

# **Telecommuting**

## **Organisational Impact of Home-based Telecommuting**

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**STOCKHOLM SCHOOL OF ECONOMICS**  
**EFI, THE ECONOMIC RESEARCH INSTITUTE**



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Telecommuting

Organisational Impact of  
Home-based Telecommuting



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## **Preface**

This report is a result of a research project carried out at the Centre for Industrial Production at EFI, the Economic Research Institute at the Stockholm School of Economics.

This volume is submitted as a doctor's thesis at the Stockholm School of Economics.

The research project had been carried out within Institute for Management of Innovation and Technology. The project has been funded by the Swedish Transport & Communication Research Board (KFB), by the Swedish Council for Work Life Research and by Telecon. This support is gratefully acknowledged.

As usual, the author has been entirely free to conduct and present his research in his own ways as an expression of his own ideas.

Stockholm in April 1999.

Bo Sellstedt  
Director of EFI  
Economic Research Institute at  
Stockholm School of Economics

Christer Karlsson  
Professor  
Head of the Centre for  
Industrial Production at EFI



*To Mother and Father*



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To start in a new direction is not always easy, but it is always easier if someone believes in you. Warm thanks to my family, who never doubted my decision to start a new career and take up academic studies again. I know that I always will have support there, no matter what project I start next.

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## Reading instructions

This book is written as a thesis for a PhD in business administration. Certain parts of the book have more relevance for a certain audience. The following section briefly introduces the content of the chapters and indicates how the book is organised, to guide the reader to the parts that may be of interest.

Chapter one introduces the study, covering the background and the purpose. This provides a necessary framework for the reading of the rest of the thesis. Chapter two presents a conceptual framework for telecommuting and introduces previous studies in the field. This is useful as an introduction to telecommuting and needed to understand the context in which this study is performed. Chapter three presents the framework used in this study, based on previous theories. Chapter four presents the method and techniques used in the empirical study. This chapter is more of an academic interest, and not necessary for the understanding of the results. The fifth chapter contains a comprehensive account of the case studies, with a first partial analysis. This is summarised in chapter 6, where an account of the development of telecommuting over time is added. Both chapters 5 and chapter 6 contain a certain amount of analysis, or condensation of findings, based on the initial framework. This is followed, in chapter 7, by an expansion of the theoretical framework, introducing new theoretical perspectives, to better understand the findings presented in chapter 5 and 6. These additional perspectives are used in the analysis, in chapter 8, where possible underlying mechanisms are discussed. This is developed further in chapter 9, where possible implications for management are presented.

The impatient reader may start with chapter 1, then read the empirical results in chapter 6, to conclude with chapter 8 and possibly 9. This will cover most of the study, without going into any details. A more comprehensive reading is recommended, but the non-academic reader may possibly exclude chapters 3 and 4.

The basic set-up of this book is presented below, in figure 1.

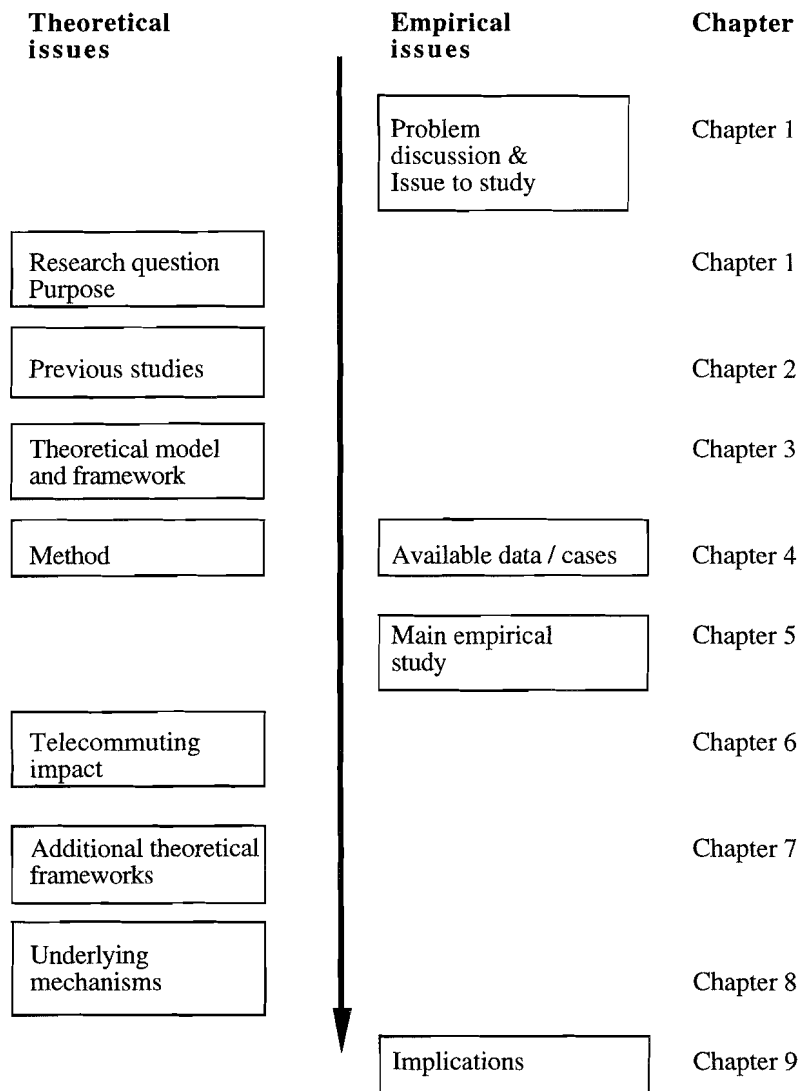


Figure 1  
Study design and book content.



# **1 Introduction, Background and Research Design**

This study focuses on organisational aspects of telecommuting. The changes when a group of people in an organisation spend part of their working time at home are studied. A knowledge-worker may spend a few days a week at home, working from an office in his own home rather than travelling to the regular work site. What happens to the organisation and the way of working when this is implemented? Will the organisation change? Will communication find new ways when meetings are not possible? Will the roles and the tasks of the telecommuters change? How is the work and the output of the telecommuters changed? These are some of the questions that arise when discussing telecommuting. A further question is how telecommuting is likely to develop. Development so far has been limited, will this change, or are there deeper lying mechanisms that have not been taken into account when talking about telecommuting?

In this chapter, the background for the study is presented: What is the area of interest of this study, why is this area of any interest, and what questions are to be answered. The concept of telecommuting is briefly discussed, to be developed further in the following chapter. The purpose and research question for this study are stated. Finally, a model to study telecommuting and organisational impact is developed. The model indicates three areas on which to concentrate; management and co-ordination, communication structure and personal work patterns.

## ***Background***

The recent development in information and communication technology (ICT) has facilitated communication and collaboration over a distance. This development has made it possible for employees to work from locations remote from the centre of the organisation. Several tasks could theoretically be performed from any location, that is from the normal office, while travelling, from a client's office or from the home of the employee. There are still technical limitations, but in addition to this, there seems to be other factors that influence the feasibility of telecommuting. There is also uncertainty on what impact flexible work

arrangements, and more specifically telecommuting, may have on an organisation.

Telework and telecommuting, or in Swedish "distansarbete" ("distance work"), has received a significant amount of press in the period 1994-1997, related to a general debate on the issue. The public debate has recently been focusing on telecommuting as a phenomena, and some recent surveys claim that there are a significant amount of employees practising this in Sweden. One survey (Telia/Temo, 1995) claims that more than 500 000 people are teleworkers in Sweden, and this is supported by a similar survey by TCO the same year. If this is the case, (which to a large degree depends on what we define as telework, as we will come back to later) we have a major challenge ahead.

Today's organisational forms and practices are often not considering effects of geographical distribution. The possible geographical distribution of the work place means that we could be breaking old patterns and replacing them with something partly unknown. What this is, and if this actually will happen to any greater degree remains to be seen. From an organisational point of view, we have a major challenge. How should this possible change be handled? What could it mean to organisations to be geographically distributed, not only multinational but locally distributed, down to the single employee?

Historically, the term telecommuting was coined in the early 1970's by Jack Nilles, a consultant in the management area (Nilles, 1994). It attracted some general attention in the mid 1980's, and then lost the interest of the public for some years. In the early 1990's, as mentioned above, the field flourished with several conferences received a great deal of attention from the general public. Telecommuting was seen as a new and exciting way of working in the coming IT-era. The major difference from earlier periods of interest in the field is the possibilities brought by the rapid technical development in the IT-area. Personal computers are now on everyone's desk and in many homes, and obtainable at a reasonable price, and Internet is spreading rapidly. The phenomenon is seen as relevant and interesting from many aspects, technical, environmental and from a quality of life perspective.



The personal reasons for me to take an interest in this field are several. When I first found the area interesting I was working as a management consultant, and in my own work had to deal with geographical dispersion, communication, and co-ordination over a distance. In my job before consulting, my superior was situated in another country, with my tasks and responsibilities including sites in 5 European countries, leading to a large amount of travelling. This experience, and the public attention to telework, led me to take up the issue as a project at Stockholm School of Economics, and IMIT, aiming for a PhD in Business Administration.

### **Proposed research**

In a Swedish national seminar on telework, documented by KFB (1994), a conclusion was that future research should be focused on the non-technical issues of telework. An area where further research was called for was in the impact on work content and work organisation in combination with telework and telecommuting. Social effects and new work forms were not sufficiently investigated, according to the seminar group, consisting of researchers on telework. Van der Vielen and Tallieu (1994) conclude their conceptual discussion on telework with the conclusion that future research needs to be directed towards central issues of organisational functioning and cultural changes rather than technological and economical imperatives.

An overview of telework research in 1996 was given by Analytica (Huvs, 1996). On organisational issues, it is concluded that there is a general picture of telework increasing productivity of the workers. This is largely based on logical arguments, but not always empirically shown. According to Huvs, there is limited support to the notion that home-based teleworking is a means towards economic development. There is a need for qualitative studies in relation to teleworking among higher-skilled professionals and executive staff, which look beyond the short-term immediate effects. This should imply that this study is in line with proposed research by other actors in the field.

The overall structural approach taken in this study, focusing on management and co-ordination, communication structure and work patterns seems to address areas that are little studied at the present. A qualitative approach, longitudinal time frame and the focus on

organisational issues fits well with the proposed areas to further concentrate on.

### **The area of interest**

The area of interest in this study is the outcome of an organisational change, the introduction of telecommuting in an organisation. By introducing telecommuting, a new structural form of organising is introduced in a company. This may lead to a process of adaptation in the existing structures, both the formal and the informal structures. This adaptation occurs on several levels of analysis, from the individual way of working and handling daily situations to the structuring of roles and linkages. The introduction of telecommuting may lead to changes in the existing structure, but may also lead to an adaptation of the introduced new form of working to the existing practices. This interaction of changes, and the outcome of the process, is the focus of this study. To investigate this, the change in some chosen organisations, where telecommuting had been introduced, was studied, and the perceived changes sought.

The study could be seen as a before-after study, where two situations are compared. The comparison is done by capturing the perceived changes during and after the process has taken place. The strategy is to identify some major areas of change, or expected areas of change, and concentrate on these. Based on pre-studies and previous research, three main areas of interest are identified. These are changes in formal structure and management practices, changes in communication patterns and changes in work content and work patterns.

The background for this choice will be discussed in chapter 4. Major areas where this change is believed to take place are identified and indications as well as opinions on the direction and importance of these changes are sought. The nature of the study leads to the decision to concentrate on direction of changes, and not attempt to quantify any changes at this stage. Before the purpose of this study is formally stated we will look in to the background of the studied area, and define the issue in more detail.

### ***Studied issue***

Based on the theoretical conceptualisation of telecommuting presented in more detail in the next chapter, a framework for the positioning of

studies in the field of telecommuting is developed. Rather than defining this, the framework allows for a common language when discussing related but partly different studies. This is used to position this study, as well as to limit the scope of the study. The major limitations and choices will be presented briefly here, to be argued for in more detail in chapter 2.

The study is focused on telecommuting on a part time basis. The limitations are that at least 1 and no more than 4 days a week should be used for telecommuting, counting only regular working hours. Overtime at home is not considered telecommuting in this case. The study also chooses to concentrate on telecommuting groups located in the same time zone or in this case the same country. Regarding work sites, the study focuses on one regular office and a home based telecommuting office, excluding mobile workers and excluding flexible office solutions.

The level of analysis is primarily the group and the nearby organisation, but the individual will be included since the personal work pattern is found to be central in understanding telecommuting. The category of work studied is professional non-routine tasks, with an interaction component in the work. This implies that both solitary work and communication are parts of the task, as well as certain group activities. The focused contract form is full time employment. ICT is seen as a requirement for telecommuting, but this is not focused on, technical solutions as such are not evaluated.

These limitations and choices mean that several forms of telework fall outside my study. All forms of detached units are excluded, as well as mobile work forces, such as sales representatives and service personnel. Most consultants are excluded, due to the interaction requirement and the requirement for a home based work site. Overtime performed at home, or work at a distant location due to travelling, is also excluded due to the requirement of work from home regularly during normal working hours, at least one day a week. In all these areas, interesting parallels can certainly be found, but they are not the core areas for this study.

## ***Research question***

After introducing the issue to be studied, the research question and the purpose of the study will now be stated. The study focuses on the interaction between various aspects of organisational structure and telecommuting as a way of organising work. The aspects of structure treated here are management and co-ordination, communication structure and finally work patterns. These three aspects of structure will be the central areas of interest in this study.

This study focuses on what impact the introduction of telecommuting has on an organisation. It is not the actual change process that is studied, but the outcome of a telecommuting introduction. As stated initially, the focus is on the perceived change in the organisation when telecommuting is introduced. Major areas where change can be expected are identified and the outcome is studied.

The research question may be stated as follows:

How does the introduction of telecommuting impact on a knowledge organisation, and how does telecommuting develop over time in this organisation?

This leads us to the purpose of this study.

## **Purpose**

- The study aims to contribute with a deeper understanding of what impact telecommuting may have on an organisation, and more specifically how telecommuting influences management and co-ordination, communication structure and personal work patterns.

This will be done by:

Describing the most important perceived changes in structure and ways of working in combination with the implementation of telecommuting in a few chosen organisations.

Analysing the findings using an expanded theoretical framework, to interpret and understand these findings, and suggest underlying mechanisms.

This is also linked to how the organisation's characteristics may influence the acceptance and outcome of telecommuting. The cases are studied longitudinally, and the outcome and development of the telecommuting initiatives are followed.

### ***Operationalisation***

The operationalisation has been an integrated part of the first phase of the study. The questions have gradually been refined and the areas of interest defined and limited. The previous studies in the field related to this study will be reviewed, to position and link this study to what has been previously done, and to what is proposed by previous studies as interesting areas of research. This is followed by a more detailed operationalisation, which should give an opportunity to justify the choices made and the approach taken. Based on this the method used to seek answers to the questions is discussed.

### **Model for studying organisational structures**

Based on the expectations, the previous studies, discussion and personal interest, a model to study organisational structure is designed, presented in figure 2. The model has developed gradually during the reading of previous studies, and from expectation interviews and organisational theories on geographical dispersion. This has led to the focus on **structural** issues. Three main areas of interest are identified. These areas will be looked into in more detail, and specific questions will be identified to which this study will seek answers. Questions are focused in these three areas, and refined further when interesting issues appear. In the case presentation and the analysis, the same framework is used and expanded, to categorise data.

The model takes a structural perspective on organisations, with a three level approach. Structure is seen as an expression of organisational outcome (a symptom) rather than a design objective. Structure is used to observe impacts on the organisation. The model consists of three aspects of structure: Management and co-ordination, Communication structure and Work patterns. These are selected as areas where telecommuting is likely to have organisational impact, based on previous studies, organisation theory and expectations from the telecommuters. The operationalisation and research model is used in the first part of the study, finding impact from telecommuting on

organisations. In the second phase, where underlying mechanisms are sought, the theoretical framework is expanded and additional theories are added.

### **Areas of interest**

A reason to focus on structure is that this is commonly discussed in the organisations. Change is often communicated in structural terms, and the organisation is often described in the same way. Structure is easily communicated and part of the organisational member's frame of reference. This also makes structure a good starting perspective when studying telecommuting as a phenomenon. Telecommuting will influence organisational structure, but at the same time, the structural characteristics of the organisation will influence the outcome of telecommuting implementation. Note that this means structure and structural changes are seen as a way to analyse an organisation, a symptom for deeper underlying factors, which will be discussed in the analysis chapter.

To further refine this, structure needs to be operationalised, and further focused. For reasons discussed in chapter 3, three areas of structure are focused on. The first area focused on is **management and co-ordination**. The geographical structure is in itself changed when telecommuting is implemented. How this has developed, and influenced other structural issues, is of interest here. In close combination with this comes the management practice, both formal and informal co-ordination mechanisms.

The second area that is to be focused on in this study is the **communication structure** within the organisation. This is forced to change, since certain media for communication, face to face communication, is not available for part of the time. The perceived impact on ways of co-operating and communicating, and ways to handle the new situation is of interest.

The third major area where telecommuting is supposed to have some influence is regarding the actual **work patterns**, on a more individual level. This could be the case both for the telecommuters themselves and for their colleagues. The basic research design is shown in figure 2.

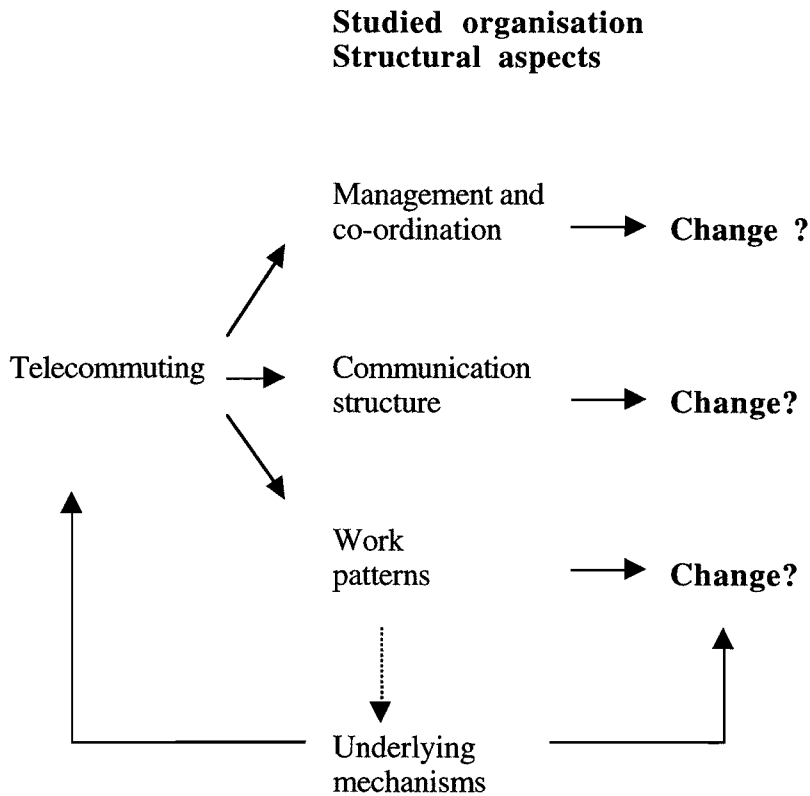


Figure 2, basic research design

The first part of the study concentrates on the changes in the three identified areas of structure, while the second part of the study concentrates on the underlying mechanisms. First an introduction to the three structural areas is given.

The three areas focused are related to each other. Both management & co-ordination and communication structure are focused on the organisational level of analysis, changes in organisational and group structures. Communication structure may be seen as partly overlapped by management & co-ordination, but is separated from this due to the central role communication has in a geographical dispersion. Work

patterns focus on the individual telecommuters way to organise his or hers own work. Part of this is influenced by the two other structural categories. Work patterns are the way work-related activities are organised on a personal level.

### ***Management and co-ordination***

Telecommuting is likely to have impact on structural variables; such as co-ordination mechanisms, meetings, degree of formality, formal planning, line vs project activities, and formal organisational structure. Perceived changes are sought, and since general areas of influence and direction of change are focused, no actual measurements are made on these issues. Reasons for changes, or lack of expected changes, are also focused on in the data collection.

Aspects that are studied:

- formal organisation, changes in structure, or adaption of formal routines to telecommuters
- activity and project management, any changes related to telecommuting
- relations to colleagues' and managers', roles

Other reasons for changes than telecommuting are discussed. In the interviews, we try to establish causalities between telecommuting and the structural changes when possible. Other influences are discussed and alternative explanations are sought.

### ***Communication structure***

The area of communication is central to telecommuting. Communication is likely to both be affected by telecommuting and affect the way telecommuting is used. Communication can be characterised in several ways, which will be elaborated on in chapter 5. Informal communication, such as informal meetings and discussions in the corridors, is likely to be affected by the absence of colleagues. Also formal communication, such as planned meetings, might be affected, both regarding content and amount of time spent in them. Another aspect that is looked into is the media used for communicating.



Aspects that are studied:

- meetings, type and frequency, changes
- informal communication, relationships to colleagues
- substitution of communication media and use of ITC
- media used for various types of communication

### ***Work patterns***

Telecommuting is believed to have impact on the personal work situation. Areas where changes are expected are in productivity and efficiency and possibly in the quality of performed work. This is looked into in several previous studies, with indications of higher productivity for telecommuters. Productivity or efficiency is not the primary focus of this study, but an indication of perceived change in productivity is captured. An interesting area in relation to this might be the amount of work performed, measured in actual time spent on work.

An aspect of the personal work situation is the changes linked to having two separate work sites. This is believed to lead to a division of tasks between the work sites, and a change in how work is performed. This is investigated both by interviews, but also by work diaries, looking into the work situation at the office and at home. A third aspect of the work situation is the roles in projects and the division of tasks between project members. The impact of telecommuting on tasks in general, type of tasks given and possible preferences by project leaders regarding telecommuters or others is investigated.

Aspects that are studied:

- personal planning, time used and activities performed
- changes in routines and work pattern, where and when tasks are performed
- changes in tasks due to telecommuting
- perceived productivity and output

### **Related issues**

In addition to the main areas of interest, there are issues that have impact on the studied situation, but are not focused on in this study.

Although these are not primarily in line with my question, they will probably influence the outcome, and may be crucial to the overall outcome of the way telecommuting is perceived in the organisation. These areas are not focused on, but may be discussed as possible underlying factors when the impact of telecommuting is discussed.

One of these areas is technical issues. Technology-related issues are frequently mentioned and raised as one of the expected problem areas. Some of these are solved, while some technological problems remains. Technology is vital in some aspects, and is one of the most important hindering factors for telecommuting. Technology is treated as an important factor in the discussion, but technical details and solutions are not discussed. At some points, the discussion calls for a more detailed view on technology, such as in media choice discussions. On a more general level, "technology" covers all aspects of information and communication technology, such as computers, communication links and software. Technology as such is not focused on, but will play a role in the other categories as an underlying factor.

Another area of interest in this category is the social aspect of work and the social situation in general for telecommuters. The issue of informal contacts, or social contact is partly dealt with under communication. The personal situation outside work, such as family life, social contacts outside the professional role, personal stress reduction and over-working or workoholism is not included in this study, but this is used as background to the other focused areas.

Both technical solutions and private social issues are seen as secondary. They are observed and used in the further discussion as possible factors of influence, but not studied as such. Theories for these areas are not looked into at any depth and the study claims no contribution in these areas.

### ***Interpretation of findings***

In this type of study, mainly exploratory, it is feasible to first study the primary effects. The next step is to seek underlying mechanisms. This justifies an approach that captures an, in some respects, unreflected picture of what is changing or not changing when

telecommuting is implemented. Once this has been established, deeper mechanisms can be looked into.

The first part of the study aims at identifying the changes linked to telecommuting, using a structural framework. In the second part of the study, these findings are examined and underlying mechanisms are sought. The interpretation of the findings will call for a wider theoretical approach than the model used to study telecommuting in the first part. The scope of this study is to include both these steps. The data collection focuses primarily in the first area, but underlying mechanisms are analysed in the second part of the study. This is made possible by including a new set of theoretical perspectives in chapter 7, to be used to interpret the findings. This also means that the results will be presented in two steps, one based on the initial structural framework, and one using the additional theoretical perspectives. This has implications for the method, since the first part is a more straightforward impact study, while the second part takes a more interpretative stance. This is discussed further in chapter 3, method. Before this is done, an overview of the field of telecommuting is given in the next chapter, followed by a more thorough presentation of the framework used for the study.



## **2 Telecommuting: definitions and previous studies**

### ***Introduction***

The impact of telecommuting on organisations is the primary interest of this study. Telecommuting is seen as a structural change in the way work is organised. This will have impact on other aspects of organisational structure. Telecommuting is seen as an organisational arrangement where employees are allowed to spend part of their working time at home, away from the regular work place. The limitations and definitions of telecommuting in other studies sometimes differ from my use of the concept, and this will be discussed in the present chapter.

In this chapter an overview of current research on telecommuting, focusing on empirical studies and linking to management literature and popular press articles is given. Since the popular writing is extensive on the subject, this has played an important role in shaping peoples' picture of telework, and thus will have an impact on their perceptions of their own situation and role when telework is introduced. For this reason, non-academic material is included in this overview of the area.

There are a number of papers discussing the concept of telework and telecommuting and trying to define this. These papers are reviewed, and based on this a framework for positioning this and other studies in the field of telework, telecommuting and flexible work arrangements is developed in this chapter. This chapter focuses on a theoretical review of telework in the first section, and on empirically based writings on telecommuting, with a focus on structural and organisational issues, in the second section.

### **Introduction to previous studies, short history**

Telecommuting and telework are relatively new concepts, with roots in the early 70s. Although work from home and other locations has existed for a long time, and even been the dominant form of work organisation before the industrial revolution, it has not been termed telework. The concept of telework and telecommuting was first used by Nilles in 1973, when a first wave of interest appeared, in

combination with the first oil crisis (Nilles 1994). This was also related to the "green wave", with professionals wanting to move out from the cities to live and work closer to nature. The interest in telework faded, but ten years later, another boom occurred, this time focusing on telecottages and neighbourhood centres. Focus was put on all levels, society and regional policy as well as individual advantages and company gains. Sweden was early in this area, and some pilot projects in neighbourhood centres gained international attention (Engström 1985, Ranhagen 1985).

In the early nineties the development was pushed by legislation in the US, primarily in California, and public interest was rising again, now focusing both on telecentres and home-based offices. In the mid-90s commercial forces entered the field, such as equipment suppliers and teleoperators. This was linked to a third boom in public interest on telecommuting, resulting in a number of seminars, conferences and a massive amount of articles in newspapers and magazines. In Sweden a magazine was started in 1994, solely dedicated to telework. When public interest decreased again, the magazine was closed in 1996.

During this 20 year period, studies have been made on telework and telecommuting. I will discuss some of these in the following sections, where the main focus will be on studies with an organisational interest. As a complement, some of the popular literature in the area, such as guidebooks and magazines, will be looked into.

### ***The field***

This study is focused on **telecommuting**, with one fixed work site and a complementary work site at home. To put the issue (telecommuting from an organisational perspective) in perspective, and give a picture of the field as such, this chapter introduces the concepts of telework (a wider concept), telecommuting (the area of interest) and flexible work arrangements (a different but related concept), and positions this study in relation to these. In the following sections, telework and telecommuting sometimes overlap each other, since the use of the terms is not clear in the studied articles. For clarification, telework is in this study seen as a broader concept, including telecommuting.

### **Overview on telework and telecommuting**

From a public, or common sense, point of view telecommuting or telework is perceived as something fairly coherent, people working from "somewhere else". The field has been defined by consultants,

and the public view of telecommuting has influenced the academic interest in the field. This has also been the ground for an initial treatment of telecommuting as a coherent field from an academic point of view. In the common sense world, telecommuting is not seen as problematic as a term. It is assumed that people involved in telecommuting, be it research or practice, are doing roughly the same thing, and looking at the same problem. An example of the perceived coherence of telecommuting is the proposed scientific journal in the field, and the specialised magazines, such as the Swedish monthly magazine "distans", with telecommuting as the main subject.

Seen from this point of view, telecommuting could be described as an issue-based area of academic interest, as are many fields within management and organisation studies. An issue-based field is not mainly based on a theoretical perspective, but on a specific problem or issue. The general research approach in an issue-based field does not aim to develop theory specifically in an academic area. A common approach is to use several different theory bases. The aim is to understand and explain the phenomena or the issue.

A major problem with an issue-based field is to identify the borders of the issue, to include or exclude sub-fields and to define what telecommuting research is. The boundaries of the field are often not defined by academia itself, but by other players, such as practitioners. The agenda might even be set by public discussions in the media. It can be argued that the process works both ways, with a mutual influence on agendas between academia and the public discussion. Since the public interest is focused on this new field, there is a general feeling that telecommuting might be relevant and worth looking into further. A reason to relate to telecommuting in research might be the need to show practical relevance in applications for research findings. Thus, the issue is not always academically determined.

In the following text some of the terms used in connection with telework and telecommuting will be put in a context and major concepts will be investigated. Definitions will be looked into, where the question is whether there is a possibility to clarify some of these concepts, or if there is a need to agree on a common definition of telecommuting and telework.

### **Previous definitions of telework and telecommuting**

Most of the researchers and consultants within telecommuting or telework have tried to establish their own definition of the concepts. These definitions can generally be grouped into two categories. In the

first category attempts are made to create a general definition, acceptable for all. These definitions are vague and by necessity on a high level of abstraction. The second category is when the definition is aiming to describe what the researchers have been concentrating on in their own study. This latter approach is not an attempt to create a general definition, but more of a clarification of their own perspective. We will start to look into the general definitions, to come back to the more individually related definition approach later.

Teleworking, as opposed to telecommuting, is generally used in a broader sense, covering several forms of distributed work. Some of the common definitions, on a more general level, are as follows:

*"Telework:*

*...ANY form of substitution of information technologies (such as telecommunications and computers) for work-related travel. (Nilles, 1994)*

*.....work that on a regular basis is located outside the employer's premises, for instance in the home of the employee, or in certain designated locations in another town. (Nationalencyclopedia, "distansarbete", translated from Swedish)*

*...work which is independent of the location of the employer or the contractor and can be changed according to the wishes of the individual teleworker and/or the organisation for which he or she is working. (Huvs et al, 1990)*

*...the use of telecommunication-related technology to conduct work. (Mokhtarian 1991)*

*...involves all work-related substitutions of telecommunications and related information technologies for travel. (Qvotrup, 1996)*

*Remote work:*

*...work done by an individual while at a different location than the person(s) directly supervising and/or paying for it. (Mokhtarian 1991)*



This gives us a picture of telework, or remote work, as a rather wide category of work involving some form of distance in the work situation, and possibly including some form of information and communication technology (ICT). We then take a look at telecommuting.

### *Telecommuting:*

*...the partial or total substitution of telecommunications technologies, possibly with the aid of computers, for the commute to work. (Nilles, 1994)*

*...commuting by tele and IT communication, from home or other site, substituting physical transport to the regular work place. (Nationalencyclopedia, "telependling", translated from Swedish)*

*...the combination of flexiplace, flextime and electronic communication (Kugelman, 1995, p. 20)*

*...working at home or at an alternate location and communicating with the usual place of work using electronic or other means, instead of physically travelling to a more distant work site. (AQMD, in Mokhtarian, 1991)*

*...remote supervision ... in combination with reduced commuting. (Mokhtarian, 1991)*

Telecommuting, from these definitions, is a narrower concept than telework. Telecommuting requires travel substitution for commuting to work. The use of information and communication technology (ICT) is included as criteria by some definitions, and left out by others. Mokhtarian reflects on her own change in definition over time (Handy & Mokhtarian, 1995). In her early work, Mokhtarian defines telecommuters as "information workers that worked almost entirely with computers, telecommuting full time and working from home". In her later articles, commuters are not seen as a necessary requisite, telecommuting is found to be mostly part time and home is not the only possible alternative work site.

Both telecommuting and telework are very broadly defined in most attempts to set a general definition. When the decision is made to study telework or telecommuting from a more specific perspective, a more stringent definition than these general ones is needed. A question to be answered is if telecommuting or telework in general can actually be defined, that is if there is one relevant for all. As noted by Huvs (1990: p9), telework can not be adequately characterised in terms which are solely technological, organisational, locational or contractual. Even a definition that takes account of all of these factors in combination cannot be generally valid.

