam). Using a simple forwarding mechanism has the important advantage that any mail remains marked unread on the regular mail host until the mail is really accessed. Furthermore any mail management by use of folders can be done totally independent from the tasks running on the attached system. So the conventional mail service is entirely unaffected by the working (or even existence) of the NOVICE-system.

A tradeoff in choosing this architecture is that additional user and system management is needed, but with respect to user subscription and authentication, accounting and billing of the NOVICE-service, we consider that a dedicated user management is a necessity. By using a Microsoft Windows NT based system to run the Exchange Server, the basic software required is included. (For certain cases one could consider a setup using simple POP3 access to the regular mail host and thereby eliminating the need for the redundant mail server. But this less expensive solution would cause some other undesirable side effects such as reduced mail filtering capabilities etc.).

Notification Server

Immediately after the mail has been received by the NOVICE-system, optional filtering and some preprocessing will be performed. The filtering capabilities are those built into the Exchange Server and are described in the related product documentation. A hierarchy of filtering conditions will be processed (to spam, archive etc). All messages passing the filter will be forwarded to a post box named SMS-Server, showing the NOVICE-user as sender and covering the original message header as the first paragraph in the body.

The notification component will read those entries and proceed depending on the user-specific profile data. Those data contain an on/off switch for the service, refined by an activation interval represented as pair of timestamps, one or more mobile phone numbers to which a SMS message should be send. Stored are also a variable expressing the number of SMS messages (they are limited by the GSM standard to a length of 160 characters in total [2]) generated per email plus some more parameters. The specification of all these data can be done from any web browser by connecting to the user database residing on the NOVICE-system. For the provision of this web service, a Microsoft Internet Information Server runs concurrently on the 'NOVICE in a box' system. A relational DBMS is used for the storage of the data, which is offering an ODBC interface.

Because of the limit of 160 characters per message, only the 'from' and the 'subject' fields are extracted from the lengthy original mail header. This string is then filled with

characters from the body (after blank compression etc.) to the total of 160; the message is then sent via SMS to the predefined mobile extensions.

The technical realization of sending SMS notification can be done in different ways —for higher workloads X.25 based solutions are freely available. In SME environments a mobile communication device, like the SIEMENS M1 module used in the prototype [5], are sufficient. For more detailed considerations see [1].

CTI-Server

If the user has specified in his profile that voice mail should be generated, the so called CTI server running a text-to-speech program will produce digital sound file. Through a voice mail system, with a user interface based on those used in the mobile phone service of T-Mobil (the provider of service D1 by Deutsche Telekom), the sound files are accessible via any phone connection. Programmed in Visual Voice, a CTI-componentware language, the system offers all the standard functionality of typical voice mail systems plus some administrative options (change of PIN, on/off switch etc.). The procedure for retrieving any voice mail has to be initiated by connecting to one of the switched lines and a user authentication dialog (using DTMF-signals). Thus a separate user ID and PIN are used, consisting only of digits. By flat menu structures the user is then offered all standard voice mail management features, like play back and skipping back and forwards of either new or old messages, deletion of single or all messages etc. To avoid possible disk overflow, a parameterized garbage collector has been added. Any message store with entries older than a specified period or any user space exceeding a certain quota will be reorganized with respect to the defined criteria.

More interesting and challenging is the design of efficient preprocessing functionality. For the mail reading component the national language identification is essential, as selecting the wrong text-to-speech program leads to nearly inextricable conversion difficulties. We can't treat this issue here in more detail but an introduction to this problem is given in [3] and refer also to [1]. By using the well known speech synthesis software by Lernout & Hauspie [4], the prototype allows the reading of English, German and French emails. Other languages could be added without major changes to the system.

Obviously preprocessing also has to eliminate unwanted paragraphs (e.g. quotes) or patterns, like underlining by hyphens or smartly designed signatures etc. Sometimes, however a simple deletion is inadequate. In some instances rather sophisticated routines will be needed for replacement (e.g. inserting a note that an attachment was originally appended). Presently the preprocessing component is still "research in progress".

The first prototype system was realized in mid 1997 and various practical evaluations have since been undertaken in collaboration with Deutsche Telekom AG. During the evaluation it became clear that we initially underestimated the relevance and importance of extensive preprocessing. It now appears that general acceptance and usability of the mail reading component depends significantly on the quality of the implemented preprocessing features.

Design Considerations

Critical success factors for the practical application of the research include:

- an underlying architecture which allows for the ready substitution of individual components to cater for various application scenarios;
- an appropriate user interface for both users and the administrators of the system.

During our evaluation program in which the initial prototypes were exposed to the comments of potential users, we identified a number of key concerns:

- Redundancy in user database management;
- Security — and, in particular the need, to maintain a security management system for NOVICE which was independent of the organization internal security system. Also of significance was the question of centralization/distribution of both data and security within NOVICE.

Other design issues are the scalability and modularity of the NOVICE-system. Performance testing to date has been restricted to consideration of one and two telephony adapters each serving up to four lines simultaneously. For these configurations performance tests have not generated observable bottlenecks. Clearly, however, as we move towards diffusion of NOVICE-like functionality into high-load environments such as ISP or telecommunication carrier hosted implementations, it will be necessary to undertake further and detailed performance testing. We anticipate that a 'one box system' would be inadequate under these conditions. That suggests an approach to modularity in which we put heavy-load components on to dedicated servers.

As we move to enhance the capability and throughput of NOVICE we must ensure that other devices — e.g. a Personal Digital Assistant — including those not yet thought of! — may be connected to the Notification server. It is presently left for future projects to explore those alternatives by setting up prototype systems.

As mentioned in the introduction, the NOVICE-system can be regarded as a component of a more general unified messaging solution. Therefore it could be extended to notify the user about incoming faxes as well as voice messages using the same/similar technology. As the OCR procedures for fax are widely regarded as insufficient, one could focus as a first attempt on the inclusion of the fax header line into an SMS message. Incoming voice mails could be handled in the same way — provided that a CallerID has been transferred. In general many other events could be triggered like the upload or update of specified documents, the breakthrough of thresholds (shares, options, leftover in stock, temperature or any other measurement), causing an automatic message with annotations being generated by a system.

In the following section we briefly sketch some areas of application, which are being addressed within ongoing research studies.

Examples for Application

The main application area of the service is the integration of mobile coworkers into a company's data- and work-flow. Various application scenarios are conceivable such as (partially) asynchronous communication with support or sales representatives in the field. Another example could be found in locally distributed projects, where project workers must be informed about time-critical messages.

As a very interesting application scenario the field of network management has been studied and realized. Within larger networks using management protocols (for example SNMP), specific error codes are generated by active components. These are reported to central management servers and can be linked with additional information for the purpose of sending out precise error notifications. Based on the duty schedules of qualified personnel, a skills based routing mechanism can be established, combined with emergency levels or contract details, availability and location of parts to swap etc.

Feedback from a majority of users participating in the prototype tests over the last 12 months pointed out that, in many cases, the pure notification service provided sufficient information on the content of emails to judge their relevance. Only rarely did users immediately ring the voice mail system to listen to the full email message. The acceptability of the email reading decreased rapidly in those cases where a queue of messages was waiting in the voice mail system due to rare access and deletion. That observation caused the implementation of a switch, allowing subscription to the email reading service independently from the notification service. A detailed user survey will be prepared by Deutsche Telekom Berkom GmbH for an internal evaluation. Furthermore it was often reported, that users often liked to use the system whilst driving in a car, imposing a potentially significant safety risk.

Conclusion

Telecommunication services like NOVICE will receive even more attention in the near future, as operational structures deviate more frequently and radically from centralized management structures. It is therefore important to create ubiquitous awareness of and access to information and support a much higher level of independence of mobile workers from their base central offices. The next generation of mobile networks, the UMTS, will provide enough bandwidth for the practical extension of NOVICE with much more sophisticated components. As has been reported many times elsewhere, the generation and marketing of value added services will be an essential key for the differentiation of carriers and telecommunication service providers in an even more competitive market. A major challenge is the easy accessible and inexpensive support of mobile tele-workers with any piece of information or functionality needed. The NOVICE-system described may be used as a starting point to derive much more sophisticated services.
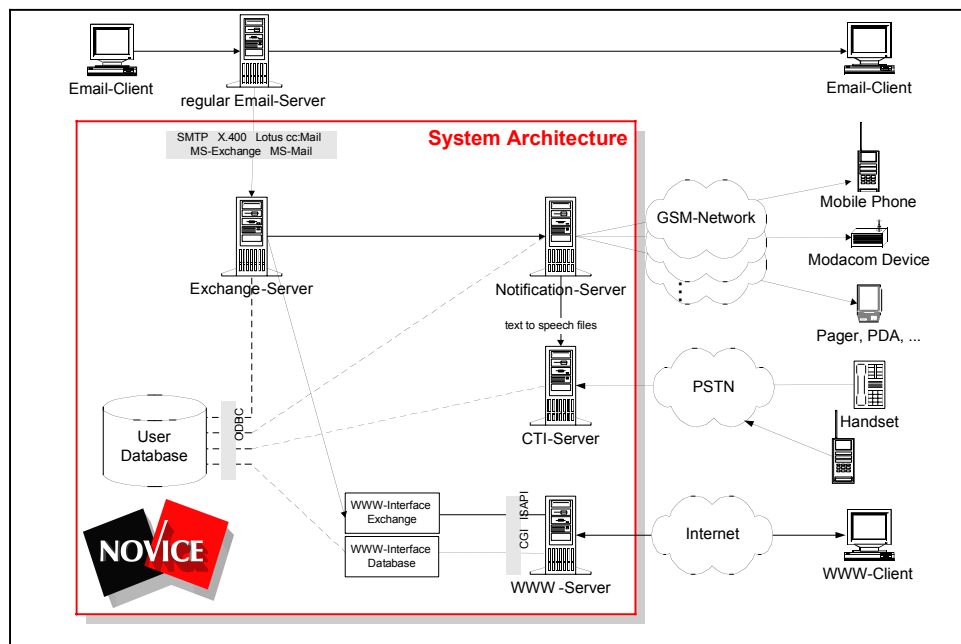
Figure 1: Architecture of NOVICE-system

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Telework and teleworkers at Siemens and Siemens Nixford in Finland

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1. INTRODUCTION

The pilot project

The companies (Siemens and Siemens Nixdorf, both in Espoo, Finland) carried out a pilot project on telework in 1995. The enterprises´ motives to carry trough telework pilot were to find out if the telework is a worth of use and to clarify the strategic points for further developing. There was made a qualitative study about that project from the socialpsychological viewpoint. The aim of the study was to find out what part-time telework is in practice and what kind of changes it may bring with it. The main empirical data was obtained from two semi-structured interviews made before and after the telework project. Seven teleworkers and five of their superiors were interviewed. Additional data was collected in the form of job satisfaction inquiries.

It was possible to distinguish from the data four types of teleworkers. They differ from each other on the basis of the meaning of telework to the individual, his motive to begin doing telework and the nature of his work tasks. The types are: "an efficient worker" to whom telework is only one way of effective working, "a flexible mover" who was working as a teleworker even before pilot project, "a worker who avoids commuting" to whom telework means an improvement of working conditions, and "a peace-seeking worker" to whom telework means peaceful working conditions.

When the change of work brought about by doing telework was studied, it was found that part-time telework had hardly affected the contents of the work or the working methods. In addition, the communication possibilities and the relations within the working community remained the same if part time telework was carried out approximately two days per week. Although telework raised doubts within the working community, there were, however, elements that made telework more efficient. At the level of an individual these elements increased job control. In general, it may be concluded that part-time telework included more advantages than disadvantages and that its appli-

cation is fairly straightforward if the basic requirements, i.e. work autonomy, smooth functioning of information and communication technology and a separate working space at home, can be guaranteed. At the corporate level the telework project was the first step to practising telework more widely. During the pilot project the formation of telework principles begun.

Telework for Change -project

After the pilot project, Siemens companies were one case out of seven in research and development project called "Telework for managing structural change, (TFC)" which was funded by European Unions Social Fund and Ministry of Labour. The aims of the TFC -project were to develop innovative telework arrangements and new ways of working, to promote new working culture and to support the organisations on the new situation. During a two and a half year period the pattern of official telework arrangements was developed at Siemens companies and action research was made by the TFC -project organisation.

At Siemens companies the aims of the research and develop project were to find out:
- how the telework affects on client services
- how telework affects on job satisfaction and the quality of work
- does the productivity increase when applying telework
- how the telework fits to team organisation

2 TELWEWORK IN PRACTICE

The Siemens companies concrete motives to develop new ways of working were to find out if it is possible to reduce office costs by teleworking and to apply telework as a part of personnel policy. Also the development of IT practices was important motive for companies which operate on that sector. About 30 persons from different business units started to apply part-time telework and the principles of telework were formed at the enterprise level.

The definition and principles of telework at Siemens companies:

Telework is working which happen partly or full timely outside from employers premises. The teleworker and employer make an contract about the place of work and other principles of teleworking and the employee works on a permanent base.

The organisation has official attitude to following items on the company´s personnel guide. These items constitute basis for principles of telework

- definition of telework
- agreement about the usage of telework
- working hours

- the amount of work
- salary
- vacations
- discussions on targets and special "starting discussion" for teleworkers
- tools for teleworking and use of them
- ergonomics
- insurance
- health care
- visits to office
- payments (for instance telephone bills and travelling costs)

The concrete stages of process at Siemens:
- nomination of the advisory board for the development project
- continuing the formation of telework principles at the company
- preparing the models of telework contract and the equipment form
- announcement about possibility to start teleworking for the personnel
- nomination of the technical support person
- selection of teleworkers by the project manager at Siemens
- applying telework in practice was delayed because the technical reasons (preparing the user interface with ISDN connection took more time than assumed)
- after four months delay the first new teleworkers started applying telework and after three more months the rest of chosen teleworkers started part-time teleworking
- Gradually, more employees started applying part-time telework on their job

The pilot project had created good basis for the further telework development. Even the suspicious attitudes towards the new way of working had started to soften. Nominating advisory board for telework, the creation of telework contract model and introducing and adoption of the equipment form were the ways to create company´s official telework scheme. The selection of teleworkers was made on two branches and it was not systematic on the entire company level.

Two technical support persons were nominated (one in each company), but one of them evaded his responsibility. In general, the support and maintenance of telework´s technical issues did not belong specially to anybody at the companies. Checking the commitment of technical support person is essential for functioning telework implementation and above all, enclosing supervising task for somebody´s job description. Implementation of telework was delayed even the companies´ communication culture sustain the use of electronic mail. Workers were also used to use IT and to take initiatives and responsibilities for their own work. On the companies there were no existing rules or schemes for practical aspects concerning to the very first stages of telework implementation and no special training was organised for the teleworkers.

3 TELEWORKERS

17 teleworkers were interviewed during the project so that 9 of them were interviewed twice (on springtime -97 and on autumn -97). Two of them had taken part to the pilot project in the 1995. There were found three telework models among the teleworkers interviewed:

Model A
- places were working occur: at the office or at the clients premises or at home
- the nature of work: for example a salesman or an expert who works with software
- applied telework: working in all three places in mixed form. The most efficient workplace is at the clients premises, the second efficient is at home with the connection to companies network by ISDN -line. The working place varies in terms of work projects. The reasons for coming to office are bringing paper post or clerical material, meetings and associating with colleagues. Worker spends only little time at the office.

Model B
- places were working occur: at the office or at home
- the nature of work: the large amount of autonomy at work and in generally the work where the results are more important than being at the office. (For example, person who edits company´s publications and person who calculate offers about installation work for the clients)
- applied telework: the amount of working days at home varies so that one work 3-4 days per week at home and other work only on evenings to lengthen working day. Worker has a possibility to connect to company´s network from home by ISDN -line. Prolonging of working day at home, after the work day at the office, was fairly popular way of teleworking. Teleworkers who works whole days at home prefer 1-2 days working at home per week. Minority of teleworkers works 3-4 days per week at home.

Model C
- places were working occur: theoretically, any place and any country where worker happened to be. In practice, at home, at the office or employer´s premises aboard, or during travelling.
- the nature of work: a member of international virtual team who applies IT technology at his work and who works at the international projects.

The greatest part of teleworkers worked according to model B. Anyhow, there was variation between teleworkers on that group. For teleworkers working according to model A, telework was the only reasonable way to organise working. The members of international virtual teams were the most rare, but there were a few of them among interviewed teleworkers.

There were variation on teleworkers´ job descriptions and on their work tasks. Some of them were software planners and some worked with administrative tasks. The mobile teleworkers, who teleworked according to model A, were salesmen and workers from the client support services. In general teleworkers were used to work with information and communication technology and they were real information workers even before teleworking.

4. IMPACTS OF TELEWORK

4.1. At the individual level

Generally, adaptation of telework was very positive thing for the employee. Part-time telework appeared to increase the significance of the work as well as job satisfaction. Several teleworkers reported that efficiency of working increased while teleworking. Teleworkers experienced the new way of working as an advantage. Flexibility on working hours provides possibilities to schedule the work on the basis of personal criteria and the peaceful place of work offer better possibilities to concentrate on working. In general, telework provides better possibilities to combine work and private life and to control one`s own job. Telework is also one way for professional development at least with the items concerning usage of IT. Possibility to use Internet at home often increase the time used for fetching information through world wide web. The negative aspects of telework were according to interviewed the difficulties to distinguish between working hours and leisure time and the absence of support, with IT problems as well as general support at the new situation.

25 teleworkers answered to enquiry which originate in the work of professor Topr Guimares, Tenness Technical University, USA. There were also enquiry for the teleworkers´ superiors and six superiors answered on that. In addition to increased job satisfaction there seems to be tendency that amount of work is greater at home than at the office. On the following tables there are some results from the enquiry.

Please rate the effect you believe this telecommuting project has had on the following characteristics of your job.

	Decreased	No Change	Increased
Importance of job	1	23	1
Amount of work required on job	**1**	**11**	**13**
Accuracy demanded from job	-	19	6
Skill needed to do the job	-	18	7
Job appeal	**-**	**6**	**19**
Feedback on job performance	5	20	-
Freedom in how to do job	7	17	1
Opportunity for advancement	3	17	5
Job security	1	19	5
Relationships with fellow employees	7	17	1
Job satisfaction	**3**	**3**	**19**

Feedback on job performance and relationships with the fellow employees seems to be issues which could decrease on telework situation.

The following items assess your personal satisfaction and attitude towards your organization`s telecommuting program. Using the scale below, please ondicate your level of agreement with each.

	Disagree	Uncertain	Agree
I see telecommuting as vital to organization´s survival	10	7	8
As a result of telecommuting, I am seen as more valuable in this organization	14	9	2
I personally benefitted from telecommuting effort	**2**	**1**	**22**
Telecommuting has been proven extremely successful	**1**	**3**	**21**
As a result of telecommuting, the speed at which processes are being performed has greatly in-creased	8	7	10
Telecommuting has greatly increased effective utilization of organization resources	7	5	13
Telecommuting has improved the overall efficiency of our organization	6	8	11
Telecommuting has improved our organization work environment	9	9	7

The fact that telework were experienced as an advantage could also be seen on that table. Teleworkers answered on a great extent that they have personally benefitted from tele-work.

4.2 At the working team level

Implementation of telework has effects on working methods. Teleworking can for example promote the adoption of new tools. At Siemens one team begun to use new groupware and the working of all team members, the teleworkers and the others, improved. The character of work can alter so, that teleworker is more on-line stage than the worker at the office. Peaceful environment at home and possibility to concentrate sustain that effect. The time when clients and fellow workers can reach teleworker is often longer at home than at the office. Many teleworkers read e-mails also on the evenings and reply directly after reading them. This is one issue which improve client service.

Very often telework requires some kind of reorganisation of work. For example, teleworker has no secretarial services available at home and he has to arrange the adequate office equipment at home. Anyhow, the most important part of reorganisation concern the whole work group. The team members need to make an agreement about times when teleworkers could be reached by phone and point of joint meetings. Part-time telework requires also flexible shifting between autonomous working at home and co-operative working at the office.

4.3 At the organisational level

According to interviews and inquiries telework was an advantage to the employee, but it was not easy to show the influence of telework on business activities. Obviously, the efficiency of the work is a result of the adaptation of telework, but its measurement in terms of money was not done as a whole. Clarifying of costs was initiated by collecting details on hardware and telecommunication costs. [1] Two years period for development and research project is fairly short time. This explains partly the lack of the final calculations about the costs and incomes of telework. On the beginning there is the hardware and installation costs and in general, it is more difficult to count the benefits of telework in terms of money than the costs of it.

In practise, limiting the amount of teleworkers is almost the only used way to control telework. At organisational level the limiting of the amount of teleworkers is rational action if there is no exact information about the costs and incomes of telework. Large number of teleworkers will also lead to the situation where the organisation is forced to make opinions about the wide principles of working and the values behind all functioning. Adaptation of telework is often unofficial way of working which is related to confidence between the teleworker and his superior. Superiors ability and willingness to admit responsibility for consequences of telework are among the issues which determine the amount of telework in organisation. The role of superiors will also change on telework situation. If the superior was before as a distributor of information his role in a new situation will be more as a creator of possibilities.

Large number of teleworkers will also increase the telecommunication costs. At Siemens companies the employer pays hardware and telecommunication costs and the employer follow the principle that the teleworker should have an equal hardware to conditions at the office. Even the cost are not high comparing to the whole scale of companies costs, the double cost of hardware on the situation when the employee has working tools at the office and at home, will result considerable costs if there is hundreds of teleworkers. The use of office premises was traditional at Siemens companies during the telework project and several teleworkers worked with two personal computers, one at the office and another at the home.

Inflexible information management could limit spreading of telework on organisation. Adaptation of telework requires flexibility for the information management system. For example, remote access to company`s network is a threat for system security and often teleworker needs individual user interface. In general, individual needs are emphasized in telework situation and whole information system is considered more on individualistic viewpoint than in normal office working situation.

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[1] Average telecommunication costs for one teleworker per month at Siemens were 100 - 500 FIM and at Siemens Nixdorf 600 - 1500 FIM. They used more long distance connections at Siemens Nixdorf than at Siemens.

When benefits of telework can not be shown concretely in terms of money at organisational level, confidence and trust on teleworker´s abilities are emphasized and telework can be seen as a part of humanistic way to manage. Anyhow, there can be seen some contradiction between the humanistic viewpoint and the business viewpoint which both are needed on telework situation. Adaptation of telework can create new possibilities for linking humanistic viewpoints and business viewpoints together.

Six managers involved to telework project answered to enquiry. Their answers for the one question are shown on the following table.

For each item below, please rate the impact telecommuting changes may have had on your organization.

	Not at all	Moderate extent	Greta extent
Sales growth rate	6	-	-
Market share	6	-	-
Operating profits	6	-	-
Rates of profits to sales	6	-	-
Cash flow from operation	4	2	-
New product development	4	2	
New market development	4	2	
R&D activities	5	1	
Personnel development	2	1	3
Political/public affairs	5	1	

Telework was seen as a part of personnel development and there was reported hardly any impacts on organisations strategic functioning.