An approach to this problem is to refrain from defining the concepts more strictly, and let a common sense definition hold the field together. This will allow groups of common interests to form, and give room for individual definitions, depending on focus and unit of analysis.

One problem with refraining from defining the concepts more strictly is the possibility of misinterpretations. This calls for a personal clarification and definition of the use of the telecommuting concept for each study. An example of the problems that might occur is illustrated in the results presented by Telia/ TEMO and of TCO, which both claim there are more than half a million teleworkers in Sweden at the moment. This is true, given a very wide definition of telecommuting. The definition of telecommuting is not taken into the discussion, and wrong conclusions are therefore drawn from the reports by journalists and other readers, not fully aware of the unclearness of telecommuting.

To give some general background, a picture of the present situation regarding research on telework and telecommuting will be given in the next section.

### **Perspectives on telework and telecommuting**

As an overview on the complexity of the area discussed, telework and telecommuting, some of the different approaches to telecommuting will be presented. This is based on an article presented at a workshop in London 1996, (Rognes & Rogberg 1996). The workshop handled the issue of new international perspectives on telework. The field of telecommuting spans several academic areas, and takes several different perspectives on a given phenomenon; people being somewhere else than at the office when they work. This is apparent when the content of four different workshops and conferences is studied and classified.

What needs to be clarified further are both the issue studied and the taken perspective (or perspectives) on the issue. These areas are inter-linked, for certain questions, certain aspects are of more importance than others, and the slicing of the larger issue into a more manageable area is done differently.

The basis for this overview on telework research is two Swedish workshops during 1995 hosted by IMIT, and two conferences on telecommuting, one Swedish and one international. The workshops were focused on bringing together researchers in the telecommuting field active in Sweden. The Swedish conference was a national seminar on telework and telecommuting, (*distansarbetsdagen* 1995), gathering 400 practitioners and politicians in 3 locations in Sweden (transmitted via video conferencing), with around 10 presenters of articles. The international conference on telecommuting (Telecommuting -96, Jacksonville, Florida), included both academia and practitioners, gathering around 100 participants and approximately 40 articles. The articles and projects discussed in these gatherings will form the base for the overview of the telecommuting field.

When trying to analyse the different approaches to telework and telecommuting, dimensions for grouping are needed. A first way to group the perspectives could be to look at the unit of analysis. From this point of view, we may classify the studies into three main groups, an *individual* perspective, an *organisational* perspective and a *society* perspective. These are frequently used as categories in the popular telecommuting literature, and are chosen as one dimension of categorisation.

Complementary to this we can make a distinction between area of interest in the studies. A possible way to split the material into four categories based on the area studied are: a *technical / IT* focus, a *social / organisational* focus, a *social / individual* focus and a *medical / ergonomical* focus. These categories are not the only ones possible. The groupings could be done differently, but this will give us a satisfactory division of the field to illustrate the diversity.

If the projects and articles are classified according to this framework, the picture shown in figure 3 emerges. There is a diversity of projects, but some clusters are possible to identify.

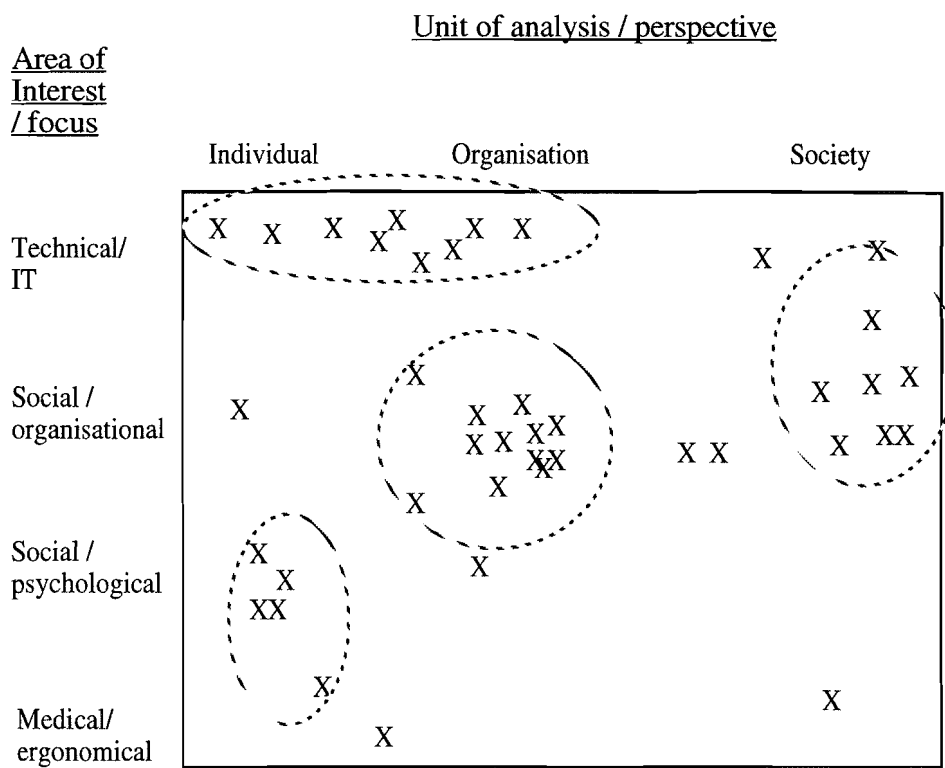


Figure 3 Illustrating the diversity in telework-related research, each X representing one project on telework. Clusters and positioning are indications only

Each article is represented by one X in figure 3 (for a more detailed discussion on this, see Rognes & Rogberg 1996). The organisational cluster (centre) and the society-related cluster (upper right) are fairly clear in this picture. We have an additional cluster around social and ergonomical issues, on an individual basis (lower left), and we see a technical cluster, dealing with communication and use of new computer applications related to communication and computer aided co-operative work, CSCW (top left). This grouping is not strictly quantifiable, but based on the content of the articles, and placed in the matrix relative to the other articles in the material studied.

A question here could be; what are the common areas of interest between these projects? Is there a possibility to have a general

definition of telework or telecommuting relevant to all of these groups? An attempt to give a stringent definition of telecommuting on an academic level is difficult due to the diversity of the field. Instead, I suggest that each study related to telecommuting or telework has to define their issue based on their own focus and their own perspective.

What is shown above is that the issues of telework and telecommuting might differ when seen from different perspectives. For this reason, it is important to decide on how to handle this problem. At this stage, I choose to narrow the aspects on telework (including telecommuting) to those related to the organisation area. This is still a very broad field, but it rules out the society-related consequences, hardware questions and medical/ergonomical issues in figure 3. These may still play a secondary roll, as triggers to organisational impact, but will not be treated as the primary areas of interest in the following discussion.

### **Related concepts on a macro level**

Lindström, Moberg and Rapp (1996) identify a number of concepts related to teleworking, information and communication technology (ICT) and organisational forms. In order to clarify the concepts and highlight similarities and differences between them, some conceptual models, using a number of analytical dimensions, are created. These concepts will be used as a starting point for the further positioning of this study.

Some central issues, according to Lindström et al are concepts linked to organisational forms. 14 terms related to telework and organisational forms are identified by Lindström et al. These are classified according to what level of analysis is central in the concept. Levels of analysis discussed are the following: individual employee, (work)group, division, company, company group and "outside the group". This is shown in figure 4.

Level of analysis	Network	Virtual organisation	Franchising	Outsourcing	Distance meetings	Flexiplace	Multitflex	Mobile work	Work at home	Sattelite offices	Detatched units	Branch	Subsidiaries	Self employed
Individual					X	X	X	X	X					
Group					X	X	X	X	X	X				
Division					X					X	X	X		
Company					X						X	X		
Company group			X	X	X								X	
Outside the group	X	X	X	X	X									X

Figure 4, adapted from Lindström et al  
Appropriate unit of analysis for certain concepts in telework.

These organisational forms are briefly summarised here. *Network*, as the first of the concepts, is used mainly to describe an intra-company relationship. This differs from the use of the network concept in network / organisation theory, where networks also are discussed as links between groups and individuals. *Virtual organisations*, as the second concept, are not easily distinguished from networks, and some authors use the concepts synonymously. A major idea here is to disregard the legal unit as the major divider. In this case, multinational companies could have many of the same problems related to geographical distribution as a virtual company. Bergum (1996) points to the main difference that Virtual corporations stress the short-term flexibility in the contact while network theorists stress the long-term relationships. *Franchising* and *Outsourcing* are concepts related to these, with the same basic characteristics, organisationally linked units outside the legal entity.

Another group of organisational forms or concepts discussed by Lindström et. al. are *subsidiaries*, *branches* and *detatched units*. All these are mainly on a macro level, dealing with company structure. The issue here is the remote location of an entire unit. *Sattelite offices* could also fall into this category, offices at remote locations, but still

within the same legal organisation. Telecottages is not included in this classification, but are handled as part of another dimension by Lindström et al. This might be seen as a similar form of a detached organisational unit, though on an individual level.

*Flexiplace* is an arrangement where the employee, within certain limitations, can choose the location where he performs his work. In *multiflex*, flexible working hours are combined with the concept of flexiplace. *Mobile work*, to take one step further, is a situation where the location constraints are totally removed; no designated stationary work location exists. Work at home is, according to Lindström et al, used to describe full time home based work.

Terms like flexiplace, multiflex and mobile work force are more on an organisational level. They handle the work organisation rather than the company's structure as a whole. These terms are classified according to appropriate level of analysis by Lindström et al in figure 4.

From figure 4, two major groups of concepts are identified. When the interest is focused on an inter-organisational level, the concepts to concentrate on are the ones with individual, group or possibly division as unit of analysis (from distance meetings to branch, in the middle part of the matrix). The other major group is that dealing with structural, macro-oriented issues. The unit of analysis in this case is division, company, or higher levels, according to Lindström et al. Some of the concepts in the model fall between these categories, and are actually of another kind. As argued by Lindström et al, *distance meetings* fall into a separate category, a more general mode of communication than an organisational form, and will be left aside in the following discussion.

These terms could be grouped in a slightly different way. I claim that the individual or group level of analysis still might be relevant for these concepts for some aspects. A possible grouping of these concepts is to treat Networks, Virtual Organisations, Franchising, Outsourcing, Detached units, Branches and Subsidiaries as forms of Site-external networks.

In the same manner, Flexiplace, Multiflex, Mobile work and Work at home can be categorised as various forms of telework. Satellite offices fall somewhere in between, and should maybe be handled under work place rather than organisational form. *Self employed*, from a company point of view, can be grouped together with external

consultants and temporary work force, and is another dimension than the others, namely form of employment, which could be applied in any of the other categories.

Two main areas related to geographical dispersion are identified, telework and site external networks. The unit of analysis in the latter case is primarily organisations and relationships between organisations. With a focus on work organisation and group issues, site external networks may be left aside for the further conceptual development.

The study of flexible work arrangements makes the organisation, the work group and the individual primary units of analysis. This study focuses on the organisational level, and to further elaborate on telework and telecommuting, different forms of these will be looked into in the following section. Further dimensions will be added to the conceptual framework of telecommuting.

The selection of the aspects of telecommuting discussed here are based on a review of the existing literature on the subject. This categorisation is not seen as a complete conceptual model of the dimensions of telecommuting, but will serve as a tool to limit the scope of this study, as well as a framework to discuss findings and the generalisability of these, regarding the limitations made. Note that these are largely structural aspects, since this study departs from a structural framework, and telecommuting at this stage is defined as a structural change.

### ***Examining dimensions of telecommuting***

The purpose of this section is to identify and delimit the type of telecommuting focused on in this study. Concepts and terms that could be brought into the concept of flexible work arrangements are, among others, telework, telecommuting, flexitime, multiflex, mobile work, flexible office solutions, multi-skilled personnel, self-managing groups, shift work schedules and short term employment. This scattered picture shows that the concept of telecommuting has to be elaborated further. The dimensions of flexibility have to be discussed and clarified.

Telecommuting may involve different forms of spatial and temporal flexibility. There might also be differences in the work performed and contractual forms. The need for technical equipment could also be a distinguishing factor. In addition to this, several issues need to be



taken into consideration when flexible work arrangements are studied. Flexible time arrangements can be adopted in almost any organisational form, and are not really a distinguishing characteristic. The two forms flexiplace and multiflex are similar, except for the time dimension. All others could be split in the same way, but this is not meaningful. Time will be discussed in the first section. The spatial flexibility includes issues such as number of work sites, type of work site, mobility, and set-up of work place. Terms such as flexible office solutions, home work and satellite offices are handled under this heading. This will be handled next. Work related issues, co-operation, personnel type, interaction needs and legal contract forms are then discussed, to be followed by a discussion on the area of ICT use. Finally, other issues are brought up, such as culture, degree of implementation and managerial proximity.

## Time

When looking at telecommuting, time and time flexibility are central parameters. The use of flextime has become more frequent in the last decades. The possibility to move the working time in the day and to a certain degree between days has become a common option for white-collar workers in Sweden.

The first issue here is how much of the time is spent telecommuting. In a Swedish overview on telecommuting (SOU 1998:115) it was concluded that approximately half a million, or approximately 25% of the Swedish white-collar work force, was telecommuting. In this case telecommuting was defined as spending more than 2 hours a week at another location than the regular work place while working. This shows the need for a clarification.

I have here proposed three categories, full time, whole days or more than one day a week, and less than one day a week. This may of course be done differently, but some clarification on time amount spent telecommuting is needed.

<b>Time</b>	Full time	1-4 days	Part of days,
<b>amount</b>		a week	overtime

Another issue regarding time and working hours is co-presence. If time flexibility is unlimited, there is a possibility of colleagues working hours that do not overlap at all. This is normally dealt with by stipulating a core working time, when everybody should be at work, and a flexible period before and after the core working time.

Overtime is a special case of flexible working hours, adding extra hours to a fixed or flexible work scheme. The flexibility is one-sided; the employer has the option to add time. The way to treat this might vary. It could be regarded as belonging to the group "partly flexible working hours", but needs to be discussed separately, especially if the overtime is substantial, unpaid, or performed at home. Overtime performed at home is in some studies regarded as telework.

In relation to telecommuting and flexible working arrangements, both the fixed time solution and the flexible time solution is possible. There are at least three possible set-ups for time restrictions in a study of telecommuting from an organisational perspective. These are presented in the table below. A study could be designed to concentrate on one of the three cases, or include two or all of them.

<b>Time</b>	Fixed working hours	Partly flexible working hours	Fully flexible working hours
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In relation to international co-operation and time, the time blocks spent working become of interest. The blocks of working hours can be disjunct, even if fixed, due to the difference of time zones (Roe et al, 1994). The working hour blocks could be partly or fully overlapping or disjunct. The problem of simultaneous working hours is also present when we have different shifts, in the same time zone.

<b>Time Blocks</b>	Same	Partly overlapping	Disjunct
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Building on this, we can talk about the periods of co-presence during working hours. This could both be a physical co-presence, or an ICT facilitated co-presence. Introducing IT-facilitated co-presence, we now touch on the next area of interest, the spatial parameters.

## Space

As a second category of interest regarding telecommuting, we will look into space and spatial flexibility.

Space and spatial aspects are often pictured as a matter of physical distances, and the physical set-up of the spatial surroundings, being either fixed or mobile. The distance aspects are central to telecommuting. All discussions regarding flexible work arrangements, telework and telecommuting include a dimension of distance, hence

the word "tele". On the other hand, distance could be other forms of distance than spatial. Raghuram et al (1996) identifies three other forms of distance in combination with telecommuting, distance from information, from relationships and from organisational norms. This section will concentrate on spatial distances, and we will come back to these other forms of distance later.

In the previous sections, we have identified three categories of work place related to telework: at home, at an office and mobile. This will be refined further in this section.

We start to look at the work site, the geographical location of the work place. The work site can be anything from one fixed location, spanning over several intermediate forms, to a totally site-independent or mobile work place. A way to categorise this is shown below.

<b>Spatial category</b>	<b>Terminology</b>	<b>Examples</b>
One assigned, fixed work site	Traditional work conditions Home work	Employees at Traditional office Satellite office, etc.
Several assigned, fixed work sites	Multiple traditional offices Traditional and home-based offices (Flexiplace, Multiflex)	Intern. managers Consultants Telecommuters
One fixed work site, and mobile work	Traditional field work or Home-based field work	Sales-force Journalists
Several work sites, and mobile work	Multiple-office field work	Sales force Service technicians
Only Mobile work	"road warrior" (Mobile work)	Sales force Free lance

Examples of fixed work sites are: Office located at main organisational unit, Office at home, Telecottage or Neighbourhood centre, Resort office, Satellite office, Satellite work centre, Detached units, Client's office.

This may be categorised according to the nature of the work site. A first possible category is home based work sites. This is an office located in the home of the employee (or contractee). This could also be in their summer residence or other location, the main characteristics are that the premises are private and do not include more than one person related to the organisation studied.

Neighbourhood work centres and telecottages are frequently used as synonyms for office space located close to a residential area and independent of the employer. Several companies share the same premises on a more or less permanent basis. Resort office is a similar concept, but located at a recreational area rather than at a residential area.

Detached units, satellite work centres or satellite offices are all parts of a company that has been located elsewhere than the organisational unit they belong to. The difference between this category and sister units at other locations are fluid, and more dependent on organisational ties and interrelationships. Moberg (1993) states the difference as satellite offices being parts of a department located elsewhere, while detached units are entire departments located elsewhere. There is a problem with the department classification, since this is not defined, but might differ significantly between companies.

The same type of communication issues appear in multinational companies or national companies with several larger units at different locations. The differences between these categories are more a question of degree than a difference in art of dispersion. A possible alternative way to classify this is to use the number of people in the detached unit as a measure. A minor detached unit could be classified as less than 10 persons, and more than that as a major detached unit. There are problems in this case as well on where to draw the limit, and we have not solved the problem, but moved it to another dimension.

The last category is the traditional office, located at the organisational unit where the employees belong. The definition problem of organisational unit applies here as well. We could see a gradual transition from single detached person, through minor unit, major unit and whole division.

These main categories of work sites are summarised in the table below (the major and minor detached units needs further clarification if to be used as definitions).

<b>Work sites</b>	Home based work	Telecottages Neighbourhood centres	Temporary work site, Hotel
	Minor detached unit Satellite office	Major detached unit Sister unit	Office located at central unit

In addition to these stationary work sites, there are the mobile work places. These can be either of a permanent type, such as own truck or car, or of a temporary mobile work place, such as train, aeroplane or other forms of transport. These will not be specified separately here, but are handled under the category of mobile work sites.

One aspect of space is the proximity to the managers. The location of the nearest manager at another site will influence the way work is planned and performed. This needs to be taken into account when evaluating the distance influence.

The next aspect of space is the lay-out of the actual work place. This can be a traditional module (cell) office, an open office layout or a flexible office solution. The traditional office is a separate room for each employee. The open layout still has personal space for each employee, but no walls. In the case of the flexible office solution, there are no designated areas, only work space and computers available to anyone needing it, and personal storage space, often consisting of a mobile drawer, parked at one end of the open office area. This has become an increasingly popular way to save office space, especially when employees are out of the office a major part of the time, such as sales force and technical support personnel. The open office layout can also be combined with telecommuting. The main work place categories are listed in the table below.

<b>Work place category</b>	Traditional office (cell)	Open office (landscape)	Flexible office
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After discussing work site and work place, we now come to what type of work and under what circumstances this work is performed at these sites.

## Work

The actual work performed might be of interest when studying telecommuting. The outcome is most likely different for different types of activities. Dimensions to take into account are tasks, or type of work performed, mode of employment, and the interaction needs of the telecommuter.

As a first dimension regarding the study of work and telecommuting, we shall reintroduce the concept of level of analysis. Although we have concentrated on organisational issues, there is a possibility to choose level to focus on. Relevant levels of unit of analysis are the individual level, the work group level or the organisation as a whole.

<b>Level of analysis</b>	Individual	Work group	Organisation
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A possible classification of work is to divide tasks into two groups: routine, low skilled tasks and non-routine, professional tasks. This is important to telecommuting and flexible work arrangements since communication and management practice differ between the groups (Paavonen, 1992; Gray, 1993). It can be argued that there are several intermediate stages, with some highly professional tasks being fairly repetitive, and some low-skill tasks being without routines or patterns. A middle category may be added, covering most mixed jobs, with both routine tasks and others. Creativity aspects can further distinguish tasks, but at this stage, it is not necessary to make this distinction.

<b>Type of work</b>	Routine, low skill	Intermediate	Non routine, professional
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Another dimension that may influence the work arrangements linked to telecommuting is the form of employment. In many American overviews of telecommuting, self employment is seen as an ultimate form, or a possible unwanted result of the de-coupling of employees and normal full time regulated working schemes (Handy, 1995; Huvs, 1990). There are several intermediate forms of contracting that by nature lead to a flexible work arrangement. Consultants or contract employees might spend part of their time at other sites, their original employer's office, or might even have several clients at the same time. This adds another dimension to flexibility, the flexibility of employment form. Some common forms of contracts are listed in the table below.

<b>Contract forms</b>	Traditional employment	External employment, consultants	External employment. network
	Self employed one contractor	Self employed several contractors	

Short term employment, job security and the possibility to take in other personnel for shorter periods are issues sometimes linked to the telecommuting debate. This form of organisational flexibility, to replace or remove employees, is a different dimension than the type of flexibility employees might have in performing their work. This might be important for an US environment when telecommuting is discussed, but due to Swedish employment laws, it is not a relevant issue for this study, and is therefore left aside.

The level of co-operation and co-ordination needed in performing the work is another aspect that will influence telecommuting. Several studies have looked into what types of jobs are suitable for telecommuting (Paavonen, 1992; Gray, 1993; Huvs, 1990), either listing suitable tasks, or trying to find determining characteristics for such tasks. The level of interaction between colleagues is one important determining characteristic. Other important characteristics are, according to Olson (1981, in Larsen (1996)) are equipment, degree of self-control over work, measurable results, concentration needs and milestones in work. Of these, equipment will be taken into account later in this chapter. The other four could be seen as incorporated in the discussion above on the type of work.

The remaining category is the level of interdependence. A high degree of interdependence supposedly makes flexibility in time and space more difficult. This is also related to the degree of standardisation of tasks, more standardised tasks might have a high degree of interdependence, but with clearly defined interfaces, these are possible to perform independent of direct contact.

In addition to the standardisation of tasks, there is the codability of the information exchanged. If the information is codable and possible to transmit in a standardised form, the communication media might be what is described as lean. Face to face contact is the richest communication form, while communication in writing or numerical data is considered lean (Daft, 1992). More tacit knowledge is best

communicated via a rich media, while codable information could be transmitted without personal contact without any major losses. I choose to group these areas together, where low interaction needs and lean communication is seen in combination with standardised interfaces, and complex, unstandardised communication is at the other end of the scale.

<b>Interaction needs</b>	Low: standardised interfaces	High: unstandardised activities
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In addition to these dimensions, several other aspects of work can be of importance in relation to telecommuting. Management style, stability in relationships, way of organising production; i.e. project or line organisation, level of external co-operation and whether the products (final or intermediate) are material or immaterial. Although this is important, this is not necessarily linked to the definition or limitation of telecommuting, and will not be discussed further here.

Physical demand on presence is a limiting factor regarding the possibility to practice telecommuting. Nursing, personal service, physical sales activities, physical production including handling of goods and other activities related to physical contact with goods or clients have limited possibilities to practice telecommuting. This limitation is more basic. Work arrangements with a demand of physical presence do not fall within the concept of telecommuting discussed in this paper, and will therefore also be left aside.

### **Information and communication technology (ICT)**

Information and Communication Technology (ICT) is often used as a distinguishing factor when telecommuting is discussed. There is a divide between those having ICT as a necessary criterion for defining the field and those including telecommuting that do not involve ICT. In the group that have ICT as a distinguishing factor, various levels of technology are discussed. Whether a computer connection is necessary, a telephone and fax is sufficient or the use of computers is a requirement varies from definition to definition. Since the combination of technical set-ups is almost unlimited, the issue is limited to whether or not ICT, in any form, is seen as necessary for telecommuting.



ICT	ICT required (level defined separately)	ICT not a requirement
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In the field of computer supported co-operative work (CSCW) the interest is focused on the actual ICT-related communication and co-operation. Areas studied are e.g. mail use, computer-based conferencing and shared data, common software such as Lotus Notes, user interfaces and media appropriateness. The main unit of analysis is the ICT-related co-operation. Focus is often more IT-related than an organisational perspective. It is up to each research project whether or not to include or exclude ICT as a parameter deciding what telecommuting or telework is.

These four categories, Time, Space, Work and ICT cover the major areas of interest when telecommuting is conceptually discussed. In addition to these, there are several aspects that should be taken into account when analysing the findings of any study in this field. Some of these are discussed in the next section.

### ***Studied issue***

A source of influence in the choice of perspective in this study is a report issued by Kommunikationsforskningsberedningen (KFB) in 1994 on present and planned research in the telework area. This identifies the organisational area as interesting for further research in the field of telework and telecommuting. Previous research has largely been focused on either society aspects or individual aspects on telework. Further research in the area of management and organisation of telework is seen as an important future activity. (KFB, 1994)

Based on the possible choices listed above, a framework for positioning of studies in the field of telecommuting could be set up. Rather than defining the field, this framework allows for a common language when discussing related but partly different studies. I have used this framework to position my own area of interest, or to define the focused issue in this study. This is summarised below in figure 5, where the choices are marked with a grey background. These choices are further discussed in the next section.

Dimension		Options	
Time	Fixed working hours	Partly flexible working hours	Fully flexible working hours
Time amount	Full time	1-4 days a week	Part of days, overtime
Time Blocks	Same	Partly overlapp	Disjunct
Spatial category	One assigned, fixed work site	several assigned, fixed work sites	one fixed work site, and mobile work
	several work sites, and mobile work	only mobile work	
Work sites	Home based work	Neighbourhood centres	
	Minor detached unit	Major detached unit	Office located at central unit
	Satellite office	Sister unit	
Work place category	Traditional office (cell)	Open office (landscape)	Flexible office
Level of analysis	Individual worker	Work group	Organisation
Type of work	Routine, low skill	Intermediate	Non routine, professional
Contract forms	Traditional employment	External employment, consultants	External employment, network
	Self employed one contractor	Self employed several contractors	
Interaction needs	Low interdepend. standardised interfaces		High interdepend. unstandardised activities
ICT	ICT required (level defined separately)		ICT not a requirement

Figure 5 Dimensions of telecommuting Selections / limitations for this study are marked with grey background

## **Choices and limitations**

Based on the research question of the present study, choices are made regarding the aspects of telecommuting listed above. The choices are based on the focus of the study, and the arguments for each choice is presented below.

Time, Time amount & Time Block. The choice of flexible working hours is partly made for practical reasons. Most situations with skilled workers in a situation with flexible work sites also involve flexible working hours. The combination of flexible or multiple work sites and fixed working hours is less common.

The choice to require a level of at least one day, up to a maximum four days a week, absence from the regular work site, working from home, has several reasons. If the time spent at home is less than one day a week, the impact will probably be small. The regularity and the minimum level of one day a week is to ensure that we will have a situation where the impact from this arrangement is high enough to study. On the other hand, if full time is spent at home, we have a different situation. The studied category is unlikely to be able to handle a situation with full time absence, and the balance between solitary work and interaction is part of the study. This requires at least some degree of presence at the regular work site.

The study is performed in Sweden, and does not involve shift work, which means that including a discussion on different time blocks is not relevant.

Spatial category, Work sites & Work Place category. The focus is on home-based telework, with one fixed central work site and one fixed site at home. The reason to choose this is to include the situation where the workers are allowed to work in an undisturbed situation for part of their time, a requirement of solitude in the work situation for the telecommuter. A mobile situation does not give this opportunity to work undisturbed to the same degree.

This choice of fixed work sites is also linked to the chosen group, skilled personnel in knowledge production activities with interaction with colleagues required. Most organisations have a situation with one stationary site, and the next most common situation is probably two stationary sites, either employees with two work places at two different sites, or the office and at home. The choice to exclude telecottages is based on the solitude requirement (aspects linked to an undisturbed environment at home), and also on the lack of cases in

this area. Detached units are also excluded due to the solitude requirements.

Level of analysis. The chosen level of analysis is a matter of personal interest. My interest lies mainly in the organisational area, and I therefore choose to focus on this area. On the other hand both the group level and the individual level are of interest when the structural impact aspect of telecommuting is studied. From the model discussed in chapter one, I choose to include all three levels of analysis. The focus is on the organisational and group level, but since work patterns are studied, individual aspects are included as well.

Type of work & Contract forms. The impact of telecommuting is likely to differ between routine tasks and professional, non-routine tasks. My choice to concentrate on professional, non-routine tasks is a matter of personal interest. The same approach could be applied to another group.

The contract form is not really an issue in this case, since the interaction needs lead us to situations where traditional employment is the only present form of contract that is commonly used in Sweden.

Interaction needs. The impact from telecommuting or other forms of geographical dispersion is dependent of interaction needs. In order to study the situation where these impacts are largest, I have chosen cases with a high level of interaction needs. This highlights the difficulties that might occur due to geographical dispersion and telecommuting.

ICT. My approach to the issue does theoretically not require ICT. Geographical distribution could take place without the use of computers. On the other hand, ICT is an important reason, if not The reason that telecommuting and geographical dispersion may take place. I therefore choose to include ICT as a requirement since all studied cases involve communication based on ICT.

ICT will not be focused on in this study, but seen as an enabler for telecommuting. One reason not to focus technical solutions is the rapid development in the area. Actual solutions utilised will probably be outdated long before the study is completed. Instead, I will take the function of the technical solutions into account, i.e. what task they are supposed to fulfil. This means that I will not discuss how problems are solved technically, but rather focus on the areas in which ICT

have played a role, and where weaknesses in applications are identified.

These limitations and choices mean that several forms of telecommuting fall outside my study. All forms of detached units are excluded, as well as mobile work force, such as sales representatives and service personnel. Most consultants are excluded, due to the interaction requirement and the requirement for a home-based work site. Overtime at home, or work at a distant location due to travelling, is also excluded due to the requirement of work from home regularly during normal working hours, at least one day a week. In all these areas, interesting studies can certainly be made, but they are not the core areas for this study.

### ***Forms for Telecommuting Introduction***

The way in which telecommuting is introduced in the organisation may impact the outcome of the introduction. The introduction of telecommuting includes aspects such as choice of telecommuters, degree of the organisation that telecommutes, time planned to be spent at home and flexibility in the introduction process.

This study has focused on part time flexible work, as described above, where only a part of the organisation is working from home, and on a personal and voluntary basis. This will most likely have different outcomes than if for instance the entire work force is forced to work at home for certain pre-decided days. The reason to choose this set-up was because it is the most common way to introduce telecommuting. The fact that different tasks and different personal characteristics of the work force only make telecommuting an option for a part of the work force explains this pattern, with a partial introduction of telecommuting in an organisation.

Previous studies, as will be presented in the next chapter, indicate that part time telecommuting is preferred to full time telecommuting, if social aspects, co-operation and co-ordination is taken into account. This is supported by the fact that most available cases are part time telecommuting, where only part of the work force is involved. The major exception from this is where mobile work forces, such as sales force or service personnel, are all telecommuting on a large-scale basis, but this falls outside the limitations of this study. This indicates that a gradual, part time and individually based introduction of telecommuting is the most likely and the most viable development. The study is focused on three such cases, all three making honest attempts to introduce telecommuting.

## ***Overview on previous studies on telecommuting and organisational issues***

In the following section an overview of major studies on telecommuting, relating to this study is presented. The categories used indicate the main areas of the studies. Structural aspects and links to the research model are discussed at the end of the chapter.

Sweden has together with the US and a few other countries been on the front-line when it comes to testing telecommuting as an option. The actual implementation of telecommuting may be disputed, but the interest has been high, and some pilot cases are available, as well as government sponsored tests with various forms of tele-supported work arrangements. There are a variety of telecommuting studies focusing on a society/travel perspective, as well as studies focusing on the amount and spread of telecommuting. These are left out, as well as the purely descriptive cases, such as best practice for telework cases. The reason to exclude these is that they generally are not very deep in their analysis, and tend to be biased towards the positive side, where problems are left out and mainly positive anecdotes make up the arguments. Some popular writings on the subject are included, to indicate some of the content of the public discussion regarding telecommuting.

### **General exploratory studies**

Some of the first Swedish studies were focused on telecottages, or neighbourhood centres. Two reports were published in 1985, both looking at this, and both using the Nykvarn example as a basis for their study. Engström (1985) study (which is a report from the implementation group) has a cross-disciplinary approach, looking at work environment, individual situation and organisation of work. A proposition from this study is that control may increase. This will be based on control of result rather than of the work process. Tasks may be simpler due to a stricter division of the work, relating to work patterns. Informal communication and peer-ship is lower, which leads to lower work satisfaction, relating to communication structure. Career might be hindered, and the overall set-up is seen as a potential trap for women with routine tasks. Note that the test group had a high degree of routine-type tasks. Other observations mentioned were difficulties with managing the work force in a traditional way, and a potential weakening in the employee's loyalty to the company. The study used an action research approach, giving normative advice on how to develop neighbourhood centres.

Ranhagen's (1985) report is also based on the Nykvarn case, which illustrates the scarcity of cases in this area. Parts of this report, written by T Stjernberg, (Ranhagen 1985), focus on organisational aspects. Culture and organisational coherence is mentioned as potentially problematic, in combination with less social control from colleagues. The management discussion focuses on result, delegation and personal responsibility. The climate for innovation and development is mentioned, with the possibility for both positive and negative influences.

None of the above discussions result in any answers, but are intended to identify areas of interest in combination with telework. One observation is that the repertoire of means for the organisation to correct behaviour of employees diminishes with telework, which could become a problem.

An economical overview of telecommuting and its consequences on costs for the company and society is done by Paavonen (1992). His conclusion is that there can be significant economical advantages for the company. Various hindering factors for telecommuting are discussed, and grouped as technical, economical, functional and social. As a Technical hinder, IT and communication technology is discussed, and it is concluded that this in itself is no real hindrance. The same is valid for the cost aspect since equipment is reasonably affordable. Functional hindrances are connected with necessity for presence and safety issues. The fact that most work has some solitary tasks that can be performed at home is highlighted. On social issues, a brief discussion is held on resistance towards telecommuting on an individual and group level. Based on this, a large group of possible telecommuters is defined. A number of cases are analysed with a focus on potential cost reduction, and a positive cost situation for telecommuting is predicted. The study does not focus on organisational impact, but is fairly sweeping in these areas. The major input from Paavonen for the present study is indications on some areas that might be of interest regarding organisational issues and telecommuting.

In a report issued by Teldok, a Swedish foundation for information on communication and IT, Forseback (1995) discusses telecommuting based on 8 cases from different Swedish companies. This is based on interviews with telecommuters in different roles and work situations. The approach is wide, spanning personal and organisational issues as well as discussing costs and possible societal impact from telecommuting. The empirical case description is quite

detailed, and has been used to evaluate the choice of issues for this study. Trends and promoting factors behind telecommuting are discussed, as well as potential problems and future scenarios for work organisation and working life. The approach here is more to raise questions than to answer them. In terms of organisational impact, the need to develop an employee relationship based on trust rather than control, a focus on result rather than process, a change in communication pattern from quantity to quality, and a flatter organisation are discussed. These are linked to contemporary trends in management, and telecommuting is seen as an aspect of something new called IT-management. This has strong influences from consultancy literature in the area, but gives a picture of the common-sense ideas about telecommuting at the time, with a lean towards normative telecommuting introduction literature. The report as a whole gives a good overview of the area and some of the problems frequently discussed in combination with telecommuting, without answering any questions on what telecommuting means to the organisation.

### Communication

A study on satellite offices (Moberg 1993) focuses on communication between the satellite offices and the main office. Three cases of separating relatively routine-oriented tasks (customer support, switchboard and data entry) from the main office are studied. The trials are started by internal forces, and with support from the participants. The satellite offices are located in the Stockholm archipelago in two cases (Möja and Ingmarsö) and in an area with high unemployment, approximately 200 km from Stockholm (Lindesberg) in the third case. The method used for the study is a communication diary, filled in by the teleworkers, and complementing interviews. The description of communication patterns, within the satellite offices and between units, is central in the study.

The information needed by the telecommuters in these cases is described as fairly simple, due to low uncertainty and equivocality of tasks. It is possible to a high extent to communicate through computerised systems. In addition to this, the telephone was the most used personal communication media, with e-mail and fax as complements. Most telephone communication instances were short, less than 3 minutes, reflecting this simplicity of tasks. In the study, three functions of communication are studied, the command function, the ambiguity function and the relational or social function. The command function, orders and tasks, took a small part of the overall



communication. The other two took larger parts of the total communication.

The communication patterns are found to be quite similar for the satellite offices and the central units. The study concludes that there are only small differences in communication channels and frequency or duration of contacts. The fact that the satellite offices had fewer means for communication did not mean that ICT was used more than in the central offices. Social contacts were found both locally within the satellite and with other units. Based on this study it is not possible to find any patterns in deliberate change of media use. The main difference between the present study and Mobergs study is the studied group. Moberg focuses on full time telework and simple tasks, while this study looks at part time telecommuting and complex tasks with a high degree of interdependencies between group members.

Moberg follows up on the first study with an investigation on how flexible office arrangements affect communication structure and co-operation (Moberg 1997). One conclusion drawn from this second study is that the meeting structure is not much affected by the new office environment. Another conclusion is that the open office environment may very well be combined with telecommuting. Issues such as availability to colleagues, lack of spontaneous contact and social interaction are raised, but respondents suggest that the lack of spontaneous contact at home is compensated for when working at the office. There is also a belief that the communication at home is shifted to telephone and e-mail, and the total level of communication at home is equivalent to the communication at the office. This might be an interesting point to follow up.

### Task and career

In her study from 1989, Bailyn shows that in a group of system developers, tasks for telecommuters tend to be shorter and smaller in scope than for the office based group. This is argued to be functional, since smaller tasks are more cognitive (individual) in their nature than social (dependent on interaction), and thus more suited for solitary work. The study is based on a questionnaire addressed to a group of primarily UK women with scarce computer skills, who are working from home due to family reasons. Another conclusion from this study, that links to the findings in Perin's article, discussed below, is that US women seem more career oriented, and are less likely to want to give up the visibility that office presence provides. A normative proposal by Bailyn is that there should be a shift towards an output focus rather than managing input (work process and time and

resources used) when managing teleworkers. The telecommuters identified in Bailyn's studies are highly skilled (unique) people with the possibility to put specific demands on their employees. This implies that the degree of freedom sought by these people makes management in a more traditional (US) style difficult, and calls for a relationship built more on trust than on control. The communication pattern within the two groups are found to be different. The home based groups rely on telephone whereas the office based group rely much more on face-to-face communication. The tasks are independent and the home based workers spend practically all their working time at home.

### Telework resistance

Perin (1991) discusses the resistance towards telework found in American companies. Her conclusion is that this originates from a cultural division between home and work. The home is connected to relaxation and personal issues while the office is where you perform paid work. This in combination with the fact that many managers have a low degree of trust in their subordinates, and rely on direct supervision to make sure that they actually work, makes telework difficult to accept for them. Absence is culturally unacceptable since it undermines the norms and values in the group and reduces the authority of the manager. Telework is thus "*culturally inappropriate, no matter how functional*" according to Perin. Performance is based on presence rather than on result, which means that absence will have negative effect on the employee's personal career. The organisation of work is claimed to be designed to suit industrial, machine-dependent activities with mass production logic and bureaucratic control.

This is partly contradicted by Van der Vielen et al (1993) who in a study of a Dutch company finds a different picture. The organisation studied is more adaptive and non-bureaucratic. The work is of a project-like nature and the organisation is geographically dispersed, with flexible time schedules. Management is claimed to be non-bureaucratic, with a high degree of mutual adjustment between managers and project members. In this case, the attitude towards telework is favourable. A survey of the attitudes towards telework is performed among the employees. The expectations are that a higher degree of planning will be needed if telework is implemented. The main benefit is expected to be increased productivity, and the expected disadvantages are outweighed by advantages. Meetings are considered important, but maybe replaceable by other forms of communication in some cases. Modifications of work procedures are predicted, but no revolutionary changes are believed to be necessary.

In a study of the telecommuting program in the San Francisco bay area (Fay, 1996), it is concluded that the resistance to telecommuting in this case is mainly institutional, or dependent on management resistance. Technology is not seen as a major hindrance. Informal telecommuting is frequent in this region, but there is a significant resistance to formalising the option.

A "honeymoon" period is often encountered in telework implementation, as well as in other high-profile change projects (Reinsch, 1995). This is particularly pronounced in pilot studies. Parts of this can be explained by a form of "Hawthorne effect", where the pilot personnel performs better due to the focus put on them during the test period. The Reinsch study is based on questionnaires, in Bell Atlantic, where hypotheses on management of telecommuters are tested. According to Reinsch, this honeymoon lasted for 12 months, after which an "adjustment to reality" occurred. This implies that a study of the outcome of telecommuting ought to be longer than the possible honeymoon period, in order to avoid the "Hawthorne effect".

Moktharian (1994) presents a conceptual model on the individual decision to telecommute, based on three types of factors, constraints, facilitators and drives. The major types of constraints / facilitators (or negative / positive hygiene factors) mentioned by Moktharian are awareness, organisational factors, tasks and internal psychosocial factors. The major types of drives are work, family, leisure, ideology and travel. Moktharian argues that the absence of constraints is a necessary but not sufficient condition for telecommuting. The presence of one or more drives is necessary. This implies that organisational issues are not an individual drive to telecommute. The organisational constraints are summed up as management resistance and lack of support. Colleagues and organisational / communicational issues are not raised, but may be included in task related issues. Institutional and social / cultural issues are briefly mentioned, but not elaborated on. The focus is on individual choice. In following articles (1996, 1997), based on empirical studies, job unsuitability and management disapproval are found to be major constraints when telecommuting is a preferred alternative for the individual. Only for 11% of the sample in Moktharian's study, was telecommuting preferred, possible and chosen. An important factor is the individual attitude towards social or professional interaction at work, with persons assigning a high value to interaction being less likely to prefer telecommuting.

### Telework appropriateness

A discussion on criteria for successful telework is held by Olson (in Huys, Kort & Robinson, 1990). Six criteria are proposed, Not too high dependence on equipment, self control in work, measurable results, need for concentration, natural check point in work and finally a low or manageable need for co-operation. These criteria are used and developed by several authors. Heilmann (1988) proposes further dimensions, such as whether the task is presence oriented or result oriented and if the work is done in a group or on an individual basis. The further discussion on the subject has been dependent on the type of telework.

Different conclusions can be drawn dependent on time spent at other locations, tasks, company and national culture, technology used and so forth. In some aspects, most administrative or non-physical tasks have some moments that are possible to combine with telework. Several consultants and management oriented authors (Schepp, 1995; Nilles, 1994; Gray, 1993; Reinsch 1995; Solomon; 1993) have tried to identify suitable tasks or job characteristics, as well as personal characteristics, in combination with telework, based largely on similar lines of reasoning. A number of points are said to be supportive for telework. Among these are clear results, solitary and long-term tasks (contradicted by Bailyn, 1989), independent of heavy equipment, high level of external contacts, control over own work planning, low dependence on informal contacts and low need for presence (on behalf of others).

Larsen (1996) aims her study at identifying factors that support or hinder the use of telecommuting as a way to organise work. A special focus is put on tasks of the teleworkers, and the co-ordination between teleworkers and the organisation as a whole. The study is based on four cases, with both part time and full time telework. Interviews are used as main data source, and the findings are related to communication and co-ordination theories.

The first focused area is the character of the tasks in relation to telework. Critical aspects found are independence in tasks, both in the definition and initiation of tasks and in independence from colleagues in performing the task, which seems to facilitates telework. The duration of tasks, long term tasks or short assignments, is not shown to play any major role. According to Larsen, the possibility to measure the result of the performed tasks seems to have a positive influence on the possibility to telework. This is partly in conflict with the tasks chosen in my cases. The cases are deliberately chosen to

include co-operation and interdependence in parts of the tasks. This is to highlight the possible problems with co-operation over a distance. On the other hand, most tasks have parts that do not require co-operation, and if the telecommuting is part time, this can be handled by scheduling of the different parts of the work.

The second focused area is co-ordination. One indication is that the need for formal co-ordination might increase due to telecommuting. The importance of informal communication is also stressed. In addition to these points, the role of ICT is discussed, and it is found to play a central role in all cases. An observation is that the vulnerability increases. The organisation becomes more dependent on technical systems.

Generally, a strong company culture, the motivation of all parties, in other words commitment to the use of telecommuting, and clear and measurable result variables are said to facilitate the implementation of telework. Note that this study aims at identifying possible factors that might influence the viability of telework, and does not claim to conclude on these issues. The results are more to be seen as indications and areas for further research than actual findings.

Tomascovic-Dewey and Risman (1993) suggest that the adoption of telecommuting is contingent on the organisation of the firm, where smaller, less bureaucratic firms with financial pressures and firms with sufficient organisational slack are most likely to pursue the workplace organisation that telecommuting represents. This is based on the notion that larger and older firms are more reluctant to changes in these areas. Tomascovic-Dewey and Risman suggest that the organisation is contingent upon organisational constraints and power of groups of employees rather than on technology, as suggested by traditional contingency theory (e.g. Thompson, 1967). The two dimensions of organisational inertia (similar to institutional factors) and power and status are seen as important. The study is done as an attitude survey among US managers, checking for organisational, managerial and employee constraints for implementing telecommuting. A distinction in this context is made between professional groups that are allowed to telecommute, and clerical groups. The development of and rationales for telecommuting are different between the two groups. For professional groups, considerations among managers are linked to productivity and employee satisfaction, while for clerical groups, cost savings and control issues are seen as important. The professional group have far more possibility to use telecommuting to gain personal advantages than the clerical group.

This split between different categories of teleworkers is developed by Salaff and Dimitrova (1996) where two groups of tasks are identified, "cool jobs": structured and predictable tasks with little disturbances, and "hot jobs": mainly sales force, with high uncertainty and low degree of predictability and structure. Telework is shown to have mixed impact for those with "hot jobs" with some advantages of flexibility in scheduling and travelling, but perceived follow up problems from the managers side. Persons with "cool jobs" find telework liberating, allowing them to structure their work and plan their time, drawing on the benefits of no disturbance when working from home.

### Managing teleworkers

The management of teleworkers is discussed by Handy (1995) where he stresses the need for trust as the most important factor for successful implementation. The traditional (US) way of controlling work by direct supervision, or even controlling the work process, needs to be replaced by a relationship based on trust. This is a recurrent theme in management literature, and not specific for telecommuters, but as stated by Reinsch (1995), the general characteristics needed for leading an organisation based on a higher level of trust than historically is particularly important when dealing with telecommuting or other forms of geographical dispersion.

### Efficiency and productivity

Efficiency and increased productivity is one of the major arguments for introduction of telecommuting. An increase of between 4 and 80% in productivity is claimed for telecommuters in various studies, with an average improvement of around 40%. Forester (1987) notices that productivity changes reported so far in telecommuting experiments are all on the plus side and rarely less than 35% (in Brocklehurst, 1989, p.47). Perhaps the most extensive US study - of 1200 employees by Electronic services Limited of New York - found average productivity gains of between 40 and 50%." Many of these studies are on routine work. Further examples of raised productivity are given by Kugelmas (1995, p42); data corporation, 15 to 25% increase among home programmers; insurance company, 22% and 25% in two cases; data entry clerks, 37% and 50% increase in productivity.

Productivity is harder to measure for less defined tasks such as managerial tasks and problem solving. Bailyn (1988) claims a 50% increased productivity in the "networked" Rank Xerox teleworkers.

These are former employees, hired on a consultancy basis, working from home. The increase in productivity is built on three factors, according to Bailyn, personal gains in work performance, better management and specification of work and an increased efficiency of the core support staff. Other similar studies are also reported by Kugelman; managerial tasks report a 43% increase in output, and professionals 20 to 30%. 94% of the telecommuters claim better productivity, 52% claim better quality as well and 57% report better morale.

Huvs (1996) summarises the productivity studies of teleworkers as typically around 20 to 40%, raising to 100% in some cases. These figures should, according to Huvs, be regarded with some caution. Selection of teleworkers, as well as a self-fulfilling effect of the expected gains plays a role. The second argument is that mainly low-skilled routine tasks are studied, and for relatively short periods. The long-term generation of new ideas and informal contacts for professional roles have not been taken into account. A general picture, according to Huvs, is that over 90% of the questioned managers of teleworkers regard them as better or the same as the other office-based workers, in terms of productivity, reliability and loyalty. On the other hand, only certain persons are allowed to telework, and the general case has a small number of teleworkers, carefully selected. Again, it is concluded that the greatest barrier to telework is not technological but organisational and social, and future research should be directed towards these areas.

Reasons given for the increased productivity are the undisturbed environment at home, giving the employee an opportunity to concentrate on the work. This leads to more work being done during working hours, since less time is spent on other activities with less actual measurable output. It is also suggested that the actual number of working hours (time spent on work related activities) is higher for teleworkers than for office-based workers, leading to higher overall output. This is not necessarily linked to paid overtime, and is therefore captured as higher productivity in some measurements (output per hour of paid work).

A possible reason for the increased productivity is the fact that many of the studied cases are pilots, where the teleworkers are volunteers and take a personal interest in the success of the trial. An extra effort might be put in to the work to justify the perceived privilege of being allowed to work from home. The same type of argument can be raised for all studies, based on the "Hawthorne effect", where anything that

is studied is affected positively due to the attention put on the studied persons (Roetlisberger, 1943). All efficiency and productivity studies are based on short-term output. Results from long term development are not yet available, and issues such as personal development and learning is not taken into account.

### **Management literature**

The management literature in the field has multiplied in the last few years. Most books on telework and telecommuting have the same message, "this is good for you as a manager and as an employee, as well as for society and for your family". The positive myth is strong, and normative advice is given on how to implement telework or telecommuting. The literature varies from a fairly academic touch (Kugelmas, 1995) to a more populist approach (Leonhard, 1995). The common approach is to give a background to telework, trying to define it, and then listing all the advantages. Following this are possible problems to avoid, and then a guide on how to implement telework or telecommuting. I will here give a short introduction to some of the current books.

Kugelmas, "A Managers Guide to Flexible Work Arrangements" (1995), is more or less what it claims to be, a guidebook. The book is building more on cases and previous studies than many of the other books, and in the first part of the book gives a fairly good introduction to telework. The first part is describing the "turbulent world we live in", defining flexible work, changes in work force demographics and preferences, giving benefits and challenges to flexible work, covering technology demands, and finally discussing selection and management of future telecommuters. The second part is an implementation guide, which follows a traditional step-by-step rational implementation plan. This approach can be criticised, but this will be left aside for now. This is the basic set-up of many of the management oriented books, introduction, problem and solution.

Nilles (1994) starts out with the selection of telecommuters, based on the task involved and the personality of the employee. Most jobs have some parts that can be combined with telecommuting, according to Nilles. Personal traits important for telecommuters are, among others, self-motivation, self-discipline, flexibility, innovativeness and not too high needs to socialise. Telework centres and technology issues are discussed briefly, and then control and management issues are focused on. Here, words such as trust, quality communication and product/result focus are used. Meetings and the use of meetings are discussed, and importance of informal communication is stressed.



Potential problem areas such as career, workoholism, and isolation are also discussed. Then follows the implementation guidelines for managers and advice to telecommuters, on everything from legal contracts to work place design.

Gray (1995) starts with a more ambitious approach to telework history and telework definitions. The book is partly built on studies by British Telecom. Two of the most important obstacles for telework are identified as threats to corporate culture and structure, in combination with expected management difficulties.

Schepp (1995) starts with the mandatory introduction and definitions. Next, driving forces for telecommuting, advantages and disadvantages are discussed. Again, arguments such as productivity and money savings are raised for telecommuting, as well as new management styles and new basic values of the "X generation". Managerial attitudes and inertia is seen as the main obstacle to the introduction of telecommuting. Other problem areas are isolation and communication problems, with the possibility for face to face communication eliminated for part of the time. Reduced informal contacts and negative reactions from colleagues are also seen as potential problems.

Leonhard (The underground guide to telecommuting (1995)) has written a book aimed at the would-be telecommuting individual, taking a "humoristic" approach. Everything around telecommuting is seen as positive, but there is little substance in the arguments raised. The language, which is very simplistic, reveals that the book obviously is written for people not used to management literature, or even reports, but more aimed at tabloid paper readers. The book is a virtual myth spreader, selling telecommuting as the salvation for the new and better individual.

This brief review of some popular books should show that the public has taken an interest in the subject. This study intends to contribute to the public discussion by challenging the widely accepted outcomes of telecommuting, i.e. the benefits and disadvantages discussed in most books. Some of these are derived from common-sense guesses or anecdotes on how things ought to be, and then spread as taken-for-granted myths on how telecommuting works. This has to be commented on and challenged.

### **Other reports and writings**

In 1994, two reports on telework were issued by the Swedish Technical Attachés, one based on empirical data from the USA and one from France. The US report (Lagg, 1994) summarises the state at that time, concluding that this is a growing phenomena, with certain advantages and certain disadvantages. Areas of concern are highlighted, such as productivity, result follow up and financial justification of telework. The French report (Frisk, 1994) focuses more on technical and legal issues, as well as the telework situation in France at the time. Reduced absenteeism is proposed as a possible advantage due to higher personal flexibility, based on the possibility to work during light illness. Other possible advantages frequently mentioned are recruitment of personnel in remote areas and personnel retention, job satisfaction and disaster handling capability (earthquakes and other disasters).

Distans, the Swedish magazine on telework, published between June 1994 and the autumn 1996, with a total of 11 issues, gives a good picture of the public discussion on telework. These articles have been used as background material; over 50 articles were used for ideas and references (these are not included in the reference list, due to practical reasons). This period of time outlines the period when there was a major interest in the area, starting somewhere around late 1993 and gradually fading in 1998. This is the time period when the phenomenon was seen as new and interesting for the public, and a time when many daily newspaper journalists focused on the issue, with extensive articles on telework and teleworkers. Almost weekly, a story on new ways of working, such as telecommuting and mobile IT-work, was to be found in major newspapers.

### **3 Theory for studying telecommuting's impact on structure**

#### ***Introduction***

As stated in chapter 1, the purpose of this study is to identify what impact telecommuting, can have on a knowledge-producing organisation, such as the organisations in this study. This is done by describing the most important perceived changes, and also when possible, by quantifying such changes. This calls for a focus in the investigation on areas where major changes are likely to occur. Since the study starts with an open question, this needs to be refined during the process. Refining the question has sometimes been described as a funnel, where the question is gradually filtered. To do this I will present the background for the more specific areas of interest, and give a model for the data collection and analysis. In the model, areas of interest in terms of organisational impact from telecommuting are identified and elaborated on.

The direction of the study has been decided by a combination of personal interest and general interest. Issues that have been raised in discussions, in combination with previous studies and proposed future research form the base for the research model to be presented. An issue is to find the appropriate level of width and depth. The decision was made to take a wide approach, including more than one aspect of structure and organisation in the framework. This may be considered a rather large scope for the project, but since the study is of an explorative character, aiming to understand telecommuting, a relevant approach is to start with a broad area of interest rather than to concentrate on one theoretical aspect.

In defining the areas to focus on, several types of input were used: previous studies and literature, discussions with experts and a pre-study on expected changes due to telecommuting in one of the chosen organisations. The operationalisation of the study was done in steps. The major issue and area of interest were defined in chapter one, while a more detailed research model is developed here. The research model is used to form a framework for the data collection. This

framework worked as a base for designing interviews and other means of data collection, which is elaborated on in the next chapter.

### ***Input to research model***

In shaping the ideas for how the research should be set up, ideas were discussed on several occasions at workshops and conferences, as well as with colleagues. Some of the discussions with impact on the outcome are accounted for below.

IMIT (Institute for Management of Innovation and Technology), the research foundation in which this study was run organised a seminar on a countrywide basis, with the aim to map the ongoing research in the field. The seminar is accounted for in more detail in Rognes 1996. The IMIT seminar was set up as an academic workshop, gathering researchers interested in telecommuting. Consultations with other experts in the field were also held, and conferences and workshops on telework, telecommuting and flexible work were visited. Another source of ideas was Telia, the major case company. Since Telia had been planning a telecommuting pilot, their view and focus were taken into account, to reach synergies with their proposed pilot introduction of telecommuting.

The subject and research set-up was discussed with colleagues in the same department. The discussion was more focused on theoretical framework than on the issue to be studied. Several theoretical approaches were proposed in these discussions.

### **Pre-study expectations on telecommuting**

At the start of the study I had access to a pre-study made internally by Telia Research, looking at the expectations of the telecommuters-to-be. Before the actual start-up of the Telia telecommuting trial, the telecommuters, a control group and some of their colleagues were interviewed. Questions were asked about their expectations and fears regarding the impact of telecommuting on their professional situation and private life. The interviews covered social and individual aspects of telecommuting, technical issues, tasks and work content, as well as work relationships and collaboration issues, both for telecommuters and colleagues. The interviews also included the telecommuters' reasons for taking part in the telecommuting trial. Some of the major findings are summarised below.

The findings in the expectation interviews were in many aspects similar to subjects and areas covered in the public discussion held in newspapers and other media at that time. The overall expectations could be seen to reflect the common picture of telecommuting. The headings, management & co-ordination, communication structure and work patterns, were not used in the expectation study, but added afterwards. The headings are based on the analytical model and used to structure the spontaneous comments by the respondents. Other issues were raised as well, such as personal and private expectations, but these are not included here.

### Management and co-ordination

Organisation structure and support organisations were expected to adapt to the telecommuters, where needed. These expectations were based on the belief that the surrounding organisation would support the telecommuting trial, and change ways of working that were in conflict with the new dispersed organisation. Telecommuting was generally seen as fairly unproblematic, not requiring any dramatic changes in the normal way of working. Since the scope of the trial was limited, the impact on the overall organisation and work pattern would be limited, according to the expectations. Projects were expected to go on more or less as before, with some adjustments. Co-ordination at the sections (line organisation) was expected to become more formal and structured. Management would have to put more effort into planning and scheduling. Supervision may become more detailed and less visionary. On the other hand, some respondents expected a more long-term management, with less frequent checkpoints. The relations to managers might become less personal and more bureaucratic, since there would be less time for personal contacts.

### Communication structure

Social issues regarding colleagues and the telecommuters professional and social contacts with them were widely discussed, and fear of less social contact was raised, both by telecommuters and their colleagues. The increased absence would make the social interaction at the office suffer, with less time for social chat, and the overall atmosphere at the section may deteriorate. Ad-hoc meetings and discussions would be

less frequent. Formal communication or expected communication problems were not mentioned much in the expectation interviews, mainly because no specific questions on communication were asked at that stage.

### Work patterns

Expectations regarding the work situation focused on increased personal flexibility, better self-control and increased efficiency. A reason for increased efficiency would be the possibility to work in an undisturbed environment for a part of the week. Work was expected to be split into solitary tasks done at home and group related tasks done at the office. This split would require a restructuring of work habits, with clearer personal planning of activities. A more flexible work pattern was mentioned as a possibility, rearranging the workday and maybe working in the evening instead. Most of the telecommuters expected to work more than before, the gained time would be put on work rather than on the family. The main gains from telecommuting were expected for the individuals, both professionally and privately.

The discussions held in the expectation interviews focused mainly on a structural level. A major reason for discussing structure is that structural issues (in many cases) are easy to communicate. Much of the common sense understanding of an organisation is on a structural level. This study sets out to capture the perceived structural changes, which can be seen as symptoms or expressions of more basic mechanisms, also to be discussed.

### **Proposed perspectives by previous research**

Many previous studies have proposed an organisational focus when studying telecommuting. Structure is a recurring proposed perspective in many of these, and is often seen as an appropriate approach. Olsen (1990), Heilmann (1988) and Moktharian (1994, 1996) all list a number of structural aspects of formal organisation as being constraints, criteria or areas of necessary change in order for telecommuting to be feasible. The structural focus is even clearer in contemporary literature, where organisational structure is predicted to change towards a flatter and more result oriented organisational form due to telecommuting (Schepp, 1995; Nilles, 1994; Gray, 1994). Many previous studies mentioning formal organisation predict or show some form of change due to the introduction of telecommuting.

Larsen (1996) indicates that the formality of the co-ordination needs to increase to accommodate telecommuting. Bailyn (1989) in contrast found that management based on control is difficult in combination with telecommuting, and trust becomes more important, loosening the formality of the organisation (see also Handy, 1995). Van der Vielen (1993) stresses the expectations of more planning as a change in management & co-ordination due to telecommuting, in a non-bureaucratic, European company. The opposite change is expected in control-oriented US companies (Bailyn, 1989). These, and other examples, show that there are expectations for change in management & co-ordination due to telecommuting, but that the direction of this change is uncertain. Much of the normative literature claims that management & co-ordination has to change, towards more management by objectives and less control. The management of the organisations in this study are already based on a high degree of trust and personal freedom, thus being suitable for telecommuting, but in these cases, a change towards more formal control is expected. This is a reason why management & co-ordination seems to be an interesting area to look into further.

A change in communication structure is seen as a natural effect of telecommuting, since face-to-face communication is supposed to be replaced by distance communication, based on IT solutions. This is not always questioned, but seen as a natural change when geographical distance is introduced. The picture varies, from predicting a total substitution with communication based on e-mail and phone instead of meetings (Handy 1995) to a more nuanced view, where media use and communication content are seen to change in a more limited way (Moberg 1993).

There is an indication in several of the studies that the individual changes in work patterns in relation to telecommuting are of interest. Issues such as a possibility to plan own work, to be undisturbed for longer periods at a time, to be able to move working hours to a time more suitable for the individual and to co-ordinate work with leisure time are all raised as possible changes in personal work patterns (Huvs, 1996).

### ***Theoretical base for research model***

This chapter introduces the theories used in the empirical stage of the study. The basic model for investigating the impact of telecommuting on an organisation is presented in chapter 1. This model is based on a structural perspective, focusing on three aspects of structure; management & co-ordination, communication structure and work patterns. The set of theories presented here is not a theoretical framework to which I hope to contribute, but rather a conceptual framework to help me focus on areas that are shown to be of interest in conjunction with telecommuting. The theoretical base presented here will be complemented in chapter 7, where further theories are introduced, to be used in the analysis of underlying mechanisms. Changes in the areas focused in this study may in some cases be better explained by other theories than the ones used to focus on the issue. This will be discussed further in chapter 7.

In this chapter the concept of structure is seen as a meta-concept, covering all three groups of theories. The ambition is to look at all three levels, and see what impact telecommuting has.

- The first focuses on the traditional aspects of structure, management & co-ordination, where in this case "formalised informal practices" or institutions are included.
- The second part focuses on a more specific aspect of structure, communication structure and media use.
- The third part takes a more individual perspective, looking at the structuring of the personal work situation.

First an introduction to structure.

### **Organisational structure**

There are many possible starting points for investigating the impact of telecommuting on an organisation. In this study, structure has been chosen as the basis for further analysis. One reason for this is the proposals for further research discussed above, where impact on organisational structure is seen as an important field for further studies. Another reason for the choice of structure is the exploratory nature of the study, which calls for a broad approach to data collection.



Structure is easily communicated and part of the organisational members frame of reference, both if studied as perceived structures, or if studied as "hard data", such as time used for an activity or formal organisational plans. This makes structure a good first perspective when a new phenomenon is studied. The approach taken means that structure is seen as a way of analysing an organisation, a symptom for deeper underlying factors, and not the main area of interest in itself. This means that the impact of structure on efficiency is not the studied issue. An underlying assumption in this study is that there exists some form of organisational structural fit. This implies that a change in the surrounding organisation or the environment could trigger a change in the local organisational structure. In this case, telecommuting is in itself a structural change, which might lead to other changes.

The notion of contingencies in some form is appealing. The thought that various factors will influence the organisations' structure, be it technology, environment or institutions, is well established (Scott, 1992). Causalities may be difficult, or even impossible, to identify, but it should be possible to gain a better understanding of the interactions between the overall system structure and local changes in structure, such as the introduction of telecommuting. The aim of this study is not to quantitatively measure impact or to develop a contingency model. What I will look into is the interaction between telecommuting and the chosen aspects of structure.