Telework project was a kind of experimentation with about 30 teleworkers and the time period was fairly short in order to have some visible changes at the companies business activities level. The problems with the measurement of impacts and the incomes of telework, are also reasons for missing information about consequences of telework implementation at the business activities level. The incomes of telework are often more qualitative by their nature than the costs of it. Increased job satisfaction and the quality of outcomes of work are examples of that. However, the adaptation of telework had effects on corporate culture. Gradually, the corporate culture will change when the employees and their superiors are going to have subjective experiences about telework.

5.CONCLUSIONS

Team working was not a hinder for teleworking at Siemens companies. As the interviewed teleworker mentioned, the idea of teamwork is not to be face to face all the time. Adaptation of telework demands joint action for the entire working group for reorganising working methods and the role of interaction skills may be emphasized on a new situation. Anyhow, telework offers new opportunities for world wide co-operation between experts.

There were signs of the positive effects of telework on customer services and on the teleworker´s efficiency at work. However, it is hard to draw conclusions of the productivity at the whole enterprise level. It would be interesting aim for further examinations to investigate where the effects of efficiency are directed. Roughly the effects can be directed to the quality of telworker`s life or to the productivity of the company. Probably, the truth lies somewhere between these two extremes.

One result from the whole TFC -project is that telework is often unofficial and spreads slowly on the organisations. This was situation also at Siemens companies. Even there were appropriate communication culture for teleworking the applying telework was delayed. Obtaining all the equipment required and installing them took much more time than planned. Packing the IT for a suitable packages for teleworkers is one issue which can create difficulties at the beginning. Even the company´s aim was to create official telework scheme, there was increase in the amount of unofficial (without telework contract) teleworkers.

There is always a kind of unofficial strand on telework. The individual needs of teleworkers concerning the user interface and the organising of one´s own work on the basis of personal criteria, are examples of that. At the organisational level there is some obstacles for telework. When telework is unofficial functioning it does not crash into them as easy as when telework is more official issue at the organisation.

According to TFC -research, the traditional ways of functioning and the lack of willingness to change them, are the obstacles of telework at the organisation. At recent times the telework is applied at the organisations among the old structures. Companies do have needs to control information and information systems at recent times when the information has an increasing importance on enterprises functioning, but it exist the technical solutions for the security. Corporate culture have an essential importance for the adaptation of new ways of working. Telework provides a kind of open and modern corporate culture, but it also brings some cultural change with itself.

Reorganisation of work provides joint action especially at the working team level. Taking care over the cohesion of work community is one challenge including to adaptation of telework. Teleworkers` commitment to the company and it´s values is also one essential issue at the telework situation. Adaptation of telework creates a new challenge for company`s management to combine individual and company`s benefits and needs. There is a gap between the benefits of telework at the individual level and at the organisational level. The challenge for the development and the research at the area of telework will be to find tools for diminishing that gap.

Anyhow, the development process at Siemens companies shows that long-term development action together with the organisation´s resources and external expertise do have an effect on increasing the implementation of new ways of working. Siemens companies

have a general plan of teleworking for the current year and the development of new ways of working will continue at the organisation. Telework has also become as a part of organisation`s normal functioning.

Applying telework systematically in an organisation demands joint investments and a joint vision about the meaning of the development process and its goals. In practice, the organisation need to determine the meaning of telework and to make a new definition about work and working. When applying new ways of working, the roles are changing and the determination between individual and common responsibility is a central thing. Autonomy, activity and ability to communicate are the requirements focused on the employees and on their superiors in a new situation. It also demands a variety of skills from both groups. The development of new ways of working should be a part of a general development, during which all the members of the organisation learn new ways to communicate and to work. The "learning organisation" is a suitable term for such an organisation.

Management Considerations in an In-house Pilot
at a Major Japanese Power Utility

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Abstract

Since the fall of 1997, a major Japanese power utility began preparations for an in-house telework pilot for its head-office staff. The pilot is three-phase, covering a period of three years, actual telework commencing in May 1998, and combining both office-based and home-based telework applications.

This paper documents the steps followed in the pilot preparation phase up to an including actual pilot implementation. It attempts to highlight any unique Japanese management considerations which came to light in that process as well as examples of universal best practice. A particular focus will be the implications of general Japanese management practices as a determinant of the design and success or otherwise of corporate telework programs in Japan.

1. Introduction

Corporate interest in the application of telework in Japan dates from the late 1980's when, at the height of its economic bubble, a series of so-called satellite offices were established mainly in the Greater Tokyo area (Tokyo Metropolitan and the neighbouring prefectures of Chiba, Kanagawa and Saitama). A lack of rigorous evaluation procedures combined with the demise of the bubble saw many of these early telework pilots abandoned or substantially curtailed.

Since 1995, however, renewed interest in flexible workstyles, including telework, has been triggered by a number of factors. First is the computer boom Japan has been experiencing as evidenced by the sharp increase in computer shipments to both companies and individuals, 1995 registering a 70% increase on 1994; 1996 a 26% increase on 1995; and 1997 a 1% drop on 1996 as the recession began to bite (Japan Electronic Industry Development Association figures). Sustained media coverage on Windows 95, the Internet, the World Wide Web along with government sponsored multi-media projects have all contributed to growing corporate interest in the business/management implications of the "Information Age", as has the prolonged economic recession and increasingly robust global competition.

Government sponsored research groups have attempted to clarify the practical and legal

issues involved in a widespread adoption of telework, the Ministry of Posts & Telecommunications (MPT) and the Ministry of Labor (MOL) taking the lead in their jointly sponsored Telework Promotions Council. The MPT is particularly keen to include telework in its policy arsenal, establishing a subsidy fund for regional telework centres, conducting research on the environmental benefits of wide scale telework for the Kyoto COP3 meeting, and conducting its own in-house pilot. There are also moves afoot to introduce legislation offering tax breaks for companies introducing a telework work option.

It is against this backdrop that a major Japanese power utility began to consider implementing its own in-house telework pilot in 1997. As with all such organizations in Japan, the Utility operates a regional monopoly and in terms of business approach is more akin to a public sector organization that a private-sector company. In other words, sheltered from competition and strongly aware of the public nature of the service it provides, the Utility is inherently conservative in its organizational structure and personnel management.

What, then, would motivate such a conservative organization, which does not even offer flextime as a work arrangement, to embark upon a telework pilot? The answer is threefold. First is the general malaise experienced by Japanese management across the board. This can be summed up as a sense that current business paradigms, including employment, need to be changed, but a lack of certainty as to which direction those changes should take. Amid rapid computerization, demographic shifts, changing worker attitudes and the prolonged recession, the Utility in question is no exception, the telework pilot being deemed one means of creating a "21st Century workplace".

The second motivation is a planned move to new headquarters in a few years time. The Utility wished to experiment with new workstyles and office environments before committing to a final floor plan. And thirdly, the Utility in question is facing deregulation in its industry, which would open it up to competition for the first time. The telework pilot is, therefore, positioned as an attempt to use information and communications technology (ICT) to reform existing business procedures as well as to improve individual and overall worker effectiveness.

2. Pilot Outline
2.1 Goals
Major aims of the program are to explore the feasibility of flexible workstyles, with a particular emphasis on fostering more self-disciplined, autonomous workers and improving overall work effectiveness. More specifically, these are articulated in the concept book created for the pilot as per Chart 2-1-1.

Chart 2-1-1
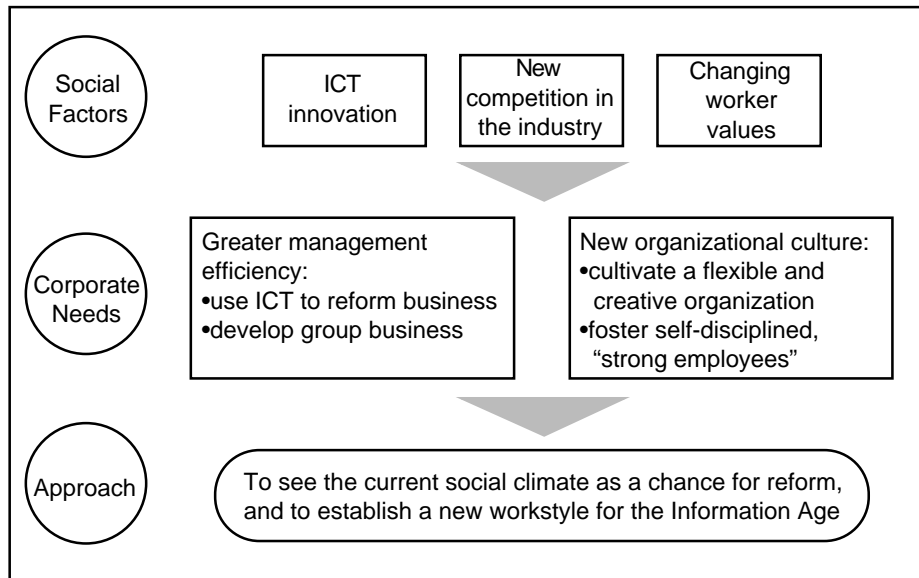
The office design project was expected to provide experimental workspaces, which would be non-territorial and provide distinct spatial and visual environments for different types of creative working: intensive solo work, informal meetings, team work and so on. Its brief also included a requirement for ecologically sound design, which led to the use of recycled materials in certain sections of the office facility.
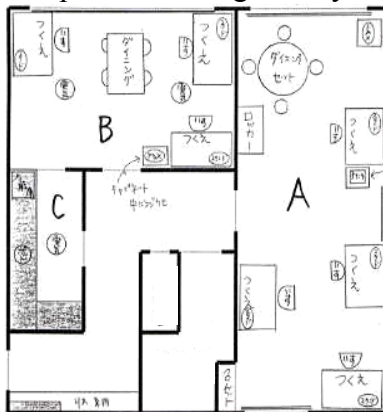
2.2 Pilot Specifications
The pilot is three-phase, each phase covering a one-year period, actual telework commencing in May 1998. The pilot combines both office-based and home-based telework. The office-based segment comprises a conventional alternative office arrangement in a hi-tech research park as well as the innovative conversion of two apartments in the Utility's staff accommodation complexes. Floorplans are provided in Chart 2-2-1. Approximately 80 full-time employees are expected to participate as either home-based or alternative office-based teleworkers, the actual number of participants at the pilot's start totaling 59 (see Table 2-2-1). Workers are expected to telework at least one day a week and to cooperate with surveys and interviews for the pilot.

Chart 2-2-1

State-of-the-art satellite office
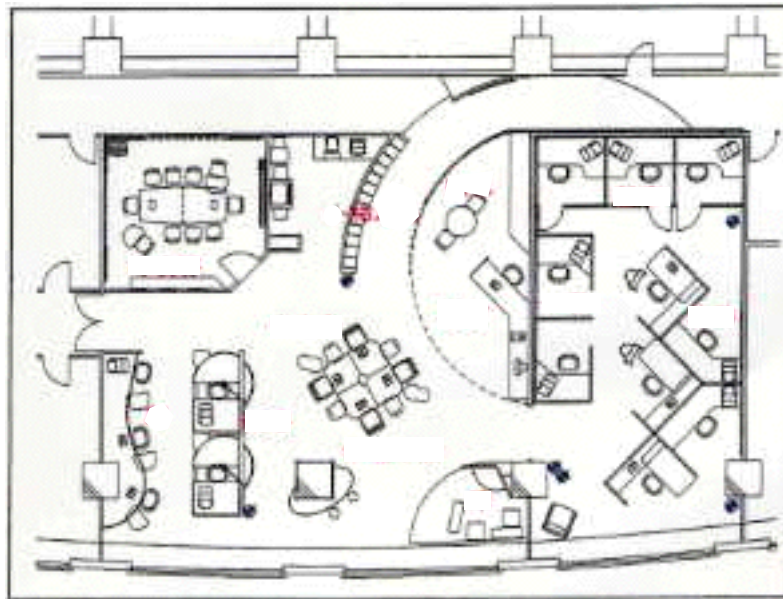
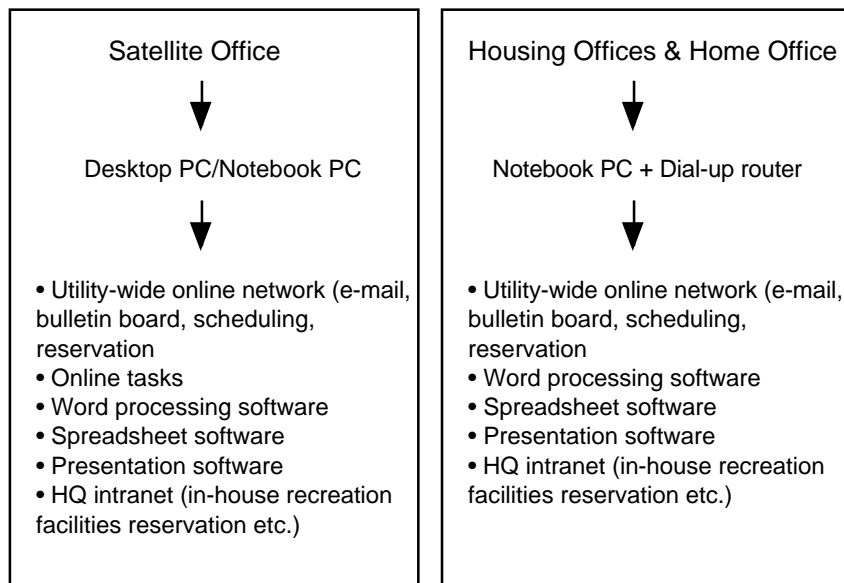Corporate housing facility A   Corporate housing facility B

Table 2-2-1

	Office-Based Pilot		Home-Based Pilot
Facility	satellite office	corporate housing A+B	individual worker homes
Capacity	20	A=7 B=3	n.a.
No.	50 (34 as of 5/98)	30 (corporate housing A & B: 7 x 2; home-based 12)	
Eligibility	Full-time headquarters staff/research institute staff		
Duration	4/1998 - 3/2000		
Frequency	At least one day a week		

The satellite office is linked to headquarters via a Local Area Network, providing al-

most seamless access to the utility-wide host online system and the headquarters intranet. The corporate housing facilities and home-based workers are linked by a combination of commercial ISDN lines and PHS mobile phones, which give them access to the headquarters intranet network bulletin boards and e-mail, but only to part of the utility-wide host online service. In addition to the mobile phone, home-based workers have further been provided with a dedicated fax line. Notebook computers are checked out from headquarters as the need arises.
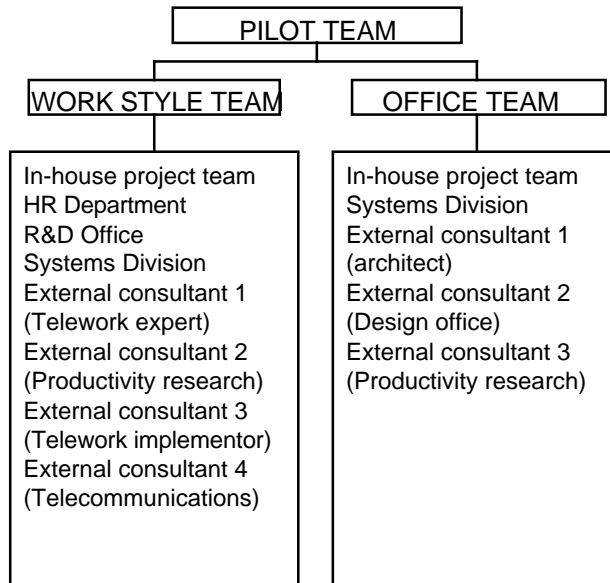
Chart 2-2-2

Satellite Office	Housing Offices & Home Office
↓	↓
Desktop PC/Notebook PC	Notebook PC + Dial-up router
↓	↓
• Utility-wide online network (e-mail, bulletin board, scheduling, reservation • Online tasks • Word processing software • Spreadsheet software • Presentation software • HQ intranet (in-house recreation facilities reservation etc.)	• Utility-wide online network (e-mail, bulletin board, scheduling, reservation • Word processing software • Spreadsheet software • Presentation software • HQ intranet (in-house recreation facilities reservation etc.)

2.3 Implementation Structure

An in-house team was set up to manage the pilot's implementation and housed in the project section responsible for overseeing the construction of the new headquarters. Due to the twin objectives of office design and workstyle reform, members were divided into two discrete teams according to expertise and organizational responsibilities, although some overlap occurred. Chart 2-3-1 outlines the various members. As can be seen, external consultants were brought in to cooperate with the in-house team members. The office team, responsible for designing the satellite office and converting the two apartments involved, was led mainly be external members, major input from the Utility covering budget and IT configurations. In contrast, the workstyle team had extensive representation from officers in the human resources department, the R&D arm and the systems division. In addition, a wide array of consultants were included, an aspect which will be discussed in a later section.