### ***Background and overview, early structuralist***

Structure has played a central role in many of the early studies of organisations, and has been the central subject of concern for organisational theories and design. The focus on structure has changed in the last couple of decades, with other areas such as personal motives, culture, organisational institutions and societal norms having been focused on. Today the focus on structural design of an organisation has somewhat decreased in interest. On the other hand, focusing on structure and structural changes may still be a powerful analytical approach to an organisation.

A way to see structure in this case could be formalised activities, or stable patterns in activities, such as communication. One can consider formal meetings, division of tasks and responsibilities and formal

reporting, as well as preferred media for communication, as parts of structure. This expands the concept of structure beyond formal hierarchy, including routines and formal working procedures. How formal structures have initially been set, and if they are "rational" or not, is not the focus of this study, but rather how they are affected by a change such as telecommuting. This might be seen as a form of causality, related to contingency theory. According to contingency theory, structure is determined by external factors, contingency factors. Examples of contingency factors are technology, size and environment. I prefer to see structure as depending on several other factors, such as for instance institutions and historical influences. This indicates that the formal structure is likely to be more or less suitable, or will evolve in certain directions, for any given activity, as discussed by Mintzberg (1979).

In his book "In defence of Organisation Theory (1984) Lex Donaldson discusses the concept of contingency theory and structural functionalism. This is mainly a positivist and quantitatively oriented branch of organisational studies with structure on organisational level as the unit of analysis and the interest is in factors influencing organisation structure. On the other hand, various factors' impact on structure is the area of interest in several schools other than structural functionalism. Institutional theory, as discussed below, builds basically on the same fundamentals, but includes a non-functional dimension.

The aim of organisational theory, according to Donaldson (1984) is to find general causal laws. The possibility of finding general laws on a technology basis, except on a very abstract level which would not fit very well with the taken research approach, a positivist reductional approach to studying organisations may be criticised. One thing that is turned against in structural functionalism is the rationality assumptions, including the assumption of an optimal equilibrium state, when functional solutions are found.

Lawrence & Lorsch (1967) set out to increase our understanding of the organisational characteristics which allow firms to deal effectively with different kinds and rates of environmental change, especially technological and market changes. There is clearly no *single* best way to organise. What kind of organisation does it take to deal with

different environments? The authors develop a contingency theory that focuses on the organisational characteristics that lead to effective performance given the specific demands of an organisation's environment. It is noted that organisations differ along lines of function in different ways to organise different departments. This leads to the problem of integrating different departments to achieve a common goal. The concept of environment - technological and market conditions - influences organisation. Given these technological contingencies, it is investigated how the company should be organised in the best way. Lawrence and Lorsch study this by looking at three different industrial sectors: food, containers and plastic industry. While "traditional" organisation theorists sought the one best way to organise in all situations, this approach is contingent on the situation, hence contingency theory.

A major emphasis is put on the differentiation and integration in organisational systems. The division of labour problem and the problem of differentiation and integration are not new. There will be differences between departments, the most important differences being the orientation toward different goals, different time orientation, different interpersonal orientation and finally different degree of formality in structure. This could be put as the differences in cognitive and emotional orientation among managers in different departments. Integration on the other hand is defined as the quality of the state of collaboration that exists among departments that are required to achieve unity of effort by the demand of the environment. It is noted that the integration is not achieved primarily through the chain of command, as stated by earlier researchers. Interpersonal skills play an important role, as does conflict resolution. The conclusion is that the methods and practices to handle disagreement need to be consistent with the environment, to achieve the required degree of differentiation and integration internally.

A contingency theory is formulated by Lawrence and Lorsch, with the major content that internal attributes of the organisation, in terms of structure and orientation, can be tested for goodness of fit with the various environmental variables and the predisposition of members of the organisation. A more sophisticated model of organising, that will not only reduce the confusion in organisation theory, but also will

have considerable implications for the design and management of complex organisations.

Organisational fit is taken up by Galbraith (1973), who states that there is no best way to organise, but that all ways of organising are not equally effective. In Galbraith's framework, the degree of uncertainty in the task is identified as the key variable upon which alternative organisational designs are contingent. Design variables are for instance the level of slack resources and the degree of self-containment in the tasks, which are used to reduce the need for information. The creation of lateral relations, using various integration mechanisms, is also discussed as an option, with the matrix organisation as one example. The key to a viable organisational design is the fit between the organisation and the task.

A further development of the contingency approach is made by Mintzberg, with five generic structural forms, each suitable for a specific task and environment. Structure is not necessarily linked to a realist ontology, with little place for social explanations and bi-directional causalities. One example of this is the neo-institutionalism in organisation theory. This field studies structures as institutions, taking a social constructivist stance. Structures are seen as patterns, high-level units of analysis, rather than "hard" entities. This is a way to treat structure as an aspect or symptom rather than as a true picture of the organisation. Structure will be treated in this way in the following sections, where the three highlighted areas: management & co-ordination, communication structure and work patterns will be looked into in more detail.

### **Management and co-ordination**

The first area in the model used for studying telecommuting's impact on organisations is management & co-ordination. This has been an area of interest for several decades or even centuries, but still the perspective is central for studying organisations. I will now give a brief background to the field and then use earlier work to build a framework for this study.

Management & co-ordination relies in some respects on formal organisation. Formal organisation may be seen not as a picture of how work is done, but more as a tool used for communicating formal

responsibilities and accountability. The actual performance of tasks may differ from the formal structure, but since the formal structure is widely used as a means of communication, changes in the communicated picture of the organisation are as such interesting.

In the present study the term management and co-ordination is broadly defined. It encompasses many areas where changes in organising the activities linked to the telecommuters are observed. This covers most perceived organisational changes, including formal and informal organisation. This broad approach calls for a further operationalisation of management & co-ordination. Management & co-ordination may be seen as a number of variables, and an impact on management & co-ordination has to take these into account, which will be elaborated on below. Communication is normally included as an important area when management & co-ordination is discussed. This will be discussed in more detail in the next section.

Organisation structure is often discussed in combination with the design of an organisation. It may be argued that designing an organisation is a difficult task, and even that organisations may not be designed, but emerge (Scott, 1992). On the other hand, the deliberate actions taken to design an organisation will have influence on the final form the organisation takes. For this study it is interesting to take into account various aspects involved when trying to design an organisation. These aspects are seen as a way to structure the examination of management and co-ordination, and is borrowed for this purpose. The designing is not central, but the categorisation of organisational variables. As a basis for this, Mintzbergs categorisation of design parameters is used (Mintzberg, 1979). The following main groups and categories are suggested by Mintzberg;

Design of position, involving job specialisation, behaviour formalisation and training; Design of superstructure, involving Unit size and unit grouping; Design of lateral linkages, involving planning and control systems and liaison devices, including communication systems; Design of decision making systems, including decentralisation, authority and responsibilities.

As a further framework for studying management & co-ordination in the organisations, basic co-ordination principles identified by

Mintzberg (1979) may be used. These principles are mutual adjustment, direct supervision, and various forms of standardisation. Standardisation, the allegedly most used mechanism, is divided into three types, standardisation of work (process standardisation), standardisation of output (management by objectives) and standardisation of skills (by recruitment or by training). Most organisations rely on a combination of these, with preferences towards one depending on the nature of the task. This is linked to the above discussed design areas, and will be reviewed in combination with these.

#### Position, role and task aspects for telecommuters

The design of position, in Mintzbergs terms, includes the degree of job specialisation. In the present study the idea was that telecommuting might influence the job specialisation. This may be elaborated on further, to form of tasks and how jobs are divided, but it is seen as sufficient to look for any form of perceived or measurable change in job specialisation or task assignment. Such changes may also be labelled as increased specialisation within the organisation or within the project/group.

A second dimension of position is the degree and type of behaviour formalisation. Behaviour formalisation is influenced by telecommuting, since a more organic form of organisation, as in the studied cases, is dependent on mutual adjustment and face-to-face communication. A third dimension is the degree of standardisation, related to the level of set procedures and work instructions. The degree of standardisation may also be influenced by the fact that the employees are out of reach for part of the time.

Another aspect of management is the division of tasks between group members. Is the division made clear or is it worked out during the process of getting the tasks done? Are telecommuters given different types of tasks compared with non-telecommuters, or are they exempt from certain tasks during the time when they telecommute? The issue of task division is relevant for both personal work patterns (discussed later in this section) and the overall structuring of a groups tasks. A specific expectation found in the pre-study in relation to tasks is that telecommuters may be freed from short-term tasks while working from home, since they were not immediately available for short-term

assignments, where immediate response is required. This would give telecommuters an advantage on long term tasks over their non-telecommuting colleagues.

The final dimension, training is not seen as directly connected to telecommuting by any of the reviewed previous writings, and is therefore left aside in this study. The connection between telecommuting and how telecommuters are trained to fit into the organisation may be a future area of interest, but is not seen as immediately relevant to the impact of telecommuting on an organisation.

#### Superstructure, formal organisation

The superstructure is more of a macro-level approach to organisational design and therefore less relevant to the present study. One dimension may still be of interest: the relative importance of the project organisation or the links to persons working on the same output, versus the line organisation or the links to colleagues in the same discipline. This may be described as a shift in the relative strength of the different dimensions in a matrix organisation.

This balance between line vs project is interesting at least in the main case, where a matrix organisation is in place. Telia is a matrix organisation, with telecommuters belonging to both a line organisation and one or several projects. The balance between project and line may be influenced by telecommuting, making one of the links stronger. This may have impact on relationships to managers and on commitment and priorities set by the telecommuter. Many of the more high-level dimensions discussed by Mintzberg in the area of formal organisation, such as choice of overall structure and grouping of units and functions, is not relevant to the present study. The study is conducted within a single unit rather than studying the linkages and co-operation between units.

#### Lateral linkages

The area of linkages in Mintzbergs model is a question of controlling units and output, by various forms of planning and control mechanisms. The area concerns an aggregated level of analysis, and is not directly relevant for this study. It also takes a mechanistic

approach to linkages, seeing them as formal means of co-ordinating organisational units. The design of linkages includes the discussion on decentralisation and decision making systems. Regarding linkages and communication, communication theories more relevant to this study will be discussed in a following section.

### ***Planning and degree of formality***

A possibility mentioned in previous studies, as well as in the pre-study, was that the degree of planning in the work of telecommuters would increase. This increase regards first of all the overall planning of group or project activities, since short term correction would be more difficult with subordinates in another geographical location. The increase in planning also includes the individual planning of a teleworkers daily work, which will be discussed under the heading "work patterns". Aspects of planning are the level of details in the plan, the range of the planning, the necessity to follow the plan and the level at which the plan is determined. The possible increase in planning may also be linked to the degree of formality in the organisation.

Formality may be described as to what extent the behaviour is prescribed or is to be referred to the next organisational level for authorisation. Telecommuting may interfere with formality in two different ways. Telecommuting can cause an increase in formality, to handle the increased uncertainty due to geographical dispersion. Telecommuting can also lead to a more informal organisation, giving the individual a larger discretion to handle his own work situation.

In combination with formality, the co-ordination mechanisms in the organisation may be influenced by telecommuting. This is a complex system of task division, decision making, responsibilities, relationships with managers and colleagues and finally expected output from each person or group. Since a comprehensive mapping of this is not within the scope of this project, a more pragmatic approach is used. The respondents were asked if there were any changes in the way projects or other activities were organised that could be linked to telecommuting. Triggering words such as responsibilities, tasks, roles, co-operation, project management and follow up were used to probe for changes in formality and co-ordination mechanisms.



There is a likelihood that management activities will differ between different stages in projects. Telecommuting will therefore have different impact on the organisation in different periods. The possibility that organisational behaviour is different from time to time, will be taken into account when the impact of telecommuting on management & co-ordination is studied. One idea is that at certain intensive periods of project work, telecommuting may have more impact, leading to either more change in the organisation, or to less telecommuting during these periods.

### Co-ordination mechanisms

Co-ordination may be handled in three basic ways (Mintzberg, 1979). By mutual adjustment, by direct supervision or by standardisation of various kinds. Standardisation may be standardisation of output (like management by objectives). Standardisation of work (like operating procedures, for instance ISO 9000 documents describing how to perform a certain task) or standardisation of skills. Since mutual adjustment is more difficult when an activity is geographically distributed, and direct supervision is not a realistic alternative (unless "big brother" really starts using IT for direct supervision) a hypothesis is that standardisation will be relied on more.

An impact on decentralisation of responsibilities may be linked to telecommuting. Two contradicting views exist, one predicts increased centralisation as a compensation for the increased uncertainty induced by telecommuting (Bailyn, 1989). The second view propagates the necessity to delegate this to the telecommuter, focusing more on result than on process and planned activities (Handy, 1995; Reinsch, 1995). This is most probably linked to organisational climate, and how the management style is prior to introducing telecommuting. One way of capturing the possible changes in management practices is to investigate any changes in follow up procedures, time frames for follow up or changes in meeting frequencies or check points.

The time frame for follow up may also be affected by telecommuting, and linked to how co-ordination mechanisms are used. There is a possibility that telecommuting is difficult to combine with a frequent feed-back system on a personal and informal basis. Telecommuting may invoke more impersonal, formalised and less frequent ways of handling contacts, subordinates and less frequent follow up.

## **Communication structure**

The second area of interest in the present study is communication structure, and more specifically choice of communication media, amount of communication and changes in communication habits for telecommuters. In this section, communication will be elaborated upon, and a short introduction to communication theories will be given. The area of communication has turned out to be more interesting to the present study than management & co-ordination, and is therefore given more attention at this stage.

### ***Background and introduction to communication in organisations***

In early theoretical frameworks, communication in organisations is mainly seen as channels to give orders and control the workers/troops (Rogers, 1976). Vertical communication is seen as appropriate, in combination with hierarchy, the preferred organisational model. The Human Relations movement takes an opposing view, and highlights communication from a social and relational perspective. Informal communication is thereby added to the formal, hierarchical communication emphasised in previous works. In parallel with the development of organisation theory, communication as an organisational phenomenon was developed and given more attention.

Early research on communication has largely been focused on an S-M-C-R approach (source-message-channel/media-receiver) see figure 6. This approach to communication has been used in organisation theory, in psychology and in technically oriented literature. The approach uses a few basic components, the sender, the message to be communicated, the media or channel through which the message is communicated and the receiver (Rogers, 1976). This approach can be developed further by adding sources of distortion that might affect either sender, receiver or the media. We can also add some form of feedback, from the receiver to the sender. Communication might be studied from several perspectives. The technical perspective deals with non-human senders and receivers, and focuses on distortion and transmission quality and speed. Another, quite different perspective deals with shared meanings and shared understandings in the communication. In this case the distortion, or filter, is located in the senders' and receivers' minds, linked to their ways of interpreting the message.

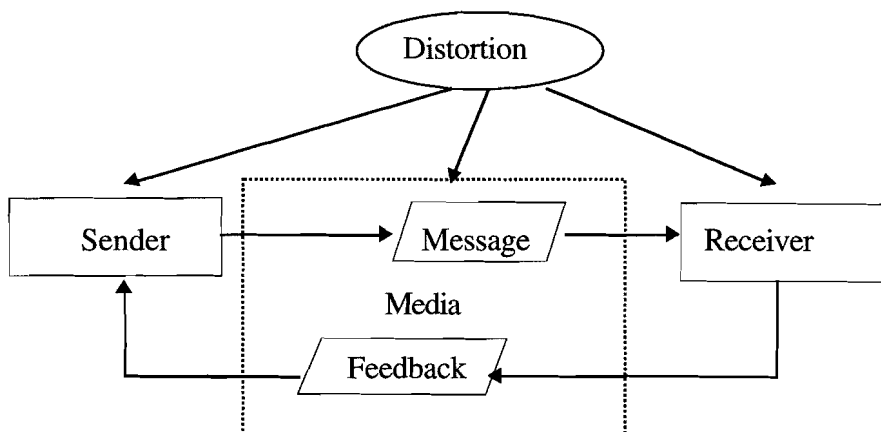


Figure 6, Basic communication model

The SMCR model, as shown in figure 6, is often criticised as being overly simplistic, but is still frequently used as a starting point for discussing communication. Two additional concepts are added to the SMCR model in the figure, distortion and feedback. Effect is sometimes used as a term in this framework, meaning a change in the behaviour of the receiver, such as changed knowledge, attitudes or overt behaviour. Feedback is the response given to the source, and is classified as negative or positive. A statement often made is that the more feedback-oriented a communication process is, the more effective it is (Rogers 1976).

The approach used in SMCR research is to change one of the components of the basic communication model, to determine its effect. Communication is thereby seen as something one person does to another, a linear, one way activity. This view is criticised along three dimensions: the lack of process orientation, the ignoring of mutual causality, and the small role of structure in the analysis. The lack of process orientation leads to a disregard of time as a dimension, communication is seen as a one-time activity, instant in time. The study of dependent and independent variables disregards the mutual dependence and the feedback loops in communication. Finally, the focus on individuals, and the disregard for the structure ignores

relationships between source and receiver, which are present in any organisation (Rogers, 1976). Communication is in the SMCR-model seen as a logical, intentional, fairly linear and measurable entity. The concepts are borrowed from cybernetics, logical systems such as control systems in electronics, with feedback loops, noise, redundancy and effect on output.

The effect of organisational structures on communication is in the SMCR-school related to formal structure. It is noted that horizontal communication is more common than vertical, and that downward communication is more common than upward. The vast majority of communication is claimed to be informal, communication where no formal channel exists. Formal communication is claimed to be mostly written, and vertical. In this view on communication, formal communication is seen as uni-directional messages, and informal communication is seen as social chat. Used media is not discussed, and dialogue is mentioned, but not taken into account. The perspective taken is fairly control oriented and hierarchical.

### The Systems School

General systems theory is defined as "the science of wholeness", a holistic view, where the complex interaction of the parts of a system is studied (Scott, 1982). It assumes that dissection of a system through atomistic research destroys the picture. Apart from assuming a holistic view, the open systems school also looks outside the organisation, to the environment. The organisation is an open system with continuous interaction with its environment. The system must be analysed as a whole in order to be understood properly. The organisation is composed of interdependent subsystems, and the individuals and their understanding are the carriers of the organisation.

The systems school places communication as a key to understanding organisations as social systems. Communication is crucial, since it holds the organisation together and relates the subsystems to each other. Communication across boundaries, between the organisation and its environment is also important. The main purpose of communication is to control and co-ordinate and to provide information to decision-makers. Communication is going in all directions, including sideways, downward and upward.

An open systems approach prioritises communication highly, shifting from individual to relational variables, and includes the environment when explaining an organisation's behaviour. Environment is defined as "the totality of physical and social factors external to a system's boundary" (Scott, 1982). The environment is taken directly into consideration in the decision-making behaviour of individuals in the system. The greatest degree of uncertainty in an organisation occurs when its environment is complex and rapidly changing. The environment can be measured either by looking at the perception of the environment by the organisations members, or by measuring the reported communication relationships with the environment.

Linked to the open system school is the technology school, (or contingency theory, as labelled in later literature), as discussed in the previous section. Organisational variables should be adapted to the organisations environment. Taking the contingency thoughts further, there can be no best way to communicate, but this is contingent on the larger system, and what is communicated. This idea is developed further by media choice theory, where communication is dependent on the message. Media choice and media use will be discussed in a later section, as a central perspective for this study.

### Communication networks

In the beginning of the 1970s, focus was put on networks and communication within organisations (Norcia & Eccles, 1992). Networks are said to be a grouping of intermediate size, something between the individual and the organisation (Rogers, 1976). This definition of networks differs from the wider definition of networks used in more recent network theory. In more recent literature, networks are more or less any form of communication patterns, both within and between organisations (Norcia & Eccles, 1992). The network perspective makes no sharp distinction between source and receiver, communication is instead seen as a mutual interchange. I will in the following section elaborate on the group communication network discussed by Rogers. The term network is used in three ways, according to Rogers; for the communication in the total system (organisation), for cliques, subgroups making up an identifiable network, and for a personal communication network.

Two main types of communication network research can be identified: laboratory experiments on artificial small group networks and sociometric surveys of communication flow in real organisations. The lab research often is criticised for atomism and lack of relevance (Rogers, 1976). An observation is that formal communication systems are to some extent forced, while informal systems emerge spontaneously, are less structured and hence less predictable.

Four basic patterns or archetypes of communication are identified by Leavitt (1951), a circle (decentralised) a wheel (centralised), a chain (linear) and an all-channel (full communication). These archetypes are tested in laboratory experiments, and it is shown that centralised structures are best for rapid performance, but the error rate is high. The decentralised structure is better suited for innovative thinking, but the all-channel is not shown to be better than the circle. These two are also associated with higher member satisfaction.

These relationships between archetypes and communication are criticised by Rogers (1976), since the composition of the groups are random, the environment is artificial, the systems framework is missing and all members are strangers. This criticism casts some doubt on the results. Instead of the approach used by Leavitt, a network analysis procedure is proposed. The focus in the network procedure is identifying cliques within an existing system, and specialised communication roles. The approach also measures various structural indexes, such as connectedness for individuals and cliques.

One problem in this approach is that different communication patterns appear for different types of communication (professional, social) for the same group. Another problem is the immense number of connections that exist in a large organisation. This problem is handled by limiting the study object and by studying cliques instead of individuals. A normal procedure is to gather sociometric data, identify cliques and superimpose these cliques on the formal organisation, to look for correspondence or misfits.

The analysis of the structural variables of communication can, once sociometric data is gathered, be carried out on three levels: individual, clique or system. For the personal communication network, a relevant variable is integration. Integration measures links *between* the persons

included in the personal network. For example if ones friends are friends with each other, there is more integration. On the clique level, integration is interesting again, but also connectedness (level of links within the clique), openness (communication between clique members and the environment) and dominance (deviation from equality). Finally, on the system level, relevant variables are connectedness (between cliques), differentiation (level of distinct cliques), dominance and openness, as above but for the whole.

### Communication in R&D

The advantages of functional management vs project management is discussed by Allen (1984), and it is found that projects are better for short duration and low rate of knowledge change while functional organisation is better for long duration and high rate of knowledge change. The actual overlap between formal organisation and communication network is found to be significantly above chance, there is a correlation between formal organisation and communication networks (Allen, 1984). A further conclusion by Allen is that communication is low on lower levels of the organisation, and is mainly directed upwards. Communication on higher levels of the organisation, on the other hand, is higher. Low-status colleagues avoid other low status colleagues, and look upwards, hoping for advancement. The explanation used by Allen is purely rational; no attempt to use institutional factors or path dependence is made. Engineers are seen as purely rational, which could be questioned. Allen also found, supporting Leavitt's findings, that innovative systems have a higher degree of connectedness (Allen, 1984).

Tushman (1979/1988) investigates the communication within research projects and finds that high performing research projects have extensive internal communication, with a decentralised communication pattern. In contrast to this, a high performing technical service project (less innovativeness and more defined problems) tends to have less intra-project communication and a more centralised communication structure. These results could be explained by the type of uncertainty encountered in the projects. The research projects deal with unclear issues and face ambiguity which means more discussions are needed to reach a good result. The technical service projects have more well defined problems and need less internal communication.

Intra-firm communication is also investigated, and the finding is that research projects have extensive direct communication with closely related units. Technical service projects, on the other hand, have more extensive communication with the rest of the organisation, mediated through managers. These findings also indicate the importance of face-to-face communication for loosely defined tasks, with a high degree of equivocality. In critical periods of the projects, it is found that communication increases within a research project while it decreases in a technical service project.

Tushman combines his results into a contingency model for managing communication. Task, environment and interdependence with other tasks influence the uncertainty faced in the project and thus the information processing requirements of the project. A fit between communication network and information processing requirement is necessary to have a high performing project, according to Tushman.

The relationship between professional communication and physical closeness is investigated by Allen (1984). One conclusion is that the first thirty meters are the most important for close communication. When people are more than thirty meters apart the communication decreases drastically. Communication is also found to be greater within organisational units than between units. The findings are used to argue that separation in a group should be minimised, preferably by a circular layout. The advantage of integration-promoting facilities is also discussed, such as copiers, coffee machines and washrooms. (Small rest areas in connection to the office area - "Fikarum" - available in all Swedish offices, are apparently not so common in other countries).

### ***Dimensions of communication***

As a language for the further analysis of communication structures, a variation of dimensions linked to communication will be discussed in this section. These dimensions are derived from the studies of communication presented above. The selection of dimensions is based on the premises that telecommuting is introduced in a communication intensive knowledge producing organisation.



Communication can be labelled as either "formal" or "informal". This label may be described in the same manner as an organisation. Formal communication is communication performed in a formal system, for instance as communication through a protocol or designated channel. Informal communication on the other hand is not restricted by a set mode of communication, or by a protocol to follow. Note that formal/informal is not the same as planned/spontaneous. A meeting may be planned but informal, but formal communication may not be spontaneous. Informal communication may very well be professional, but may also be of a social character. The dimensions of formal and informal communication are central in this study, where the balance between formal and informal communication as well as changes in professional and social communication will be studied.

All face to face communication is synchronous, or in other words the two participants taking part in the communication do so simultaneously. Telephone and video conferencing are synchronous as well. Asynchronous communication modes are for instance mail, e-mail, and any other form of written or otherwise stored communication.

Dimensions of communication:

formal	-	informal
planned	-	unplanned
professional	-	social/private
synchronous	-	asynchronous

In many studies, a division between vertical and horizontal communication is made (Rogers, 1976). In the organisations studied here, project-based knowledge organisations, the difference between vertical and horizontal communication is less pronounced. Therefore, no separation is made between these two communication types.

A further dimension of communication is the content of the communication and the type of the message or information communicated. A common classification relates to the degree of clarity in the communication (Daft & Lengel, 1984; Fulk & Boyd, 1991). Communication is often used to solve problems or unclear situations. The traditional or rational approach to problem solving is that more information will solve a problem, or, in other words, that

the problem is a matter of uncertainty. An alternative approach is that the problem is not information but the formulation of the problem itself. This approach involves a higher degree of ambiguity and is sometimes termed equivocality (Weick, 1979). In this case, more information will not solve the problem. The communication need is different in the two cases. This categorisation may also be labelled "problem finding" and "problem solving" (Schön, 1983). Problem finding involves clarification and agreement between parties. Problem solving mainly involves information processing. The requirements on the media used to communicate in the two different situations are different. Media is linked to both format and content of the communication. The question of media use and media appropriateness is central for this study, and will be treated in more detail below.

### ***Communication Media***

In the present section, I will concentrate on communication media, the middle part of the basic communication model shown in figure 6. The focus of the present study regarding communication is on the media used to communicate, not primarily on the message. On the other hand, these are interlinked, according to media choice and media richness theory, since the content of the message is believed to influence the choice of media. In addition to message content the environment, habits and many other factors influence the communication process.

### **Communication as reduction of uncertainty and equivocality**

Organisations can be viewed as information processing systems. In this view, communication in organisations fulfils a need for information processing among organisational members. Information processing is a way of reducing uncertainty inherent in the tasks the organisational members perform and the environment in which these tasks are performed (Galbraith, 1973). The information processing model builds on the basic assumption that the better the fit between the information processing need and the information processing capabilities, the better the performance (or task effectiveness). The model presupposes that the information processing need increases with increased uncertainty. Information processing capability is supposed to be affected by the way different organisational mechanisms are configured in respect to each other, or stated otherwise: *"information processing requirements that are*

*appropriately balanced by a set of mechanisms, structure, process and IT, that reflect the total available capabilities to process information”* (Bensaou, 1996).

According to the above presented view, information need is resolved by increasing the amount of information processed in the organisation. Thus, the issue becomes one of finding the right mechanism to increase the amount of information. One main contribution of Daft & Lengel (1986) is that they suggest a more nuanced view of how to resolve the organisation’s information processing need. Daft and Lengel suggests increasing the amount of information will reduce uncertainty, equivocality can only be resolved with a greater capability “to enable debate, clarification and enactment more than simply provide large amounts of data”. Daft and Lengel (1986) introduce the concept of "equivocality" (from Weick, 1979), as a complement to uncertainty, for explaining an organisations need for information processing. Uncertainty refers to the difference between the amount of information required to perform the task and the amount of information already possessed by the organisation. Equivocality means that multiple and conflicting interpretations about an organisational situation exists.

Uncertainty and equivocality represents two “complementary forces” (Daft & Lengel, 1986) which interplay to create organisational information processing needs. The mix of these forces depends on the organisational situation analysed. A routine task co-ordination situation may for example involve more uncertainty than equivocality, whereas the reverse is true for an ad-hoc difficult problem solving situation. Equivocality reduction calls for organisational mechanisms to enable debate, clarification and enactment in addition to a mere increase in the amount of information. The key factor for reducing equivocality is the ability to process rich information. The term equivocality is sometimes used in a similar manner as the term ambiguity.

#### Media type, media richness and media choice

Information richness refers to the amount of information contained in a message, while media richness refers to the ability of a media to handle rich information. Information richness may be defined as the

ability of information to change understanding within a time interval (Daft & Lengel, 1986, p 560).

According to media richness theory, information media differ in their capability to handle rich information. The reasons for richness differences include the medium's inherent capacity for immediate feedback, number of cues and channels used, personalisation and language variety (Daft and Wignton, 1979). In order of decreasing richness, Daft, Lengel and Trevino (1987), suggest the following classification:

- 1 Face-to-Face communication
- 2 Telephone
- 3 Personal documents
- 4 Impersonal written documents
- 5 Numeric documents.

A further category located between 1 and 2, may be added to this classification. The addition of pictures to telephone communication creates a middle category, Video conferencing.

For a specific task and message, an individual can, to a certain degree, choose from the set of communication mechanisms that exist in an organisation (Daft & Lengel, 1986). This choice has been discussed from two perspectives: media choice as a rational decision (Daft & Lengel, 1986), or media choice within a social context (Webster & Trevino, 1995, Yates & Orlikowski, 1992). The rational school, or media richness theory argues that the content of a communicated message drives media choice. The individual manager is described as recognising the difference in media richness and adjusting behaviour accordingly. Successful managers have been found to choose the appropriate media for a given situation (Daft, Lengel and Trevino, 1987).

In further developments of media richness theory, situational factors, thus not only inherent media richness, have been found to determine media choice (for an overview see Webster and Trevino, 1995). One example of a situational factor that affects media choice is distance between communication partners. A large distance between communication partners, was found to constrain the use of face-to-face communication and promote the use of telephone and e-mail (Trevino, Lengel & Daft, 1987). Similarly, Webster and Trevino

(1995) found support for their hypothesis of a positive relationship between long distance communication partners and increasing use of e-mail, memos, letters and telephone, and decreasing use of face-to-face communication. The only exception in their study was telephone use which was negatively related to the distance between communication partners.

A complementary explanation of media choice has been developed by analysing *social determinants*. Management's and co-workers' attitudes and behaviour can for example influence the use of media in a positive or negative way (Fulk & Boyd, 1991; Fulk 1993). Thus, the use and consequence of media in an organisation can be shaped by social processes such as sponsorship and socialisation (Markus, 1994). This also means that a certain media's perceived degree of richness is affected by the social context in which it is used. For example, case study research has found empirical evidence to support that e-mail (usually regarded to be "lean") can be used for communication of rich information (Markus, 1994).

Another dimension of social context explanations of media choice is that different media may send different *symbolic cues* (Trevino, Lengel & Daft, 1987). Choice of media does not only depend on content but also on the symbolic meaning of a particular medium. A letter may be perceived as being more formal than an e-mail, which in turn may be perceived as more formal than a face-to-face meeting. These social meanings become part of the message, in addition to actual content. Media choice as a function of social determinants can be seen as a concurrent theory of individuals' actual media choice (Markus, 1994) or as a complementary explanation.

It is proposed that the form of interorganisational relationship is influenced in at least four crucial dimensions by the use of rich communication media. Establishment of roles and identities, resolving of uncertainties and ambiguity, mobilisation of collective action and the robustness of the organisation all depend on the use of face-to-face communication (Noriah & Eccles, 1992). This would lead to the conclusion that in certain periods the use of rich communication media is vital for the outcome. In turbulent periods, such as start up, when problems are faced and when other external demands are met, such as time pressure, face-to-face communication is vital. Other forms of

communication media may be adequate for more structured and well defined communication.

Proponents of communication technology argue that ICT will substitute for face-to-face communication in many cases. The problem lies in the need for rich communication in problem-solving situations, involving cues, feedback and interaction (Norcia & Eccles, 1992). This leads to the conclusion that the use of electronically mediated communication is most relevant in situations where a traditional organisational form such as a market or a hierarchical situation is quite effective. In a network form of organisation, face-to-face communication will play a vital role. A minimum of face-to-face communication seems to be required in any (known) form of social organisation, according to Norcia & Eccles (1992).

The above presented rational view on media and media use was useful for setting up the present study and gives a good framework for understanding and conceptualising the communication area. On the other hand a rational view may not provide a good enough theoretical framework for analysing the outcome, if there are other mechanisms than rational (in a traditional sense) media selection involved. This calls for a wider approach to media use. Yates and Orlikowski (1992) argue that it is not sufficient to study the relationship between communication and communication media by focusing on determinants of media choice or consequences of media choice for organisational communication effectiveness. An alternative is to change the unit of analysis and study genres of communication. Genres of communication are recurrent situations in an organisation where people communicate according to a specific pattern (Yates & Orlikowski, 1992). Memos, meetings, etc. are examples of genres of communication often found in an organisation. A genre's substance (what is being communicated) and form (by what means communication is performed) is developed dynamically. This dynamic development takes place through a structuration process where individuals actual usage patterns reproduce and transform the social institutions over time.

One of Yates & Orlikowski's main contributions is to introduce a dynamic perspective to the theories on organisational communication and media choice. Communication is neither a mere rational choice of

media as suggested by media richness theory, nor only dependent on the social context in which communication is made. Communication is better explained as a complex process where specific patterns of communication “emerge in interaction with certain socio-historical conditions, become institutionalised through reinforcing cycles of use, and evolve over time and in relation to changes in situation” (Yates & Orlikowski, 1992). This links media choice to institutional theory, which will be looked into further in chapter 7.

### **Work patterns**

The third area of interest in the present study is work patterns. The area of work patterns and work content for professionals or knowledge producing employees is very sparsely studied. A literature search on the subject, using ABI on-line, SSCI on-line, Alta Vista and colleagues, yielded no articles focusing on what a professional actually does during a regular working day. This may seem odd, but one factor contributing to this lack of success may be that the major part of the search was done using computer database material, and thus only covered the last couple of years. This indicates that there is no present research in the field, but there may still have been some earlier studies.

Some of the early studies of what people do at work concentrate on the shop floor, with MTM and scientific management as a basis (Scott, 1992). The other group of studies looks at what managers do, what is the managerial role, and how managers fill their day. The professional employee, or knowledge worker, seems to be sparsely investigated, and theories on what is done at work are not easy to find. A look at the early studies in work organisation, taking a socio-technical approach, shows that the way of organising work has been studied, but mainly blue collar workers, and also mainly on a group level. Studying blue collar workers at a team level is a common approach in later studies as well, focusing on the team and on the team performance. Individual performance or work situation of white-collar workers seems to be very sparsely studied.

The lack of studies of professionals' work situation is supported by Barley and Kunda (1998), who discuss the absence of work-studies in contemporary organisational studies. Only a small percentage of studies mention, even fewer examine, what people actually do.

Articles mentioning work usually discuss it in terms of increasing complexity, independence, delayering, the permeability of tasks, but not in terms of *what* is done and how it is done. According to Barley & Kunda, after organisation studies turned from inter-organisational issues towards the environment in the 1960s, the field has gradually abandoned studies of work. The field of organisational sociology, however, has a small group focusing on work, but mainly on lower status occupations. Studies of managers, engineers technicians and sales people are conspicuously rare, according to Barley and Kunda, which is in line with the literature survey made for the present study.

The issue of what people actually do, when and where they do it has attracted little interest in combination with IT and organisational change. This may seem odd, since the whole IT-sector claims that the new technology will change the way we do work. To claim this we first need to know how work is done today, or even what work is. This would mean that to study what people do at work would in itself be a contribution, especially if these people are technicians and project managers.

### ***Structure and change***

The impact of telecommuting on organisational structure is mediated through a change process. This study focuses on the outcome rather than the change process, but to understand the outcome a basic understanding of the change process is needed. The traditional picture of change is summarised from three perspectives by Orlikowski (1996); planned change, change by technological imperative and change due to punctuated equilibrium.

The planned change perspective has dominated the organisational change and development literature, and is the basis for most of the management literature and consultancy methods. The technological imperative is largely deterministic and embraces the "technological fix", while the idea of punctuated equilibrium stresses the possibility of discontinuities in the development, long periods of stability are interrupted by short revolutionary periods. In addition to these perspectives, emergent change describes a type of change that occurs without intention, over time. The concepts of emergent change and planned change will be used in this study to investigate the impact of telecommuting.



These concepts do not necessarily exclude each other, but may be seen as complementary. Any given change process may have aspects of several of the above described mechanisms. Both emergent change and planned change will be focused in the analysis. The telecommuting cases studied are themselves examples of planned transformation, where a structural change is implemented by management. This is thought to lead to emergent change in the surrounding organisation.

An approach to change is to see stability as the natural situation, and change as a disturbance to this equilibrium. An alternative perspective on organisations may be taken, one where deterioration is seen as ever present, and change the normal situation. In this case the role of the manager is to handle incidents in the organisation, to keep the organisation together, to co-ordinate and to ensure co-operation (Barnard, 1956). The survival of the group or the organisation is in this case one of the primary goals.



## 4 Method

### ***Introduction***

The method used in this study is described in this chapter. To do this I start with a positioning of my scientific stance. Social science has another scientific position than natural science, since research often is not replicable. There is a need to show clearly what is done, to gain credibility, and given this, the argument for the methodological approach is more central in social science than in natural science. I will here argue for my approach to the issue. This is followed by a motivation of chosen methods, and a detailed description of strategy. Data collection and data analysis is described, and possible dangers and quality issues are discussed.

### **Scientific stance**

The scientific stance of the researcher has implications on the choice of method and the way the research question is stated and answered. I will therefore try to clarify my position in this area. First a short overview of the two main paradigms in social science. Helenius (1990) makes a distinction between interpretative social science and explanatory social science. The interpretative stance could be said to be a groping of phenomenology in its various variants, hermeneutics, Marxism, critical theory and historiography. These five are pure forms of interpretative philosophies of science, while the actual research often combines approaches and views from several of these. The explanatory stance is often described as positivism.

### **Explanation-oriented social science**

This paradigm within social science has a mainly Galileian view on the world. The view on knowledge is most of the time straightforward: the world is the way it seems to be. The role of science is to build further on the fundament of previous scientists, reality can be reduced to parts, and these parts can be studied and then reconstructed. The role of the scientist is to contribute with a building block in the large structure of knowledge. The ideal is exact and measurable knowledge. Predictions and causal explanations are central in this paradigm. The method to achieve this is to have unitary,

exact and simple techniques to collect data and then reduce this to a causal pattern. The influence from natural science on explanation-oriented social science is strong. Reliability and validity is a question of measurable repeatability and uniformity and use of the appropriate scientific method. Empirical data is seen as observations, separate from theory. Data are often in the form of quantitative data, and thus often analysed using statistical methods. Context can be treated as a number of variables, and accounted for.

#### Interpretative social science

As opposed to the explanation-oriented paradigm, the interpretative paradigm of social science has a more careful attitude towards knowledge. Knowledge is influenced by context, and not always reducible or possible to remove from its context. The role of the scientist is partly to describe and contribute with new parts of knowledge, as in the explanation-oriented paradigm, but also to question the overall picture and reflect on holistic issues (Burrell & Morgan, 1979). The questions are not necessarily precisely defined, open questions and new approaches are accepted. Various methods and approaches can be used and combined, each scientist has to show that his approach is valid and appropriate to his studied question. The concept of validity is more a philosophical issue than a choice of the correct method. Reliability is more to prove the rigor of the study than to show repeatability. This puts a demand on the scientist to describe explicitly what he has done to the reader, and how he has reached his conclusions. Plausibility is an important aspect of the presentation, and the presentation becomes an important part of the method.

Theory, frame of reference, environment and collected data are interrelated. Context is important and can not be disregarded. Language plays an important role, as well as the interaction between the scientist and the study object. The overall picture is seen as complex, and reduction of the situation to a small number, or even a large number, of formally interrelated parameters and variables is not always seen as meaningful, or possible. Empirical data can take several forms, and need not be treated in a uniform way (Alvesson & Skoldberg, 1994). When a problem is of a complex nature, crossing conventional scientific boundaries or dealing with new and partly unexplored areas, the interpretative approach is considered to be the most suitable. On the other hand, when the problem is defined,

measurable and within an existing scientific field, the explanatory approach is preferred.

This dichotomy is not necessarily valid; it may be incorrectly stated. To clarify this, it can be useful to draw a parallel to natural science. The perceived absolute and true frame of Newtonian physics was overthrown by relativity theory in the early 20th century. When the frame of reference was widened, and situations outside the "normal" were studied, such as very high speed or very high gravity, the Newtonian physics was proven unable to explain events. On the other hand, in everyday life, where certain assumptions were made, the Newtonian physics still remained the main tool for understanding events. It could be said that Newtonian physics takes a relativistic stance. On the other hand this frame of reference is much easier and thus fulfils one of the main criteria of a good theory, simplicity, while still explaining the studied phenomena.

In the same way, a theory that explains contemporary phenomena but not the overall grand master plan can be of more interest than a more general but less deep theory. The point of this argument is to show the usefulness of a more relativistic stance in this case. All scientific theories rest on some basic assumptions about reality. The closer to these basic assumptions you get, the closer to philosophy you get. It can, on all levels, be argued that there are some underlying assumptions or unanswered questions that need to be resolved or taken into account before any conclusions can be drawn. This dilemma can only be handled by choosing the level of abstraction, or the level of pragmatism, for the study.

The important issue is to make clear what basic assumptions the study rests on. If this is clear, the level of relativism chosen depends on each specific case. What is taken for static or stable in one study might be analysed as changing in another. Also, what is true in one context is most likely questionable in another context. An argument here is that general patterns should be sought, that to find basic truths, valid for all situations is the ultimate goal for science, both social science as well as natural science. This has been questioned. This assumes that patterns can actually be isolated from their environment, that reality can be reduced to building blocks and put together again. Until lately this has been the basis for all natural science, reductionism

has constituted the preferred alternative. Chaos theory has proven this non-adequate in some cases. Reality can not always be measured, no matter how much data we have or how well we know the conditions (Gleick, 1988). Complex systems are not the sum of parts. This does not mean that we can not study anything, but it limits the usefulness of reductionary techniques in situations that have chaotic aspects.

#### Level of abstraction

It can be argued that there is a choice to be made regarding the level of abstraction when studying organisations. On the one extreme, there is a philosophical wing, which takes a highly abstract approach, claiming that the basis for understanding anything needs to be addressed before moving further. Epistemological and ontological issues are seen as vital, and discussions on what we can and can not know are embraced. On the other extreme there are more theory-less observations or empirical description, claiming a cross-disciplinary, management-oriented approach to business studies. In between these stances, there are several more or less pragmatic and theory-based positions. This could be described as a continuum, with total pragmatism and lack of theory at one end, and philosophy and theology at the other end. This continuum could be described as in figure 7.

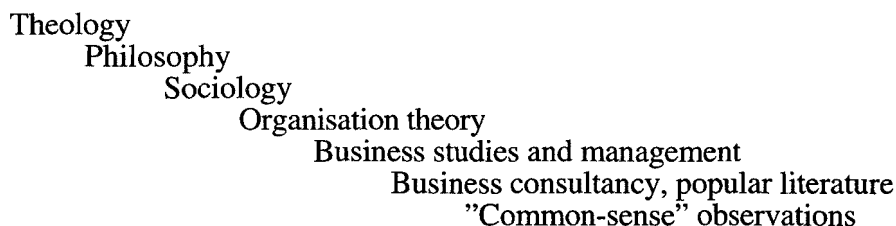


Figure 7. Abstraction levels in Business studies

In doing this categorisation, it can be noted that public interest is focused on the right-hand side, where contemporary phenomena are discussed on a basic level. Moving left, the abstraction increases, and at the same time the studied issue becomes less central, leaving room for more general discussions. Contributions can be made to any point on this scale, but the scientific status of the contribution will be

questioned by persons positioning themselves further to the left on the scale than the proposed contribution. On the other hand, the usefulness of the contribution may be questioned by anyone further right on the scale. Given this choice of abstraction and generality versus practical usefulness and applicability, a choice of abstraction level has to be made, taking more abstract levels as given, and leaving more specific levels to other to indulge in.

The discussion on what is science and what is not science is to a certain degree a question of good craftsmanship in the respective level of abstraction. On the other hand, the higher levels of aggregation, as well as the more metaphysical levels of abstractions, where philosophy relates to theology, are very hard to operationalise in an acceptable way, regardless of scientific stance. Where the limits for good science should be drawn is not an easy decision, and there is probably no definite answer. Within these limits, though, good science, with quite different scientific stances, can be made at several levels of abstraction. The present study is positioned as a management study.

In a complex situation, with a holistic question, reductionary methods are of little use. Based on the nature of the research question, exploratory, this study is performed in the spirit of interpretative social science, with a qualitative approach. Focus is put on the perceived situation rather than on an objective and measurable situation. To capture some of the complex interdependencies within the system, a holistic approach is preferred to a more specific (or atomistic) approach. The study is focusing on a relatively new and unknown issue, the issue of telecommuting. Since the purpose of the study is to gain deeper understanding on how telecommuting interacts with structural aspects of an organisation, a more open approach is preferred. This calls for an interpretative approach.

### **A two-phase approach**

This study could be seen as consisting of two phases. The first phase is focused on the exploration of changes linked to the introduction of telecommuting. This first phase uses a variety of data collection approaches to capture the changes in organisational structure, as described above. The result from this phase is a description of found changes, related to what was expected from the initial framework.

The second phase focuses on underlying mechanisms. This involves an expanded theoretical framework, and a re-interpretation of data given the expanded theoretical framework. To make this possible, a rich data collection in the first phase is vital.

The second phase of the analysis introduces a new set of theories, to examine the findings from more than the original structural perspective. This is a conscious choice, the addition of more theory after the empirical study was planned from the beginning, but since the outcome was needed to choose relevant perspectives to explain or understand the findings, these theories could not be chosen before the start of the study. This explains the set-up with theories being introduced at more than one stage in the process. The following section will elaborate on the use of theories in this study.

### **Use of theory**

Theory can be used in two different ways when conducting a study. It can be used actively, to form a theoretical base for the study, to formulate questions and areas to investigate. Theory can also be used to put the findings into a frame, to synthesise and to seek underlying mechanisms. This study focuses on the issue of telecommuting rather than being linked a specific theory tradition. The use of theory will thus be broader, including more than one theoretical field. The aim is to contribute with theory and reflection on telecommuting.

Theory has been used to create a frame for the study, based on a literature study and proposed research from previous studies. The active use of theory will, however, be less than in either a positivistic study or a theory-based study. On the other hand I will not go as far as Glaser and Strauss propose in their discussion of "Grounded Theory" (Glaser & Strauss, 1967). Grounded theory, as defined by Glaser & Strauss, is in its pure form characterised by the absence of any hypothesis or theoretical frame when the study begins. This has been criticised, and in later works, Glaser himself stresses the importance of literature studies and a frame of reference, while still keeping the empirical focus of the research. Especially in an exploratory study as the present, the importance of an open approach must be stressed. On the other hand, the process will be much longer and we will have to "re-invent the wheel" if no previous theory is taken into account.



Therefore it is decided to study both previous research in the area and general theories related to questions of interest. The process has followed an iterative path. The first interest in the issue was evoked by the public discussion around telecommuting, and partly connected to my own previous work situation as a management consultant, in which I had possibilities to work with flexible arrangements. Based on this general interest in the area, articles on the subject were collected, and I finally decided to propose a more extended study on the issue. In this way I had a basic understanding of the issue before the study, which makes a grounded theory approach in the pure form impossible. After deciding to concentrate on telecommuting, I undertook a more extensive literature survey on the subject. This is described in detail in chapter 2. Based on the tentative questions that arose from this survey, literature on management and organisation theory was studied to develop the question and find relevant areas to concentrate in when performing the exploratory study.

To get a picture of the contemporary state of the management discourse, popular management literature is used as a background for the problem formulation. By using the management discourse as part of the framework, areas that are considered as problematic or important to management are identified. Parts of this might not be considered theory in a conventional sense, but more as background material, it may even be considered as empirical data for some issues. This is combined with more academic writings on telecommuting. This literature specifically focused on telecommuting was reviewed in chapter 2.

### ***Theory for synthesis and framing***

The process described above leads us in to the other way of using theory, as a framework for analysing data. The process of continuous refinement of the issue makes the start of the analysis undefined. Therefore the theory used in the analysis will be based on the same theory used in the framework building and in the empirical process, but expanded further. When a question is found in the empirical data this can be handled either by seeking more data, or by looking for a theoretical explanation. In the earlier stages of the process, the empirical focus is stronger, while the theoretical focus takes over in the analysis and synthesis phase.

This process could be described as a partly reversed use of theory (or a combined inductive / deductive approach). Reversed use of theory indicates that the empirical work can be ahead of the theoretical framing for part of the time (Alvesson & Sköldberg, 1994). Findings in the empirical data prompts for theories to explain them, and this triggers new questions. There is no strict order in which empirical data or theory comes, but the idea that a hypothesis should be formulated on theoretical ground, then to be tested empirically, is not followed. Ideas on how telecommuting influences the organisation and vice versa is continually formed and reviewed during the research process. An approach as the one described above also calls for a wide use of theory. As in all issue-based research, the use of theory is not limited to one theoretical tradition, but can use several, not necessarily related theories to interpret and analyse the issue.

### ***A case-based data collection approach***

Based on the relative unexplored status of the field, a descriptive and exploratory approach is called for. Stated differently, the research question consists of one "how" part (how telecommuting influences the organisation) and one "why" part (underlying mechanisms). To answer these questions, a strategy with possibilities to capture a wide range of empirical data is required. The selected method has to be able to handle open questions and to develop these during the research process. This leaves us with a qualitative approach to data collection; quantitative techniques are less well suited for open and holistic questions.

Case studies are adequate when obtaining data from multiple levels and perspectives (Leonard-Barton, 1990). This implies studying the phenomenon in its real environment, in this case in organisations where telecommuting is taking place. Case studies make it possible to study the outcomes and changes in combination with telecommuting in a context. This approach, with a rich data collection, is suitable for exploratory research, according to Yin (1989). To reveal patterns and underlying mechanisms, the width of the data is important. The need for rich data, and the availability of a good case, has lead to the choice of a case-based approach in this study. Choices to be made are whether the study should be a snapshot or a longitudinal study, how

many cases there should be and how the studied organisations should be chosen.

### ***Chosen approach***

The approach chosen for this study is to study one major case, for depth and a rich input. This is then complemented with two mini-cases, to seek similarities and widen the base for generalisation. A single case is limited in generalisability, and has a potential bias in misjudging the importance of a single event. This can be helped by using a multiple case approach. A possible combination that is proven to be useful is to use one major case, with a number of mini-cases as a compliment (Leonard-Barton, 1990). This approach has been chosen, and one major, longitudinal case study is complemented with two mini-cases. The number of accessible cases in the area of telecommuting is limited; there are only a few suitable cases in Sweden. This limits the number of mini-cases, which is also limited by the time frame of the project.

Based on the discussion in Huvs (1996) a longitudinal study will be of value, since several of the effects of telecommuting are likely to vary over time, or take some time to develop. The problem with longitudinal studies is that they require a long time to perform. On the other hand, they may be partly reconstructed, in that the first part of the study is recreated from historical data. I have chosen to include a longitudinal aspect in the cases. The major case is studied over 3 years time. The first mini- case is studied during one year (reconstructed) while the last case is treated as a snapshot, with some historical data, but not evaluated on a longitudinal basis.

### ***Choice of cases***

After deciding on the overall approach, the cases must be selected. The main case was already available when the study was designed, and therefore the selection of this was given. The main criterion for choosing a case to study was if the company had a group of telecommuters or possible telecommuters. The limitations stated in chapter 2 were taken into consideration, and companies that were within these limitations were sought. There is a problem of access, as well as a problem of finding relevant cases. The found cases are not ideal in all aspects, but since availability is limited, the available cases that fulfil the criteria best were chosen.

The major case focused on a telecommuting trial in Telia Research, a research and development department in Telia, Sweden's major tele-operator. Telia Research was running a trial on telecommuting within their own organisation, and there were obvious synergies between my interests and their own internal goals of their project. Mini-cases were sought, and one was found in co-operation with Telia. A service company wanting to test telecommuting as an option had a co-operative project with Telia. The approach to telecommuting and the set-up of the trial was similar, but the organisation differed regarding tasks and other variables. This was a good complementary mini-case, since a similar approach made comparison possible. The last case was chosen partly as a contrast, but still with similarities in organisation and tasks. There were no deliberate efforts made to implement telecommuting on a large scale in this organisation. The organisation is the Swedish Ministry of Health and Social affairs, and the telecommuter the minister herself. In addition, some of her subordinates had the possibility to telecommute. These cases should give an opportunity to study the chosen question.

The mini-cases were chosen to highlight findings in the first, major case. The similarities between the cases are highlighted rather than the differences. Even though the cases differ in certain aspects, they fall inside the limitation defined in the previous chapters. The interesting aspects are the similar findings in the three cases. The smaller cases are used to support and reinforce the findings in the major case, rather than providing a contrasting view. Even though the approach does not in any way provide a basis for generalisation in a statistical manner, the use of three cases instead of one provides a possibility to ensure that the findings in the major case is not an exceptional outcome. The findings in the main case are supported by at least two other cases, and thus increase the plausibility of the findings.

### ***Studied group***

The natural group to interview when studying the impact of telecommuting in an organisation is the telecommuters. On the other hand, telecommuting can be expected to influence the rest of the organisation as well. The interviews were thus performed both in the surrounding organisation as well as with the telecommuters. For some areas the comparison between telecommuters and remaining

employees is of interest, for instance on work planning and changes in tasks. For this sake, a comparison group is set up for the first case, where a group similar to the telecommuters group, but working according to the old routines, is studied parallel to the telecommuters for some issues. To get a broad picture of the impact of telecommuting, both close colleagues, managers, support personnel such as secretaries, administration and computer support, and to some extent family members are studied.

### ***Data collection***

Interviews are a major source of information in case studies, but this can be combined with several other sources, such as various documents, reports, statistics and quantitative data collection (Yin 1989). In any case study, width and variety in the empirical data is preferred. Quantitative data included need to be handled and analysed with a qualitative mind-frame. Other possible sources of information can be anecdotes, external articles and other studies of related issues or other studies of the same object but from another perspective. Here I describe the actual data collection in this study. My role in the main case was primarily that of the researcher. Telia had a project for introducing telecommuting, in which my role was mainly to participate in the follow up and documentation of the project. This lead to the fact that some of the data collection was more extensive than called for in this study, which can be seen in the interview guides in appendix 3.

Two main types of data were collected. The first was information about the actual work situation, the organisation and the private situation of the respondent, anyone to be interviewed. This could also be described as background information. The other type of information was the respondents' perceptions of changes caused by or linked to the implementation of telecommuting in the organisation. The analysis and the conclusions are based both on patterns in the background information and on statements and patterns in the perceived changes.

The main instrument for data collection was interviews. These were designed catch the perceived impact of telecommuting on the organisation, in the previously defined areas. This was done using multiple techniques in the same interview. The first approach was to

give the respondent the possibility to reflect over the issue freely. The main events and changes connected to telecommuting were acquired, and were used as input in the remainder of the interview and in following interviews. In this manner the interviewing process is iterative, where the findings in one stage are brought further in the next rounds of interviews, or to the next group of interviewed personnel.

The technique for doing the interviews was to use a detailed checklist as a back up, to see that the main issues are covered, but not using the list as a questionnaire. The interview was held as a discussion, where the interviewee was allowed to associate freely and lead the discussion into new areas as the discussion moved forward. When a subject was emptied, the list was used to trigger a new direction for the discussion, and at the end, most areas should have been covered. This approach made it possible to cover a large area of issues without being overly dependent on formal questions. The approach puts certain demands on the interviewer. He or she must be very familiar with the subject, and have studied the previous interview protocols, to be able to follow up on any new comment that may be of interest.

The approach was gradually changed during the project. Initial interviews were more formal and covered a wider area, while the later interviews were more informal and focused more on issues that were found influenced by telecommuting in the previous interviews. This learning process in the project made it possible to cover a large area of issues with a reasonable amount of work.

Several of the interviews were conducted by two interviewers, who worked in pairs. Both asked questions and took notes, and these were typed up separately, to give a richer picture of the situation, and to validate the interpretations from the interview. To illuminate the data collection process, I have chosen to use the first case as an illustration. The following cases use the same techniques, but not as ambitiously.

The main interviews were similar in all three cases, using the same set-up and the same interview guide. The last set of main interviews were combined with a quantification of perceived impact from telecommuting. The questionnaires were used in case one and partly

in case two. Work diaries were only used in case one. For a more detailed list of used data sources, see appendix 1.

### **Data collection in the main case**

The main case dominated the data collection. Since the methods used in the main case also were carried over to the mini-cases, the data collection of the main case will be described in detail, while the other two cases are described more briefly.

#### ***First questionnaire***

Based on the pre-study, and on input during the first phase of the project, a questionnaire was put together to evaluate the use of technical equipment (data wanted by the internal project group), the work situation in general, work tasks, and relationship issues. This was used as a basis for finding areas of interest in the following interviews. The questionnaire had essay type questions on the work situation, tasks, relations, technical issues and one open question for general comments.

Parts of the first questionnaire were replicated in the following interviews, to capture the longitudinal aspects. A recurrent question is to let the respondent state advantages and disadvantages with telecommuting, from a professional perspective. Another recurrent issue is the work process, planning and performing the work, and changes in this. The first questionnaires were typed out, and are available in full text, giving approximately 5 pages per responding telecommuter, a total of 11 respondents.

#### ***Main interviews***

The main interviews were performed at the studied company, in the respondents office or in a nearby conference room. For one of the respondents, the interviews were performed via a teleconference link. Most of the interviews were held with one interviewer, but some had two interviewers who both took notes. A majority of the interviews were taped, more as a backup than for transcription. The notes taken during the interviews were extensive, and after each interview the notes were summarised and typed into an interview protocol of approx. 4-8 pages. These interview protocols formed the basis for further analysis, and the taped interviews were mainly used for clarification, when needed, and for backup.

The main interviews were conducted as directed discussions, where the interviewer lead the respondent into areas of interest, but did not necessarily follow a set order or used specific questions. Significant room was left for the respondent for reflections and personal comments. If an area was not covered properly, or answers were perceived as unclear or shallow, the issue was brought up either later in the same interview or in a later interview. Interviews longer than one hour had a short break after one hour, when the interviewer had some minutes to go through the answers and see what to concentrate on for the rest of the interview.

The questions were of an open character, prompting the respondent to elaborate on a specific issue, or develop a line of thought further. Other techniques used were to reverse questions or answers, to use analogies and examples in questions, and to prompt the respondent to tell a story to verify the answers he had given. This all gave a very unstructured response, which was structured and partly distilled by the interviewer in the interview protocol. A detailed transcription would in this case be very time consuming and add little data compared to what additional interviews performed during the same amount of time would add.

An example of how this is treated is the following discussion on how P communicates with his colleagues, more specifically how they act when he is at home:

*P comments that those who sit in the same corridor do not call him at home, they can see that he is not there, while those who cannot see his room is calling his office number and is reconnected to the home phone. Those in the corridor choose to wait until he comes back.*

In this way, a longer conversation is summarised to the point made by the respondent. The way interviews are set up makes it possible to follow up questions and test answers during the interview. The interviewer has the possibility to clarify points later in the interview and concentrate on interesting answers.

### Overall interview structure

The main sets of interviews were performed in an iterative manner, where the findings from one set of interviews were briefly analysed



and used as input for the next set of interviews. In this way, ideas could be tested during the process, and patterns could be checked and re-checked in a better way than if the questions were standardised and set from the start. To assist the interviewer, separate lists of issues, broken down to questions, were prepared for each round of interviews. These were used as checklists, or general support during the interviews, but not all questions or issues were followed up during each interview. All questions were not relevant to all people.

For the additional cases, the findings and experience from the first case was used to refine the area of interest. The interviews in the second and third case were more focused on issues identified as central to the first case. The general set-up, with open questions and an unstructured set-up of the interview situation was the same, but the area of interest was narrowed down. The main interviews were held at three different times in case one, covering telecommuters, colleagues, spouses and other involved personnel. For the two mini-cases, the main interviews were held once with each involved person. (65 interviews constitute the main interviews, all 3 cases included, of which 54 were held by me personally.) For a detailed list of interviews, see appendix 1.

### *Quantification of impact*

As a complement to the final interviews, an evaluation form was used to capture the perceived impact from telecommuting in a more structured way. The categories in this form were based on intermediate analysis, including areas where many telecommuters had indicated changes, or where changes had been expected from the start. The evaluation was filled out jointly by the respondent and the interviewer, with each question discussed before an answer was given. This ensures the comparability between the respondents, and the correct understanding of the different questions. A scale from -2 for negative impact to +2 for positive impact, with 0 as no impact, was used. The issues were related to effects of telecommuting only, trying to exclude other factors. The evaluation form is shown in appendix 4. This is used in combination with interviews and work diary.

### ***Work diary***

One of the areas where changes were expected due to telecommuting was in the personal planning and execution of tasks, and the use of communication media (as discussed in chapter 2). Since these areas seemed suitable for a complementary approach on data collection, it was decided that a work diary would be used as a complement to the interviews. The aim was to try to capture the changes in work pattern and communication when telecommuting was practised. The work diary data is different from interviews in the respect that it is actual figures on time spent in activities, as opposed to the perceived impact captured in the interviews.

Work diaries, communication diaries, or duty studies, is a data collection method where the respondent himself log his activities during a study period. The advantages of this approach is the rich information possible to obtain and the directness of the data, which is not dependent on the respondents memory, but logged continuously. Furthermore, large amounts of data can be gathered with limited effort from the researcher. Disadvantages are the high need for co-operation, and the willingness of the respondent to devote time to fill in the diaries. Reminders and telephone calls from the researcher were necessary to obtain the diaries. The set up of the diaries by Telia was based on the expectation interviews and previous literature studies.

The diaries were set up as pre-printed schemes with one row per hour and columns for various activities, which were categorised as follows:

- *solitary work, split into the following categories: reading, writing, mail-related work, computer/database work*
- *telephone, in and out, number of calls and total time*
- *meetings, planned and spontaneous, number of meetings and total time*
- *others, where various other activities were logged, with a descriptive comment*

The form used for this is included in appendix 5. The diaries were to be filled in on a minute-to-minute basis, but some respondents filled in the diary on a more aggregated level, with 5-10 minutes accuracy. Some respondents filled in the diaries continuously during the day,

while some filled in the events every few hours. The level of entry error is judged to be maximum 15 minutes or 10% for each category and day.

Work diaries were handed out to telecommuters and to the control group, to be filled in during a full day. The telecommuters filled in one day at home and one day at the office during one week. The control group filled in two diaries at the office. The two days should be representative of normal days, and the respondents were allowed to choose these themselves during the selected week.

This was repeated for five separate periods, during April, June, August, October and December 1995. Each time the diaries were prompted by the project group, and support was given if respondents were insecure on how to use the form. On one occasion, August, the diaries were followed up with short interviews and comments from the respondents were collected. This was done to check the reliability of the diaries and to get a picture of how they were filled in. The process of collecting the diaries included several reminders to the respondents, since there was some reluctance at first to spend time filling them in. A total of 129 diaries were collected, covering approximately 1000 hours of work time.

At first, there was some reluctance to fill in the diary, but this was overcome. Each diary gives us approximately 10 to 50 data points, stating activity, time and endurance, and comments when needed. These data points are grouped in 8 categories as described above, and summed up for each day studied. This is then used for calculating the average use of communication media for each group. The number of diaries was limited by the access to these persons time, since the completion of diaries took some effort.