Chart 2-3-1

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                    ┌──────────────────┐
                    │   PILOT TEAM     │
                    └──────────────────┘
          ┌──────────────────┐    ┌──────────────────┐
          │ WORK STYLE TEAM  │    │   OFFICE TEAM    │
          └──────────────────┘    └──────────────────┘
   ┌────────────────────────┐  ┌────────────────────────┐
   │ In-house project team  │  │ In-house project team  │
   │ HR Department          │  │ Systems Division       │
   │ R&D Office             │  │ External consultant 1  │
   │ Systems Division       │  │ (architect)            │
   │ External consultant 1  │  │ External consultant 2  │
   │ (Telework expert)      │  │ (Design office)        │
   │ External consultant 2  │  │ External consultant 3  │
   │ (Productivity research)│  │ (Productivity research)│
   │ External consultant 3  │  │                        │
   │ (Telework implementor) │  │                        │
   │ External consultant 4  │  │                        │
   │ (Telecommunications)   │  │                        │
   └────────────────────────┘  └────────────────────────┘
```

An abridged implementation schedule can be found in Table 2-3-1, the initial joint team meeting taking place in June 1997. Regular meetings were held thereafter by each team, with occasional joint meetings to inform the other of their respective progress. By December 1997 the plans for both the office portion and the workstyle pilot were in place, and were subsequently approved by the Utility's top executive in January 1998. A call for participation, selection and training were conducted between February and April, participants being guided around their telework facilities in the week prior to actual commencement. The pilot itself started in the last week of May, timed to coincide with the MPT's third Telework Day, a promotional event conducted every six months to raise awareness of telework.

Table 2-3-1

6/97:	First pilot team meeting
/	
/	creating pilot framework
/	Pilot plans finalized President's
12/97:	approval
1/98:	Call for participation
2/98:	Selection
3/98:	Notification of selection; training
4/98:	workshops (worker, supervisor)
5/98:	Site explanations; pilot start

Participation was open to all staff at headquarters and the in-house research institute. In order to streamline the screening process, all candidates were required to submit an application form including written approval from their direct supervisor. In a few cases

where such approval was not forthcoming, the in-house project team approached the supervisor to ascertain the reasons for opposition, this process succeeding in persuading several supervisors to change their position.

In addition to the aforementioned concept book, which was used in executive presentations, general guidelines and an ICT rule book for the telework pilot were issued to each participant and supervisor. The guidebook provided a definition of telework; the pilot background; pilot specifications; work rules; ICT platform; security and other considerations; pilot operation methods; expense procedures; facility rules for each site; and pilot support desk contacts. The ICT rule book outlined the information telecommunications environment for both office-based and home-based teleworkers; help desk contact numbers; the level of ICT service provided; user support; an operations manual for the telework reservations system (by facility and booth); an operations manual for electronic posting of work reports; and an operations manual for the telework salon system (chat room for teleworkers). It was decided that a corporate telework policy and formal telework agreement were not required, a decision that will be discussed later.

2.4 Data Gathering

In order to avoid the mistakes of earlier Japanese telework pilots, it was decided at a very early date that clear evaluation criteria needed to be set and a series of rigorous data collection be carried out at set intervals in order to assess the success or otherwise of the pilot. This was especially crucial for the workstyle team, debate spanning several months. It was quickly decided that pre-pilot, mid-pilot and post-pilot information gathering was required and that workers, direct supervisors and co-workers should be included in any framework. The difficulty lay in determining what criteria should be used to evaluate workstyle changes.

The criteria finally adopted for the pilot evaluation were conceptually underpinned by the five pilot goals provided in Table 2-4-1, with especial emphasis on the first three assumptions.
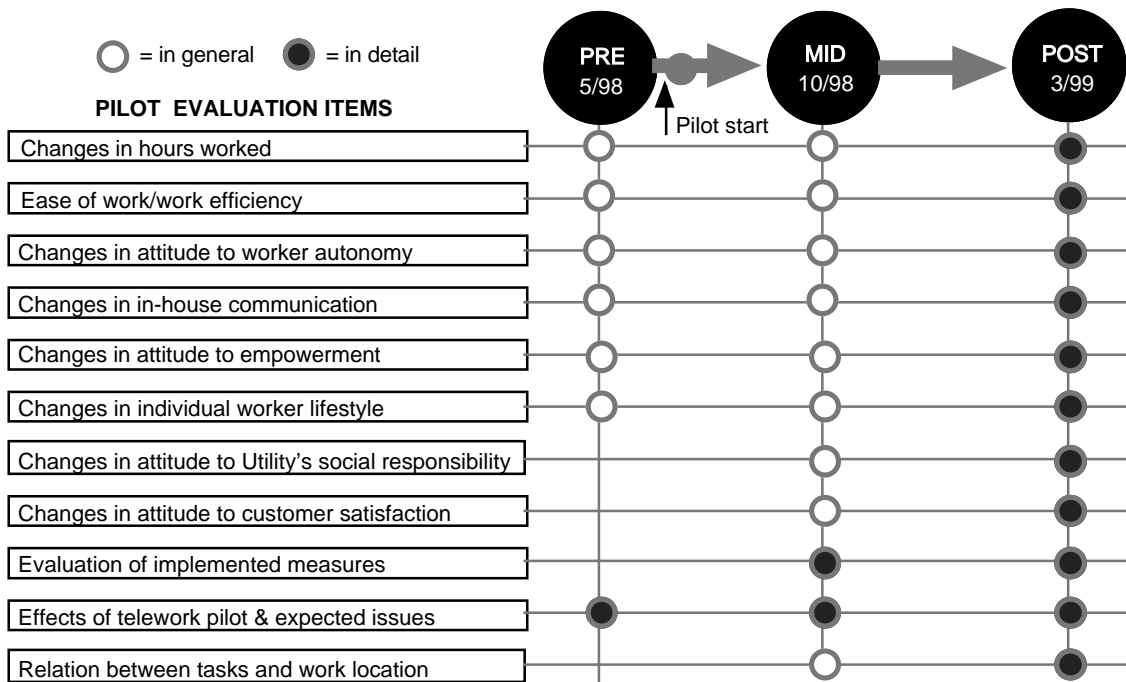
Table 2-4-1

Assumption 1 Result Aims:	Telework is an effective measure for raising white-collar productivity. (1) The introduction of telework will be effective in raising the work efficiency of employees involved in the pilot. (2) The introduction of telework will be effective in raising intellectual productivity (creative opportunities) of employees involved in the pilot.
Assumption 2 Result Aims:	Telework is an effective measure for fostering a flexible but resilient corporate culture. (1) The introduction of telework will promote self-discipline and flexible behaviour from employees involved in the pilot. (2) The introduction of telework will be effective in promoting greater empowerment (flatter decision-making processes) of employees involved in the pilot.
Assumption 3 Result Aims:	Telework is an effective measure for creating the most appropriate balance between the lifestyle and work commitments of individual workers. (1) The introduction of telework will increase the discretionary hours of employees involved in the pilot. (2) This increase in discretionary hours will have a positive impact on the individual quality of life (family and community interaction, self-improvement, pastimes, etc.) of employees involved in the pilot.

Assumption 4 Result Aims:	Telework is an effective measure for lowering the environmental burden of corporate activity as well as for corporate risk management. (1) The introduction of telework will be effective in lowering energy burdens associated with physical movement. (2) The introduction of telework will be effective in decentralizing risk in times of emergency and natural disaster. (3) The introduction of telework will be effective in raising employee awareness of energy consumption.
Assumption 5 Result Aims:	Telework is an effective measure for improving customer satisfaction with the Utility's business activities. (1) The introduction of telework will be effective in raising employee awareness of customer and market needs through their greater commitment to their local communities. (2) The introduction of telework will be effective in raising the quality of customer service (less customer waiting time, etc.) in specific business areas.

These aims were then reduced into a series of evaluation items, outlined in Chart 2-4-1, which were to be assessed at varying levels of enquiry at set stages throughout the first year of the pilot. The results gained therefrom would then be incorporated into the evaluation framework for Year 2 and so on. Of the eleven specific evaluation items, the first two items, namely "changes in hours worked" and "ease of work/work efficiency", are targeted at Assumption 1 (productivity) in Table 2-4-1; "changes in attitude to worker autonomy", "changes in in-house communication" and "changes in attitude to empowerment" at Assumption 2 (flexibility); "changes in individual worker lifestyle" at Assumption 3 (lifestyle); "changes in attitude to the Utility's social responsibility" at Assumption 4 (environment/risk management); "changes in attitude to customer satisfaction" at Assumption 5 (customer satisfaction); and the remaining "evaluation of implemented measures", "effects of the telework pilot and expected issues", and "relation between tasks and work location" being included as overall evaluation items.

Chart 2-4-1

PILOT EVALUATION ITEMS	PRE 5/98	MID 10/98	POST 3/99
○ = in general ● = in detail			
Changes in hours worked	○	○	●
Ease of work/work efficiency	○	○	●
Changes in attitude to worker autonomy	○	○	●
Changes in in-house communication	○	○	●
Changes in attitude to empowerment	○	○	●
Changes in individual worker lifestyle	○	○	●
Changes in attitude to Utility's social responsibility		○	●
Changes in attitude to customer satisfaction		○	●
Evaluation of implemented measures		●	●
Effects of telework pilot & expected issues	●	●	●
Relation between tasks and work location		○	●

Pilot start

Regarding the inclusion of "changes in in-house communication" in Assumption 2 (flexibility) as opposed to Assumption 1 (productivity), it was decided that although changes in communication would have a considerable impact on work efficiency, it would be more pertinent in light of the pilot's overarching aim of examining potential new workstyles to bracket changes in communication as an indicator of the degree of worker empowerment. It should also be pointed out that both Assumptions 4 (environment and risk management) and 5 (customer satisfaction) were set as long-term objectives, the consensus being to focus on changes in workstyle and lifestyle in the initial phase of the pilot. As such, the Utility has decided that evaluation of telework's impact on risk management will only be incorporated in the final stages of the pilot when and if the telework pilot has proved itself to be viable option. Likewise, the Utility's stance is that improving customer satisfaction will only become viable when and if the pilot is expanded to include not only headquarters staff, but workers in the field. Accordingly, emphasis on this aspect of the evaluation framework has been kept intentionally low-key.

Regarding the nature of the work sheets each participant would be required to fill out electronically, it was decided to group such activities around three conceptual clusters: thinking, handling, and moving. The external members came up with an initial list of activities grouped into six basic areas, which was then modified by the in-house team to better reflect the work characteristics of the Utility (see Table 2-4-2).

The pre-pilot survey issued to teleworkers, their direct supervisors and co-workers, was kept intentionally brief and focused on the pilot's expected impacts and challenges to existing workstyles. The surveys were further designed to maintain integrity with the

mid- and post-pilot (Phase 1) surveys. This was achieved by drawing up a detailed plan of the evaluation items which would be required in the post-pilot (Phase 1) survey, then "back-designing" the mid-pilot survey, then pre-pilot survey. Items were also included covering ICT platforms and office satisfaction at the request of the systems division and the office team. Results from the pre-pilot survey were not available at the time of writing.

3. Issues

Issues which arose in the preparatory phase can be divided into those pertaining to general approach, management ethos, and cultural considerations. Looking first at general approach issues, the Utility decided at an early stage that it would need external advice in order to successfully implement its pilot, a decision in keeping with telework best practice. As is clear from Chart 2-3-1, however, the Utility seems to have erred on the side of over-presence of consultants, especially in the workstyle team, where no less than four external consultants were involved: a telework expert, a productivity research company, a telework implementor, and a telecommunications consultant. With the exception of the latter, the telecommunications consultant, the Utility failed to delineate clearly the respective roles of the consultants, which resulted in considerable confusion and poor task coordination. There also seems to have existed on the Utility's side an expectation that the consultants would not only create the workstyle experimental framework, but also forge the in-house consensus thereon. The former was an unrealistic expectation given the need to tailor specifications to the Utility's specific organizational structure and tasks performed therein, as was the latter given that the initial impetus came from within the Utility itself and that the external parties did not have the requisite knowledge of respective in-house power centres to meld consensus.

Table 2-4-2

External Draft	In-house Modified
1. Thinking • Information search/compilation • Plan proposals • Creating hypotheses/ideas • Debate/problem-solving meetings • Organizing meeting outcomes • Other	1. Thinking/Conveying • Information search/compilation • Contemplating/creating ideas • Plan proposals • Compiling reports/minutes • Compiling explanatory material • Giving explanations/presentations
2. Conveying ideas • Creating reports • Preparing/uploading information to home pages, magazines etc. • Preparing/holding negotiations/presentations • Information exchange at conferences • Other	2. Routine Work • Processing forms/files • Data input/spreadsheet calculations • Copy proofing/word processing
3. Handling tasks with clear procedures/outcomes • Compiling daily/monthly worksheets • Processing forms • Information conveying meetings • Spreadsheet calculations • Other	3. Meetings • Problem-solving meetings • Decision-making meetings • Information conveying meetings
4. Organizing job environment • Maintaining ICT equipment	4. E-mail & Electronic Bulletin Board Tasks • Receiving/sending e-mail • Reading the bulletin board • Posting information on bulletin board

• Learning to use equipment/applications
• Organizing/tidying work environment
• Telework preparation/reservation
• Other
5. Moving
  • On-site movement
  • Travel to partner/client offices
  • Other
6. Other
  • Breaks
  • Meals
  • Photocopying etc.
  • Ticket purchasing/hotel reservation
  • Other
	5. Other
	  • Filing/document organizing
	  • Dealing with IT equipment trouble
	  • Photocopying, bookbinding, sorting, mailing
	  • Undergoing education/training
	  • Dealing with customers
	  • Travel (time physically on the move)
	  • Other

On the other hand, coordination between in-house and external members also left something to be desired. One example of trouble which emerged pertained to the timing of selection and pilot commencement. Bearing in mind the Utility's desire for a May 1998 start, application, screening and training were scheduled for February to April. In subsequent discussions with the in-house project team, however, it emerged that, as with many Japanese corporations adhering to regular job rotation, June was the season for such in-house transfers. This meant there was a risk that after selecting and training workers they might be transferred to another division, thereby invalidating their supervisor's approval. The in-house team, including members from the human resources department responsible for determining these transfers, were adamant that they could screen out any workers likely to be transferred, but external members were left wondering what other surprises lay in store. Shortly thereafter, when attempting to determine the long-term survey schedule to match participants' growing familiarity with telework, it became apparent that any interim data needed to be gathered and analyzed for its impact on the next phase of the pilot by October, the deadline for in-house budget requests for the following financial year.

This issue of general approach would suggest that it is by no means sufficient to bring in external expertise for first-time telework implementation. It is crucial that the efforts between external and internal members be coordinated, that clear roles are defined and that information on the organization in question's annual calendar of events, including personnel transfers, budgeting, vacation peaks, etc., be provided up-front to facilitate establishing a telework pilot calendar which compliments the existing timetable. Moreover, one should be wary of what might be termed "consultant overkill".

3.1 Management Ethos
Like many quasi-public organizations, the Utility is inherently conservative in its management stance. Its work force is predominantly male with female employees filling clerical support positions. With the exception of workers in plant facilities, who may work shifts, no flexible work arrangements are available at headquarters, not even flexible work hours. The lack of flextime is considered to act as a potential constraint on the benefits which might accrue from the telework pilot, especially in terms of fostering a more creative work environment. The lack of discretionary work positions, a category which is exempt from the Japanese Labor Standards Law requirement to track specific work hours, is a further constraint on innovative practices by individual workers. These

two factors are reflected in the work rules laid down by the human resources department for the pilot (see Table 3-1-1), which permits individual workers no leeway in scheduling work hours and also requires daily reports on the same. One innovation, however, is promoting the use of the in-house e-mail network to submit these reports. Nevertheless, the lack of flexibility in the pilot parameters remains a serious concern, but, at the same time, provides an interesting test case in that any productivity, efficiency or creativity gains cannot be attributed to the introduction of more flexible time schedules.

Table 3-1-1

Office standing:	Satellite and home offices deemed to be official enterprise sites.
Work standing:	Telework deemed to be "normal work".
Work hours, holidays etc.	Normal worker regulations apply. o Fixed work hours = 08:50 - 17:30 o Break = 12:00 - 13:00 o Fixed days off conform to the normal, regular days off. o Overtime work is possible (contingent on supervisor approval) o For the time being, work on days off not permitted.
Work schedule:	Telework day to be scheduled on Notes DB the preceding week, formal application and supervisor approval by the preceding day.
Work hour tracking:	Tracking via e-mail o Start and end of work hours to be reported. o Start and end of overtime work to be reported. o Start and end of any non-work period to be reported.
Performance tracking:	Tracking via e-mail o Work progress reports to be compiled. o Approval for absences from the office required.

Another issue which emerged in the preparatory phases was the subtle but persistent resistance demonstrated by the human resources department. Despite the clear in-house brief that the telework pilot was to test new workstyles and office environments, the HR department was extremely negative about too radical a departure from the status quo, especially as concerns worker evaluation yardsticks. The cynical explanation here would be that the HR department, which is in charge of evaluation and promotion structures, did not look favorably on the prospect of overhauling its current systems, and wielded its expertise in the area of labour legislation and interpretation of in-house rules to water down attempts to introduce both quantitative and qualitative evaluation standards. At one stage, it even voiced an objection to the very term "workstyle", preferring "ways of working". In this case, as in several others, the rationale for resistance was that such terminology might aggravate the union, a situation which was to be avoided at all costs. This relationship between the HR department and the union will be explored below, but it is, nevertheless, unfortunate that no union representation was included in the implementation team. Inclusion of such representation would have provided a clear and open forum for discussion of issues of union concern and prevented the HR department from acting as sole spokesperson for this constituency. It is also unfortunate that no other in-house group seemed willing to tackle the HR department on such issues, an indication perhaps of the degree of power wielded by this department in a traditional Japanese corporate management framework premised on so-called lifetime employment.

3.2 Cultural Considerations

Cultural factors are often cited for the apparent failure of Japanese telework to achieve a broader footing in corporate Japan, the most frequently cited factor being the Japanese propensity for group behaviour, hence a cultural aversion to the often solo status of a teleworkers. One reason why early Japanese telework trials were office-based rather than home-based was the assumption that Japanese workers would be more comfortable in the group setting alternative offices provide. As the failure of many of these so-called satellite offices attests, a non-isolationary group setting is not enough to ensure successful telework. Moreover, there is evidence that at the individual teleworker level very few differences exist between full-time employee teleworkers in Japan and North America in terms of sense of isolation, sense of belonging to the organization or satisfaction with telework arrangements (Spinks 1998).

When dealing with the only non-Western industrial power, it is only too easy to attribute different corporate outcomes to a different cultural context. It is more revealing, however, to avoid broad cultural stereotypes and focus on the specific cultural aspect which pertains to the case at hand, namely Japanese management culture (Spinks 1997). While it is not the intention of this paper to conduct an in-depth analysis of traditional Japanese employment patterns and management practices, a brief summary of the more cogent aspects is necessary in order to consider several facets of the telework pilot under study, including the decision to waive a formal telework policy and agreement as well as the position of the human resources department.

Despite recent trends towards greater labour mobility, both pro-active in the form of mid-career job changes and coerced in the form of layoffs, the Japanese employment market maintains many of its post-war rigidities and can still be characterized by the three pillars of lifetime employment, seniority-based promotion and company, as opposed to trade, unions. The so-called lifetime employment system and the resultant corporate reliance on internal labour markets to meet staffing needs remain firmly entrenched (Shimada 1994). This has led to a management stance which assumes the long-term presence of employees and provides a remarkably stable employment environment but at the price of a virtual management monopoly on decisions over individual employees' postings and career development. Management powers in such a setting are broad. To cite an example, in the case of internal transfers or external secondment, the right of an organization to order out-of-town transfers has been upheld by the courts, in effect denying employees the right to refuse such an appointment (AERA 1997).

It is against such a backdrop that the HR department's sensitivity concerning a formal telework policy, and more pertinently, a formal telework agreement, must be viewed. In keeping with telework best practice, a proposal for both a formal policy and telework agreement was approved by all on the workstyle team bar the HR representatives. In this case, their opposition hinged on the question of whether it was appropriate to ask employees to sign a document which, in essence, was a management directive to perform a given job. In their eyes, such action would set a dangerous precedent, or in the words of one senior HR officer, "we don't ask their approval for anything else, so why should we start now?" It is clear that this line of thought is the result of dealing with what is effectively a captive labour market, the attitude that the Utility's employees

were conscientious and would obey any directives issued the leitmotif of many discussions.

The existence of a corporate union and its relationship with the HR department is another facet of Japanese management culture which affected the implementation process. The Japanese labour movement was quite aggressive in the early post-war years, so much so that the American Occupation moved quickly to squash trade unions and promote company unions. However, the high-growth era of the 1960's ushered in a generally harmonious period, Japanese management and labour relations today still being largely characterized by a strong degree of cooperation, both parties tending to act as partners rather than opponents in a given negotiation setting (Imano 1996). Aided by an expanding economy, this cooperative approach frequently resulted in win-win strategies. Once again, the lifetime employment system figures here, the knowledge that most employees were committed long-term prompting both management and labour to perceive themselves as sharing a common destiny. In such a setting, the role of the HR department is a key one given that it is responsible for formulating many of the policies which impact directly on employee work conditions. Traditionally, therefore, the HR department and the union have had a close relationship and also played an important role in forging a management-labour consensus on the interpretation and application of more often than not esoteric labour legislation, corporate rules and union directives. It is in this role, as the one organizational unit in constant contact with the union, that the HR department derives its "authority" to act as union spokesperson.

As has already been mentioned, the HR department was extremely cautious about introducing new evaluation procedures or stressing the workstyle implications of the pilot in an effort to avoid unduly inciting the in-house union. While this is, indeed, a valid concern and best practice requires careful accommodation of union demands, in the absence of direct union representation on the workstyle team, doubts persisted as to whether the HR department was using the union as a convenient front for their own opposition or not.

4. Concluding Remarks

The telework pilot outlined herein has only just commenced, so discussion has *perforce* been limited to the preparatory phase. As has already been observed, the pilot is unusual in several ways, not the least being its innovative use of corporate housing as alternative office facilities; its attempt to forge a rigorous evaluation framework for the workstyle aspects of the pilot; and the fact that it is introducing a highly flexible work arrangement into a very rigid organizational structure. The impact of telework on an inherently conservative organizational culture is worthy of further examination as the pilot evolves.

The preparatory stage of the pilot also highlighted resistance from an area of the organization with considerable vested interests in the employment status quo, namely the human resources department. In some ways, the pilot offers a glimpse in miniature of the clashes which may occur as the traditional Japanese employment paradigm is forced to accommodate changes in global economic competition, worker values and ICT platforms. Future research from this perspective would also be valuable in identifying viable telework models for Japanese organziations and testing telework universality hy-

potheses.

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Extensive in-house documentation was also used in compiling this report, including internal meetings minutes, concept book, pilot guidelines, ICT rule book and survey sheets.

Expression management in virtual environments

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Abstract

In theories regarding ICT (Information and Communication Technology), a common assumption seem to be that it is difficult, if not impossible, to create and maintain social relationships by only using media low in richness such as e-mail. Despite these theories, users of newsgroups, chats etc. on the Internet seem to be able to do exactly this. In this paper we argue that technology mediated communication should not be seen as a kind of communication low in richness, leading to less genuine relationships, but instead as a different kind of communication.

Drawing heavily on the works of Mead (1934) and Goffman (1959, 1974), we discuss social interaction as it takes place in face-to-face situations and in virtual environments. By turning Goffman's (1959) concept of "impression management" inside-out, we propose the term "expression management" for analysing mediated communication. This concept is illustrated by some examples. Finally, an agenda for future research is presented.

Introduction