The reliability of the data in the diaries was ensured by following up the first sets of diaries with short interviews. Differences were adjusted and the filling in of diaries was co-ordinated between the respondents. When prompting for the diaries, spontaneous comments were collected, and the habit of filling in the diaries was checked.

On the issue of comparability between the groups, the control group was chosen as similar to the test group as possible. They worked in

the same unit, with similar tasks. The age and sex profiles for the groups were similar, and no other major differences were present. The work patterns of the groups were studied for 6 months. This allowed most projects to pass through all stages, since many projects are shorter than 6 months.

We measured the time spent at each activity during the day. The content of the activity was not specified to any greater detail than the different categories. Neither was the number of e-mails or telephone calls counted. Each period for each activity can be distinguished, but not the number of separate activities within that period. This means that the study concentrated on the total time used for each activity, not number of contacts or content in communication. Some complementary information on content is collected in interviews.

### *Other sources*

As discussed in the introduction to this chapter, there is a strong argument for using a variety of different sources in taking a case approach to a research problem. In addition to questionnaires, interviews and work diaries, various other sources of information were used. These are briefly described below. Not all of these sources were available for the complementary cases. A complete record of the used complementary data sources is given in appendix 1.

Internal investigations on telecommuting: Since two of the cases have had activities prior to my study, there are documents on the telecommuting trials. Plans for implementation, choice of telecommuters, technical specifications and other internal documents, such as protocols from internal meetings on the telecommuting issue, were used as input.

Internal reports and reporting standards: To get a picture of how projects were run and reported, some examples of internal project reports were studied. This gave a picture of the degree of formality, differences in ways of reporting and focus of the company. In addition to this, formal project management systems were looked into, as well as follow up mechanisms used.

Observation of meetings: In connection to internal reporting standards and communication routines, some meetings held in the telecommuting project in the first case company were documented. These documented meetings were used as input on management style and meeting routines. In these meetings, my role was mainly one of observing participant.

Annual reports and policy documents: To capture the official structure and organisation of the company, annual reports and documents of company presentation were used. Policy statements from the management, official statements on how the company should be perceived by the customers and how the business should be focused gives cues on the internal culture and company values were used. Official documents give a picture of the company's own image of itself. In addition to this, official documents were used for data on employees: age, number, education and length of service in the company. This, together with additional interviews with managers and staff personnel gave a background picture of the organisation.

Complementing interviews with management: Interviews with chosen managers were held, to get a picture of how the company was managed. The degree of personal freedom for employees, follow up system, level of standardisation and other structural issues were raised.

### **Data collection in the mini-cases**

In the two mini-cases, interviews were the main source of data. The interviews were performed according to the same procedures as the main interviews in the Telia case. In Info Company, a follow up on the telecommuting implementation was made internally by the organisation, using the same set-up as the first questionnaire in the Telia case. In this case there were a total of 29 respondents, 2 managers, 18 colleagues and 9 telecommuters. This was used as input, but we were only given access to the summarising report, not to the underlying questionnaires. The telecommuting situation was followed up with interviews one year after the project abortion.

In the Ministry of Social affairs case; interviews were the main source of data, combined with an internal report on telecommuting from

another ministry, the Ministry of Foreign Affairs. For more details on data sources, see appendix 1.

## ***Analysis***

As described above, the analysis was performed in two steps. The first step dealt with the question of how telecommuting impacts on the organisational structure. The second step looks at possible underlying mechanisms for the found impact. The first analysis was done based on the initial research model, and is presented in chapters 5 and 6. The presentation of the first analysis is partly integrated in the case presentation in chapter 5, as a thematic classification of findings, and a search for impact in the areas defined in chapter 2 and 3. This is followed by an introduction of complementary perspectives, and the material is viewed from these additional perspectives in the search for underlying mechanisms in chapter 8.

### **Thematic analysis of primary data in step one**

The basis for the analysis was to find patterns in the data, general statements or answers given by several respondents. To do this, the answers were coded and classified into different categories, or themes. The themes were selected based on the initial framework for the study, management & co-ordination, communication structure and personal work patterns. In addition to this, a reclassification of the data was partly made in the second stage of the analysis, where new issues arose. This classification is described in more detail below. The technical approach to the thematic coding of the data was to use a computer-based text analysis program, Nud.Ist. The analysis is described in the following section.

### ***Analysis of interviews***

All data were entered into a computer database, as notes from interviews. Material from interviews was analysed by classifying and grouping statements. The main way of finding patterns was by looking for statements repeated by several respondents. An issue that was taken up by several respondents was regarded as a theme. Since data were collected over time, a preliminary analysis was done in several steps. During the project, an analysis, or scanning, of collected data was done, and possible patterns identified. Based on this preliminary analysis, more questions were asked in the identified area, in order to verify or discard the found patterns.

The second stage of analysis was to classify and sort all findings, both chronologically and by source. Sources were grouped and classified, and factors such as who did the interview and when in the implementation the interview was made were noted. The findings were classified according to a scheme based on the main areas of interest, or issues. These issues were communication issues, management and structure, work patterns, technical issues and "others". Each of these groups had 4-10 sub-groups. The process of finding suitable subgroups was to test-code data sets, analyse the groupings and add or delete groups according to how well they suited the material and the questions asked to the material. For a list of the codes and groups used in Nud.Ist, see appendix 8.

After the data were grouped according to these issues, each group was searched for patterns, common statements and areas perceived as important or noteworthy by the respondents. An example of this procedure is the group structure, classified under management and structure. All answers or comments regarding meetings and meeting structure were coded under this category. When studied, some comments were found to be common to several respondents. Formal changes were said to be limited or none, with the only major change being that section meetings are concentrated to specific days. Amount or content of meetings was not said to be affected.

Another example of thematic analysis is the question of personal productivity for the telecommuters. This was coded under productivity and quality, in the work routines category. Productivity was perceived as affected positively by nine out of ten of the telecommuters. This was taken further, by looking into the reasons for this change in productivity given by telecommuters, and trying to establish the credibility of the stated change. Other groups were also checked for comments on the same statement. Based on perceived change of productivity stated by the telecommuters and the circumstantial evidence from other sources, such as work diaries and comments from colleagues, a picture was created.

Codification was done by reading through the protocols, and classifying each block into at least one category. Some blocks fell into several categories at the same time. A block is normally one sentence

or a short discussion on one subject. The text analysed was a condensed protocol, and not a word-by-word transcription, and thus already partly summarised into suitable blocks for further analysis. The choice to use summarised protocols instead of transcriptions was partly due to practical reasons. A large number of transcribed, unstructured interviews would be very time-consuming to code and analyse in this manner.

A first step in the analysis was done immediately after each set of interviews, and when possible the outcome of the previous interviews was allowed to influence the direction of the following interview. Since the material was analysed continuously, the focus in each interview could be on interesting areas highlighted in the previous sets of interviews.

### *Analysis of work diaries*

Work diaries were analysed in two steps. First, the comments and outcomes were reviewed, to find weaknesses in the material. Some categories used in the work diaries may have overlapped, and are in those cases combined. When this was done, the numbers were analysed. Differences between groups and between work sites in use of time for different activities were examined. To establish if these differences were statistically significant, some basic tools were used. As a first step, the distribution of the time logged for each activity was investigated. This was done by plotting the spread in answers and comparing the outcome with a normal distribution curve. Since the fit was low for most of the categories, with a more flat distribution, and limited by the total time available in one day, the approximation to the normal distribution was rejected. This left us with non-parametric test tools to examine the differences.

To examine if the difference in mean values between two independent groups, not normally distributed, is significant, the Mann Whitney test is recommended (Siegel & Castellan, 1988). This test investigates if the two tested samples are drawn from the same population. Since the telecommuters and the control group were selected to be similar, but not paired, a paired test was not viable in this case. On testing the difference between telecommuters at home and at the office, a paired test might be used, and in this case both a Mann-Whitney test, as above, treating each day as a sample, and a Wilcoxon test, treating



each person as a sample, may be performed. The chosen approach was to use the standard module of a Mann-Whitney U - Wilcoxon Rank Sum W Test from SPSS. This approach gives an answer to where the difference between the two groups tested is significant. Given this method it is not possible to test whether there is no difference, but it could be tested if the likeliness of a difference is smaller than a set value.

### ***Analysis of assessment schemes***

The quantification of impact was done by using an assessment form filled in by the respondent and the interviewer together. This was used as interview data, and not analysed statistically. The reason to treat it in this way was partly because of the low sample size, but also because the analysis was linked to the content in the interviews in combination with the filling out of the assessment schemes. The data is presented in graphical form.

### ***Analysis of background data***

Background data, such as external documents and meeting protocols, were not treated thematically as primary data. One reason for this was the amount of background data collected, in combination with the format, that is not computerised. Background data was used for specific purposes, for instance to form a picture of how the company's image of itself was presented. This was used to compare the three cases, and to seek differences in organisational structure and culture. The analysis in this case focused more on specific issues, and the material was scanned for answers to the questions raised around these issues.

### ***Introduction of additional theories and re-interpretation of the data***

The second part of the study aims at understanding the outcomes from a wider perspective. The first part of the study looks at the outcome of telecommuting, through perceived changes, but not causes (surface structures). The second part, on the other hand, reflects and questions the findings in the first part, and seeks underlying mechanisms (deeper structures). This calls for a different approach. More theoretical perspectives are used to understand and interpret the findings from the first part, and alternative explanations of the outcome of telecommuting are sought.

A major difference in the second part of the study is that the underlying factors sought can not be observed, they need to be captured through interpretation of available data. The underlying mechanisms can not be seen directly. The surface structures of the data is confronted with theories, and deeper structures are sought (Alvesson & Skoldberg, 1994). Since the initial framework was not primarily intended to create understanding, but rather to enable a stringent data collection, additional theories need to be added. This may in some aspects cause a discrepancy between how data were gathered and what data would be required to fully make use of a theoretical perspective. This discrepancy must be taken into consideration when conclusions are drawn. This will, due to lack of relevant data, also make certain theoretical perspectives less useful.

The further analysis of the material, based on the perspectives introduced in chapter 7, is a re-reading of the empirical data presented in chapter 5. The material was searched for patterns that could be of interest, from the various theoretical perspectives. This was done using the coding in Nud.Ist from the initial model, but also by searching the material for statements and words linked to the proposed underlying mechanisms discussed in the new frameworks. No additional empirical material is introduced after chapter 5.

The main contribution of this part of the study is to point towards different ways of understanding the impact telecommuting has had on the studied organisations, and propose underlying mechanisms for these outcomes. This means that several perspectives on telecommuting is included. With this approach, there is a risk that perspectives may be in conflict with each other. This study will not attempt to build a unified theory on telecommuting, but will attempt to give a number of possible ways to understand the results found in the three cases. None of the perspectives used are claimed to be the only correct one, but one theoretical perspective may have a better explanatory value than another. This study aims at exploring telecommuting, and the explanations are more to be seen as indications of possible underlying mechanisms.

## **Quality aspects**

The quality aspects of qualitative research are different from quantitative research or positivistic approaches (Alvesson & Sköldberg, 1994; Helenius, 1990). Other terms and categories of quality are applicable in qualitative research. Issues such as relevance, theoretical fit to data, explanatory value is more important than validity and reliability. On the other hand, the terms of validity and reliability can be restated and applied to qualitative research as well, which is done by e.g. Yin (1994). I have chosen to partly relate my quality discussion to these terms, discussing quality aspects of data collection and analysis.

## **Capturing the studied situation**

The question if the material is reasonably well depicting the studied situation, is vital in the case study approach, and is often labelled "validity". Yin (1989) discusses three dimensions of validity, *construct*, *internal* and *external*. Construct validity deals with the use of multiple sources, establishing chains of evidence and having the material reviewed by the studied unit. Internal validity is concerned with the analysis, but in Yin's terms internal validity is only relevant for explanatory studies, dealing with causal statements. External validity is the issue of generalisation to areas outside the study, and will be handled in a following section. The necessity of a systematic approach and defined techniques in qualitative research is discussed by Alvesson & Sköldberg (1994). The techniques and approach used are discussed in previous parts of this chapter. Issues such as repeated evidence, restated questions, multiple data collection methods and more than one interviewer using parallel protocols are techniques used in this study.

The quality aspects of the data collection in case one were handled in several ways. Members of the organisation actively participated in the research project, and proposed conclusions were discussed with these project members. In addition, intermediate reports were written, presentations of the project outcome were given, and the telecommuters had the opportunity to react to any misinterpretations. Another approach to increase the validity in the Telia case was to use two interviewers, taking separate notes, and using both these sets of notes in the analysis. This approach was used for at least one of the three interviews with each telecommuter in the main interview series.

The use of three separate rounds of interviews gave the possibility to go further in areas that needed clarification. In some areas, the three rounds of interviews were used to increase clarity on an issue, when the respondent was confronted with responses from the previous interviews. The reaction to these earlier notes showed if there have been any misunderstandings. Another aspect of data collection is the use of several sources of data for each question. Questions were asked to several persons in different categories, and parts of this were checked using secondary data sources. The repeated interviews' value for re-establishing data is partly counteracted by the fact that there is a longitudinal aspect in the study. Differences over time are expected, and the change over time is explicitly discussed in the interviews.

There is also a question about what we actually are trying to establish with the data. Is the issue to present the "real" or objective picture? Are we looking for the perceived situation, which might differ from person to person, or are we looking for the official, rhetorical picture? This varies depending on how the question is formulated, how the respondent perceives the question, and varies between issues in this study. In some areas, all these different levels of answers are interesting, and differences between them are important. In other areas, one is more interesting than the others. This affects the demands that should be put on data collection.

An example of this was productivity. Productivity was perceived to increase when telecommuters were asked, but was not measured, either by us or by Telia, and thus we cannot in this case say anything about actual productivity improvements. Another example was the follow up system at Telia. The official picture is one of standards according to ISO 9000. The perceived situation differed between members of the organisation, where some saw the standards as not applicable to them, and others honoured the standards as a norm.

In the case of the work diaries, the quality of the data was assured by following up the completion of the diaries with interviews and comments on how the categories were used. The respondents were asked to describe how they filled in the diaries and the answers were used in the analysis of the data, and to re-group some of the categories used.

## **Plausibility and reliability**

A characteristic of exploratory case studies is that the study can not, by definition be replicated. The concept of reliability is linked to repeatability, and therefore reliability would not be applicable to exploratory research. On the other hand, the method and the approach to the problem can be replicated. To ensure that an external party can investigate the approach to the problem and the path followed, as much of the study as possible should be explicit and operationalised.

The issue is in qualitative studies more about plausibility than reliability (Helenius, 1990). The primary data, and a description on how they were captured, should be available. This allows the reader to follow the research process, and the procedures may be replicated if needed. The research set-up is described in this chapter. Data are kept as computerised files. In addition, there are paper documentation and protocols from meetings and presentations that may be reviewed if this should be wished.

## **Generalisation**

In case study research, generalisation outside the case can not be made based on statistical arguments, but must be based on multiple evidence and take place towards theory and previous studies, not towards samples (Alvesson & Sköldböck, 1994; Yin, 1989). This approach is taken in chapter 8, where additional theories are used to interpret the results and to suggest more general underlying mechanisms.

This study contains both qualitative and quantitative data. The quantitative data should not be seen as a basis for generalisation built on appropriate sample sizes. The argumentation in the analysis is based on patterns found in both types of data and multiple sources of evidence pointing in the same direction. The work diaries are partly analysed using statistical methods, as described above, but the analysis and interpretation of the results is basically qualitative.

The choice of study objects puts a limitation to the generalisation of the findings. It can be assumed that telecommuting will have different impact on an organisation when task and other internal and external factors differ. Parallels can be drawn to similar organisations and similar situations, and contribute to the understanding of problems

and outcomes linked to telecommuting. The underlying mechanisms, on the other hand, may be the same in quite different organisations. Based on theories the generalisation may be taken further and findings may be relevant for quite different organisations than those studied here. The issue of generalisation will be followed up in chapter 8.

## **5 Case studies**

In this chapter, the three cases studied are described and the findings in each case are presented. The chapter links these findings to the initial framework, management & co-ordination, communication structure and work routines. This is to answer the question of how telecommuting impacts on these aspects of organisational structure. The discussion on underlying mechanisms will mainly take place in chapter 8. The methodology used leads to that part of the analysis done during the data collection. Due to this approach there are no "clean" data to present, there is a degree of analysis and interpretation built in to the empirical data. A further grouping and categorising of the findings is done in this chapter.

First, the main case is presented, followed by the two mini cases. The findings are presented in chronological order. Some of the findings are hard to fix to an exact date, since they emerge gradually. An issue is discussed when it was raised by a majority of the interviewed, or when it was a focused issue in the project. A complete list of data sources, a time schedule for each project and other related documents are found in the appendixes.

### ***Telia Research case study***

The main case in this study is the telecommuting trial at Telia Research, performed between 1994 and 1996, with a follow up one year later, 1997. This case deals with a telecommuting pilot test group at Telia Research, Haninge, Sweden. Telecommuting is a potential future product extension and could be used as a sales argument for Telia as a supplier of telecom services. As a part of Telia's wish to acquire more experience and knowledge about telecommuting the decision was taken to start an internal trial with a group of telecommuters, within Telia research. At the time the trial was initiated telecommuting was not very common in Sweden, and study objects were not easily available. This resulted in the decision to start the telecommuting project. The idea was raised in 1993, and the project started in mid 1994. The autumn of 1994 was used for project

planning, setting of project goals, basic design of the trial and for setting evaluation criteria. Questions of interest were, among others, organisational impact of telecommuting, equipment needed, choice of telecommuters and consequences for the individual.

The initial stage of the project was based on ambitious questionnaires, interviews and relatively detailed plans. The initial scientific approach by Telia Research could be described as a mix between an exploratory case study and a field experiment. Focus was placed on measuring effects, and a control group was set up to make a comparison. This was discussed in the project group during the project, and the set up was expanded to a wider approach, including a larger part of qualitative data based on open-ended questions. This means that the full project contains more collected data than is presented here. The data collected during the project is described in detail in appendix 1. The collected data has been summarised in various Telia-Internal working documents, for instance a report on expectations, an introduction and pre-start-up report, an equipment report, a project management report, a report regarding personal situation and work roles for the telecommuters. These documents are not publicly available.

A Telia-internal steering group was formed at the start of the project, consisting of senior line managers and people in the project management. Due to the strategic interest in the project from top management, the initial management support was strong, and resource allocation was liberal. This support is apparent from the level of home equipment supplied to the telecommuters by the company. This might have had some impact on the result, since the project was perceived as important from the start, and evoked significant managerial interest in the company. Some of the results might have been different if top management had not shown a positive attitude towards the project and telecommuting in general. The areas to be studied in the overall Telia project can be summarised as follows: how are the work processes influenced, how is organisation and leadership influenced and what technical equipment, both IT-related and non-IT-related, is needed. In addition to this, the personal situation of the telecommuters and the impact on family life and home situation is also looked into.



At the time of the project start-up in the autumn of 1994, the public interest in telecommuting was high and increasing. Almost every week at least one of the major newspapers had an article about new ways of working and living. Telecommuters were interviewed and pros and cons with working from home were highlighted. Commercial players such as computer manufacturers and telecommunication firms like Telia itself, entered the field, using telecommuting as a sales argument. This further increased the focus on the telecommuting project, both internally, within the project organisation, and externally, throughout the organisation and in the environment. The project was mentioned in several public newspapers and magazines during the first year.

At the start of 1995, the telecommuting project team was reorganised. The new team consisted of a project manager from Telia Research, two project members from Telia Research, who were to focus on individual aspects and work organisation, and myself, as an external project member from Stockholm School of Economics focusing on organisational issues. This was later to be expanded with another project member, focusing on technical equipment. Connected to the project group were two representatives from Massachusetts Institute of Technology (MIT), who participated in the internal evaluation of the data collected, and performed some separate studies on the organisation. The project team had a dual role in the project, being both responsible for the implementation of telecommuting in Telia Research, and for the evaluation of the outcome of the trial. My role was mainly one of analysis and evaluation.

### **The organisation**

Telia Research is the research and development department in Telia, the main Swedish tele-operator. Telia sprung from the government-controlled Televerket, until recently the only tele-operator in Sweden. After a rapid de-regulation in the early 1990's, there are now more than 10 players in the Swedish market, and it is now regarded as one of the most liberal and deregulated telecommunication markets in the world. The main task for Telia Research, as stated in their annual report 1994, is to "defend and develop existing markets, develop new markets and improve the technological competence of the company". Telia Research was formed in 1991, when the research units from several divisions were brought together. In 1996, a major

reorganisation took place, where some parts of Telia Research were moved to other units. In this description of Telia Research, I will mainly rely on data from the time prior to the reorganisation, since this is the main period for the telecommuting trial. The reorganisation and its influence on the project and the telecommuting outcome will be handled separately.

Telia Research had in 1994 approximately 600 employees, located in Haninge (main location), Farsta, Nynäshamn, Malmö, Linköping, Karlstad, Sundsvall and Luleå. This gives a distance of more than 1500 km between the different locations, and, as we shall see this impedes certain demands being made on the organisation. Of the 600 employees, more than 70% had a university degree, more than 50% a Master degree or higher, and around 5% a PhD. The age profile of the company was evenly distributed; the average age being 37 and the main group of employees between 25 and 50 years.

One unit within Telia research was the Service Development Division (Tjänstutveckling), Tu. Tu had approximately 60 employees, divided into three departments. Of these 60 employees, 48 were influenced by the telecommuting project. The Tu unit concentrated on the user related aspects of telecommunication services, such as user interfaces, and worked less with the hardware-related technical solutions. In Tu several of the employees had a background in social science, or a combination of a technical background with experience from other areas. The telecommuting project was staged within the Tu division, and all telecommuters belong to Tu.

Telia Research as a whole had a matrix organisation, with a line manager taking care of personnel and administrative responsibilities. Several project managers were responsible for the actual results in the projects. All activities were organised in projects of various sizes, from one person working part time, with the projects lasting a few weeks, to projects with more than 50 people, lasting several years. The ties within departments were described as weak by several of the interviewed employees. Since the department's main task was administrative, and most activities were linked to projects, the impact of the departments, or the line organisation, on the daily work, was perceived as relatively small. People had their main belonging in projects, which is also the main production structure.

Projects are either ordered by other parts of Telia, or initiated internally in Telia Research. The internally initiated projects are financed from free funds, set up to facilitate strategic research. This results in projects with quite different profiles, ranging from highly defined technical evaluations with well specified targets and time limits, to loosely defined pre-studies or feasibility studies of potentially interesting new market areas. In 1995, there were almost as many projects as employees at Telia Research, and many people worked in more than one project. The high diversity of projects and research subjects made co-ordination within departments difficult. One department manager described the situation as "severely fragmented, with too many disparate activities for one group. It is more like a consulting firm selling their time to anyone interested than a coherent group".

Projects were followed up by a time-based resource allocation system. Officially, there was no slack in the system, as a person had to book 100% of his time on projects. Personal development, conferences, general meetings and other activities not directly related to projects, were to be handled within the project system. This was handled differently by different managers, where a large degree of personal discretion was allowed by some, and a stricter attitude was held by others.

Telia Research had implemented a quality system based on ISO 9000, and had an ISO 9001 certificate. The system, as stated by ISO 9000, was based on routines and instructions for project management and documentation system. This rather unusual approach from a research department had been received with varying degrees of enthusiasm. Some project managers said that they used the structure in their project work to help structure and manage their projects, while others described it as "a form of administrative cosmetics for the project reports".

### ***Management practices***

Each organisational member had a high degree of discretion on how to manage and perform his or her own work. Despite the rather formalistic quality system, there was a high degree of freedom on how to plan and execute projects. Another factor was the mentioned

diversity between projects. This permitted a highly flexible managerial approach, with few constraints set on subordinates. The common situation was that managers had less knowledge of the projects than the project members did, and therefore sometimes lacked the ability to evaluate the content. As standardisation of work process or output is difficult in this type of projects and research to rely on other forms for co-ordination of work. Direct supervision is not a possibility, and this leaves us with mutual adjustment as the main co-ordination mechanism (Mintzberg, 1979). The level of bureaucracy could be described as low, with few coercive rules and a high amount of freedom left to each member of the organisation.

The organisation of Telia Research could be seen as an operating adhocracy, to use Mintzbergs terminology. The operating adhocracy being characterised by multi-disciplinary teams of experts, often working under a direct contract from the customer. The administration and the actual work tend to blend into a single effort. This form of organisation calls for a high degree of communication between project members. Planning is difficult and frequent contact between project members is a must. Formality is fairly low and communication patterns are complex and shifting. People can hold several roles simultaneously, and roles change frequently.

The follow up system in Telia Research is worth commenting on. Formally, the projects were evaluated in the ISO 9000-related PQM system, which was a highly standardised project management system. In addition to this, time spent on projects was a major parameter subject to follow up. Both these parameters had little to do with the actual content or quality of the result, but focused on the formal allocation of resources. This approach is considered suitable for standardised and predictable activities in a stable environment, and might be found less relevant in this type of organisation. As a result of this, both systems were disregarded by some of the organisations members. Only superficial attention was sometimes paid to the formal reporting system, and the actual project evaluation and follow up was handled informally and on a personal basis.

An important aspect in the study of telecommuting was the current strategy for dealing with geographical distances and co-operation with units in other locations. Many projects were run with several locations

involved. This meant a high level of travelling and a great deal of contact with people at other locations. Communication used several available media, such as e-mail, telephone, video conferencing and shared computer bases. The technical level of technical communication equipment used was high as Telia is an IT company. All major units had state-of-the-art video teleconferencing equipment, and this was sometimes used for projects meetings. Geographical distance was not seen as a major problem, and this led to a familiarity in the organisation in handling contacts with colleagues who were located elsewhere. This fact is of some importance when we study telecommuting.

### **Pre-start activities**

After the decision to go through with the telecommuting pilot group had been taken, the initiation of the project took place in the latter half of 1994. The involved departments were informed and a questionnaire regarding potential participation in the trial was distributed to all concerned personnel. Out of roughly 40 people, 27 returned the questionnaire, and 19 were interested in taking up telecommuting themselves. Out of these 19 people, 11 were selected as telecommuters. Both project managers and project participants were chosen. Emphasis was put on stability in the present work situation, recent or coming changes in position or tasks were avoided.

Four criteria were used for selection among volunteers. Firstly they should have tasks suitable for telecommuting, i.e. parts of the job should be possible to do at home. All of the applicants fulfilled this criteria. Secondly, the telecommuters should have enough experience, or length of service in the company. Thirdly, an appropriate home situation with enough space at home to set up a home office was necessary, and finally they should not be single. The criteria were based on advice for selecting telecommuters found in available literature in the field (Gray, 1994; Nilles, 1994). A group with an age profile and a distribution between sexes as Tu as a whole was preferred, and chosen. In addition to the telecommuters, a control group with a similar profile was selected, colleagues to the telecommuters to be used as a reference. As the interest was greater than the number of telecommuters, some applicants not chosen were disappointed, which further enforced the privilege of telecommuting.

Some of these were later placed in the control group. This was not perceived as a problem during the evaluation.

At the same time, in late 1994, the legal arrangements were discussed and decided for the telecommuters. Since the general agreements on working conditions and responsibilities did not cover a telecommuters situation, separate agreements covering issues such as security, work environment, insurance and working hours were established. The resulting agreements were generous; the employer took most extra costs, except the cost of allocating a part of the home for workspace. The question about the level of equipment and what the project should pay for was one of the most discussed questions in the initial phase. The future telecommuters argued for the best possible equipment. This was seen as too expensive by the company. Finally, it was decided that the home equipment should be a replica of the office equipment. This included a computer, a laser printer, a fax and in addition to this an ISDN connection (which was not very standardised at that time, and caused some problems). The computer support department put a significant amount of work into the equipment selection process.

Bargaining for personal solutions or asking for trade-offs on equipment was frequently made by telecommuters, but not accepted by management. Some telecommuters arranged for additional equipment, such as personal video cameras for primitive video conferencing, or cellular phones, from other sources. For a complete list of equipment provided, see appendix 3. Furniture for the home offices was not initially provided by the company, but some old furniture was given to those who needed additional office furniture at home. Telephones were to be switched to the home office when telecommuters were at home. Colleagues that wanted to reach them by phone would not know the difference. Installation of equipment was facilitated by the computer support department. Programs and systems were installed in the computers, but the set-up at home was done by the telecommuters, with telephone assistance from the computer department. Several of the telecommuters had problems with getting the equipment up and running, as we will come back to later.

### ***The telecommuters***

The eleven people selected for telecommuting covered a good mix of different individuals, roughly representing an average of the studied organisation. They all worked at the Service Development Division at Telia Research. Two of them work in Luleå and the rest in Haninge, close to Stockholm. The age of the telecommuters was distributed within the range from 30 to the mid 50's. One telecommuter was a section manager, some were project managers for major projects, other were project managers for smaller projects and some were project participants, either in a generalist role or as experts in a specific field. Of the eleven telecommuters, eight had children, some young, and some grown-up. All of the telecommuters were married or lived under marriage-like conditions.

All telecommuters had been working for Telia for some time, from a few years to more than ten years. Their education varied, with eight engineers of various speciality, three psychologists and one economist. Three of the telecommuters were women. The commuting distance varied from almost walking distance, through an average of 30-45 minutes one way to the extreme of 120 kilometres one way, taking up to two hours by car. Some of the telecommuters worked regularly from other locations than the main office. A reason for this was projects together with other sections in Telia. The people in Luleå regularly visited Stockholm for project reasons, and people in Haninge participated in project located in Farsta, Nynäshamn or other Telia offices. Thus, travelling was frequent, and absence from the office normal.

### ***Pre-telecommuting expectations***

Before the actual start-up of the telecommuting trial, the telecommuters, the control group and some of the other close colleagues were interviewed by Telia personnel involved in the telecommuting project. Questions were asked about their expectations and fears regarding the impact of telecommuting on their professional situation and private life. The interviews covered social and individual aspects of telecommuting, technical issues, tasks and work content, (both for telecommuters and colleagues), as well as work relationships and collaboration issues.

The interviews also included the telecommuters' reasons for taking part in the telecommuting trial. Some of the major findings from these interviews are summarised below. Note that these are expectations, or hopes, fears and wishes, attitudes and values regarding telecommuting, not the actual outcome of telecommuting. Questions raised in the expectation interviews were similar to subjects and areas covered in the public discussion held in newspapers and other media at that time. The expectations could be seen to reflect the common picture of telecommuting. Telecommuting, in the public discussion, was often seen as a privilege for the individual, and the telecommuters were seen as a favoured group.

The expectations for impact on management & co-ordination were limited, but some adaptations from the rest of the organisation were expected, and some indirect impact from telecommuting on the organisation was predicted. Organisation structure and support organisations were expected to adapt to the telecommuters, where needed. Co-ordination at the sections (the line organisation) was expected to become more formal and structured. Management would have to put more effort into planning and scheduling. Supervision might become more detailed and less visionary, but at the same time more long term. The relations to managers would become less personal and more bureaucratic, since there would be less time for personal contacts. Ad-hoc meetings and discussions would be less frequent. Telecommuting was generally seen as fairly unproblematic, projects were expected to go on more or less as before. The expected impacts from telecommuting were not seen as a threat to the organisation. The advantages were stressed. The more structured way of working, expected by some, was seen as a positive development in a quite unstructured work situation.

Ties to the line organisation were already rather weak, since projects were the main production unit. These ties were expected to be further weakened. The main gains from telecommuting were expected for the individuals, both on a professional and a private level. Expectations regarding work situation were focused on increased personal flexibility, better self-control and increased efficiency. Increased efficiency was mentioned by a majority of those questioned. A reason for increased efficiency would be the possibility to work in an undisturbed environment for part of the week. The undisturbed



situation would allow for higher concentration, and less interruption in the work. Work was expected to be split into solitary tasks done at home and group related tasks done at the office. Examples of home tasks were given, such as reading, writing, planning, and personal administrative tasks. Tasks performed at the office would be social contacts, work-related meetings, discussions and other group-related activities. This split would require a restructuring of work habits, with a clearer personal planning of activities. A fear from some of the colleagues was that the telecommuters would get larger, more coherent tasks, while the persons remaining at the office would have to take the smaller problems that had to be handled immediately. On the other hand, a fear of loosing in terms of career possibilities was mentioned by some telecommuters. This issue works both ways; some telecommuters expected it to be an advantage to their careers to be on the project.