In theories regarding media choice, it is frequently stated that for example textually based communication such as e-mail can not replace social interaction face-to-face (compare for example Daft & Lengel, 1984; Short et al, 1976; Trevino et al, 1987). However, there is an increasing amount of literature on phenomena like Multi User Dungeons/Domains (MUDs) and Internet Relay Chat (IRC) that seem to indicate that traditional theories describe media choice in a too narrow way. This literature points out that people to a certain extent seem to be able to build and maintain social relationships by only using computer mediated communication. To talk with Turkle (1995), they live important parts of their lives on the screen. These observations are not compatible with the observations of the traditional media choice theories' emphasis on a hierarchy of media, most apparent in the media richness theory (Daft & Lengel,

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1984, 1986). The concepts of these theories are too limited to provide a thoruogh understanding of the processes of mediated communication. A number of authors—e.g. Lee (1994), Lindström (1996), and Webster & Trevino (1995)—has directed attention to the necessity of more elaborate theories.

One way of dealing with this is to turn to ideas from social psychology (here represented by Goffman, 1959, 1974, and Mead, 1934) and the way in which these theories deal with human communication and the concept of self. According to these theories, meaning is created, recreated, and assigned to objects in a continuos interaction. In this interaction, also the self is created and recreated. To create and express a social identity is a fundamental process in all human interaction and in this paper we argue that this process and/or the result of it might be different in a context with a lot of computer mediated communication, as compared to a situation with frequent face-to-face contacts. However, this difference is not as simple as a hierarchical order among media according to for example their "richness" (Daft & Lengel, 1984, 1986) or their degree of "social presence" (Short et al, 1976). Instead, we need concepts that are flexible enough to capture the more subtle differences between mediated and face-to-face communication.

In this paper we will focus not on the whole process of creation and maintenance of the self/selves, but rather on the *expression* of self in "virtual environments", i.e. environments where non-face-to-face interaction takes place.
The aim of the article is not to build new theory, but rather to introduce new perspectives to traditional media choice theory and thereby generate insights and ideas about how the discussion regarding media choice and media use can be taken further. The ideas presented may be used as sentisising concepts, and should be viewed primarily as suggestions.

Certain parts of the literature we will refer to concerns non-business environments like MUDs. There are a number of important differences between these environments and what we normally would consider as "work"; for example, in a MUD you have total anonymity and what you do might be characterised as play. In a business environment on the other hand, your identity will often be known by your communicating parties[2] and what you do might be characterised as to a larger extent being guided by purposive-rational interests (Habermas, 1971, ch. 6). However, there are a lot of insights to be collected from this literature when transferred to a business environment. This is specially true when it comes to teleworking environments, where the organisation's communications to a certain extent has to rely on information and communication technology (ICT).

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[2] Even though there are examples where the communicating parties are unknown to each other, e.g. systems for anonymus brainstorming (Gallupe & Cooper, 1993).

In the following sections, we will first discuss the presentation of self in face-to-face situations as well as in virtual life. We will then turn to some examples as an illustration of how the concepts developed can be applied. The paper is concluded with a summary and proposals for future research.

The presentation of self

Goffman and the concept of impression management[3]

Erving Goffman is one of the most ingenious observers of social life. In his first major work, *The Presentation of Self in Everyday Life* (1959), he develops a dramaturgical metaphor for social interaction. It is to some significant contributions from his treatment of this metaphor we will now turn.

Goffman (1959) discusses the presentation of self, i.e. how we in everyday life create and maintain a sense of self, and also a sense of collective order. In this, an important feature is the concept of *impression management*. In the beginning of the book, he accounts for Preedy, a character from William Samsons' novel *A Contest of Ladies*. Preedy is constantly aware of the prescence of others and consciously tries to control the impression he gives to those present. A number of "Preedys" are presented: Big-Cat Preedy, Methodical and Sensible Preedy, Local Fisherman Preedy, etc. Preedy is by Samson pictured as a person overconcerned with his own existence, constantly trying to influence the others present. The point is that this is an accurate, if exaggerated, description of social behaviour.

Attempts at influencing others are a major concern for Goffman (1959). Impression management is about controlling the way that the self is presented in different situations. This is mainly accomplished through the continuous monitoring of one's body. But the monitoring is never perfect; one can never be in total control.

> The expressiveness of the individual (and therefore his capacity to give impressions) appears to involve two radically different kinds of sign activity: the expression that he *gives*, and the expression that he *gives off*. The first involves verbal symbols or their substitutes, which he uses admittedly and solely to convey the information that he and the others are known to attach to these symbols. This is communication in the traditional and narrow sense. The second involves a wide range of action that others can treat as symptomatic of the actor, the

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[3] This account of Goffman's (1959) writings is very narrow. The scope of this article does not allow us to revise his theories more extensively.

expectation being that the action was performed for reasons other than the information conveyed in this way. (ibid:2)[4]

For example, sneezing during an important person's presentation at a meeting definitely has an impact on the impression one makes. It is, however, (presumably) not a controlled action. Furthermore, many features of face-to-face communication are attributed to more or less unconscious aspects, for example tone of voice (para-verbal) and gesture (non-verbal). The expression one gives is deliberate, subject to control, but the expression given off is undeliberate and unconscious (Asplund 1980). Also, "one can stop giving expressions, but not stop giving off expressions" (ibid:102, our translation). Mead (1934) stresses one fundamental aspect of interaction: the dual aspect of taking the role of the other.

> The function of the gesture is to make adjustment possible among the individuals implicated in any given social act with reference to the object or objects with which the act is concerned; and the significant gesture or significant symbol affords far greater facilities for such adjustment and readjustment than does the non-significant gesture, because it calls out in the individual making it the same attitude toward it (or towards its meaning) that *it calls out in the other individuals participating with him in the given social act, and thus makes him conscious of their attitude toward it* (as a component of his behavior) and enables him to *adjust his subsequent behavior to theirs* in the light of that attitude. (ibid:46, our emphasis)[5]

The interaction is dependent on the possibility to continuously adjust one's behaviour toward the behaviour of others. The stimuli-response pattern is impossible to break down into sequences, it is an intertwined web of stimuli and response. Therefore, the dual aspect of impression–expression is entangled; the expression given contains the impression, since one has to take the role of the other to give the expression (Mead, 1934). When the role-taking is successful, we have a situation where the interaction is guided by *significant symbols*, symbols toward which all participants act in the same way—in fact, Mead (1934:334) defines rationality according to this. Goffman's (ibid) emphasis is on the impression aspect, and the expression is mainly a source of impressions.

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[4] In a strict sense, this means that everything that is ambiguous should be treated as given off. We will however make the distinction between what is intended (expressions given) and unintended (expressions given off) since Goffman's (ibid) account of these terms presupposes an unambiguous situation. In his later writings (i.e. Goffman, 1974) the aspects regarding ambiguity has more significance. Also, we believe that there may be a functional aspect of ambiguity in communication (Rosen, 1985; Rosen & Astley, 1988) which has to be taken into account.

[5] We have adopted Goffman's (1959) terminology in this paper; Mead (1934) employs a different. We hope that this will not cause too much confusion.

> Expression, then, has been treated in terms of the communicative role it plays during social interaction and not, for example, in terms of consummatory or tension-release functions it may have for the expresser. (ibid:248–9)

We take a similar stance here, thereby deliberately excluding the important aspect of the construction of self. Like Goffman (ibid), we are mainly concerned with the presentation of self—the expressions in interaction.

Monitoring and control

Mead's (1934) account of human interaction is limited in (at least) two ways: it focuses on intentional aspects of interaction, and it is pictured as consensus-driven.[6] These aspects are not necessarily "natural" and inherent in all forms of interaction—perhaps one could say that Mead's (ibid) analysis regards the expression given, and ignores the expression given off. They may, on the contrary, well be accounted for as social constructions.

> The expressive coherence that is required in performances points out a crucial discrepancy between our all-too-human selves and our socialized selves. As human beings we are presumably creatures of variable impulse with moods and energies that change from one moment to the next. As characters put on for an audience, however, we must not be subject to ups and downs. […] A certain bureaucratization of the spirit is expected so that we can be relied upon to give a perfectly homogenous performance at every appropriate time. (Goffman 1959: 56)

Interaction is subject to bureaucratisation of the spirit—in Foucault's (1979) terms, discipline (although Foucault's focus is on the body)—and this aspect may fruitfully be applied to social interaction (cf. Alvehus, forthcoming; Asplund, 1987). But the bureaucratisation may be subject to disturbances. Goffman (1959, 1974) discusses the role of different types of interruptions in performances. In *Frame Analysis* (ibid, 1974) these interruptions are called frame-breaks, a term that reveals the essence of the idea: someone diverts from the appropriate expressive behaviour at the present situation, thereby breaking the rules (the frame) and introducing a degree of uncertainty on behalf of all present on how to behave next. Some of these interruptions are of deliberate character, e.g., someone may scream in the library in order to draw attention to the fact that the building is on fire. Many frame-breaks, however, are of unintended character. A

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[6] Goffman (1959) has also been criticised for his focus on consensus (e.g. Asplund, 1980). We acknowledge this critique, but, as we see it, Goffman's (ibid) analysis contains a potential for discussions on non-consensus. This is however not explored in the text.

sneeze at a funeral or a strange facial expression are not (necessarily) intended acts; as acts, they have their origin in factors that are difficult, if not impossible, to control. Also, mimicking and paraverbal behaviour is difficult to control and hard to constantly monitor.

The presentation of self in virtual life

Today, information technology provides alternatives to face-to-face interaction[7]. Many new media are asynchronous, which means we have to reconsider the expression/impression dimension. What in face-to-face interaction is an intertwined web is in asynchronous interaction clearly separated. This also reconnects with the basic concepts of give/give off as employed by Goffman (1959).

In the issue of given/given off, we can note that control increases. When changing to asynchronous, text-based communication (such as electronic mail), many aspects of "give off" simply vanishes. It is easier to monitor a text than one's whole body. Also, the time available for control purposes also increases—it is possible to re-read the message before sending it. The "total expression" will then to a larger degree become the expression given, since control over the expression increases dramatically. This is not to say that the control of the impression increases; on the contrary, it will probably decrease because of the lack of simultaneity. One can not continuously revise the expressions in the same way as in face-to-face interaction. The expression/impression dualism is thereby accentuated.

This leads us to turn Goffman's (1959) expression (sic!) "impression management" inside-out: in asynchronous interaction the relevant expression is "expression management".

The expression of self: some observations

As can be seen by the above discussion, there are important differences between the presentation of self in everyday life and in virtual life. A number of observations can be made in connection to these differences. In this paragraph we will discuss both certain examples from earlier literature, as well as some more generic phenomena.

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[7] This is not to say that information technology, or mediated communication, is something new. Letters, semaphors etc., are old technologies. Today, however, the asynchronous communication media have become widespread and widely used as a more direct compliment to face-to-face interaction. Although, our analysis could probably benefit from a more historical approach (cf Yates & Orlikowski, 1992).

One area of interest for our discussion is the post-modern notion of self, where there is no unitary self but rather a *bricolage*, in Lévi-Strauss' (1962) terms, of selves. The very image of a unitary self is suspect to speculation:

> [I]t is dangerous to unmask images, since they dissimulate the
> fact that there is nothing behind them (Baudrillard, 1983:9).

Goffman's (1959, 1974) frameworks—the dramaturgical metaphor and the notion of frames—do not necessarily imply the existence of a unitary self or multiple/fragmented selves. In a commentary to Goffman (1959) and his example of Preedy (above), Asplund (1980) writes that there are two possibilities. There might be no "real" Preedy and then it is futile to search for the human behind the masks. However, there might actually be a true or real Preedy, but he is not present in the text of Goffman, who is only interested in describing and analysing Preedy's masks.

The unmasking of the self is not a necessary task, as we see it, in this paper. When concerned with the expression of self, the depth behind the expression may remain unexplored. Our suggestion here implies that an examination of the expression of self has to take multiple selves into consideration, which also e.g. Reid (1991) and Turkle (1995) argue for. In Turkle (1995) such a discussion relates to more or less created "persons" on different MUDs (where the anonymity is perfect). One person is quoted as saying

> I didn't exactly lie to him about anything specific, but I feel
> very different online. I am a lot more outgoing, less inhibited. I
> would say I feel more like myself. But that's a contradiction. I
> feel more like who I wish I was. I'm just hoping that face-to-
> face I can find a way to spend some time being the online me.
> (Turkle, 1995, p. 179)

This can in our terms be viewed as an example of expression management instead of impression management. Monitoring and manipulating a text is easier than monitoring and manipulating the whole body. Thus, the gap between what is given and what is given off decreases, and a person may experience a certain degree of control in such a situation, more able to give the expression s/he wants.

Further, a distinction could be made between synchronous media like MUDs (Reid, 1991) and asynchronous media like e-mail. The effects discussed here for synchronous media are even greater in asynchronous media where the time is given to really think through the message composed before it is sent. Since for example e-mail are much more common than MUDs in work-related settings, the phenomena of multiple selves should be at least as relevant there as in the more play-like environments for which it has been discussed traditionally.

Emoticons and cyberlanguage

In face-to-face interaction, large and important parts of the interaction are made up not of the words themselves but of gestures and facial expressions accompanying the words, the tone of voice, the posture and dress of each participant, and the environment (Dening, 1988; Reid, 1991). However, for certain media the possibility to exchange such para- and non-verbal information is simply not there. This is for example the case with electronic mail, MUDs, and IRC, all more or less common tools in virtual environments. They are all text-based and computer-mediated media, and thus lack a lot of the possibilities inherent in a face-to-face interaction.

However, over time ways of partly coping with these limited possibilities have developed. One such way is the use of so called emoticons or smileys. These are combinations of characters and symbols that together create emotionally charged icons (thus the name emoticons). There are an immense amount of such emoticons and whole "dictionaries" may be found on the Internet (see http://www.netlingo.com/smiley.html for one example). A few of the most common are:

> :-)   the basic smiley. A smiling face as seen side-on.
>
> :- (an unhappy smiley
>
> :-@   a screaming smiley
>
> 8-)   a smiley with glasses

These examples could be continued almost infinitely, when there are no more "established" emoticons, all one has to do is create new ones. However, in that case not everyone might understand what is intended. Although a few of these emoticons are rather well known and commonly used, a lot of them might cause confusion when used. One example of this is the often used emoticon ;-) that either symbolise flirtation or irony. These are two very different expressions and if the context is not clear enough, the use of this emoticon might cause ambiguity. As another example of this, consider the case of emoticons and cyberlanguage discussed above. The use of these presupposes a common understanding or a shared meaning between the communicating parties. This common understanding can be more or less wide; certain very specific emoticons, for example, might only be used within a very small group of people. Others are used and understood only within different parts of the world, examples of this are the japanese emoticons (^_^) and (^.^) for a male and a female smile respectively, rarely recognised in the west (Keeney, 1997).

So far, it has been noted that emoticons is a way of increasing the capabilities of a text-based medium—or rather, to use the capabilities to the fullest extent possible—and that the use of emoticons are highly dependent on shared meaning and common understanding. When such shared meaning exists, the use of emoticons can be viewed as a way of moving what is given off closer to what is given. On the other hand, the

difference between given and given off might actually increase when shared meaning and common understanding doesn't exist.

One further thing is worth noting and that is that even if emoticons are a way of narrowing the gap between face-to-face interaction and computer-mediated text-based communication (when shared meaning exists), this doesn't work equally well for all such media. With synchronous media like MUDs and IRC, an experienced user might write these emoticons without thinking and controlling himself. This gets rather close to a face-to-face situation where we cannot control for example our facial expressions other than to a limited extent. In this way the use of emoticons might be seen as keeping a gap between what is given and what is given off. However, it works quite differently for asynchronous media like e-mail where the user writes the whole message and can review it before sending it. In such a case, the control over the message sent is much larger and the emoticons can be seen as a way of extending the manipulating possibilities that already exists. Thus, emoticons is in such a case a way of further closing the gap between what is given and what is given off.

Finally, a phenomena that is often seen as related to emoticons is cyberlanguage or e-mail shorthands, i.e. the use of abbreviations like BTW (by the way), IMHO (in my humble opinion), FWIW (for what it's worth), F2F (face to face), etc. (see http://www.netlingo.com/e-mailsh.html for a longer list). In many respects, there are important similarities between cyberlanguage and emoticons. Both are phenomena where a small part is known to a large group of people while other parts are only used within a much smaller group. And, as for emoticons, it is possible to create an enormous amount of new abbreviations and thus be very group and/or context specific. The effects of synchronous and asynchronous media on the gap between what is given and what is given off is also similar to the effects discussed for emoticons.

Flaming

The term flaming, coined by the hacker community, means "to speak rabidly or incessantly on an uninteresting topic or with a patently ridiculous attitude" (Steele et al., 1983). The phenomena is discussed in connection to electronic mail and other types of text-based computer-mediated communication. One of the reasons behind the occurrence of flaming is the fact that electronic mail provide interactions where social context cues—things like sender's and receiver's job title, level of the hierarchy, departmental affiliation, race, age, and appearance—are weak or absent (Sproull & Kielser, 1986, p. 1497). An explanation similar to this one has been proposed by Matheson & Zanna (1988), namely that computer mediated communication reduces public self-awareness. Two other ways of interpreting flaming is presented—without much discussion—by Aycock (1995). The first of these interpretations is to see flaming as a way of defining the rule of emotional distance by transgressing it. The other is to see it as a ritualised confrontation that expresses formulaic anger.

403

In the terms of this paper, flaming may be described as a frame-break. In text-based communication, the loss of bodily control as a reason for frame-breaks is to a high degree irrelevant. Today we use keyboards etc.—what could formerly have been an inkblot is now something that is possible to edit out in a simple way. In short, the possibility to exert control over what is expressed is huge compared to especially face-to-face interaction. The error-sources still at hand, e.g. misspellings are also subject to technological inventions such as spellchecking.

However, with the use of technology a lot of social cues disappears as well as the possibility to constantly monitor the reaction of the communicating party. Thus, the relation between impression and expression is in some sense broken and it becomes harder to know if one is correct when trying to take the role of the other (cf. the discussion of Mead, 1934, above). This lessens the chance of a successful interaction and increases the possibility for frame-breaks like flaming. Following from this is that frame-breaks aren't necessary more rare in computer mediated as compared to face-to-face communication, but of a different type.

Final remarks

In this article we have discussed social interaction in face-to-face situations as well as in virtual life. We have explored the differences between those two forms of communication. The emphasis has been on the expression—rather than on the creation—of self, and theories used have been mainly those of Goffman (1959, 1974), and Mead (1934). We have proposed that for virtual life—as compared to face-to-face interaction—the expressions given and given off respectively, gets closer to each other. In relation to this, we have also observed differences between synchronous and asynchronous media. Further, we have proposed that for virtual life, Goffman's notion of *impression management* might be turned inside out, leading us to talk instead of *expression management*.

To divide communication into impression and expression management the way we do here might give the reader the impression (sic!) that we have a very mechanistic view on communication. That is, however, not the case. We view communication as a continuos interaction, aiming for the creation, recreation and transfer of meaning. The impression aspect can never be separated from the other aspects of communication, except perhaps analytically. Mead's (1934) very idea is that we constantly have to take the role (or the attitude) of the other in order to create expressions, and this would refer to all forms of communication, synchronous as well as asynchronous. The analysis presented here is subject to the fallacy of breaking the unbreakable apart. One such aspect is the importance of being able to constantly monitor the effect one's words and actions have on other people (i.e. impression management; Goffman, 1959). When treating computer-mediated and text-based communication, rather than face-to-face communication, this aspect of interaction looks radically different. It is that difference we want to explore in this article. We believe that to be able to discuss the issues at

hand here, this analytical separation is at this stage necessary. Hopefully it will eventually be possible to include other aspects into the discussion and thereby give a less reductive account of the process of human communication.

The aim of the paper was said to be to introduce new perspectives to traditional media choice theory. This was mainly motivated by the tendency in much of that literature to rank media in hierarchies. By pointing at the qualitative differences between face-to-face interaction and computer-mediated text-based communication when it comes to social interaction, we hope that we have shown that such hierarchies are built on too simple distinctions. Future research might benefit from taking the aspects highlighted in this article into consideration. Furthermore, a more dynamic approach where consideration is taken of the development of significant symbols (cf. Mead, 1934) is necessary. In such an approach, the analysis could benefit from cultural theory, e.g. Geertz (1973).

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Teleworking at the
Technology Centre of Deutsche Telekom

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1. Introduction

While it is already quite common in the United States to telework, where there are already many guidelines for the introduction of telework published (see e.g. [BAY], [SVTC], [GORD]), telework in Europe and Germany is just about to start. Practical implementations of telework with comparatively large numers of teleworkers are still quite rare (see [GLAS] for an extensive evaluation of a telework project at IBM Germany).
In the year 1997 a teleworking project was started at the technology centre of the German Telekom in Darmstadt. About 30 voluntary participants are taking part in the project. The following criteria formed the basis for the decision on who was selected as a teleworker from the applicants:

- professional activities, which appear especially suitable for teleworking
- occupation with innovative technologies, which may have an impact on the technical realisation of teleworking,
- other project-related occupation with teleworking,
- social criteria (distance to working facilities, family situation...).

Besides the teleworkstations installed at home, the selected participants keep their office environment. Each participant is allowed to leave the project and take up "normal" office work again. There were no initial regulations about how the teleworkers have to divide their working time between home and office. Thus, the participants had the possibility to approach gradually the new work form and to maintain their social contacts in the company.

The technical connection from home to the office environment was provided via an ISDN link. At the beginning of the project, before actually starting to telework, the participants were asked about their expectations in a first questionnaire. After six months a second empirical data collection, e.g. working hours spent at home, connection times to office and communication costs, was carried out. So-called "log-files" were also evaluated automatically created by the ISDN routers. Furthermore, the teleworkers were to report on their activities in a "working diary". In addition, sociological data concerning satisfaction and motivation of the teleworkers were collected by means of a questionnaire and individual interviews with a selected part of the teleworkers.

The paper contains the results of these two evaluations carried out within an interval of six months and describes briefly the technical set-up of the project.

The evaluation results provide valuable insights into working habits, collaboration patterns and social relations of the project participants and their colleagues.

2. Technical Set-Up

In figure 1 the technical set up of the project is depicted. The connection of the home offices to the intranet of Deutsche Telekom is based on an ISDN network. On the company side we are using an ISDN-Router (ASCEND, Pipeline Max 4000) which allows the connection of 30 parallel ISDN B-channels. The home offices are equipped with ISDN Routers (ASCEND, Pipeline 75). Both types of routers are easy to configure and maintain (remote access via telnet). The security requirements are met by number signalling and a call-back function.

The home office ISDN routers offer also two a/b interfaces, e.g. to connect a fax machine. The routers provide an Ethernet plug which can be used in the same way as the one in the office, that means an alteration of PC-set up and configuration could be avoided.
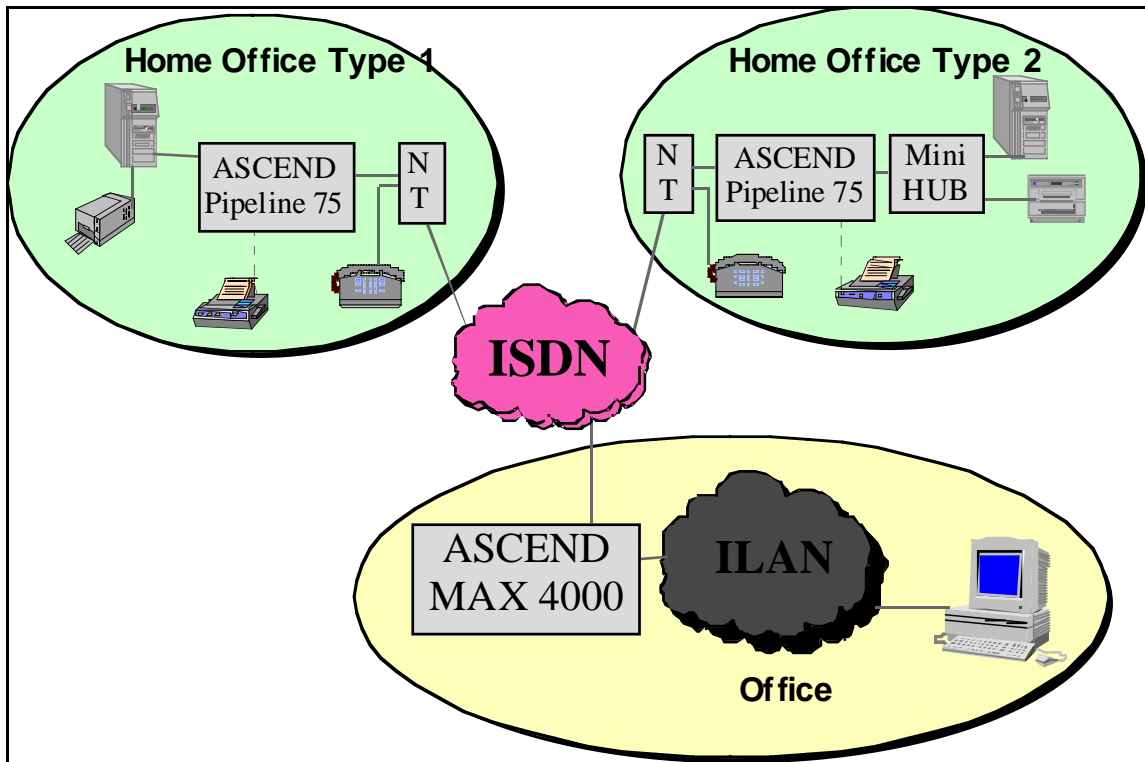
Figure 1: Connection Set-Up of the Teleworking Sites [HUWE]

3. Results of the Evaluations

We have analysed the expectations, the experience gained by the teleworkers during the project and the altered working behaviour of the teleworkers by means of:

- individual interviews with a selected part of the teleworkers
- two questionnaires to all teleworkers (one in the beginning, one after six months)
- analysis of log files
- analysis of working diaries

The main subjects of evaluation were the working hours during the day, the communication behaviour of the teleworkers, the quality of work done at home and the technical assessment of the equipment used.

3.1. Analysis of Working Hours

3.1.1.   Analysis of Working Diaries

The teleworkers were to keep a diary of the working hours at home. The analysis of a day pattern averaged over weekdays and different teleworkers is shown in the following figure:
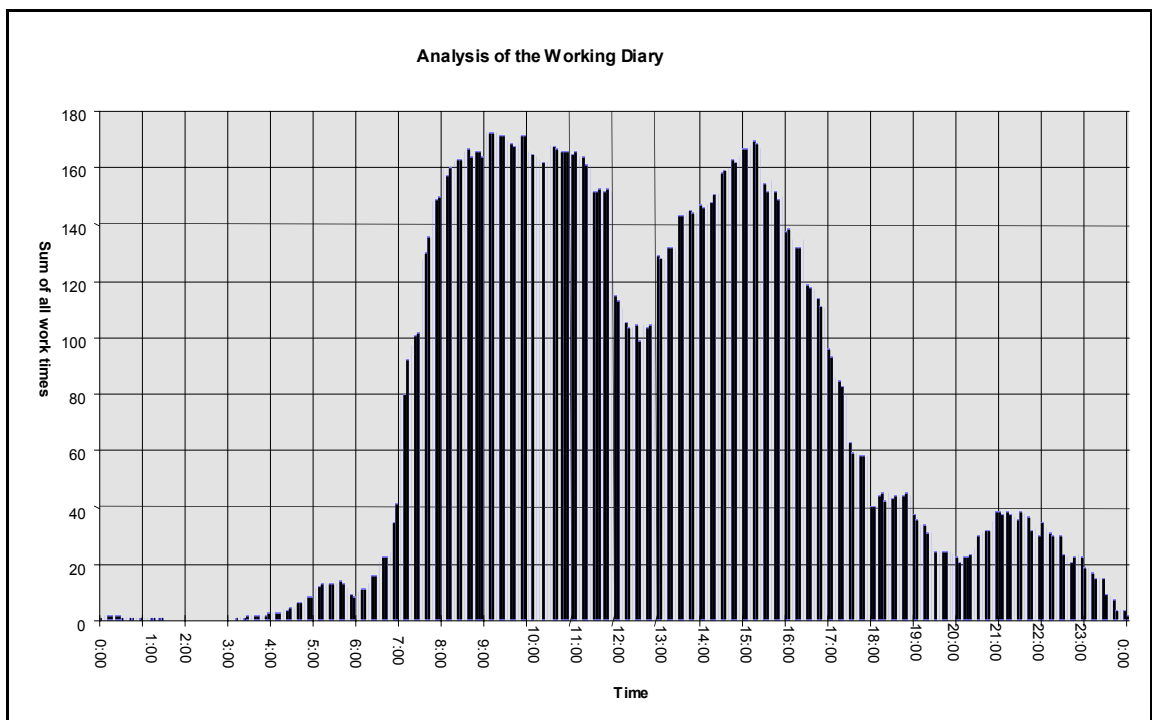
Figure 2: Analysis of the Working Diary

The pattern of working hours is similar to usual office hours, including a one-hour lunch

break. Additionally, after 8 p.m. a third smaller peak is visible, indicating a shift of work into the evening.

3.1.2. Analysis of Log-Files

In the log file all ISDN-Router connections are listed. The data are averaged over all teleworkers but the data of the weekdays mo – fr are separated from the data of the week-end (cf. figure 3).
The huge peak at 9 p.m. is quite unexpected. A possible explanation is that teleworkers shift an essential part of the usual office work into the evening, but do not notice this in the working diaries to the same extent.
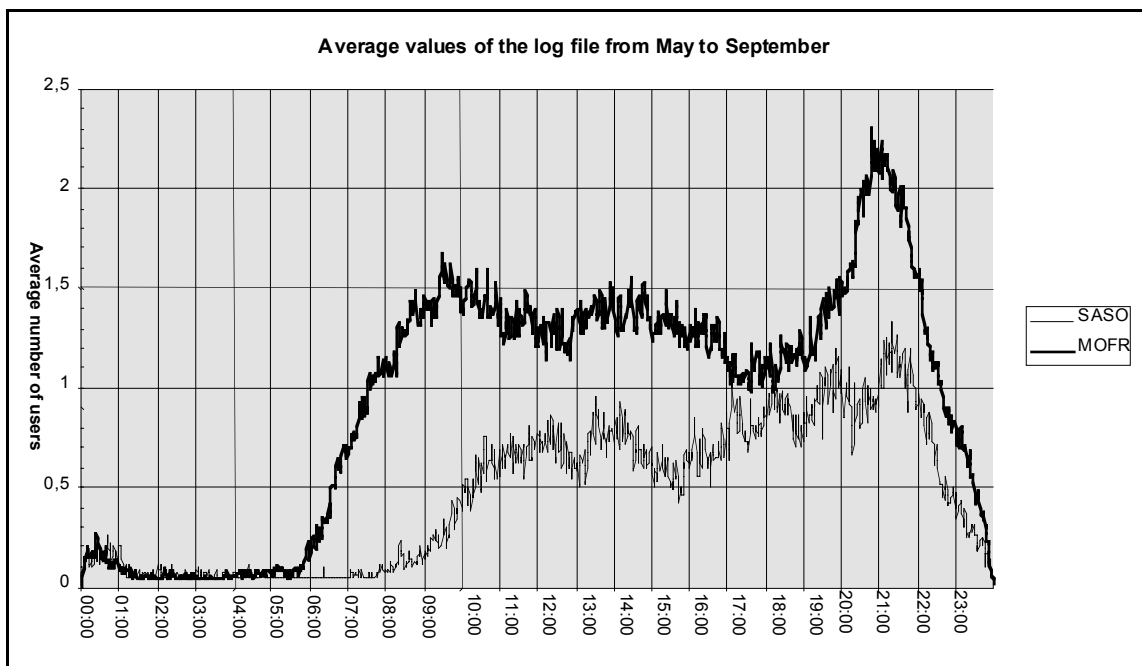
Figure 3: Analysed Log Files Monday to Friday(upper curve) and Saturday to Sunday (lower curve)

3.2. Communication Behaviour

The communication behaviour of the teleworkers was analysed by means of the two questionnaires distributed at the beginning of the project and after six months.
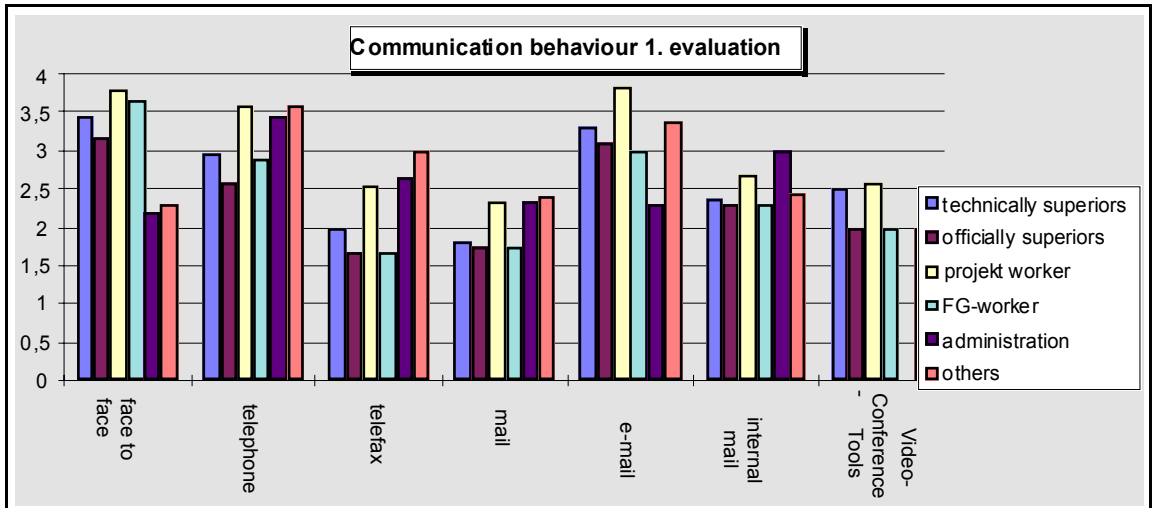The results are shown in figures 4 and 5.

Figure 4: Communication Behaviour from the First Questionnaire (the higher the number the higher is the usage of the specific type of communication).
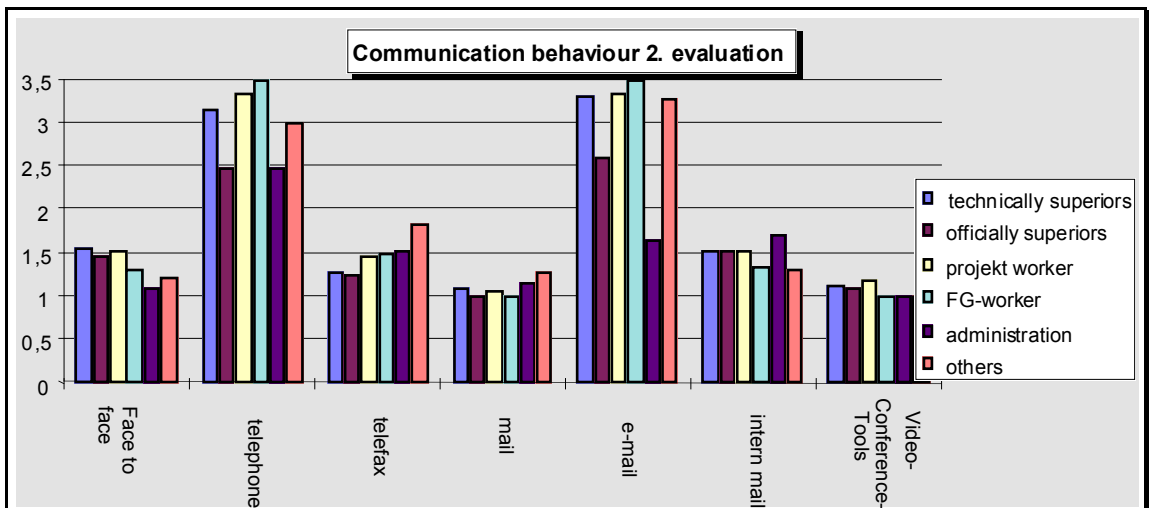

Figure 5: Communication Behaviour from the Second Questionnaire (the higher the number the higher is the usage of this specific type of communication)

The first evaluation has shown that besides face-to-face communication, telephone and e-mail play an important role in nowadays office communication. When communicating with other project participants working in other office buildings, e-mail is even the most important means of communication.

The comparison of the two figures 4 and 5 now yields an overall decrease in communication.

The decrease in face to face communication and the concentration on telephone and e-mail was expected. It is surprising, however, that even the use of electronic means of communication has decreased after six months of teleworking. Obviously, necessary and important project communications are shifted into the days of the week which are spent in office.

3.3. Quality of Work

We asked in the second questionnaire how telework has influenced the quality of work. More specifically, the teleworkers should rate their agreement with the following statements:

- My work is more intensive.
- My work is more efficient.
- My results of work are of higher quality.

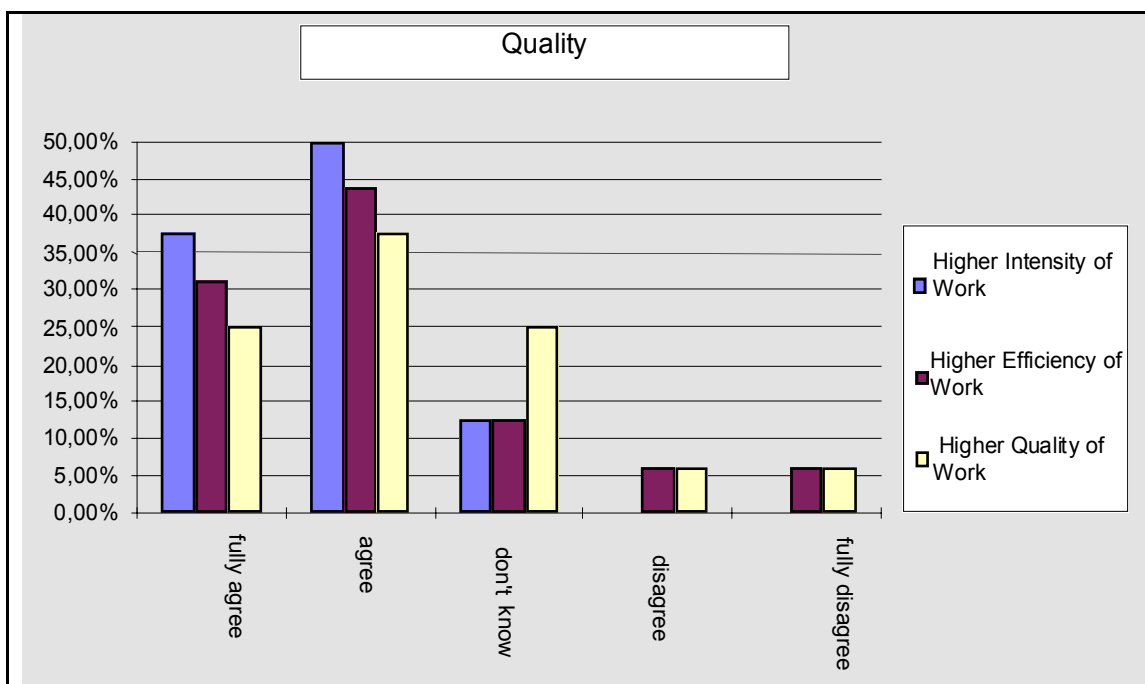The following figure shows the results of the evaluation of these questions.

Figure 6: Increase of Quality of Work

Especially the intensity of work, i.e. the degree of concentration is estimated to be higher at home than at the office. On the other hand, an increase in quality of work is not expected, which may be deduced from the fact that the quality of work is very difficult to assess in the research & development area.

3.4. Technical Assessment

Part of the second questionnaire were questions about the degree of satisfaction of the teleworkers with their technical equipment. Additionally we used information we obtained from individual interviews with the teleworkers. In the following these subjects are described and evaluated in detail.

- Speed of data connection to the office

Most participants were satisfied by the bandwidth provided by ISDN (2 x 64 kbps). Only participants who had to transfer huge amounts of data complained about the speed of the connection (also see next question)

- Amount of data transferred

  The amount of data transferred by the teleworkers is widely scattered. As a rule, it can be said that the less data are transferred, the more the participants are satisfied with the connection.

- Reachability by telephone.

  The participants do not see any problems in this area.

- Technical problems with hard- and software

  On the average, the participants of the project are satisfied with the hard- and software. The main technical problems of telework seem to be solved. However, also in this question a wide range of answers exists, probably depending on single experiences with severe technical problems

3.5. Further Personal Experiences Made by the Teleworkers

The second questionnaire also asked for personal experiences made by the teleworkers. In the following we discuss the main questions. As in the preceding section, the contributions are supported by interviews with a selected part of the teleworkers.

- Is there a weakening in the perception of corporate identity?

  Only a few participants saw a weakening in the perception of corporate identity. On the contrary, most teleworkers consider their company as more progressive and attractive if it offers them the possibility of telework.

- Is it conceivable to give up your office desk or share it with a colleague?

  No teleworker likes to give up the office desk but there is willingness to share a desk with a colleague on the condition that the work flow is adapted to telework. Asking for a short term implementation of the concept of shared desks most of the teleworkers answered that their current work organisation is not ready for that.

- Do you have more spare time now?

  Most teleworkers gave a negative answer but they saw an enhancement in the quality of their spare time through telework, since they are now in a better control of their spare time.

- Do you have problems with the co-operation with your colleagues?

  Most teleworkers saw no problems in this point. But some kind of face to face communication could not be replaced by telecommunication.

- Have you got more time for your family?

  In most of the cases this is true. Variations depend on different family circumstances.

- Are you able to separate professional from private live?

  The majority of the participants gave a positive answer. Nevertheless, we have the strong variation of all answers. In the interviews we found out that some of the participants do not consider it as a disadvantage if professional and private live are linked more closely. Others described it as a big potential for problems that they find difficult to handle.

- Are your working hours are accepted by customers, the partners or the family and friends?

  Surprisingly, there exists an overall agreement of all participants of an acceptance. Literature often mentions that teleworkers possibly are often disturbed at home. This is not true for the participants in our project. Already in the first questionnaire the future teleworkers stated this though they stood at the beginning of the project and had no experience in teleworking at that time. They now confirmed their former assumption after having collected sufficient experience. In the interviews it turned out that the participants developed particular working models they follow consequently. Some of them lock themselves up in their working room and imitate their normal office day. Others feel free to use the possibilities teleworking offers them in arranging the working hours and environment individually.

4. Conclusion and Outlook

This paper covers the experiences made during a teleworking project. Individual interviews, answers of two questionnaires, the analysis of log files, and the analysis of working diaries provide a lot of material to give us valuable insights into working habits, collaboration patterns and social relations of the project participants and their colleagues.

We learned that the technical concept deployed is mature enough to met the requirements of a teleworking project. The working diaries show that the working hours are similar to usual office work in contrast to the log files of the routers. They indicate a shift of the work into the evening, however, which could be explained by additional work done at home compared to the usual daily work at the office. The overall decrease in communication is significant but to be expected. The teleworker regarded their intensity of work higher at home and saw a higher quality of spare time. There is only a minor willingness to adopt a desk sharing concept without an overall workflow concept which integrate the teleworkers. Major social problems, such as problems with the acceptance of the family or a loss of social contact at work could not be observed.

After more than half a year of project duration and experiences it would be advantageous to extend the project. By rising the number of participants it should be possible to discover some up to now unknown problems and to collect further experiences. The positive influences on the productivity reported by the participants and their personal enthusiasm prove that teleworking leads in the right direction. Many colleagues are interested in this subject now and the project participants do not want to give up this new form of working anymore.

But still the open question remains how the working world should be changed. Companies need to reduce control and replace it by more confidence in the teleworkers. Certain mechanisms of the working world we are accustomed to need to be thought over again with openness to new ideas. For example, new management methods need to be defined, such as 'mangemenet by objectives'. But new working models can not be introduced

without a changed awareness of workers, managers, politicians and unionists. Teleworking would not be the first example for states to miss an industrial change and fall behind more flexible countries with respect to the competition of market shares. Caused by the development of the information and telecommunication technology there will probably be big changes to be dealt with, that do not only have consequences on the business world but also on society and social aspects. Where up to now continuity and specialisation guarantee success the future of the working world will be ruled by flexibility and speed.

5. References

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http://www.abag.ca.gov/bayarea/telecomm

[GORD]   Telecommuting, Teleworking and Alternative Officing
http://www.gilgordon.com

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[SVTC]   Smart Valley Telecommuting Project
http://www.svi.org/PROJECTS/TCOMMUTE

Assets of ISDN to Teleworking

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Abstract

ISDN - Integrated Services Digital Network - is a well-known technology for telephony and data transmission, but first the latest development shows a greater exploitation of the service to take place. By allowing digital transmission also in the subscriber line the ISDN standard and services open new applications and solutions for the teleworker. This paper introduces the ISDN technology, discusses the ISDN equipment, services, and markets, and gives some examples of the use of ISDN in teleworking.

Introduction

The popularity of teleworking as an alternative way of doing work has gradually increased during the 1990s: In the fifteen EU countries some 1.5 million people were teleworking in 1994, about 4 million in 1997, and 12 million is expected to telework in 2000. However, teleworkers still represent a minor part (0.5-4%) of the total workforce /1/. There are several reasons to this development: large enterprises have outsourced their functions, emerging traffic problems in urban areas, appreciation of country side life style, changes in the nature and contents of work, and *new technical and sosioeconomical possibilities* to work remotely without being tied to certain location and office hours.

This paper will explain the role of telecommunication technology, especially the ISDN (Integrated Services Digital Network), and the new possibilities it opens in teleworking, keeping in the mind, however, that teleworking rarely is inspired on technological basis alone.

The public switched telephone network (PSTN) is the main bearer of information used in the teleworking, allowing two, three, and multiparty telephone conversations, video-conferencing, faximile transmissions, and exchange of documents in binary formats. Being originally analogue, the PSTN begun to be digitalized from trunk lines in 1970s. The

digitalisation continued in switching equipment during 1980s, and is now moving to the subscriber lines.

In western countries practically all the trunk lines and switches are digital in 1998, and the possibility to deploy digital end-point to end-point ISDN transmission is commonly available for enterprises and public. Generally, the digitalisation of the PSTN has made the information exchange faster, more reliable, and also cheaper. Digital subscriber connections will make new services possible, and bring the full benefits of the digital network available for everybody.

Although the ISDN has been technically standardised (CCITT) for some 15 years now, it was not until the leading European teleoperators and the European Comission expressed in 1989 a political will in forming and taking into use the EuroISDN standard by ETSI as the continent wide common platform for interoperatibility of ISDN equipment and services. After this important decision the national interpretations of the CCITT ISDN standard have gradually been replaced by EuroISDN, and the number of EuroISDN subscribers has increased from a few thousands in 1993 to about 6-7 millions in 1998. The growth is expected to continue at a rate of 50-100% in the coming years /2/. The EuroISDN standard has also been adopted outside Europe; e.g. in Australia, in South Korea, in South Africa, and in Brazil. In USA and Japan different ISDN standards are in use.
The worldwide distribution of digital subscriber lines is presented in the Figure 1 (source: John Matthews,OVUM, "Status of ISDN World-Wide", presented in Global ISDN industry forum, Cambridge, 7.7.1998).
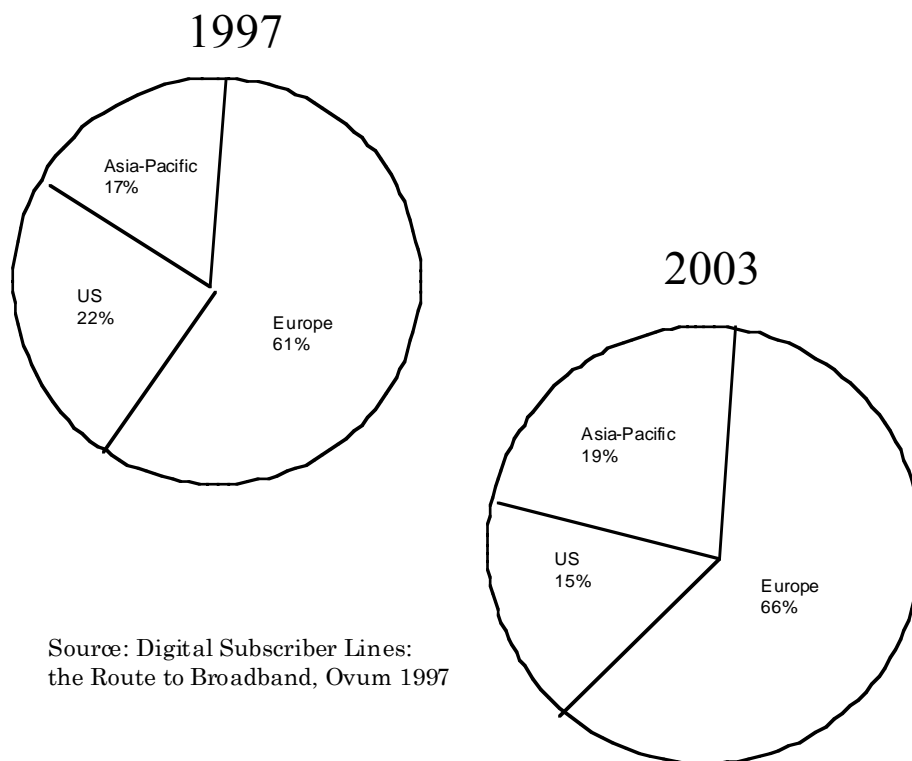
1997

2003

Source: Digital Subscriber Lines:
the Route to Broadband, Ovum 1997

Figure 1. ISDN worldwide, the distribution of the total number of ISDN lines in Asia-Pacific, Europe, and US in 1997 and 2003.

ISDN as a technology

The access to the ISDN network can take place in two different ways, via the PRI (Primary Rate Interface) and via the BRI (Basic Rater Interface). The PRI is designed for corporate PABXs (Public Automatic Branch Exchange) and routers, whereas the BRI is ideal for SOHO (Small Office Home Office) use. In the PRI access 30 simultaneous traffic channels are available, whereas the BRI makes it possible two simultaneous connections for speech and/or data. In addition to the switched traffic channels (B-channels) there is a signalling channel (D-channel) for connection control and low speed packet type data exchange. The transmission speed of the B-channel is 64 kilobits per second (kbps) and that of D-channel 64 kbps in PRI and 16 kbps in BRI. The channels can be bundled for higher data rates, e.g. in videoconferencing 2-6 B-channels are typically used.

In ISDN all the transferred data, either being speech or motion picture, is in binary format. There are *bearer* and *teleservice* classes defined in the ISDN standard. These service classes are defined for equipment and service interoperatibility. For example the 7 kHz audio is used for near high fidelity audio transmission between two ISDN terminal equipment supporting this feature. Radio reporters use this for remotely commentating of sports and games. Examples of bearer services are unrestricted 64 kbps data, speech,

and 3.1 kHz audio, and of teleservices group 4 telefax, telephony, and modem data, correspondingly.

For telephony use there are several ISDN *supplementary services* which make the use of the ISDN telephone more comfortable, and bring several features of the PABX office phones available to private ISDN phone users, too. Examples of useful features are the calling line and connected line identification (CLIP, COLP), display of call costs (AOC), different phone numbers for private and business use (MSN), forwarding of incoming calls in different cases (CFU, CFNR,CFB), three-party conference (3PTY), and so on.

A comprehensive explanation of the ISDN and its technology is presented in the reference /3/.

ISDN subscriber connection and ISDN tariffs

The ISDN equipment will be connected either to the PRI or BRI access. For the EuroISDN BRI there is a NT device (Network Terminator), which is typically the property of the teleoperator and is installed by the teleoperator when the digital ISDN access is subscribed. Recently some operators have let the customers install the NT. In the US ISDN the NT is integrated in the equipment.

The subscription & installation fees vary a lot in different countries, but the common trend during the past years has been a decrease in the tariffs. Also, different kind of aggressive pricing campaigns and even subsidizing has occured in the past. Typically, the subsrciption fee of an ISDN connection is at the moment of the order of ECU 100, and the fixed mothly costs are about the same as the costs of two analogue connections. The traffic tariffs are about the same as those of analogue lines.

The NT device opens on the subscriber side a local 4-wire S0 bus, to which up to eight ISDN devices can be hooked (see Figure 2). The applicable area coverage depends on the bus topology, but in most cases the S0 bus can be installed into a normal private home and/or small office, and it can serve users as apart as hundreds of meters from each other.
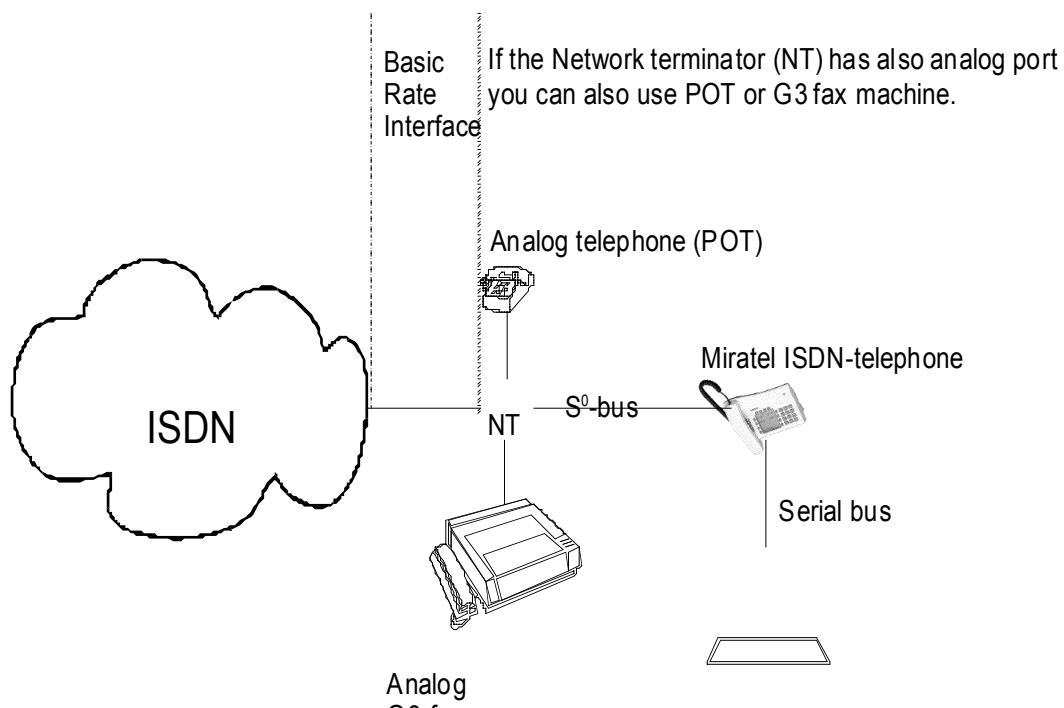
Figure 2. The ISDN Basic Rate Interface (BRI).

ISDN equipment and their market

Examples of ISDN devices are ISDN telephones, PC cards, PC terminal adapters (TA), local area network (LAN) routers, small office telephone switches (PABX), video-phones, ISDN G4 telefaxes, and adaptors for analogue telephone equipment (a/b adaptors). Some NT devices include built-in adaptors for 1-2 analogue equipment. Roughly, of the total ISDN equipment sales, the data transfer equipment (PC cards, terminal adaptors and routers) represent 2/3 of the market value, and ISDN voice equipment (PABXs and telephones) 1/3 of the market value.

The offering and the brand names of ISDN terminal equipment vary in different market areas. In Germany the development of ISDN has been rapid /1/ due to the active subsidization of Deutche Telecom (German PTT). This has evoked a wide variety of products to be launched in the German ISDN market /4/. Examples of PC card manufacturers are AVM GmbH, ITK GmbH, Stollmann GmbH, Siemens, and Eicon Ltd. ISDN PABXs are manufactured by all the main telecom equipment manufacturers (Siemens, Alcatel, Matra, Ericsson, Ascom), and by several medium sized companies mainly for their domestic markets (Elmeg, DeTeWe, SDX, Miratel). ISDN telephones are manufactured by over 20 companies in Europe and in Far East. Well known brands are Ascom, Siemens, Hagenuk, Elmeg, Miratel just to mention a few. Also many teleoperators have branded ISDN phones on OEM basis (Telia, Deutsche Telecom).

The prices of the equipment have decreased 100% - 200% during the past 3-4 years. There is, however, wide market dependent variation in the prices. Passive ISDN PC cards cost about ECU 100 in 1998 and ISDN telephones ECU 100 – 500. Minirouters cost ECU 400 – 1000 and small PABXes ECU 200 –2000.

ISDN, internet, and related services

Internet has been the accelerator of growth of ISDN accesses. The demand of more bandwidth for faster data transfer has caused the change from analogue modems to more advanced technologies like ISDN, xDSL ('X' Digital Subscriber Loop), or cable TV modems. Although the analogue modem technology has been developed to its limits (56 kbps down stream, 33 kbps upstream in ideal conditions), there is a clear tendency to new access technologies (see Table I). Among these new communication technologies the ISDN is the most widely spread, and in most cases also sufficient – especially when two B channels are bundled. One must bear in the mind, that often the bottle necks of transmission are in the international connections, not in the local loop.
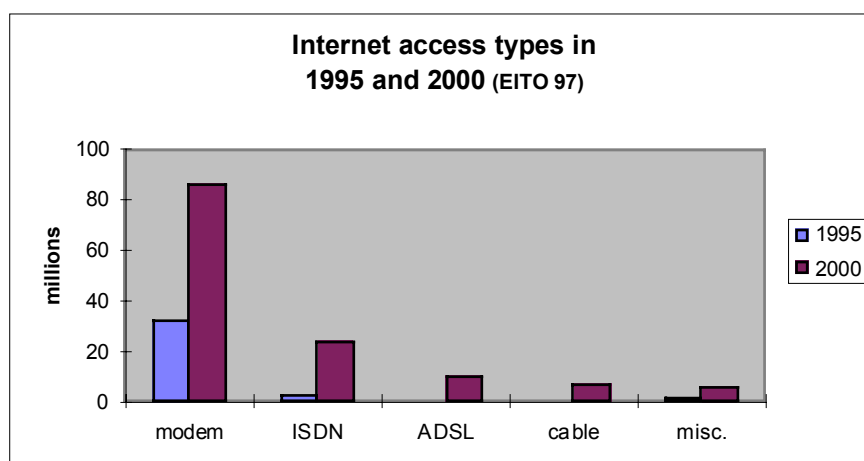

Table I. Internet access types by modems, ISDN, ADSL, and cable modems in 1995 and 2000.

An interesting new application of the ISDN is the 'always on/dynamic ISDN' (AO/DI) scheme. It combines the strengths of the D- and B-channel /5/. For the virtually seamless connection to internet or main office LAN the packet transmission capability of the D-channel is used. For example the incoming e-mail can be recognized in this way immediately on its arrival to the remote mail server. When more bandwidth is needed, it can be supplied in dynamic fashion by offering 1-2 B –channels for faster data transfer. The AO/DI can in the near future vanish one's dependency on physical working environment.

CTI (Computer Telephony Integration) means the use of telephone and computer facilities in a tight connection. Either the PC offers telephone user interface (IP telephony) or telephone is connected to the PC and the call control is managed by the PC alone or in close co-operation with the telephone device. CTI opens new interesting possibilities for teleworking i.e. in help desk, call center, and telesales applications. In CTI the calling line identification supplied by the ISDN network can be used for opening the customer data base upon the alerting tone. In telesales the lists of customers to be called can be updated and followed during the conversations.

Another new teleservice facilitating the teleworking is the (ISDN) centrex. Centrex is a PABX like service offered by teleoperator, and it is technically carried out in the central office switch. The centrex user – e.g. a teleworker – can use his/her telephone as if it was a PABX extension phone. Some operators (e.g. Sonera, the former Finnish PTT, Tele 2 in Sweden), switch manufacturers (e.g. Nokia in their DX 200 switch) and terminal equipment manufacturers (e.g. Miratel) offer equipment and services for ISDN centrex.

ISDN solutions for teleworking

Typical equipment used by teleworkers are the PC, modem, printer, telefax, and phone, the tools needed in information creation, exchange, and documentation. The costs of setting up a teleworking environment including the above facilities have decreased from the about ECU 8000 in 1992 to ECU 2000 in 1997 /2/.

Since ISDN handles voice and data in the binary form, it is ideal for combining two or more of the above mentioned teleworking equipment. A PC equipped with suitable ISDN devices can offer in a compact form all the essential tools needed in teleworking: the fast data transmission access device (PC card, minirouter, or ISDN terminal adapter), G3 or G4 telefax device, ISDN telephone, and CTI application software for convenient call control. There are devices, where this kind of multifunctionality is available. On the PC card side some manufacturers offer optional connection of an analogue phone to the card (Siemens). Some routers or terminal adapters include multifunction features like fax G3 transmission (Zyxel). There are also ISDN multifunction telephones including either CTI features (Ascom, Hagenuk, Miratel) or data transmission features (Ascom, Sinoca, Miratel), or both (Miratel).

Miratel Oy has deployed teleworking schemes in its own organisation. There are four sales offices besides the headquarters, which is located in Turku, in South-West Finland. One sales office is in Helsinki, the others are in Kuopio and Stockholm. One employee is teleworking four days in a week, in addition several others work occasionally either on mobile basis or remotely from their homes. The equipment used in teleworking are ISDN router and Microsoft NT server at the main office, and Miratel ISDN Dataphones tied into a PC on the remote office side. The mobile workers use laptop computers and GSM mobile phones with data transfer modems (PCMCIA card in the labtop).

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Collaborative Virtual Workspaces in the U.S. Air Force

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Sustainment Logistics Branch

Introduction

The Sustainment Logistics Branch of the Air Force Research Laboratory develops technologies to improve the logistics capabilities of the United States Air Force. Logistics attributes of systems are optimized when considered very early in the system design process. This can only happen by enabling logistics specialists to actively participate in the design process that is distributed across functional organizations and geography. Two research programs are underway in the Air Force Research Laboratory to assist personnel collaborating in such a distributed setting.

IRSS Background