Regarding the use of time, several of the telecommuters expected a more flexible work pattern, rearranging their workday and maybe working in the evenings instead. Breaks in the middle of the working hours would be used to do private things, such as exercise or shopping. Most of the telecommuters expected to work more than before, the gained time would be put on work rather than on the family, but one expected to work less since he or she would be more efficient. More possibilities to "play with the equipment" and surf on the internet (new to the telecommuters at the time) were expected. Social issues regarding colleagues and professional and social contacts was widely discussed, and fear of less social contact was raised, both by telecommuters and colleagues. The increased absence would make the social interaction at the office suffer, with less time for social chat, and the overall atmosphere at the section would deteriorate. The telecommuters were expected to be the winners in the process. Telecommuters would have the personal advantage of gaining better control of their overall situation.

### **Telecommuting at Telia Research**

The telecommuting trial started according to plan, with eleven telecommuters, being equipped with a home office and getting full support from the technical staff. The development of telecommuting during the trial, and the development in period after the project was finished, will be described below. Telecommuting is still an option

for many employees at Telia (1999), but the formal telecommuting trial was finished in 1997.

### ***First months of telecommuting, spring 1995***

The following section is based on discussions, short interviews and questionnaires collected in June 1995. In spring 1995, the telecommuters started to work from home. The start dates spanned from 15 January to 24 April, but most of the telecommuters started in February. Initially, all telecommuters were expected to work from home for two fixed days a week. A telecommuting-free day a week was also set. No other formal changes in the organisation or in the tasks of the telecommuters, or others, were made due to the start of telecommuting. The basis for these first findings were the questionnaires sent out in June, and some additional interviews in connection with these.

During the very first period, a common concern was to get the equipment working as intended. The installation was left to the telecommuter, which was problematic, since no detailed instructions were available. Some problems were also encountered regarding the ISDN connections and computer software. Quite a lot of the technical problems were discussed in the E-mail news-group. Since some of the telecommuters were actually working with the development of services close to telecommuting the discussions could get quite technical at times. A general conclusion 3 months after start-up was that the equipment, at that time, was working more or less to satisfaction.

When summer came, four months after start-up, the fixed schedule with two set days a week had been abandoned by some of the telecommuters for a more flexible schedule. Some telecommuters never actually got in to a fixed schedule, but took a more flexible approach from the start. None of the telecommuters had yet noticed any change in relations with their line manager. Neither had the sense of belonging to the line organisation changed significantly. Three of the telecommuters mentioned a tighter relation to the project, but not necessarily due to telecommuting.

Tasks were generally split into two categories, tasks for the home office and tasks for the normal office. Most of the telecommuters

reported that they worked slightly more than before, without regarding this as a problem. Some of the telecommuters used the possibility to reschedule the work-hours during their days at home, but generally most of them stuck to normal working hours, and also added some extra time in the evenings. Here are some comments on the working hours (note that some of the quotations in the following sections are second hand, notes by the person performing the interview, and not strict quotations):

*"It is easier to work overtime at home than at the office. It is positive to be able to work at home when the workload is high and the job situation is stressed. The border between work and leisure is blurred, but so far this is not a problem for me"*

*"I work slightly more than before, mainly because I surf on the Internet at home."*

*"I work more, but this is a subjective guess"*

*"In terms of the number of hour I work, I work as much as before, but I have a feeling of being more efficient, due to better use of time."*

*"I work more now than before, since the project I take part in requires a lot of overtime at the moment. The possibility to work from home has made overtime much easier."*

*"I work slightly more now, since the work is "there all the time". It is an advantage not to be forced to finish at the office, but have the opportunity to do this at home, with renewed energy."*

The change in social situation was mentioned by some of the telecommuters. Relations were not seen to have changed significantly, but some uncertainty was expressed due to the fact that the trial was still in its infancy. Some concerns regarding less social contacts were raised by some of the telecommuters. More than half of the telecommuting group reported little or no change. One was slightly negative, while some mentioned changes towards more structured relations. The overall relations to colleagues, as well as the project

situation and the line manager relations were at that time not seen to be much affected by telecommuting.

Within the telecommuter-group, e-mail seems to be used mainly for technical communication. This is obvious from the logging of mail within the telecommuting group, where a mail list has been set up to facilitate communication between the new telecommuters. For specific work related issues, mail is widely used throughout the organisation.

On a more general level, at this stage all telecommuters seemed positive to the new way of working. Since no one was forced stay at home, the down sides could be handled by reducing the amount of time spent at home, which some of the telecommuters did, as we shall see. As positive effects, they mentioned reduced stress, private and professionally, increased self-control and a better overall personal situation. Some general comments on telecommuting after a few months were as follows:

*"Nice! This is very good! I want to go on telecommuting. It is excellent to be able to work with planning, follow up and report writing from home. The only negative side is that the phone rings more than I had expected, I don't get as much undisturbed time as I thought."*

*"Most things are positive, I would not want to loose the possibility to work from home. The one negative effect is that it is easy to feel guilty for not being efficient enough at home."*

*"(Telecommuting is) very positive when overtime is required, reduces stress, and I get more done. One negative effect is that I can not have spontaneous discussions with colleagues."*

*"Positive. I like the possibility to control my own work."*

*"It is positive to be able to work in a more optimal way. Solitary tasks are better done at home."*

*"Telecommuting is very positive both personally and professionally. My flexibility increases. Since the telecommuting is only two days a week, there is no radical change, for work or for private life."*

### ***Half a year after start up, autumn 1995***

We now reach October 1995, and projects were running as normal again after the holidays. Colleagues and telecommuters at Telia Research were getting more accustomed to the new situation. The following section is based on more extensive interviews with telecommuters and colleagues, performed by company-internal personnel. The telecommuters have now been working from home for approximately 8 months. Some further changes have taken place in the working schedules. The fixed day schedule had been abandoned by most of the telecommuters in favour of a more flexible combination of working at home or at the office. One person had chosen to stop telecommuting, due to personal and social reasons. He lives close to the office, is new in the company, and prefers to have people around him when working.

*"The main reasons for me to stop telecommuting were social. It is boring to work from home, no one to talk to and no spontaneous contacts, few breaks and you tend to be quite hard on your self."*

The other telecommuters were satisfied with their situation. Most telecommuters claimed to be working slightly more than before. They also admitted that not all hours spent on work were reported. Less productive activities are often not regarded as work, even if they are work related. The fixed schedule was now working (more or less) for 3 of the telecommuters; the rest had switched to a more flexible schedule. This links well to the findings in the first questionnaires. The amount of telecommuting and the impact on creativity and overall result was commented on, and this is seen as a potential problem.

*"The line manager does not care where you spend your time, but project colleagues often ask where you have been if you have been away for a day."*

*"More telecommuting would be a disaster, since work at Telia Research consists so much of informal gatherings, spontaneous ideas and contacts."*

*"An important part of work consists of creative processes and brainstorming. If everybody would telecommute, this would suffer. Although he saw little negative consequences of telecommuting so*

*far, he fears that it in the long run will severely decrease the creative atmosphere at Telia Research."*

This links to the social aspect of telecommuting, and the possibility to have spontaneous interaction with colleagues. Management practices have been slightly adapted, even though this was not articulated by all. The ad-hoc problem solving, where managers walk into the room of the subordinate, or vice versa, have decreased. Some questions that earlier should have been answered right away now have to wait a day. This was not necessarily for the worse, as one manager states, "since many questions are not that vital or not really thought through". The disturbance decreases and independence increases.

*"On the negative side, it could be hard to really relax when telecommuting, and basically he is a very social person (which does not fit with being alone at home). "*

*"Decreasing social contact may be a problem in the future. Right now there is no problem, since I have been working with my colleagues for several years."*

*"What he misses most is the spontaneous discussions, and he say that he interacts much more now than before when at the office, something that his colleagues are not always happy about. He fears that in the long run he will miss some spontaneous meetings."*

*"...the people best suited for telecommuting are those not dependent on social contact with colleagues, and who have work tasks well fitted for telecommuting."*

The communication from home was not seen as a substitution for being at the office, but more like another form of communication. E-mail was seen as an appropriate media for task-related communication by many of the telecommuters. Much of the communication on e-mail was reported to be of a technical and project oriented nature, dealing with specific problems and solutions. Telephone was not as good as meetings.

*"Within Telia Research it is usually OK with telephone or video conferences once in a while, but since I work with people at the*

*mother company, who do not have a tradition of this, I need to go to Stockholm much to often."*

*"The quality of communication is not as good from home, there is nothing that can be done about it, telephone is not as good as face to face meetings."*

There was a perceived potential problem in having access to mail at home. Several of the telecommuters reported that they checked e-mail at night, and started responding to them. Without really having planned to, they may easily spend an hour in front of the computer, answering e-mails, before going to bed. A few of the telecommuters commented on the attitudes some colleagues had to their privilege of working from home. Comments like "nice weather for telecommuting today" shows some envy from the not so privileged.

The routines that had been practised at the office seemed surprisingly hard to break. These routines remained unchanged to a higher degree than expected when working from home, with roughly the same time schedule as at the office for many of the telecommuters. The amount of telecommuting was still close to 2 days a week on average, with 6 telecommuters claiming to be working almost two days a week at home, except for when work called for more presence at the office. The average time spent at home was 1.7 days a week, for the ten people still telecommuting. Of these, three still had fixed days at home, while 7 have moved to a more flexible schedule. Six people claimed that they worked more now than before, while no one claimed to be working less. No one saw this increase in working time as a problem at that point.

*"It is hard to feel good about going out in the middle of the day, even if you make it up later."*

*"More than half of the days at home do not follow a normal work-day pattern, but are more mixed between private and work-related activities."*

*"There are hardly any borders between my private life and work any more. I am aware of the problem, and hope that this awareness will help me from drowning in work."*

The split between solitary tasks at home and co-operative tasks and communication at the office was clear, as expected. The division was seen as positive for personal productivity. One positive effect often mentioned was the possibility to finish tasks at home in the evening. This was one factor underlying the increase in working hours, but also reducing stress for the employees. The general attitude towards telecommuting was still very positive for most telecommuters.

*"...telecommuting is a very positive experience, and I am more productive now than before."*

*"...satisfied with telecommuting. It is what I expected it to be"*

*"...positive. I would like it to be an option for all employees."*

*"Right now I can not see any negative sides for myself or the people I am working with."*

*"...not yet decided if I like telecommuting or not"*

*"... very satisfied, can't see any negative sides except for some technical problems."*

### ***Telecommuters experiences after one year***

Roughly one year after the start-up of telecommuting, the pattern had become more stable. After some initial experimentation with different set-ups, each telecommuter had found an individual solution for how to organise his or her work, but some patterns were common to all. The following two sections are based on interviews held with telecommuters and colleagues one year after start-up.

#### **Management & co-ordination**

The management style was quite relaxed at Telia Research, as described above. Most telecommuters agreed that the management changes due to telecommuting had been rather small. The large degree of personal responsibility for own work had facilitated the new work arrangements. Some telecommuters mentioned that the short-term follow up had become less frequent due to their absence.

During intensive phases, with unclear activities, telecommuting was sometimes a disturbance. This had been handled by changing the schedule for the telecommuters. Management used an informal style, involving personal contact and coaching, requiring presence, according to a telecommuting manager. This could be a problem, if



the manager was absent due to other reasons than telecommuting, such as travelling or meetings.

*"A manager's task is mainly coaching, discussions and encouraging his employees. This requires a lot of personal contact."*

*"X has a manager that is a telecommuter as well, and he has not experienced any problems or difficulties to reach him since telecommuting started."*

*"It is not necessary to be in daily contact with everyone, this varies over time. A lot may be handled by mail."*

*"X works with short time horizons, sometimes days, which makes telecommuting more difficult. He talks to his subordinates every week but not every day. There are clear advantages in being personally available, direct contact is better."*

There has been little change in the surrounding organisations' planning and structuring of activities due to telecommuting. All ten telecommuters noted that no major formal or informal changes had been made to the organisation due to telecommuting. The only observable change was that some meetings had been moved to days where telecommuters were at work, "telecommuting free days". One telecommuter wished that more consideration had been shown for telecommuters in planning of activities, but this had not been the case. Meetings were harder to arrange when telecommuters were involved. Five of the telecommuters stated that this was a problem. One claimed that the number of meetings had decreased due to telecommuting, while two claimed that there was no change for them. As will be seen from the work diary analysis, meetings were frequent at Telia Research. One person criticised this as a meeting disease, claiming that 80% of the meetings were badly planned and partly a waste of time.

*"The work involves many meetings, which makes telecommuting more difficult, personal presence is required."*

*"Telecommuting has not influenced the amount of meetings or the way to plan them, except in some instances when they are moved to make it easier for a telecommuter to attend."*

*"If everyone would telecommute, this would be a problem, meetings would be problematic."*

*"It is more difficult today to organise meetings where everyone can participate."*

The situation with projects as the primary production structure, and the line organisation as number two was even stronger than before. The project colleagues played a greater role, since professional relations grew stronger and line unit lessened in importance.

*"A possible change is that fewer persons show up at the section meetings. Projects are more central than the section. " (manager)*

*"The section has lost in importance, projects are becoming more central"*

### Communication structure

The most affected area regarding communication seemed to be the informal communication. This was mentioned by several of the telecommuters. There was a loss in informal communication when being at home, since the available modes of communication did not substitute for personal meetings, and were not perceived as spontaneous. Some telecommuters claimed the lost social activities during the home days were compensated for by more social contacts during the days at the office. Six out of 8 telecommuters who mentioned the issue claimed that they compensated for the time at home by being more social when they were at the office. Four of these thought the overall social contacts with colleagues were unchanged, while three telecommuters thought that the spontaneous contacts may have decreased. No one claim more social contacts than before. The social situation was not mentioned as a problem by any of the remaining telecommuters, but the one person that ended his telecommuting program did this for social reasons.

*"an impediment to working at home for more than a few days is that the spontaneous communication probably would suffer"*

*"when being at the office, so much time is needed for planned meetings that the spontaneous communication opportunities suffer"*

*"people down the same corridor don't call you at home, they wait until you return to the office"*

*"spontaneous contacts are made at the office, even if phone would be a possible option"*

*"all spontaneous contacts are not productive, a lot of unrelated small talk takes up a lot of the time, producing nothing of value"*

*"X thinks that the lost contacts when being at home are compensated for when at the office, but it might be more job related than before"*

*"the number of social contacts at work is the same as before, I have more intensive social activity on days spent at the office"*

*"The social part has decreased, fewer personal friends, and less belonging to the section"*

Six of the ten telecommuters thought that the social activities when being at the office has increased due to telecommuting, to compensate for being away part of the time. This feeling that the social activities were suffering when being at home, but being compensated for when at the office, can be compared to the actual time spent on social activities and informal communication. This is measured using the work diaries, and the relation will be discussed below.

The use of e-mail has increased rapidly during the last few years at Telia, but it is not possible to single out telecommuting as an influencing factor. One telecommuter claimed that they used e-mail more now, sometimes almost as a synchronous media, having small meetings using mail. Several people claimed that e-mail was important to be able to work from home. The use of e-mail as a communication

media varies significantly between individuals and groups, as the following quotations show.

*"mail is an important media for the project"*

*"a lot can be handled by e-mail, e-mail is used much more now than two years ago"*

*"e-mail is not used so much for dialogue, telephone is preferred"*

*"e-mail is used to send documents which are then discussed in person or on the phone"*

*"mail is sometimes used almost as synchronous communication, a conversation via mail."*

Telephone, on the other hand, is taken for granted, and not much discussed. Some people turned off the telephone for part of the time, so as not to be disturbed. In spite of this, several of the telecommuters felt that they were more reachable at home than at the office (4 out of ten mentioned this). The reason being that at the office they spent a significant time away from their desks, in meetings or with other activities. At home, on the other hand, they were for most of the time reachable with a telephone call. The change in communication structure is also further discussed in the work diary section.

### Work routines

Personal adaptation and adjustment of the general set-up to personal preferences had taken place by now. The telecommuters had developed in different directions during the test period. Partly because of different tasks, but mainly due to personal preferences, the way of handling telecommuting varied between the different individuals

Some telecommuters stressed the importance of having equipment at home, being able to test new applications, play around with the equipment and surf on the Internet. Another category saw telecommuting as a way to get more time for the family and children, by quitting work earlier in the afternoon and catching up late at night. Related to this type was the telecommuter who used the flexibility to enrich his leisure time, adapting work hours to other interests. In

contrast, another type of telecommuter strongly favoured familiar working routines, using the same procedures whether at work or working from home, working the same hours and not really utilising the possibility to reschedule work.

On another dimension, we can see the solitary telecommuter, distancing himself from the office environment and finding satisfaction in the tasks rather than in the social interaction with colleagues. His opposite is the social telecommuter, highly social when he is at the office, talking to colleagues and dropping in to have a chat with anyone interested. All these types can be identified among the telecommuters. This pinpoints the problem of treating telecommuters as a homogenous group, and drawing conclusions on a general level. Telecommuters are no more similar than any other sample of the organisation. The only thing they all have in common is the possibility to work from home for part of the time.

Apart from a difference in telecommuting pattern between the telecommuters, there were some common changes in work patterns. There seemed to be an actual increase in the total amount of working hours. Five of the telecommuters claimed that they worked slightly more hours than before, three were uncertain and only two claimed that they worked the same number of hours as before they began telecommuting. Working days at home were generally more concentrated, with less interruptions and more actual working time. Productivity was perceived as higher or significantly higher by 9 out of ten of the telecommuters. Some key words in this area were: less disturbance, concentration, no interruptions, more thorough work, focused, better use of time, less pressing environment. Apart from the disturbance factor, their own perception of work seemed to be important. One of the telecommuters stated that to a large extent the perceived gain in productivity is to the benefit of the company, and not so much used to shorten the working hours for telecommuters.

*"working hours at home may be slightly longer than at the office"*

*" there is a difficulty to draw the line between free time and work"*

*"there is more work done in the evenings, which is not accounted for"*

*"I have become more efficient since I started telecommuting, since I have a better chance to concentrate"*

On the issue of change on tasks and possibility of affected career opportunities, the picture is more unclear. None of the telecommuters saw any major change in their tasks due to telecommuting. There were other more important factors, such as competence and experience. For some tasks, it might have been an advantage, but the general undertones were that it had not been harmful to their position. On the career issue five of the telecommuters thought that there would be little or uncertain impact on career possibilities. Three thought the impact would be positive (for this selected group) and one thought that the career might be hindered.

Leisure and work get blurred, this was noticed by all telecommuters. Some saw this as a potential problem, while others saw it as a more natural way to live. The common pattern was that work invaded leisure time rather than the other way around. Doing "other things" during working hours was apparently not socially accepted, but on the other hand working late was fully acceptable.

*"private activities are more obvious at home, which leads to more productive work time."*

Technical issues were more focused at the beginning of the project, and at the end of the first year they were not as frequently discussed. Many telecommuters still mentioned the problems in the beginning, but claimed that everything was currently working fine. Computer support had been very helpful according to several of the telecommuters. One comment was the increase in maintenance due to two computers, with dual software updates. This caused extra work. Ergonomics was still mentioned as an important area, since the work situation at home caused a much more stationary work situation, with less interruptions and less movement.

As a general comment on their situation, all present telecommuters saw telecommuting as good or very good for themselves. They were very satisfied with their present situation, and one person claimed that she would leave her job if she was not allowed to continue to

telecommute. All telecommuters thought that 2 days a week at home was a good level, on a personal basis. Five of them thought that 3 days a week would work, but only one thought that 4 days would be possible. If all personnel in the organisation would utilise this, other problems might appear. Two days a week for all would probably be OK without major organisational adaptations, according to three of the telecommuters. The rest of the organisation had not been overly affected, rather less than was initially expected. Work content has not changed due to telecommuting, but the structuring of individual tasks had changed. Productivity had increased, according to telecommuters. The social pattern had changed, not necessarily for the worse, but new patterns were starting to appear, with new communication tools (more e-mail, a general trend, not necessarily due to telecommuting) and more task focused communication.

During December to January Telia had a major reorganisation. All telecommuters were affected, Telia Research was restructured, and Telia as a whole was split into new divisions. Everybody was given new appointments and most groups were changed. During this period, the telecommuting continued, but with various adaptations to the situation. Some telecommuters who knew what they would be doing in the new organisation took the opportunity to get away from the turbulence at the office, and spent more time at home. Others reduced the telecommuting, to be able to follow the turns of the game, and guard their position in the new organisation. Activities in the organisation were supposed to go on as normal, but for some weeks the normal routines were rather disturbed by organisational issues. When the new organisation was set, the question of how to handle telecommuting came up. None of the telecommuters had really taken the possibility of not being able to continue telecommuting seriously. They all took it for granted that they would be able to go on as before in their new positions. None of their new managers had been opposed to this, and all telecommuters would have the possibility to continue to work from home in their new jobs. The actual outcome of the reorganisation in combination with telecommuting will be handled in a later section in this chapter.

### *Colleagues experience after one year*

The general picture was that telecommuting had affected the organisation less than expected. Colleagues with little or no

professional contact with the telecommuters reported no, or very little, influence on their professional situation due to telecommuting. Even colleagues with daily contact with telecommuters reported little impact on their work situation due to their telecommuting colleagues. None of the interviewed colleagues saw telecommuting as directly harmful to the organisation. All of them would accept telecommuters in their future projects, even if some would prefer colleagues to be present as much as possible.

An observation was that telecommuting had little direct impact on the surrounding organisation, at least on the observable level. The positive aura around the project was obvious, telecommuting was perceived as a future way of working, and criticism was not strong. A rather allowing attitude was taken. This may be due to the clear management's support of the project.

#### Management & co-ordination

The organisation was perceived as flexible and adaptive. Tasks were to a high degree fairly undetermined and the work was self-controlled and unstructured. This was seen as well suited for telecommuting, due to the personal freedom. On the other hand it was also in conflict with this, due to the lack of structure, and therefore need for ad-hoc adaptations. Managers mentioned that an ad-hoc way of managing subordinates was more difficult when they were telecommuting. Emergency tasks could not be handled as before. The general observation from colleagues was that very little had changed due to telecommuting. No major efforts has been made to adapt the general way of working to the telecommuters, and there seemed to be little need for this.

*"no adaption whatsoever has been made on the project to accommodate for telecommuting"*

*"there has been no changes in the way the group works, neither in tasks or in meetings"*

*"I see no change in the way people co-operate"*

*"no change in ways of working due to telecommuting"*



Two new employees had a telecommuting manager from the start. This caused some worries at first. There were less opportunities to ask for advice when the manager was not there, but this was not seen as a problem in the end. A minor loss of spontaneous contact was mentioned as a disadvantage.

The line organisation had not been affected to any larger degree by telecommuting. The line groups had not really been working very well, according to several colleagues and telecommuters. The groups were more paper constructions, at most groupings for general information and administration. They were not influenced much by telecommuting, if anything they were weakened even further.

*"the line organisation never worked anyway, and telecommuting has not meant any change"*

Projects are the main organisational production units. These had not been overly affected either, according to interviewed project managers. Things were run as before, from a structural perspective, except for fixed days for meetings, when everybody should be at the office, if possible. From a project point of view, telecommuters were handled in the same way as members from other sites, and not seen as any greater problem. This was common in Telia Research, and the way of running projects was already adapted to this way of working. During projects, there are intensive contacts between project members, normally every day. Face to face contact was not necessary, according to one project member. There could be weeks between face to face contact. Mail and phone were used instead. No conscious adaptation has taken place in formal communication due to telecommuting, except that these were held on fixed days.

*"the telecommuters roles in projects has not changed due to telecommuting"*

The administrative system had partly been affected by telecommuting. The administrative handling of external billing and invoices required personal signatures, and thus presence, which could be a problem from time to time. New routines for administrative activities might help in some cases, but no changes had been made in this area either.

### Communication structure

Colleagues close to the telecommuters mentioned that spontaneous, ad-hoc meetings were less frequent. One comment was that this was not necessarily for the worse, but might be more efficient, since it forced more planning and anticipation. On the other hand, another colleague mentioned that creative and spontaneous meetings, ad hoc problem solving, would not be as easy to have as before.

*"The telecommuters are missed by many colleagues, the social and spontaneous contact is not as frequent now as before. At times, 2/3 or more of the rooms in the corridor may be empty."*

*"the spontaneous contacts with telecommuters may be lost, but this is not necessarily a bad thing"*

*"spontaneous contacts have decreased, I miss the colleagues in the corridor, but I don't make spontaneous phone calls in the same way as chatting in the corridor"*

*"sometimes I miss people that are at home when I want to get hold of them, spontaneous and creative meetings may suffer due to this"*

*"telecommuting means that it is not as easy to get hold of the telecommuters spontaneously, this is sometimes saved for later, or until enough small issues makes a phone call necessary."*

*"spontaneous contacts are less frequent, but so is unnecessary talk"*

*"informal contacts between colleagues are vital for projects. If this is not the case, formal meetings will not help."*

Support personnel found telecommuters harder to work with. They were harder to reach for signatures or other administrative tasks. Secretaries mentioned the loss of overview, the feeling of not being able to do their job correctly by not knowing where people in the group were. They strongly advocate stricter rules and more discipline, maybe even fixed schedules for telecommuters. The content and form of section meetings had not changed to any higher degree since the project started. General meeting structures and formal co-ordination was also more or less the same. Meetings were maybe held more regularly than before.

E-mail was seen as an important communication media by most people in the organisation. Mail was mentioned before telephone by many as the prime media for contacting telecommuters. It is easier to send an e-mail, it is not as disturbing for the receiver. Many of the colleagues claimed that telephone was not a media for spontaneous communication, "you do not make a spontaneous phone call". Other media were used to a varying degree, telephone conferencing was fairly common for some people. Mail outside Telia Research was not working well at this time.

Socially, telecommuters were perceived by their colleagues as being more distant. A negative effect on the social climate at the office was mentioned by colleagues. The office was emptier, which reduced the possibility to have social interruptions and small chats about other things than work. This was especially true for colleagues that did not work with, but sat next to, a telecommuter.

Telecommuters were seen as different by some colleagues that had little professionally to do with them. They were not belonging in the same way as regular colleagues. Some saw them as more boring, keeping to themselves. One colleague was strongly negative to telecommuting, partly because she was not allowed to do it herself (due to her tasks), and saw it as a substantial benefit for the people doing it.

*"Telecommuters seems more distant than other colleagues that are here more often. They are not really part of the organisation in the same way"*

*"Telecommuters became more boring and less social to work with, they slid away from the group."*

*"I miss the ones that work closest to me when they are at home."*

*"It is quieter in the corridor, and the social situation at work is not as good as before."*

### Work routines

Colleagues saw no change in how their own work was done, and did not reflect on any changes in the way teleworkers did their work. The impact on work routines and work content for colleagues was very limited or non-existent. Subordinates to telecommuting managers had to manage on their own for somewhat longer periods than would otherwise have been the case. Colleagues that had no direct project related contacts with telecommuters saw no change at all in work tasks.

The flexibility on behalf of the telecommuters was crucial to their colleagues. All project managers and close colleagues stressed the need for flexibility in the telecommuting set-up. The fixed schedule at the start did not work well. Adapting the telecommuting schedule to project phases and meetings was needed, and at certain phases in the projects, presence was seen as necessary. This view on flexibility was not shared by administrative personnel, as mentioned above.

The colleagues view on telecommuters productivity was more uncertain. Productivity was not measured in any formal way, and judgement had to be subjective. Most colleagues had no clear view on this issue, they saw no change. Three of the interviewed colleagues thought they saw an increase in productivity on behalf of the telecommuters, due to better use of time and less disturbance in their work.

There was no change in the amount of work for administrative personnel, according to themselves. The tasks were not affected either, except for the increased problem of keeping track of telecommuters. A fixed schedule for telecommuters was proposed.

### ***Telecommuters experiences after two years, reorganisation***

The final round of interviews with the telecommuters was held two years after the start of the telecommuting trial. During that time, the group in which the telecommuters worked had been dissolved, and a major reorganisation had taken place in the whole company. Many telecommuters had moved to other departments, with new managers and partly new tasks. All telecommuters had the formal and official acceptance of their new organisation / manager to continue telecommuting in the same manner as before.

## Reorganisation and Management & co-ordination

The discussion regarding changes in organisational structure was largely influenced by the reorganisation that took place one year before this set of interviews. One important issue discussed was whether telecommuting was possible in the new organisation to the same extent as the old one.

*"I have not been working at home because it has not been culturally accepted by my colleagues. Many people think that you should be at the office during the day."*

*"my new boss saw it as natural that I would continue to telecommute after the reorganisation, there has been no problem to continue to telecommute"*

*"During the changeover, some of the telecommuters spent more time at the office than before, and not all of them have gone back to the previous level of telecommuting."*

*"During the reorganisation one had to be here, to keep track of what happened"*

*"It was important to be here in the start up phase, when the organisation was new."*

The new organisation, TTAB (Telia Telecom AB) has a co-ordinating and bridging role in Telia, co-ordinating projects and sub-contracts large part of projects to other parts of Telia, such as Telia Research. The tasks are similar to those the telecommuters had in Telia Research, but have more co-ordination and less solitary activities involved.

*"The difference between the two organisations (Telia Research and TTAB) is small, the structure and the task are very similar. "*

*"The tempo is high at TTAB, many things happen fast, and one might get the feeling of missing something if one stays at home."*

*"The general attitude towards telecommuting has not changed, at least not for the worse. There are no problems with managers if you want to telecommute"*

The turbulence in Telia as a whole limited the appropriateness of telecommuting in the last year, according to several of the telecommuters. The general attitude in the organisation towards telecommuting had become better, it was recognised as an option, and formally supported by management, but the appropriateness for oneself or close colleagues was questioned. Several of the telecommuters claimed that they would gain from working at home more, but the situation had not permitted this. The turbulence and the uncertainty called for presence at the office.

*"The job involves many contacts, both internally and externally, and parts of the job is being available for discussion on emerging problems"*

The issue of the impact of telecommuting on management & co-ordination was not raised explicitly in this set of interviews. Since the impact had been seen as limited in the previous interviews, it was assumed that telecommuting in itself had not affected management & co-ordination to any major extent in this period either. Major changes that were not due to telecommuting had taken place in the organisation. The influence seemed to be the other way around, the changes in formal organisation had affected telecommuting, in a negative way. The total amount of time spent at home had decreased for the telecommuting group. People who had stayed in the old organisation had also experienced a decrease in their telecommuting. Since the telecommuting project was closed, telecommuting was not focused on in the same way anymore. This is elaborated further in a later section, where the development over time of telecommuting in the three cases is examined.

### Communication structure

As with management & co-ordination, the reorganisation had imposed a changed communication structure on the telecommuting group. This had changed the conditions for the telecommuters, and may have caused some of the observed decrease in telecommuting. The influence of telecommuting on communication structure was limited,

as shown in previous sections. Since the new organisation had a shorter time frame, and required more interaction, the level of telecommuting had decreased.

*"The meeting culture at TTAB is not so formal, fairly unstructured, many things are going on at the same time, it is necessary to discuss unclear issues and agree on the situation, the time perspective is short."*

*"Up to 90% of the time is spent in meetings or with other contacts with people, more or less all the time during office hours is used to communicate"*

*"Spontaneous contacts are important, it is easier to get hold of someone if you happen to see them passing by"*

*"The coffee-room is an important part of the work environment, many things are discussed there which are important not to miss"*

*"People in other departments on other floors are not affected if you stay at home, phone is used anyway"*

The importance of informal contacts had increased for the telecommuters that had changed to the new organisation. This coincided with a decrease in telecommuting, which started during the reorganisation. The substitution between communication media, and use of other media for spontaneous communication will be looked into in a later section. The findings here indicated that in an environment with a high level of undefined problems and where it is necessary to agree on immediate action, face-to-face communication is preferred. This makes telecommuting more difficult.

### Work routines

The difference in how the personal work routines were set up was small compared to the previous interviews. The splitting of tasks between the office (co-operative and communication related tasks) and home (solitary tasks) was still valid for the telecommuters. There was a shift in the telecommuting time, with less total telecommuting for the group, and a shift towards more time in the evenings and weekends.