The Integrated Requirements Support System (IRSS) is a grass-roots program intended to demonstrate that virtual work and collaborative development of operational requirements for weapon systems are beneficial in two ways: reduction of total weapon system development cycle time, and inclusion of specialized disciplines into the cycle as early as possible. The IRSS project was initiated by logistics researchers seeking earlier involvement of logisticians into the development cycle.

Operational requirements are synonymous with user requirements that are typically cataloged and analyzed by systems engineers. In the case of the U.S. Air Force, operational requirements including logistics parameters are collaboratively defined by military end-users. These end-users, referred to as the requirements community, are physically located at nine Air Force bases within the continental United States. Additional end-users work at the Pacific Air Force and the U.S. Air Forces in Europe headquarters.

Achievement of community consensus on operational requirements is a historically daunting task. End-users represent many functional domains ranging from mainstream functions, for example, intelligence and logistics, to outlier support functions, for example, medical transport. The functional specialists are physically distributed but in the operational setting, the functions compose one system of co-located and interdependent functions. Consensus on system operation is not a luxury but a necessity. Despite this geographic constraint of distributed functional specialists, the current pace of

425

technological change mandates cycle time reduction for development. Redesigning the rigid hierarchical rank and review procedures to include enterprise-level information sharing and virtual collaboration appears to be a potential solution.

Present Collaboration Challenges

Officers who understand current operations and logistics operating scenarios are best equipped to express end-user requirements. These user requirements are defined by means in the Operational Requirements Document (ORD). Face-to face meetings and professional facilitation help to generate ORD consensus. While these reduce review cycle time, dollar and human costs for travel and facilitation are significant. U.S. military downsizing forces more frequent travel for the remaining personnel who also perform temporary duty in remote locations. And scheduled officer turnover perpetually challenges the corporate memory of the requirements community. Officers cycle through requirements-developing staff offices and team assignments and teammates continually strive to share information, history, and context with successors.

IRSS Potential

IRSS intends to counter these challenges by enabling virtual project teams. These teams, composed of representatives from across the community, will have the capability of working together in public or private forums. The IRSS graphic user interface (GUI) lessens facilitation and data entry burdens and enables end-users to create teams and establish links to already existing information. The GUI also enables users to access data in remote servers. IRSS, implemented by means of rapid application prototyping, is now under beta test and has drawn much positive comment due to the breadth and depth of accessible information. This information supplies context and foundation for the development of each ORD.

IRSS Functions

IRSS has four major components: People, Projects, Documents, and Executive Summary. Each component links to the others, creating a web of data. The key methods are group and access rights definition, entry and viewing of data, and the creation, assignment, and monitoring of tasks. IRSS enables wide sharing or very narrow collaboration on user-defined sets of information. The essential innovation of IRSS is the development of a common data model that supports collaboration and information exchange across organizational boundaries.

IRSS Architecture

IRSS client-server design resulted from joint application development sessions. Each organization reviewed a number of stand-alone requirements support systems and identified the usefulness and priority of the functions. Then the organizations agreed on a common set of functions and data definitions and developed a joint priority list. A key user requirement for IRSS was that each project-leading organization would maintain physical control of project data. The resulting design is a synchronized and partially replicated system that links multiple database servers. This design permits organizational control, enhances communications for each organization to its local database, enables interorganizational access to shared data, permits interorganizational tasking and workflow, and finally provides an enterprise-level information resource.

IRSS Benefits

In a time of decreasing manpower and increasing technological complexity, IRSS offers the potential for physically distributed persons to share information in context over the natural timeframe of a weapon system development. Beyond requirements collaboration, the system is also providing a point of departure as an enterprise-wide computing foundation. Other diverse functions, such as long range planning and equipment modification, use much of the same source data and are actively defining interfaces with the underlying Oracle database. Another software tool that is being developed by the Air Force Research Laboratory that focuses on distributed collaboration is the RAPTR tool.

RAPTR Background

The Readiness Assessment and Planning Tool Research (RAPTR) program aims to enhance the effectiveness of personnel in reengineering efforts. The research and development program has identified the keys to reengineering success and this information is being used to develop a concept demonstration reengineering tool which will increase the speed and effectiveness of redesign efforts. The tool is designed to assist in all change efforts, from radical redesign to more moderate process improvements, by assessing the organization and reengineering team's readiness for change, providing a tailored "cradle-to-grave" reengineering methodology, tool recommendations, and an electronic project data repository. This tool can be utilized by the members of virtual teams and organizations in distributed locations, via world wide web based software housed on a single server, in order to work on the same project or to gather information from the repository of past projects.

The U. S. Air Force Logistics Centers are seeking to implement Lean Logistics principles. This effort is characterized by aggressive schedules, ambitious goals, and a requirement to maintain operational capabilities during organizational change. Additionally, the effort involves multiple organizations collaborating on projects in a distrib-

uted setting. The overall Lean Logistics goals are: a 50% reduction in cycle time for processes, a 30% reduction in material costs, and a 20% reduction in manpower. The term Lean Logistics was borrowed from manufacturing, where Just-in-Time inventory practices have eliminated or reduced parts inventories and their associated costs. Many industries are benefiting from this lean inventory approach. The U.S. Air Force wants to benefit in a similar way.

Lean Logistics is an elaboration of the two level maintenance (2LM) strategy. Historically, U.S. Air Force maintenance has occurred at three physical levels: Organizational, where local personnel conduct remove and replace operations; Intermediate, where local personnel perform diagnostics and component repair; and Depot, where large-scale factory operations are performed. The 2LM strategy eliminates the Intermediate level and, therefore, base level spare parts and repair facilities are minimized. The 2LM strategy places a premium on rapid turnaround of repairable items at the depot and rapid transportation between bases and supporting depots. Since stock levels and repair facilities at bases are low (i.e., are lean), the logistics system must be far more responsive than it is now.

A number of initiatives are being worked simultaneously under the rubric of Lean Logistics to make depots more efficient and responsive. The gist of RAPTR is to improve the prospects for success in part by showing how organizational and cultural issues affect these efforts. In addition, RAPTR facilitates the collaborative work of distributed persons and organizations working on the same reengineering project.

Cultural guidance and advanced methods and tools will help in implementing Lean Logistics. Some of the cultural factors that inhibit or promote the ability of an organization to change include the form and level of motivation of the organization's members, the understanding of the mission and objective on the part of the membership, and the members' commitment to the organization (as contrasted, for example, to commitments to trade unions, local communities, or professions).

Present Reengineering Environment

The present environment of reengineering and change management scenarios within the U.S. Air Force is characterized by small teams adapting published methods to local circumstances, *ad hoc* use of tools, and in some locations heavy reliance on consultants to guide the change management process. These teams typically work under aggressive schedules with tight deadlines for deliverables; often they have had little previous experience with reengineering and they have no distributed collaboration support. Experience prior to RAPTR has suggested that in this environment, teams look for tools that can enhance their productivity without requiring too great an effort to learn or master the tool.

The RAPTR tool helps reengineering teams by supporting the planning of organizational change and by providing support in meeting the teams' aggressive project schedules while operating in a distributed setting. One of the system's unique capabilities is in providing an on-time and on-target assessment of cultural issues that impact business processes. The tool accommodates the various tools needed for change man-

agement (such as modeling tools and repositories, groupware, simulation packages, and project planning software) in an effective and efficient manner through a combination of system integration and system interfaces.

RAPTR Functions

The RAPTR tool assists an organization with three main functions that can be detailed into sub-functions. The functions are:
1. **Learning**
   1.a   Learning about reengineering
   1.b   Learning about an organization
2. **Doing**
   2.a   Initiating a new project
   2.b   Reviewing project status
   2.c   Executing a project
3. **Reviewing**
   3.a   Browsing past projects
   3.b   Conducting a directed search

1a. Learning about reengineering

The learning about reengineering function exposes first-time users to reengineering tools and methods. The user can access specific steps in a reengineering methodology through the Table of Contents and can then explore and learn about that step.

1b. Learning about an organization

This function allows organizations to conduct a high-level assessment on a sample of their personnel. The purpose of this function is to conduct an exploratory study prior to initiating a project. The user will be asked questions about communication in his organization, about resistance to change, and about the scope of the proposed change project. The system would then inform the user what additional data need to be collected to answer more specific questions about the areas addressed in this high-level assessment. This assessment can also provide an "annual checkup" of organizational health.

2a. Initiating a new project

A reengineering team leader would initiate a new project after learning about their organization. Depending on assessment results from the learning about an organization function, and the goals of the project, the user is directed to complete a series of detailed assessment instruments that will tailor the RAPTR model of reengineering. If the user does not want to complete these instruments, the tool will allow for the creation of a default process for a new project.

Once the data have been collected or the default settings chosen, RAPTR will display in outline format the proposed plan to be used for the new project. The user can query the system about each item included in the outline. RAPTR will respond with explanations for its inclusion, based on a combination of past project experience, the literature, and the assessment data provided to the tool. The team can then further tailor this model, selecting elements from the RAPTR model or entering new tasks or activities, which then must be defined for RAPTR by the user.

2b. Reviewing project status

This function can be used for two purposes. The first is for a status review of project plans and change management project operations. The user selects for display the needed project information from menu screen pick lists, by clicking on icons. This function may also be used to review the state of change management project products. The user selects the needed product information from menu screens or by selecting other graphical devices such as icons. The product information called up includes such as the following: assessment results; *AS-IS* and *TO-BE* models; process performance metrics; and business process improvements.

2c. Executing a project

The project management tool identifies when it is time to start a task, and who is in charge of completing the task. It will deliver the information needed for the task and identify activities to be undertaken in the task. If large quantities of information or complex data structures are needed, it will establish a local data resource on the user's PC. The system will also, when prompted, invoke the appropriate application(s) for the task. The user will then enter data, review data, conduct analyses, or create presentations, depending on the task. When the task is finished, the system will store appropriate data in the repository.

To develop the capabilities supporting this scenario, we will obtain specific Warner Robins Air Logistics Center requirements from Warner Robins users. One determination will be to consider production of "read-only" copies that will not have the capability of being checked back into the repository.

3a. Browsing past projects and 3b. Conducting a directed search

RAPTR users may desire to review past projects, either in a browsing mode or through a directed search. Those browsing the repository may decide to "check out" a project volume for a past project. Users may also want to search for items or activities of interest.

RAPTR Benefits

The benefits of RAPTR are improvements in the planning, execution, and management reengineering projects. Using RAPTR, reengineering teams will

- Have greater visibility into critical issues such as readiness and culture
- Have access to proven solutions for these issues
- Have access to the experience of previous projects
- More readily solve some of the chronic challenges of change efforts, such as scoping, tool selection, documentation, and team preparation.

By removing, mitigating, or minimizing these challenges, RAPTR provides substantial advantages in improving organizational flexibility and effectiveness.

RAPTR makes a presumption that change efforts, such as Lean Logistics, will enable the U.S. Air Force to better accomplish its mission of providing air superiority in a time of declining resources and rapidly changing threats and technological opportunities. Stated another way, RAPTR makes no judgment regarding the ultimate value of change efforts. Instead, RAPTR assumes that a healthy organization is one that is ready to adapt to changing environmental circumstances as threats and opportunities evolve.

RAPTR is conceptualized such that its benefit will grow over time. The first users of RAPTR will have only minimal access to projects through the repository; as this library is populated, the benefits of RAPTR will grow.

RAPTR is a tool that will assist organizations in a distributed setting arrive at a plan for a change that they will accomplish in their organization. After the plan is generated the change team will focus on successfully making the change in their organization.

Conceptual Integration of IRSS and RAPTR

A flow diagram (Fig. 1) illustrates that a specific operational requirement (i.e. 2LM) results from the deliberations of the requirements community that then prompts the formation of a planning team. This team reviews the repository of other reengineering efforts, focusing on those that chronicle the redesign of base to factory transportation networks and maintenance processes. RAPTR prompts the team to also assess the readiness of those affected by the process changes and mitigate the impediments to the change. RAPTR then supports the definition of the new design that meets the users' requirements for 2LM.

Virtual Workspace Benefits

Each project offers unique direct and indirect benefits. Practice-based research initiatives such as IRSS and RAPTR provide direct, concrete examples of the broad benefits of virtual work and collaboration. Indirectly, these tools expose other, less well understood cultural impacts of virtual work that will require additional research, development and testing. At least two important impacts have been realized: the need to explicitly address the costs and responsibilities of virtual workspace support across organizational boundaries, and the need to incorporate appropriate managerial participation so that the military organization, hierarchical by definition, can effectively empower subordinate technical specialists.

TELEWORK
RETHINKING THE WORKPLACE
Pilotproject

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1.GENERAL

1.1 Background

The project Telework - Rethinking the Workplace came into being because of a need in the world of enterprise. The Council of Tampere Region served as the uniting force for the participating parties. At the urging of the Council, Markkinatieto Oy and Tampereen Messut Oy contacted the University of Tampere Institute for Extension Studies in order to utilize the expertise of that organization. At that same time moves were under way in the Institute to rethink its own possibilities for further development with the aid of telework. There was thus already a natural basis for the initiation of cooperation.

The Council of Tampere Region pointed out the importance of a pilot project in further developing the region and in creating a more enduring employment policy by improving the modes of operation of the work organizations.

Telework had already been done before the inception of the project in the University of Tampere Institute for Extension Studies and in Tampereen Markkinatieto Oy. Only at the beginning of 1997 did Tampereen Messut Oy embark on an experiment in telework.

The project was financed by the National Workplace Development Programme of the Ministry of Labour

1.2.Description

The aim of the project was to ascertain how different forms of telework are applicable to different fields and in organizations operating in different environments. Telework is part of the more extensive process of change in work and organization culture in the information society.

The report provides examples of the implementation of telework in pilot organizations, possible problems emerging in connection with the startup of telework are discussed and solutions proposed. It is hoped that this will serve to promote the spread of telework and lower the threshold to initiating telework in new companies. The report is based on interviews with management, with teleworkers and with other workers in the pilot organizations. The report necessitated interviews with 11 persons: 3 at managerial level, 5 teleworkers and 3 other workers. The sample is small, thus the data are insufficient for the drawing of extensive conclusions.

The projects was carried out mostly in 1997. The report was completed in autumn 1998. The present document is part of that report.

The situation of each pilot organization was examined on a case basis. Next the common features and main issues in the startup of telework are presented.

It is important to conceive of telework broadly, as an opportunity to apply new information technology and new modes of working and as a tool by means of which a new kind of communication and enterprise culture can be developed.

Telework offers benefits to **society, to enterprises and to individuals.** It signifies an improvement in matching work and labour force, regionally and professionally. Through telework it is possible to ensure that the rural areas are not deserted and to obtain expertise from a long way off. For workers this mode of working allows freedom in planning and carrying out their own work. This new way of working promotes independence and achievemnt orientedness. It becomes easier to reconcile work and leisure more flexibly as the situation requires.

From the standpoint of the enterprise and organization telework means improved productivity from work through improved motivation to do work. The quality of work improves and personnel becomes more readily available. Telework means optimally efficient utilization of information technology at all levels in the organization. It also implies savings in use of space and promotes networklike organization. Through telework the organizations can react fast and efficiently to changes in the operating environment by increasing the flexibility of operations and sensitivity to markets.

1.3. Objectives

The basis for the project was functioning cooperation. A start was made with reference to the standpoints of the individual organizations and their needs and possibilities for applying telework. In keeping with the action research approach the project supported and provided information as a foundation for further developing the activity and decision-making of the work organization. The pilot organizations were themselves responsible for the progress of the telework arrangements in their organizations.

The point of departure for the project was local initiative and the further development of regional innovation activity in cooperation with the various parties operating in the region. One aim was to set out in cooperation with the various parties to the project, **setting up job by job the best mode of working for each pilot organization in order to enhance productivity and quality of working life.** The organizations which committed themselves to the project perceive telework as an opportunity and new mode of operation for further development.

Telework is not only a way of working, but also a **new way of organizing work,** which creates the preconditions for the organizations to adjust to changes in working environment and which entails qualitative changes in working life.

The aim of the project was

* **to stimulate the organizations' interest and knowledge regarding telework**
* **to promote and support the introduction of telework**
* **to achieve permanent telework arrangements by suporting the organizations going in for telework in implementing the changes.**

Objectives as regards national economy may also be considered to be the boosting of the organizations' competitive ability and improvement of the employment situation through enhanced personnel capability, or at least to safeguard the existing workplaces.

It was essential to set about the development work from the standpoint of the organization, its personnel and the individual workers. The development work was carried out as a cooperation project, which entails the commitment of both management and workers. Change is an opportunity to develop new, economically profitable working arrangements with consideration for the quality of working life. The adoption of telework arrangements entails changes in the pusiness activity processes of the enterprise, in personnel policy and in the overall enterprise and organizational culture. Management of these changes can be achieved through a systematic development and training project.

Each pilot organization had its own orientation regarding embarking on the development project. **Tampereen Messut Oy** wanted above all to improve its customer serv-

ices through telework arrangements. **Markkinatieto Oy** envisaged a competitive advantage for the enterprise in the upgrading of personnel professional sills and job satisfaction. The **Institute for Extension Studies of the University of Tampere** wanted help from telework to improve the services it could offer in the face of ever increasing demands for quality and ever intensifying financial pressure.

Telework applications (programmes, equipment) development work and the functionality of experimental solutions were also linked to the project.

Efficient development activity requires interaction and networks both within the organization and between organizations, as indeed it also requires within the infrastructure supporting the development work overall. Another objective was to create a network for exchange of experiences regionally, nationally and internationally. Efficient transfer of information and expertise thorough networks is a key tool in the emhancement of economy and employment in the information society.

The experiences gained from the project and the concrete action models will in future be exploited both nationally and internationally. This is ensured good prospects through the connection of the project to development work on telework at national level.

1.4. New models of work

It is considered that the development of information technology has gone a long way to improving the opportunities for flexible working arrangements and activities. In the present report the concept of telework has very flexible borders. We would prefer to use the term "decentralized work" as better describing the subject under discussion. Telework may be work in an office a long way away or mobile work done in what is known as a mobile office. A new definition for telework is proposed in which, however, three common themes recur:

*   *The bulk of the work is carried out away from the main scene of operations or physically at a distance from the location of the employer or the location where the work is commissioned*

*   *The work is typically done at home or is a specific teleoffice*

*   *The work is done using information technology and frequently the connection with the employer is also through information technology and information transfer links*

(Source: Pekkola 1993. Etätyön soveltaminen henkilökohtaisella, tuotanto-organisaation ja työmarkkinajärjestelmän tasolla. Työministeriö. Työpoliittinen tutkimus 47).

Th advances in telematics have also created the opportunity for developing modes of telework. As the more rapid information transfer techniques become more widespread the importance of information transfer has grown. Wider use of the technique has led to lower costs of technical solutions so as to be profitable even for small companies. However, the costs of information transfer depend on the need for it, i.e. the quantity of information and how it is transferred.

If the need for information transfer in great, it is worthwhile considering fixed rented lines, where the costs remain the same regardless of the density of information movement. The need for information transfer in in fixed relation to the need for information processing. Different users produce different value added through the information produced. (Source: Arrasvuori Juha, Pyykkönen Matti, 1995. Etätyö – uuden työympäristön mahdollisuudet. Kustannusosakeyhtiö Tammi).

2. SITUATION ANALYSES

2.1 Tampereen Markkinatieto Oy

Field of operation: marketing and opinion polls (no political surveys)

Personnel: 6

Turnover: approx. 2.5 million Finnmarks

This company has already implemented flexible working arrangements to some extent. Many of the employees have young children. Sickness among these young children causes an enormous amount of reorganization in the company as each individual has his/her own surveys which must be completed on schedule.

The new premises have been arranged as a landscape office where no employee has a single room but all are working in the same space. This change improved information transfer but rendered work involving concentration more difficult. This was remedied by a so-called 'quiet room' where there are no telephones of other distractions. However, one such room has proved insufficient, thus the importance of telework in people's own homes has increased.

A third important factor for embarking on the telework experiment was seen in the chance to continue in the job although an employee moved house from one place to another. Work of this kind is on the one hand hard to find and on the other skilled labour is also hard to find. The implementation of telework took a great leap forward when one survey assistant removed to another location on account of her husband's job.

The teleworker cooperates with all the survey workers in the firm. She is the only person in the company who compiles the collected data and does Excel graphics. In practice the teleworker discusses doing graphics with those doing the surveys. An effort is made to accommodate the planning of reports etc. in connection with the weekly meetings as far as possible so that it is easier to agree about questions of the external appearance of the material.

On telework days contact is by telephone or electronic mail, mostly telephone, as a quick solution is arrived at more easily. Electronic mail is used for communication of other work functions. The necessary material/data etc. for saving and graphics is transferred to the teleworker over a modem. When she has processed the data she returns it once more over the modem to the company's computer. The size of the files to be returned is in the order of 1Mb.

2.1.1 Contractual arrangements

There is only a verbal agreement between the teleworker and the company. It was easier to begin to experiment as the worker and the employer agreed that they could revert to the old system when too many obstacles were encountered.

As the move from the office to the teleworkpoint was quite fast for the teleworker there was no desire for change in the financial arrangements. The worker therefore continues in the company on a monthly salary.

The teleworker meets the costs of travelling to the weekly meeting herself. If it is necessary to make this journey more than once a week the employer meets the costs.

2.1.2 Productivity and efficiency

Company management already has an idea that telework improves productivity and efficiency. The managing director was of the opinion that the benefit and advantage of telework is in improved efficiency and flexibility in working hours. He believed that the time needed for problematic stages of the work might well be cut by half of the office time previously required. From the standpoint of the teleworker the objective is to achieve better life management through flexible working times, so that she would have time for her family when it was needed, for example. The only way for a small enterprise to achieve competitiveness is through the commitment and motivation of workers to do their own work.

The managing director's estimation of the development prospects for telework were very optimistic. It would also be easy to take on more teleworkers in a flexible way

through telework. The employer would not incur extra expenses due to temporary use of premises if the employees could do their work at home.

As the project progessed is was easy to note the anticipated greater efficiency and productivity. The teleworker is currently able to concentrate better on her own work, which speeds up the completion of work with graphics, demanding great concentration. This is the opinion of both the teleworker and the managing director.

In the opinion of those working in the office, efficiency has risen a good deal. Especially in the early stages of a project those working in the office were not able to offer the teleworker as much work as she was capable of accomplishing. On the other hand the change in the teleworker's tasks has affected efficiency. Previously she also took care of archiving, which has now become the task of others. This has slightly increased the burden of those working in the office, but this problem has been overcome by a re-organization of the work.

2.1.3 Quality of working life and well-being

Quality of working life and well-being are difficult to quantify. The analysis is based on interviews. In the early stages of the telework project the teleworker felt somewhat isolated. In the daily telephone contacts between the office and the telework location an effort was made to discuss other topics than work. Once the transition period was over the teleworker found new challenges and hobbies in her new residential environment. The weekly meetings also serve to maintain contact between her and the office. At present she is very satisfied with her quality of work. She is free to arrange her daily tasks as she likes. Increased freedom and responsibility result in greater motivation to accomplish work. Telework also brings out the teleworker's initiative.

In small companies the employees frequently also know about each other's private lives. Thus they share joys and sorrows. The teleworker need take no part in this. However, despite a feeling of relief, both the managing director and the teleworker experienced anxiety about being isolated.

2.1.4 Adapting to new things and learning new things

In the opinion of the teleworker the transition to telework went very fast and virtually without problems. The change was so rapid that her colleagues could scarcely keep up with it. Starting up the telework was helped greatly by the fact that the company took care of the installation of the information technology. The physical move was also easy as the teleworker had very compact working space and equipment which she was accustomed to using at the office. Initially the teleworker was concerned about the technical functionality and efficiency of the equipment. Problems might arise if the device

should jam, and it would be necessary to stop working and seek help from ADP support personnel. However, the installations in connection with the move were undertaken by an ADP person who installed the programmes, connections and modem connections. Work well done has resulted in a functional unity. There have been no problems with the equipment since its installation. Everything has been almost too easy according to the teleworker.

The transfer of one worker to telework came as something of a surprise to the other workers. There had been talk about this option at the workplace but such a radical change was a suprise to the others. The colleagues stated that their opinion on the shift of one worker to telework had not been consulted, thus their attitude to telework was initially somewhat suspicious. Once the tasks were reclarified activities between the Markkinatieto office and the teleworker have run smoothely.

In the opinion of the other workers the problems of the teleworker have not taken up their time any more than work-related problems would otherwise have done. Using the modem has been technically easy, and there have been no problems with it. The change in the "elicitation technique" of the teleworker with the shift to telework has been noteworthy. She now assembles more work-related questions and telephones only when the lack of an answer impedes the progress of the work. At the office the questions came singly, spontaneously and frequently with repetition. The independence of the teleworker has increased considerably as she now needs to solve small problems herself. On the other hand she enjoys the new independent way of working. There is no longer any need to ask other people about small things. The experience of telework has fostered independence. Given that she knows the way of doing things and that the office personnel are familiar with her modus operandi there have been no surprises once she has started making her own decisions.

An assessment was also made of the inclination of the rest of the personnel to do telework. Some of them had no objections and were keen some day to do telework, for example when planning questionnaires, which requires concentration. Others still wanted to work in the office. They doubted their own self-discipline in independent work. The management of Markkinatieto has no intention of forcing its people in one directon or the other. Telework demands its own attitude. In the case of Markkinatieto the condid-itons were dictated by practical necessity. In the case of other workers the need is not so great thus the shift to telework may be more difficult.

2.1.5 Utilization of information technology and protection of data

Markkinatieto are concerned about the rapid development of information technology. Telework compelled them to look at the new techniques available. Simultaneously the company became aware of its current information technology expertise. Unbiased data collection was felt by Markkinatieto to be some kind of a problem. Tthe field abounds in offers for technical solutions one more tempting than the next. SME companies frequently feel that the lack of the point of reference is a disadvantage. A good solution is often to use technology which is already established and standard on the market. Buying standard equipment is often a safeguard against unpleasant surprises which may accur when introducing new technology. Costwise, too, older technology may be better. The reforms necessitated some costs, but for Markkinatieto these were fairly small. In relation to the amount of data to be transferred modem technology was a very sensible choice for Markkinatieto.

The modem is located in one Markkinatieto computer and from there information transfer outside the company is performed. The other computers in the company are networked to the modem computer thus internal information transfer is possible on the internal network. Modem contact is only created in connection with information transfer. In practice this means that the teleworker telephones Markkinatieto when she wishes to return prodessed material after which the connection to the company is activated. In the course of the same telephone call the teleworker can exchange comments on the work in hand and have a little chat with her colleagues. This also gives the teleworker a welcome break from work at the computer screen.

The information transfer connection lasts between two and five minutes per session. Contact may be made between twice and five times depending on the work. For the duration of the modem connection work on the modem microcomputer must be suspended owing to lack of resources. However, the interruptions have been fairly small.

As the telework project progressed a need arose to use the modem connection computer in the office all the time. Sometimes it is felt that the interruption occasioned by the information transfer impedes efficiency, especially when the work being done demands concentration. As the project progressed there was a desire to further develop the system and introduce an e-mail system. The service was bought from an external company offering Internet connections. Each worker now has Internet e-mail. The material which is to be processed by the teleworker is sent to an e-mail postbox as **liitetiedosto** to e-mail. The office network is equipped with a **reititin** which is taken care of by the supplier of the Internet service. It is now also possible to send material from other companies to the teleworker's electronic postbox. This has speeded up the completion of material processing on several projects as the statistics files can be sent direct from the data collector, the Finnish Gallup Company. The teleworker can now direct the processed material to precisely the right recipient. Payments due to the Internet supplier have slightly increased costs but these are hardly significant.

Threats perceived by the managing director are above all data protection and the marginalization of the teleworker from the working community. The risk of information finding its way outside the company has always existed. Security issues have been agreed on with the teleworker. At regular intervals she destroys unneeded paper material on the office shredder. It has also been mentioned by the employer and the employee that material getting into the wrong hands would be grounds for dismissal. Safeguarding data is perceived by Markkinatieto to be a greater issue than the fluency of telework. Technical solutions or reorganization of work can frequently be of help in ensuring that telework runs smoothly, but loss of data security would cause irreparable damage.

Companies' data protection risks can be divided into internal and external threats. Internal risks comprise breakdown of computer equipment and losses caused through accident or human error. Threats caused by the personnel themselves are greatest in small companies. Turnover of personnel causes the greatest "security risk" for SME enterprises. This served to increase the management's interest in retaining a good worker in the organization and in offering the option of telework. External threats comprise hacking in to the system from oustide.

The managing director estimated that telework would have a positive effect on the company's image. The company would appear modern and innovative. Thus telework could be taken advantage of in marketing contexts. It is necessary, however, to take great care with data protection. The customer must have a clear picture of how their affairs/surveys are being taken care of. At the start of a survey is is necessary to establish who is implicated in the data and how. Absolute security must be guaranteed to each client, including security in telework. This is a prerequisite for its continuation.

The computer used for work is used for no other purpose. The family have acquired another computer for other purposes. The teleworker endeavours to keep as little sensitive client material as possible at the telework location. She also avoids making phonecalls about work when there are other people in the house. Sensitive questions are currently dealt with through e-mail. Rendering files and e-mail secret has been considered, but so far no steps have been undertaken in this direction.

2.1.6 Telework culture and organizational change

Telework has had a profound effect on the entire working culture. Markkinatieto's trump card has been the flexibility of a small organization and the capacity for rapid change if required. Establishing cooperation with the teleworker and the rest of the organization initially sought its own path but then settled down quite quickly. When the telework commenced the teleworker frequently found that at times there was a great deal of work then at other times very little. The teleworker should be ensured a steady

flow of tasks through flexibility. When the experiment began the office frequently did not know how much work the teleworker currently had on her hands at a given moment. She might be sent too much to do or then there might be imes when the teleworker rang the office asking for the next batch of material. This was partly due to the fact that it was not customary to plan survey projects far in advance, and the implementaion frequently developed on an ad hoc basis.

Telework requires that the project be planned more carefully and in good time and that the teleworker be given precise instructions. This has served to render everyone more efficient and avoided overlapping. Organization of work has served to level out very well the peak periods characteristic of work in a small organization. On the other hand the weekly meetings instituted alongside the telework have clarified what is to be accomplished and how and internal transfer of information has improved considerably. Now every worker in the company is aware of the projects of the others. Within the organization it is easier to prioritize the work for the coming week. This in its turn has brought forms of teamwork into the enterprise.

The negative sides of telework perceived were possible rigidity and the need for reorganization. The fast pace of work had offered chances for flexibility before the shift to telework when some workers were able to ease the burden of others in temporary rush situations. Since the shift to telework this scope for flexibility has proved more difficult to achieve. Those working in the office can no longer concretely see the burden of the teleworker. Thus finding the correct degree of loading for her has taken some little time to achieve.

The departure of the teleworker for telework also caused pressure for reorganization. At the inception of the project several work routines emerged on which nothing had been agreed in advance and which had formerly been the responsibility of the future teleworker. When she commenced her telework these routines were not completed. Among them were archiving, which the teleworker had done in addition to her own duties. The other workers had to learn to do this routine. The teleworker also feels that learning new work routines is fairly difficult. Changes in modus operandi may occur quickly and the teleworker may not be duly informed. This situation has been improved now that the teleworker need no longer have anything to do with office routines and concentrates solely on her own part in the projects.

Since the commencement of telework Markkinatieto have recruited a new worker to take care of office routines. According to the managing director this recruitment is not a direct consequence of the void in the office due to the commencement of telework. The positive work situation has given rise to pressures on Markkinatieto to expand, so that recruitment of more labour was only a question of time. The need to fill the void left by the teleworker was sufficient to precipitate that recruitment.

The teleworker has a clear conception of the appreciation of telework. In her estimation employers feel that telework is a plus point when recruiting labour. Among the dangers inherent in telework she percieves above all that of the stagnation of the teleworker and the halting of development. She perceives attendance at courses as the remedy for this. The problem here is how to find good enough courses which are sufficiently specific. Moreover, it is more difficult to monitor the quality of other firms when working independently at a telework location.

During the transitional period to telework there should be much more discussion as to the possible effects in order to avoid potential problem situations. Possible evasive action in case of problems should be well thought out. The creation of a back-up system is a prerequisite of flexible operation. In the case of Markkinatieto this means a shift to postal services if the system should let them down. Nevertheless the schedules for the work to be done have been made on the basis of the functioning system.

Recruitment of new employees carries its own risks for the company. These risks are multiplied when a worker is recruited for telework. Frequently the transfer of an old employee to telework is more successful as such a person is familiar with the organization in which s/he is already employed. The Markkinatieto teleworker already had two years' experience of the organization. Familiarity with the modus operandi also facilitated the managing director's decision to shift to an experiment in full-time telework. The teleworker must be very independent in his/her work and must frequently also ensure that s/he does not become too cut off from the rest of the organization. The capability for independent decision-making is a help in handling the emerging situations.

2.1. Work motivation

The teleworker was aware of no problems in maintaining work motivation as she herself had been motivated to make the move to another location. There was a clear need for telework as there were only two alternatives before her, telework or abandoning her job. For the teleworker the greatest factors in the shift to telework were the potential loss of a permanent job and family unity.

The creation of presentation graphics frequently demands a high level of concentration on the part of the worker. In the office work was frequently interrupted through phone-calls and other distractions. At the telework location it is easier to concentrate on work, thus work is accomplished more quickly and more efficiently. The teleworker perceives uninterrupted work as one of the most important considerations; she can see a demanding phase in her work through to the end in peace.

Already when working at the office the teleworker was particularly diligent. Telework has not slowed her up at all; she is more efficient than ever. At first she did not stop for coffee or lunch and frequently worked with a cup beside her. This increased pace of

444

work has resulted in the symptoms typical for prolonged work at the computer screen, pains in the neck and shoulders. Attempts have been made to cure these with massage and by taking a break from working at the screen for the duration of the short information transfer period. At present the teleworker also takes her coffee and lunch breaks away from the computer screen. It is an absolute prerequisite of efficient working that breaks be correctly placed. The importance of breaks grew with the emergence of symptoms resulting from working at the screen.

2.1.8 Information transfer

The teleworker's greatest fear was the loss of social contacts. Given that no problems emerged in the area of technical solutions the focal point for Markkinatieto in our project was on ascertaining how the teleworker maintained contact and on preventing marginalization from the work organization.

The new situation necessitated change in the transfer of information. With some incidental exceptions a working solution by telephone was arrived at in the early stages of the project in respect of work-related matters. There was more emphasis than before on the initiative of the teleworker in gathering information. She was obliged to find things herself and not leave information transfer to those working in the office. Those working at the office may not necessarily know what the teleworker was interested in and what matters she was possible missing out on. It was noted at the outset of the project that the teleworker found it difficult to ask things when she did not know what matters has been settled at the office. As the project progressed the teleworker developed certain standard questions by which to find out future matters in the office. It should also be noted that major issues found their way the the teleworker's ears more easily than minor ones. Major issues were addressed in the weekly meeting but smaller issues possibly important to other activities were frequently left unexplained. Another problem was that of filtering information which was really relevant to the teleworker.

In the discussion on telework it has frequently been mentioned that teleworkers are at risk of missing out on coffee break talk and of becoming isolated from their own organization. This was also apparent in Markkinatieto. The teleworker misses out not only on hearing about work-related matters but also on other matters emerging at the workplace. On the other hand the teleworker was relieved to escape the gossip at the workplace. She did not need to carry the cares and worries of the other workers but could concentrate on her own affairs. This served to facilitate new social relationships and hobbies in Kokemäki, the new location.

In principle the relationship to work and colleagues has remained unchanged. There is less contact with the immediate superior since this is restricted to the weekly meeting. The commitment to the physical workplace has changed as Markkinatieto moved to new premises just before the shift to telework and the teleworker does not feel at home

in the new premises. Her new physical workplace is now her own teleworkplace in her own home. She considers the weekly meeting an essential for social interaction between the teleworkplace and the office. These are a relief from working alone. She would also welcome some pleasure trips together or some training.

In the opinion of the managing director care of the internal atmosphere has been perceived to be more important than before. There was a desire to foster the sense of unity, thus efforts have been made to increase the number of pleasure outings. However, tight schedules restrict joint excursions.

2.2. Tampereen Messut Oy

Field of operation: arranging exhibitions

Personnel: 15

Turnover: 16.7 million Finnmarks

Tampereen Messut (hereafter referred to as Messut) is an exhibition organization operating in Tampere. Work in the organization consists of arranging, organizing and marketing exhibitions. The project director's job description includes selling exhibition space to companies, frequently at the client's premises. Because of the mobile working environment telework has long been the only flexible way of working at Messut. Thus at Messut the term telework has been understood for years in a very broad sense. Work may have been done in trains, hotel rooms, at the client's premises or wherever it was possible. The main objective in promoting telework at Messut has been to set up functioning transfer of information.

Work needs have automatically given rise to new modes of working, of which telework is one. In practice telework has been done, but the company has not investigated the theory and development of telework nor devoted company resources to this. Practical action has created the needs, and some sort of an attempt has always been made to fulfill them.

The managing director sees this as just the beginning, a point from which is is good to start. The telework project is one lasting 5 - 10 years and concerns the entire company. Telework will be there throughout and it may be adjusted depending on people and life situations.

The startup of the project was very problematic due to the tight schedule at Messut. At the time of writing the report telework had not started up. the main reason for this was

the hectic exhibition season, when nobody had time or energy to further the telework project. Concrete measures are planned for spring 1998.

The financial manager at Messut immediately volunteered on hearing about the project. The initial decision was purely spontaneous, but on reflection it seemed a very good one. Family considerations were largely responsible for the financial manager's decision to pioneer telework. She hoped that telework would leave her with more time for her family. She believed that this kind of work could well be done at home as she takes care of Messut's daily financial transactions by microcomputer. Given that she is seldom sought by clients her work is not limited to office hours. At the beginning of the project she planned to do two days' work a week at home. These could vary as need dictated but on account of the weekly meetings she intended that these two days should be in the middle of the week.

Not everything can so far be done by telework. For the balance sheet telework is not yet a realistic proposition at Messut. Messut have made an effort to improve the transfer of information. On Monday mornings a working meeting is held at which the presence of teleworkers is also required. Here the events of the coming week are discussed. As the exhibitions approach there are preparatory meetings scheduled according to other people's commitments. Once a month at Messut there is a personnel meeting to deal with matters weighing on the personnel. The financial manager has tentatively planned that she will work from 10 a.m. to 3 p.m., then take a break and resume work in the evening. In her case what is crucial is not the journey between work and home but to find a more peaceful environment in which to accomplish work which demands precision. The financial manager has served the company for 17 years and because of all she knows is a veritable pillar of Messut. Thus the departure for telework was a little worrying because she feels she is important to the company. People ask her all kinds of things and she expects that things may move more slowly when she is not there to respond. It was also part of her role to be a suportive person to the rest of the personnel and a mother figure. On the other hand she hopes to find new ways of working for her long career in the same company.

Other potential problems she perceived were those of organization of work. It might be that the papers would always be in the wrong place and contact might become difficult. Learning new ways demands time, and adversities are a possiblity. She feared that some urgent matters in the company might be left unattended to when she is doing telework. The other person chosen to be a teleworker works as a project manager. At Messut this means taking responsibility for exhibition projects. The work of the project manager is very varied. Sometimes client relations are taken care of through visits to the client. Sometimes the work involves stages which require that the worker be able to immerse hiself in the work in peace. At the marketing stage the teleworker must travel a great deal but still maintain contact with the data contained in the company server. He may well do work in the train or in a hotel room or wherever it is possible. In such

cases it is a priority that the worker be easily reached. He considers his e-mail connection to be extremely important.

Both telework pioneers hope to be able to do work requiring concentration difficult to achieve at the office at their homes or summer places. The only information transfer connections are important so that they can occasionally be contacted or contact others.

At the beginning of the project the other employees at Messut knew very little about the effects of telework and the project as a whole. An attempt was made to improve the transfer of information by means of a telework meeting etc. to inform the personnel about telework. The fast pace of work, however, meant that the other employees had no time to take an interest in the telework project and its implications. The teleworkers speculated that their departure for telework would come as a surprise and give rise to some envy, too. More information for the others was desired. Regrettably there was no time to discuss potential problems sufficiently.

2.2.1 Contractual arrangements

So far Messut had never concluded a telework contract as there has not been actual telework in their company. A draft contract, however, was presented to Messut and they found that they had nothing to add.

2.2.2 Effects of telework

The managing director found many reasons in the company in favour of a shift to telework. These were principally questions of accommodating work and family life. Telework first and foremost makes flexible working possible. What is most important is that matters are taken care of and the motivation and job satisfaction of workers is good. In the field of exhibitions a fast pace of working frequently causes stress, so that telework is used as a means of improving management of work and leisure. For several years running Messut has expanded its operations. one current problem in the company is that of space, due to the need for more personnel. In the coming years Messut will have to pay more attention to this issue of space. Messut management are keen to make optimal use of the space they have. At present it may be that some employee's office stands empty for days on end which s/he works elswhere. Important office space can be put to more efficient use when good information transfer arrangements and computer access have been provided.

The managing director has a clear vision of how in future external experts all over the world can be utilized more efficiently through information transfer. At their own local level these experts function through their own special local knowledge of their cultre, thus being able to make optimal use of thier local sales expertise. With EU membership the exhibition field is no longer only Finland but the whole of Europe.

Messut believes that an employee's accessibility is of paramount importance. Telephone and e-mail are important channels. For some years now Messut has had mobile computers and datacontact to them. All those who do mobile work, however, do not need application programmes when only accessibility is important. While a solution to this problem was being considered mobile phones came onto the market with all the connections needed for electronic communication. The NOKIA Communicator 9000 combines the telephone, fax and e-mail needed to maintain contact and they go wherever the salesperson goes. It is easy to send small tenders etc. direct from the telephone and e-mail can be checked almost anywhere.

Frequently one obstacle to telework is the problem of information transfer and updating. It does not make sense to transfer all applications/datafiles, either because of their size or their updating problems. Owing to the large size of the database the transfer of the Messut client directory to a private home is not practicable with the teleconnections available. The client directory programme has been made as an intranet application so that the speed of transfers on the company's internal network is much higher. The project map done on a CAD application is an important tool for the project manager when planning exhibitions. Due to problems of updating the main directory must continuously be housed in the office. When they are working elsewhere employees must be especially careful with dates so that the latest information is available to all. At the beginning of the project not a great deal was known about the possibilities for replication. As these improved the option came into being for slower connections to update even large databases. Replication refers to the updating of databases located in physically different places so that they correspond to each other. The setting up of teleconnections in Messut was begun by procuring the dataservice YhteysPalvelu offered by the Finnet companies. This has been designed with the needs of SMEs in mind. It is a package which takes care of a company's connections outside to network business. It enables the company to discuss by e-mail with its cooperation partners, to deal with its banking affiars and to search for data on the Internet etc. There is a fixed monthly fee for this service so costs are easy to monitor.

Traffic on YhteysPäälikkö utilizes ISDN connections, with 64 kbits/route connection. The speed of information transfer is sufficient for smale-scale data transfer. It is not, however, suitable for heavy application programmes in tele use.

Data security is becoming better and better. Firewall protection and similar elements improving data protection were already in use at Messut before the beginning of the telework project. On the other hand the managing director does not believe that the transfer to telework means new risks as the workers are already now 'walking databanks' who have it in their power to feed data to competitors if they so wish.

2.2.3 Telework culture and organizational change

Messut previously conceived of telework as synonymous with mobile work, when the work is done at whatever location suits best - in a car, train or hotel room. The Messut work culture has not previously considered telework done at home. For this reason the worker transferring to telework thought that the appreciation for telework done at home would be slightly lower. Her colleagues do not see how telework could be applied in the company. Project managers are frequently more tied to time and place, thus telework may seem strange to them. It will take time for telework done at home to achieve equality with other modes of working.

Nevertheless telework is seen at Messut as an asset for the teleworker when seeking a new job, for example. It confers reliability on the worker, initiative and enterprsing spirit.

It was assumed that there would be changes in the job description. Some of the work for which the teleworker has been responsible had to be transferred to someone else as many jobs need doing on the same day. Due to scheduling problems it has not yet been possible to try this out.

The organization of telework demands acclimatization. It is not easy at the beginning to manage the new working environment and to divide one's time between work and home. In the beginning it may be that the necessary papers are repeatedly in the wrong place.

The managing director perceived as one of the major advantages of telework that new personnel could be recruited on a temporary basis. The threats he mentioned included data protection and the risk that the teleworker would possibly drift away from the closeknit working comunity. He perceived positive and negative effects of operative leadership for telework. Interaction relations mmight develop on a more planned basis, so that activity would be more efficient. The negative aspect was that spontaneous innovativeness would suffer through fewer contacts.

2.2.4 Work motivation

Despite the fast pace at Messut, workers are well motivated to do their own work. The atmosphere is considered to be very good, which is a very important thing to them, as the nature of the work depends heavily on cooperation and groupwork. This atmosphere is kept up by at least 2 - 3 joint events throughout the year. It was the opinion of the managing director that telework will probably affect the atmosphere, but he was not able at the time to say what that affect might be.

2.25 Transfer of information

Transfer of information will have to be stepped up in the future. There are only limited opportunities to hold meetings and information sessions. It is therefore necessary to pay attention to the real transfer of information and so to minimize possible barriers. Electronic information transfer tools such as e-mail will increase. As e-mail becomes more common it will be necessary to derive maximum benefit from it. However, in the world of small companies e-mail connections continue to be few. At Messut e-mail is already used every day, but connections to other companies still have a long way to go.

The need for transfer of information will remain unchanged for the project manager, however. The project manager and project assistant have held regular meetings and these are to continue, with an attempt to make them more effective. The worker beginning telework may well have already been travelling for three days a week, thus telework does not mean any great change in this respect.

The importance of e-mail in the future will increase. Messut are therefore keen to create an e-mail system which is not dependent on any location. This implies an increase in the portable computers or the acquisition of mor devices of the type of the NOKIA 9000 Communicator. No negative affect on the company's image is anticipated from the start of telework. Telework symbolizes Messut's idea of being a dynamic organizer of exhibitions givning the impression of being progressive.

2.3. The Institute for Extension Studies at the University of Tampere

Field of operation: open university, professional continuing education, recruitment
                                    services

Personnel: 120

Turnover: approx. 40 million Finnmarks

The Institute, known best by its Finnish acronym 'TYT', has long been interested in the development of telework. The utilization of data transfer has for several years been an object of research both for telework and for open and distance learning. TYT sees itself as a development unit and pioneer of innovations.

The concrete impetus for telework, however, only came in the early 1990s with the arrival in TYT of a trainee interested in telework. For this individual progress was rapid as the trainee transferred almost immediately to telework. Although the experiences gained were positive it did not attract more extensive attention in TYT. During the years of economic recession TYT also felt the pinch and for a few years the burden of

work and powers of endurance of the personnel were put to the test. With the telework pilot project there came the inspiration to improve flexibility and endurance at work.

The management were most encouraging and supportive, but the telework policy can best be described as one of *festina lente.* No pressure has been applied to transfer to telework, the desire for it must come from the individual worker. On the other hand being a volunteer involves sacrifices on the part of the worker as TYT has not purchased any extra ADP equipment for telework, and this must be done by the teleworkers themselves. This has caused a threshold to telework as not everyone can afford to buy an efficient workstation. Time will tell how managerial attitudes will affect acquisition of ADP equipment if people should be transferred to telework due to considerations of rent for office space and because of economy measures.

One of the teleworkers interviewed began telework because she had to tasks in the organization which were easier to accomplish as telework. She was primarily an information officer in TYT and in addition also functioned as an ADP trainer. Sometimes these two tasks were very difficult to combine, and telework has enabled her to take care of them both in a flexible manner. The information officer's work is very suitable for telework. After compiling the necessary data the telworker writes up the articles in her own home. Both the information officer's work and the ADP training are part-time jobs so that their flexible combination was easy to shift to telework.

In 1996 TYT changed over to a philosophy of management by results and accountability. Telework has been percieved in TYT as a factor in saving on costs as expansion of TYT has meant rising costs for rent of office space. In an educational organization working hours have always been a problem. Working hours have been fairly easily organized through contact times and planning of background work. Work may be done in the evenings and at weekends, when the planning of education can be easily done from teleworkpoints. Moreover the information transfer solutions are already in place so they can be efficiently utilized immediately.

2.3.1 Contractual arrangements

From the very beginning TYT has paid attention to telework contracts. It has been felt that a telework contract between TYT and the teleworker is very important in order to standardize telework in TYT. Although the contract is basically the same for every teleworker it needs to be adapted to suit individual needs.

the telework contract covers the following areas:

* ***the parties to the contract***

* ***the tasks in TYT***

*   *where the work is to be done and how much in which location*

*   *the location of the telework (home/telework centre/own office premises etc.)*

*   *working hours taking into consideration the rules of the Finnish collective bargaining agreement*

the teleworkers' working hours at home or in his/her own office premises do not come under the legislation on working hours, the teleworker shall decide on when those hours are worked. No extra salary will be paid for work done in the evenings or at night, nor will extra salary be paid in respect of work done on Saturdays, Sundays or secular public holidays. There is also no overtime pay.

*   *confidentiality and protection of data*

Other work-related obligations. The teleworker agrees to complete the work assigned to him/her without delay. In addition to the normal obligation to treat certain matters in confidence, the teleworker is responsible for the safeguarding of data protection where this is connected to his/her home and to data held at his/her responsibility

*   *remuneration*

* The basis for remuneration. The contract shall specify on what basis and schedule remuneration shall be paid for the work done (e.g. per page, by the hour, as project work).

*   *other emoluments*

*   *adp equipment needed for telework*

*Tools and equipment. The teleworker shall have his/her own tools and equipment for which s/he is responsible. S/he may also rent equipment for his/her home, office premises or use equipment rented from the telework centre

the time of working including when the teleworker is within the employer's insurance cover and when the teleworker shall be available

beginning and ending of telework

other matters emanating from the Finnish collective bargaining agreement including annual holiday, sick leave, health care related to the workplace, pension rights

By adapting the draft telework contract to suit the organization an attempt has been made to solve certain difficult issues. Insurance was among the primary headaches - when the worker is within the insurance cover provided by the employer. The employer's insurance **legislation** is rather old and there is no mention in it of telework at all. TYT offers no compensation for the use of the teleworker's own computer, only for costs resulting from data and tele traffic does TYT pay the teleworker.

2.3.2 Effects of telework in TYT

One problem in TYT is the fluctuation in the amount of work to be done. Some projects require more workforce quickly, which causes pressure on office space. In the future it may be necessary to rent more expensive office space. However, there is no certainty about the continuing of the project thus such office space may be vacated. Investments in furniture and equipment are expensive, however, thus their efficient utilization is more important than ever. Telework has been instrumental in achieving efficient use of office space.

Telework is creating a more modern image for TYT, which is welcomed by TYT management, who take the view that the entire teaching personnel of the open university is now already constantly engaged in telework. The work of a coordinator of professional education lends itself to a great extent to telework as course planning can be accomplished over the telephone, using e-mail etc. It is also possible to organize more in this direction so that activities resemble those of a networked enterprise.

There is, however, a certain opposition to telework, and because of this the transfer to doing it should be at the discretion of the individual worker.

In the future telework and TYT's open and distance learning will have an important role and image. Modern learning environments emphasise learning while education centre thinking stresses education. In the future teaching will be decentralized so that the person in charge of the teaching will take care of matters through telework, as indeed will the learners. It is conceivable that the learners, alone or in groups will develop reflective learning programmes for themselves (instead of a course progrmme imposed from outside) and then seek teachers for it. This, however, will be under the auspices of some institution.

TYT management perceived the main risk to be the possible loss of synergy. The importance of coffee break discussion in taking things further is great. At the planning stage of the work it is very important that course coordinators should have a peaceful working environment. What are also important are the discussion with othe coordinators and the resulting comments and hints. It is easier to arrange brainstorming at the workplace. This consideration reduces the amount of tasks which can be performed at home.

Personal reasons were the most common at TYT for the shift to telework. Mamgement of time between work and family is clearly better. The length of time a child can be in day care is shorter than the the normal working day, thus the working day frequently continues after the children have been brought home.

It is difficult to perform those tasks demanding concentration at the workplace. Peace at home often makes it easier to concentrate. Quality of work is a more important criterion to the employer as the competition in the field of education is formidable. Naturally it takes time to become accustomed to working at home. Some people may find it difficult to concentrate on professional work when there are all kinds of other things waiting to be done next door. Telework demands proper working space in the home.

Getting used to telework also depends on the amount of it. It telework is only done part-time the period of acclimatization is longer. Teleworkers state that one of the best things about telework is that there is peace in which to do it, thus more gets done. Another good thing is better reconciliation of time for work and time for the family.

There have been no real problems with other employees' attitudes to telework and tele-workers. The work of a coordinator is very independent. She frequently sets up courses from beginning to end with the help of a course secretary. Thus there are few natural contacts between the coordinator and other workers. This separate characteristic and the nature of the work mean that others workers often do not even notice that someone is doing telework. As there are no regular coffee breaks at TYT the importance of coffee break discussion is not great. Discussions often take place over the phone. Flexi-time also means that a certain person may not always be readily available. TYT coordinators travel a lot thus it is very difficult to contact one without a mobile phone.

Teleworkers appreciate flexible working time arrangements. They believe that the extra responsibility counts for something when they apply for other jobs. Employers appreciate workers with the ability to do independent work.

The University of Tampere net is part of the greater Funet net. Teleworkers contact the University **soitto sarja** and obtain from the University server all the e-mail services they need. The TYT net is separate from the Unviersity net so that the teleworker cannot access TYT net services. This has proven to be a disadvantage in some cases. Knowing about the problem makes it easier to get round it.

Telworkers have a modem connection whose speed varies depending on the telework point 14,400 - 28,88 b/s. There has been very little need to transfer large amounts of data thus transfer at lower speeds has allowed the work to go on quite well. In practice there has only been a need for the connection for e-mail or small databases. There has been less Internet www browsing.

The greatest advances have been in the development of teletechnology to serve the mobile worker. Before the experiment transferring a phonecall was possible only under the University's own switchboard. With the telework project there came the need to transfer calls after the worker to the teleworkpoint. Home as a workplace is still tabu, where calling on work matters is still contrary to good manners. Before the option to transfer calls there were frequently situations when some external caller tried to contact the telework at the workplace. On hearing that the person was doing telework the threshold to calling rose a great deal. The option of transferring calls has now removed that threshold. The caller need not know when the call is transferred. All that matters is that the right person takes the call. Teleworkers now have mobile phones and are therefore even easier to reach. The necessary programmes have been procured by the employer and are the same at the teleworkpoint and at the office.

2.2.3 Telework culture and organizational change

The flexible working times at TYT are a good basis for doing telework. Workers already had the option of fixing their working hours to suit themselves. Telework means greater flexibility. Responsibility is now more with the employee. The organization has not felt great pressures to make changes. The only change may be that supervisors do more advisory and less monitoring work.

2.3.4 Work motivation

TYT employees have a very subjective conception of the rise in productivity and quality of work. This can be handled as the worker's job satisfaction, motivation and commitment to work. No measurements have been made as to increase in productivity, the estimate is based on worker's own observations and feelings.

Management believes that telework has both positive and negative affects on the working atmosphere.

2.3.5 Transfer of information

The greatest problem in doing telework is currently isolation from the rest of the work community. This has been discussed and it is believed that a serious approach will produce an improvement. There were indeed problems with transfer of information before the telework project and these were solved as the project advanced. Measures intended to improve employees' transfer of information have included the weekly meetings of the profit centres and meetings for personnel using video.

Maintaining information transfer involves greater personal activity. It also demands a change in working methods by superiors and colleagues. Colleagues have been positive in their attitude to telework, despite a little envy, although in principle this option is open to all.

3.SUMMARY AND CONCLUSIONS

In every pilot organization telework was seen as an interesting option. In those organizations in which it had already begun people wanted it to continue. It was generally felt that it has changed work in a positive dierctionand increased job satisfaction.

The advantages of telework were perceived to be above all in productivity and in certain cases in improved quality of work when people could work without distractions. However, no actual instruments for quantifying performance were made due to the short duration and difficulty of quantifying a rise in productivity.

As stated the report is based on entirely qualitative data and, indeed, the sample is small. On the other hand in two of the pilot organizations in which telework really began in the course of the project a rise in productivity can be observed insofar as the teleworkers operate directly under management so that management can immediately note the rise in qualitative and quantative work.

Doing telework affected operative leadership and the entire organizational culture such that the overall operations and transfer of information became more systematic. The system of holding meetings became established and these meetings dealt with more matters than before the start of telework. This may be said to have raised overall efficiency in the company. Meetings have a clear objective towards which everyone works.

Transfer of information is a major problem in many companies today. Decentralization of the orgnaization causes many more pressures to develop a data management system but it also clarifies the situation and compells people to consider what the optimal solution would be in each case. As seen in the course of the project very simple technical solutions are enough is they are sensibly implemented.

Haste in the pilot organizations was a problem. This prevented one pilot organization from implementing telework arrangements during the project. Although the pilot organizations were committed to development, this was delayed if the actual business activity was at a critical stage. All three pilot organizations are developing and dymnamic and operating in a growing area. This ensures good prospects for development, but use of time is a problem. It also was seen that small companies can react more rapidly than large ones. TYT is part of the University organization and in many cases dependent on the decisions of central administration. It enjoys less independence in personnel policy and information technology solutions than do the other pilot organizations.

The introduction of telework goes best if the activity of the organization is in good order. All subareas should be in good shape, likewise the technical operating environment, for the adoption of new solutions to succeed optimally. On the other hand careful planning and listening to all those concerned also makes for good outcomes. In any case, change in the organization's modes of operating does not happen suddenly, it takes years.

The action research approach is very suitable for this type of development work. The project supported and accelerated all attempts to bring about change in the organization. Here, too, use of time was a problem. The pilot organizations were committed to developmentand the responsibility for progress in this rests primarily with them. From the standpoint of the overall progress of the project it was important that the researchers gave the pilot organizations active encouragement to carry out the deveopment porjects. At times it was, however, difficult to make contact with the persons responsible for the projects in the pilot organizations and fit training days into tight schedules. During the project the idea came into being of developing a flexible action model for development work, for example with the aid of open and distance learning and net learning material.

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TUCS General Publications

1. *von Wright, Grundy and Harrison (Eds.)*, Supplementary Proceedings of the 9th International Conference on Theorem Proving in Higher Order Logics: TPHOLs'96
2. *Ruohonen, Pärnistö (Eds.)*, Proceedings of the First European Doctoral Seminar on Strategic Information Management
3. *Christer Carlsson (Editor)*, Exploring the Limits of Support Systems
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