This is discussed further in the section regarding telecommuting's development over time.

The productivity was still perceived as high for the telecommuters, but the technical problems had decreased this for some of them. The possibility to work from home was still seen as a major advantage, even if it was used less than before. This is not necessarily linked to telework during regular working hours, but more linked to the home office facilities, and the possibilities of extended flexibility when needed. The social aspects were noticed clearer in the new organisation, where the short-term communicative tasks took a larger part of the time.

*"It does not feel good, from a social point of view, to work at home. You are not up to date, and if others feels that you are not available, you feel less comfortable at work. There is a certain irritation when you are not there at the office, but working from home."*

Work in this organisation was not primarily linked to producing but more to co-ordinating and managing. The reorganisation meant a change in task for some of the transferred telecommuters. The solitary part of the work had decreased, with an increase in co-ordinative activities and communication. This was mostly handled in meetings in Telia. This had in itself made telecommuting more difficult, since the substitution between meetings and other means of communication was low, as will be discussed below.

### ***Quantification of telework impact***

As a complement to the final interviews, an evaluation form was used to capture the perceived impact from telecommuting in a more structured way. Categories were based on intermediate analysis. A number of partly overlapped statements or questions were presented to the telecommuters. Based on the model for telecommuting impact, the areas of communication and work pattern were focused on. At this stage the limited impact on management and co-ordination was obvious, and therefore left out.

The evaluation was filled out by the respondent and the interviewer in co-operation, with each question discussed before a answer was given on a scale ranging from -2 for negative impact to +2 for positive



impact, with 0 as no impact. The evaluation form with the used questions, are shown in appendix 4. This is used as interview data, and not analysed statistically. The data is presented in graphical form in figure 8.

To analyse the perceived impact, the questions were grouped into categories, or constructs. These are based on similarities in issue. The constructs were partly based on interviews held related to the filling in of the form. "Contact with nearest manager" was for instance discussed in combination with other work role issues, which explains why it is placed in the work role category.

The following constructs are used for communication

**Communication**, consisting of Social contact with colleagues; Distance to where things happen; Professional communication with colleagues; Reachability for others

**Meetings**, being the one variable Time in meetings

The following constructs are used for work-related issues

**Motivation**, consisting of Quality of own work; Satisfaction with own work; Satisfaction with general work situation;

**Stress and self control**, being Own planning situation; Feeling of control of work situation; Stress level (positive effect is reduced stress)

**Productivity**; consisting of Amount of overtime worked; Number of productive working hours; Getting things done

**Work role and work content**; being Clear tasks; Number of short tasks; Contact with nearest manager; Career development

As shown in figure 8, there is a negative impact on communication and time spent in meetings, while there is a positive impact on motivation, stress, self-control and productivity. The work role and work content seems to be little affected by telecommuting according to the telecommuters themselves.

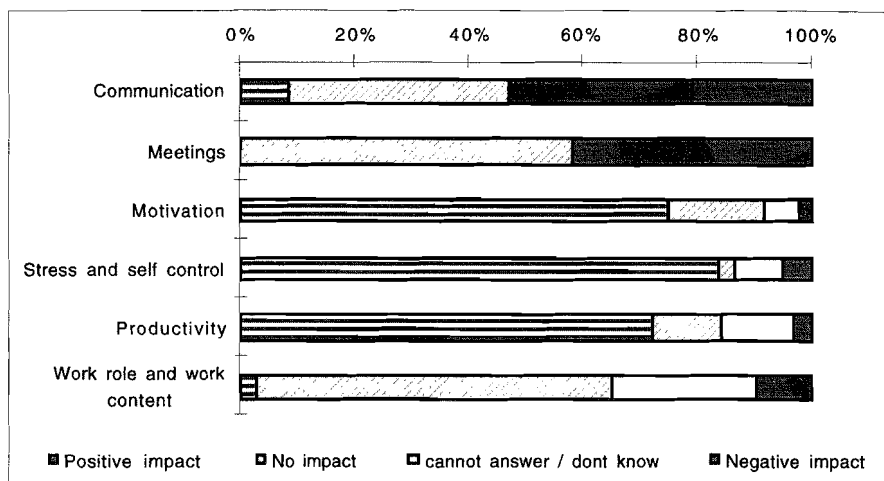


Figure 8, perceived impact from telecommuting for telecommuters

This links well with the findings in the interviews, which indicated that changes were mainly seen on the personal level, regarding personal freedom, work performance and work planning. In this area, the impact from telecommuting was seen as very positive. The negative impact on communication corresponds with the decreased informal contacts and fewer spontaneous meetings mentioned both by telecommuters and colleagues. Noticeable is the limited impact on work role and work content, where telecommuters felt that the fact that they telecommuted did not influence their work content, career options and relations to their managers.

This reinforces the picture that the gains in telecommuting were primarily on an individual level, while the negative effects were on a group level. The next section will look into the change in communication and work routines.

### ***Work diaries: communication and personal work routines***

This part of the study focuses on structural change in communication and work routines. To measure their activities during the time spent at home and the time spent at the office, the telecommuters and their colleagues were prompted to fill in detailed work diaries, specifying their activities down to a one minute level during chosen days. The telecommuting project was followed during a 6 months period, using these diaries. In addition to the telecommuters, a control group consisting of colleagues with similar tasks was also filling in the diaries. A total of 4 weeks with 2 diaries each, for 20 persons, resulted in 129 work diaries collected. The second group were included as a reference, to see if there was an overall change in communication when the geographical arrangements changed. The following section is based on these work diaries.

The diaries had 8 main categories for time logging, and a possibility to give comments in plain text on each entry. The categories are as follows: **Mail** includes communication using e-mail, both writing and reading mail. **Write** is computer-related writing of reports or other documents, except mail. **Read** is reading documents or reports, both paper-based and computer-based reading. **Comp** is other computer-related work, as searching data on Internet, programming or development of models or learning new applications. **Tele in** is incoming telephone communication while **Tele out** is telephone calls made by the respondent. **Meet sp** is spontaneous meetings, not planned in advance, including both social and professional meetings. **Meet pl** is planned meetings, from two people to large groups. **Others** finally is activities not classified in the above categories. After a reclassification of some activities coded in others (all of these had a written comment attached to them) the category accounted for only around one per cent of the total, and was therefore excluded from the rest of the analysis. **Pause** is not included in the total work time, and was also not a basis for the per cent calculation. This means that the total of work time is 100%, while pause is additional time to that. The work-diary forms used are presented in appendix 5.

After an initial analysis of the categories and the use of these by the respondents, based on the short follow-up interviews held after some studied days, the decision was made to combine some of the categories in the further analysis. This was due to the partial overlapping of the categories when the diaries were filled in. The three categories involving solitary work; read, write and computer were not easily distinguishable in all cases. Computer work involved writing as well as reading. The three other categories were combined to a constructed category, **Solitary** work. This category may have been designed to include e-mail activities as well. On the other hand e-mail is distinguishable from other computer activities since it is linked to a certain program. E-mail was seen as a mode of communication, and was kept as a separate category. The categories Tele in and Tele out were also combined to one, **Tele**, covering all telephone use.

The total amount of time spent at each activity was summed, and the percentage of time spent at each activity in each setting calculated. The set-up made comparison possible internally for telecommuters, looking at time spent at home and time at the office. In addition to this, the overall picture for the telecommuters may be compared to the control group. For technical reasons, the telecommuters are treated as one group, using non-paired tests when differences in home and office situation are compared. This choice is discussed in chapter 4.

#### Differences between telecommuter at home and at the office

The first area studied was the difference for telecommuters between time spent at the office and at home. Of the six constructs, there was an obvious difference in three areas, solitary activities, planned meetings and spontaneous meetings. This is shown in figure 9 and figure 10. To determine if the differences are significant, the material was tested using non-parametric methods, as described in chapter 4.

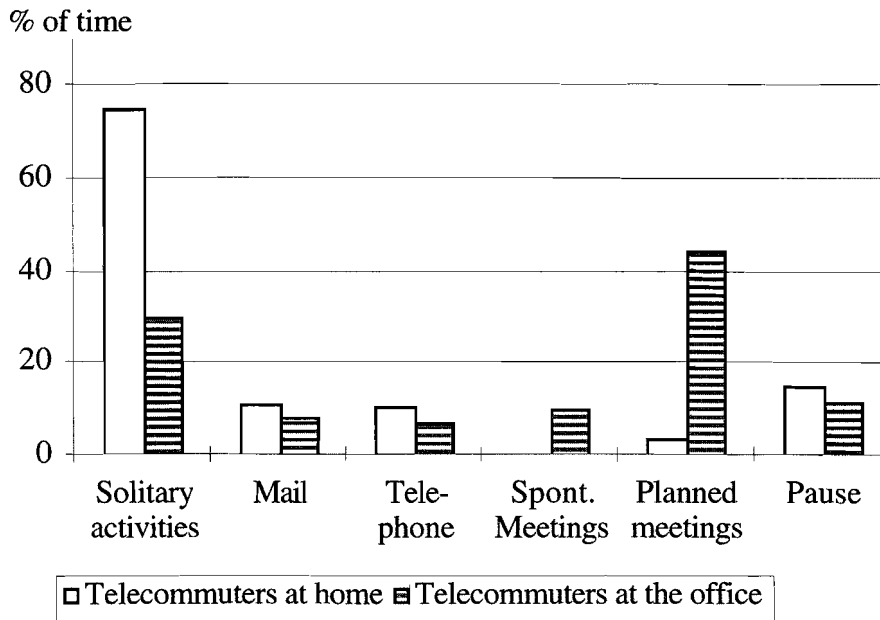


Figure 9 Comparison between telecommuters activities at home and at the office

The material from telecommuters logging activities at home and at the office was tested for differences between the two sets of data. The results of the Mann-Whitney test are presented below, in figure 10. The method used was an SPSS-based algorithm, the Mann-Whitney U - Wilcoxon Rank Sum W Test, testing for significant differences between two groups of non-related samples. The number of cases were 37 telecommuters' days at home (logged on a minute-to-minute level) and 38 telecommuters' days at the office.

% of time spent on activities	Telecommuters at Home	Telecommuters at Office	No diff prop. one-tailed P
Solitary	75	30	0,0000
Mail	11	8	0,0022
Tele	11	7	0,0366
Meet sp	0	10	0,0000
Meet pl	3	45	0,0000
Pause	15	12	0,2385

Figure 10  
Comparison between telecommuters activities at home and at the office

The standard test is performed as a two-tailed test. Since the test examines the likeliness that the samples come from the same population, the test may be reduced to a one-tailed test. In this case, the two groups are clearly separated. The possibility to be from the same population is present only on the one side of the distribution bordering to the other group.

The numbers in figure 10 should be seen as a probability for the event that the two groups do not differ with respect to the tested variable. As a limit for not differing, a level of 0,01 for a one tailed p was chosen, i.e. the chance of not differing being 1%. In this case Solitary work and meetings, both spontaneous and planned, differ between the two work locations. The use of e-mail also differed, but the absolute difference is small, 8 % of the time was used for e-mail at the office, while 11 % of the time was used for e-mail at home, a difference of 40% from the office to working at home. Note that the solitary activities except e-mail differ by more than twice as much of the total time spent at solitary activities when being at home (an increase of 150%).

This could explain the increase in use of e-mail as part of the overall shift towards solitary activities, but not really being an increase in e-mail communication as part of total activities. The use of telephone shows a small absolute increase (from 7 to 11 % of total time), but this small change can not be considered significant using the set criteria. If the criteria are relaxed to a p-level of 0.05, the use of telephone could be considered to differ between home and the office. The change in pause time is small, and not significant.

The work diary analysis lead to the conclusion that there was a clear division for telecommuters between what time was spent on at home, compared with at the office. At home, work was primarily solitary activities, while at the office there was a high degree of communication face-to-face. The change in other communication media was small.

If we study the total amount of time used for communication, we see a clear difference between time spent at home and time spent at the office, for the telecommuting group. During time at home, solitary tasks dominate, which is partly compensated for in the time spent at the office.

#### Differences between telecommuters average and control group

The second area of interest is the comparison between telecommuters as a group and a similar group of non-telecommuting colleagues. How does the overall activities and communication pattern compare between these groups? In this case, the differences are not as clear, as shown in figure 11 and figure 12. There is a difference in amount of time spent in meetings, and on time spent in solitary activities.

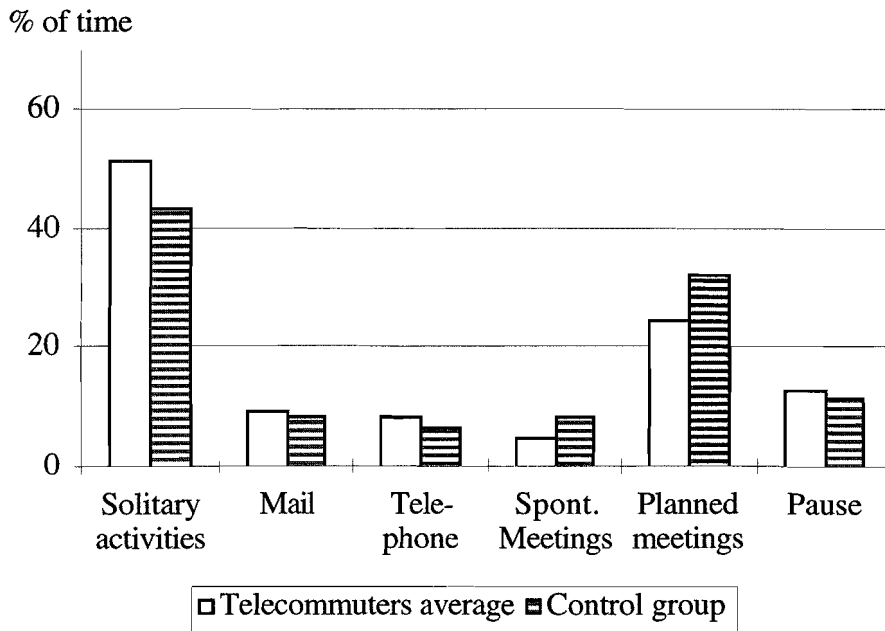


Figure 11  
Comparison between telecommuters averaging activities at home and office to the control group

% of time spent on activities	Telecommuters Average for home/office	Control group average	No diff prop. one-tailed P
Solitary	52	44	0,0274
Mail	9	8	0,0636
Tele	9	7	0,0898
Meet sp	5	8	0,0012
Meet pl	25	32	0,0341
Pause	13	12	0,4077

Figure 12  
Comparison between telecommuters averaging activities at home and office to the control group



The only significant difference in this comparison, on the 1% level, is that telecommuters have less spontaneous meetings than their colleagues. The level of spontaneous meetings are at the same level for both groups for the time spent at the office. This contradicts some of the comments made by the respondents, which implies that they compensate for the social contacts and spontaneous meetings they miss at home during the days spent at the office. The total level of spontaneous meetings was significantly lower for the telecommuters, i.e. there was no compensation made by the telecommuter group for the lack of spontaneous communication during the time spent at home, at least not by having more spontaneous meetings when being at the office.

Planned meetings does not differ significantly on the 1% level between the two groups ( $p = 0,034$ ), and the absolute difference is low (25 versus 32 %). Adjustments seem to be made by the telecommuters (either of the days spent at home or the scheduling of the meetings) to make presence at the meetings possible for the telecommuters. Around 30% of the total time is spent in planned meetings. Some days are completely booked, and some meetings last for whole days. Note that the variation is high between days and between persons in the amount of time spent in meetings.

For the rest of the variables, the difference is less certain. If the criteria are eased to the 5% level, Planned meetings and solitary activities are also seen to differ between the two groups, while the use of mail and telephone is still not significantly different, and the absolute difference is also low for these variables. The time used for pause is similar for the two groups.

The lack of opportunity for face-to-face communication at home is not compensated for during time spent at the office. Neither is the decrease in face-to-face communication substituted for using other communication media, at least not in the terms of time used for communication. Note that we have not measured the content of the communication, just amount of time spent on each activity. We can therefore not say anything about communication efficiency.

### ***Telecommuting and project work***

To get a richer perspective on telecommuting, two projects have been studied in greater detail, and the impact of telecommuting has been investigated (Telia internal report, Rogberg, 1996). There were a variety of projects in Telia Research. Since all productive time should be billed on projects, many activities not normally labelled as projects were found in this category. Projects varied in size from one person and three days up to over 50 people and several years. There were no formal measurements of productivity or quality of work. Results were reviewed before release, but not graded. Due to the PQM system, an ISO 9000 inspired quality assurance system, there were a number of formal deliveries in each project (in small projects only one). Each of these formal deliveries required a review and an approval. This required physical presence by the project manager and the customer.

Planning and scheduling of the projects was the responsibility of each project manager. Priorities were sometimes a problem when employees were involved in several projects. These priorities were often not set by the line manager, but left to the project group to be sorted out. This demanded a high degree of flexibility from the project participants, regarding both timing and tasks performed. One consequence of this situation was that a majority of the employees at Telia Research lacked a formal job description. Project communication varied in form and media. In projects internal to Telia Research, video conferencing between sites was common. This was not the case for Telia in general, and not at all for external parties. E-mail was common within Telia Research as well, but there were problems with mail disruption involving other parts of Telia.

Larger projects performed at Telia Research normally consisted of people from more than one site. Participants were chosen based on criteria such as specific competences, earlier co-operation and contacts, geographical closeness and availability at the time. There was a strive to keep projects located at one site, but that was not always possible. The fact that people were telecommuters had less impact than these factors, according to the interviewed project managers. On the other hand, several of the interviewed persons stated that they would prefer non-telecommuters, present at all time. None of the interviewed claimed that telecommuting had been (*was allowed to be*) an issue so far in project set up.

Two larger projects were studied in relation to telecommuting. The project structure for both projects was the normal one for Telia Research, with a core project group including a project manager, a steering committee, the client, and peripheral groups such as a reference group and suppliers of services. Both projects were linked to other units in Telia, and both projects were internally financed, with the client being from within Telia. In both projects studied here, one or more of the participants were telecommuters. The inter-dependencies between project members varied as a result of several factors. Apart from the factors mentioned above, several others must be taken into consideration. The higher the time pressure, the more the tasks of the project members are inter-linked and the more unclear the role configuration in a project, the greater the need to meet face-to-face in order to make things work out.

Telecommuting had been problematic at certain stages of the projects. At the start-up, when roles were clarified and tasks were set, there had been a need for face-to-face communication. This has made telecommuting difficult. Another stage of the process which required presence was at the formal delivery points. In between these stages telecommuting had been easier, and had been practised as planned. Due to the time pressure of one project, telecommuting had at times been utilised less by the project manager. These types of patterns have also been commented on by Perin (1996). On more general issues, the findings in the projects studied verified the findings in the general interviews with colleagues and telecommuters.

### ***Info Company case study***

This case covers a trial project on telecommuting at The Info Company, a service and information company in the construction sector. In combination with a planned move to new premises, the company wanted to test whether telecommuting would be a viable option for the organisation. The project was conducted with help from Telia, with a Telia employee acting as an external consultant. They helped with guidelines, advice, follow up and evaluation of the outcome of the trial. Some contacts were made between the Telia consultant and the Telia Research project case one, to co-ordinate on project planning, evaluation and a common approach to telecommuting.

#### **The project**

The Project was started in early 1995, when contacts were made with the consultant from Telia. The main reason for the project was to find out if telecommuting was suitable for their organisation. Follow up on a more general basis was not the aim, but telecommuters and colleagues were questioned both before and during the test regarding problems and advantages. The project group consisted of all 9 telecommuters, computer support, HRM personnel, one external consultant and a project manager, who was a himself one of the telecommuters.

The situation was different from the Telia case, since there was no bias in the organisation on telecommuting. There was no commercial interest in the issue, and the management had no interest in succeeding with the implementation, other than internal gains in organisational output or possibly, but not likely, savings on office space. Some of the questions raised in the Telia case were included in the internal evaluation, but other areas had been evaluated in the interviews conducted one year after the closure of the project. The data sources and data collection in this case are described further in appendix 1.

#### **The organisation**

The studied organisation was active in the knowledge-processing field. The organisation was owned by sector organisations in the

industry, and worked as a service and information organisation. The main activity was to develop, market and sell information regarding products. The main customers were companies active in this sector, both producers and suppliers, for advertising. The products from the studied organisation consisted of exhibitions, catalogues, books and databases.

The organisation had 90 employees, all located at the same site. The gender distribution was roughly 50-50, and the employees had an average age of 45 years. Recruitment policy was to recruit experienced personnel as editors. No employees were recruited directly from school or university. The most common educational level was a university degree, combined with at least a few years external experience before entering the organisation.

The organisation was described as stable, by interviewed managers. The product was well known, employees were experienced and ways of working were well established. There was little formal documentation on working routines and procedures. This was handled in a more informal way. There was no aspiration towards any formalisation, such as an ISO 9000 certification or similar formal systems.

The work consisted of collecting, sorting, translating and compiling information to a condensed version. This was either published as a catalogue, with periodical updates, or as books. The information-processing employee was called an editor. All work was computer-based, the editor produced complete pages, with layout, pictures and text. Pictures were scanned by a separate support unit.

### ***Management***

Formal procedures and rules were few, but output was a standardised product. Employees were responsible for the output quality, but the procedure to reach the result was not prescribed. In fact, employees had considerable control over their own work. Co-ordination and management of an organisation with de facto practices and common understanding was ensured by recruiting a skilled and professionally similar staff. The organisation could be described as a Professional Bureaucracy using Mintzbergs terminology (1979). The professional skills of the editors were vital for success.

According to several of the interviewed employees, the management style involved a high degree of freedom for the individual worker, see the above section on organisation. This means that the tasks of the manager were more product strategic and supportive than control and supervision oriented. The formal contact with subordinates was limited, and managers were more concentrated on projects and the future than on the daily work.

*"The work consists of making pages in the catalogue, independently and self-governed. There are no formal checkpoints or reviews from superiors or colleagues. The basis for the work is total independence."*

*"The work is solitary, with some discussion and co-operation at times. Photos sometimes need discussion with repro department."*

This implied that the need for daily contact between managers and editors, and between editors, was limited, which was supported by the view of the editors. Managers were seen more as coaches than supervisors, and the planning and carrying out of the actual work was managed by the editors themselves. On the other hand, as stated by one manager, this called for informal contacts, and that managers were available when needed, for support or advice.

### **Telecommuting**

The guidelines for the project, set up in the beginning of 1995, stated that the technical development, giving new opportunities for flexible work arrangements, was one of the main enablers when telecommuting was discussed. In combination with this, the move to new premises was imminent at the time, and the possibilities to design the new office in accordance with new possibilities to work more flexibly was discussed. The goal was to get accustomed to this new way of working and to use the results from the trial in the specification set-up for the new premises.

Some of the internal guidelines were that managers should lead the trial, by setting a good example themselves. A minimum of three days a week at the office, and a minimum of half a day at home a week was prescribed for the participants in the project. Availability for incoming

calls during office hours was a requirement when working from home, flexibility was in other words restricted to space, time was regulated as before.

An enquiry was done before the start-up of the trial. Colleagues could see the advantages of telecommuting from the telecommuters point of view, but also saw some dangers for the remaining personnel. A change in task distribution between telecommuters and their colleagues could be one outcome of telecommuting, with more short-term tasks for the remaining personnel. Practical difficulties like mail distribution and reachability on behalf of the telecommuters was mentioned. On the other hand, a more planned and structured work situation could be a positive result of the change.

The telecommuters themselves could be divided into two groups, editors and managers. The editors thought they could spend 1/2 to 1 1/2 days a week at home. They expected to gain in efficiency due to the possibility of working undisturbed for longer periods. A predicted disadvantage was the lack of reference material at home. Managers expected to spend half a day at home a week, or use the equipment for overtime work at home. Managers generally thought that the attitude towards telecommuting was positive, which we will see is not always the case in this organisation.

### *The telecommuters*

Three of the telecommuters were working as editors. Their main task was to create pages for catalogues or books, compile information and edit this to a complete page, using a computer-based layout program. The work was totally dependent on access to a computer, and required material to use as input or reference sources. Part of this material could be sorted out in advance, but the reference material was of a more general type, requiring access to information and database infrastructure such as computer files and paper-based documents.

Two of the editors spent one fixed day a week at home, and one spent up to 60% of the time at home. This was due to an imminent retirement, and that she was working half time. The editors had a work situation where they needed to be able to discuss their work from time to time. The time needed for co-operation with others was estimated by one of the editors to be 10-15 % of total time. The rest of

the time was used for solitary tasks, mainly computer work or reading / searching for information.

Five of the eight telecommuters were managers in the organisation. They were brought into the project to be able to evaluate the viability of flexible work arrangements for their subordinates. As expected from start, the managers spent less time at home than the editors. The aim was 1/2 day a week at home, but some of the managers did not fulfil this goal, but had several weeks without any telecommuting at all.

According to several of the interviewed persons, the management style involved a high degree of freedom for the individual worker (see above section on organisation). This indicates that the tasks of the managers were more product strategic and supportive than control and supervision oriented. The formal contact with subordinates was limited, and managers were more concentrated on projects and the future than on the daily work.

This implies that the need for daily contact between managers and editors was limited, which was supported by the view of the editors. Managers were seen more like coaches than supervisors, and the planning and carrying out of the actual work was managed by the editors themselves. On the other hand, as stated by a manager, this calls for informal contacts, and that managers are available when needed, for support or advice.

### ***Telecommuting experiences***

Since the extent of telecommuting had been limited, both the period during which it had been under trial and the actual time spent at home, the impact on the organisation had also been limited. In some areas, it was not possible to distinguish any changes, while other areas had shown some adaptations due to telecommuting.

### **Management & co-ordination**

As mentioned, the management style and structure of the company was based on defined tasks and a high degree of independence on behalf of the editors. The trial had been set up under the conditions that the way of working should not be changed. This limited the extent of teleworking. The impact on management practices and



structural arrangements was therefore limited. One effect of telecommuting mentioned was that co-operation with support personnel, like graphical support, had to be concentrated to the days when the telecommuters were at the office. This had not been conceived as a problem. To conclude, in the area of management and structure, there had not been any changes from the management's side, neither planned nor reactive to telecommuting.

### Communication Structure

Neither the formal nor the informal communication was affected to any higher degree due to telecommuting. Both the fact that the interaction needs were limited and that the extent of telecommuting was limited contributed to this. The communication with customers was restricted when working from home, since the access to relevant files and material was sometimes not possible. The informal communication and the social network had not been affected, according to the telecommuters or to the managers. There was one exception to this, the one telecommuter that worked from home most of the time missed the daily contact with colleagues.

### Work practices

The aim of the project was that the level of telecommuting in the organisation should not have a negative effect on performed work, but also that the level of telecommuting should be enough to have some impact, to be evaluated. The actual level of telecommuting in this case could be on the lower limit for evaluating in some areas. The editors have used their telecommuting purely to move one day's work a week from the office to their home office. There has been no overtime at home, no working at weekends or evenings, and thus no problems with separating work from private time. The total amount of worked hours were not affected by telecommuting, neither was the scheduling of working hours. Managers had a different situation, where the actual time spent at home during regular working hours was limited, but the equipment was used to catch up at irregular working hours.

The planning of work had been affected. The need to have access to the relevant material called for more planning when working from home. This was perceived as difficult by some employees, since they

were used to having immediate access to the infrastructure, without having to plan in advance. Another effect mentioned by one telecommuter was the division of work between home and the office. At the office, the creation of a page frequently called for checking the reference material for additional information, but at home, this only caused the editor to write a note to check later. This had impact on the productivity, since interruptions were fewer, and concentration could be kept for longer periods. On the other hand, if the period without reference material was too long, the effect will be the opposite.

The work situation at home, with less disturbance, was seen as an advantage by all telecommuters. The overall productivity change due to telecommuting was hard to estimate. A negative factor was the problem with the technology, which had caused the productivity to fall drastically at times. The need to show results when working at home might have influenced the productivity in a positive direction, said one editor.

Technical problem were claimed by many of the respondents to be one of the reasons for the negative outcome of the project. Since old equipment was used, the capacity was not sufficient for some tasks. In addition to this, the communication with the company never worked at a satisfactory level. Databases at the office were not reachable, or access was very slow. An investment in new equipment was considered too expensive.

### *Colleagues*

The reactions from colleagues were followed up in a questionnaire in November. Most colleagues did not see any impact from telecommuting on their own work, on the way their group worked, or on the way the group was managed. This was true both for telecommuting colleagues and for telecommuting managers. The reason for this was probably because of the limited level of telecommuting in the organisation. Some colleagues commented on difficulties to reach telecommuters.

In terms of positive effects from telecommuting for the company, colleagues mentioned personal situations for telecommuters, with happier and more motivated personnel, and the possibility to save on office space. On the negative side, the immediate access to colleagues

for consultation was seen as reduced when they were at home. Another disadvantage was the cost of extra equipment. Approximately 50% of the respondents had positive comments, and slightly more than 50% had negative comments.

Approximately 50% of the interviewed colleagues were positive toward starting telecommuting themselves. The positive effects were seen to be on the individual level, the telecommuter himself would gain from it. On the direct question of productivity, approximately 70% of the respondents thought that the telecommuters would be more productive at home than at the office, if the technical problems were solved.

### ***Project abortion***

At the end of the trial period the project was phased out, no formal report was made on the trial and the decision was to close the project and abort the telecommuting. A combination of technical problems and low compatibility with existing ways of working lead to the decision not to continue telecommuting in the organisation, as will be discussed further in chapters 6 and 8.

### ***Swedish Ministry of Social affairs***

In case three, the Swedish Ministry of Health and Social Affairs, and parts of the surrounding organisation was studied. The Minister was herself practising telecommuting, while living 300 km from Stockholm, and normally spent one or two days a week at home. Part of her work was done using a television conference utility. In addition to this, several of the employees at the ministry had the option of fully flexible work arrangements, in that respect they were free to work from home at any time convenient to them. The initial interest in this case was the minister and her telecommuting. This later developed into a general interest in the development of the flexible work arrangements at the secretariat of law. This led to a dual case study, with two different examples of telecommuting in the same organisation. These two aspects will be presented separately.

#### **The organisation**

The organisation at the ministry of health and social affairs was a traditional hierarchy. The Minister decided what was to be focused on, while the head of department had the personnel responsibility. The Minister may have specific wishes, but normally a frame was given and the details were worked out by the experts. The head of department had influence over the work of the experts, and had to approve the work done. Responsibilities followed a line of command, but personal contacts were frequent across these lines.

The department consisted of approximately 170 persons, of which roughly 10 were politicians and the rest non-political assignments. The personnel were mainly academics, with various ages and specialisation. The organisation's members were mostly experts in a specific field, working on assignments such as changing or writing new laws, or investigating the possible outcome of a change in the welfare system.

The secretariat of law consisted of 18 people in the winter of 1996, and these, together with the politicians had unregulated working hours, i.e. the possibility to telecommute. There had not been any attempt to promote telecommuting as an option within the legal unit, but there were portable computers for those who wanted to work

from another location. Many of the employees spent a few years in the department as a part of their career, after which they would go on to other jobs. The tempo was claimed to be high. Due to the development of faster communication possibilities, the tempo had increased in the work during the last decade, earlier things were sent by regular mail, now fax and e-mail was more frequently used, calling for faster responses and a more hectic work situation.

*It is not popular if you stick to your 40 hours a week, you are expected to do more. The working culture is quite hard, not many people are absent.*

The work pressure varied over the year, with a few hectic periods, and intermediate periods with less time pressure. Travelling at the ministry was limited, approximately 2-5 trips abroad a year on average. Teamwork was common, with several experts working on a common task for a limited period of time. The work situation for the secretariat of law will be elaborated on further below.

### **Margot Wallström, minister**

The only person in the ministry that telecommuted regularly was the minister herself. The minister spent 1 to 2 days a week in Karlstad, always Mondays and sometimes Fridays. Monday before lunch was set aside for preparatory meetings with her staff, using a TV-link to Stockholm. Much of the ministers work was interaction oriented, most of the regular working hours consisted of internal or external meetings or visits to various organisations. This was planned far ahead, there was little room for spontaneous changes. Solitary work was largely done while travelling, at night or during weekends.

### **Management & co-ordination**

Parts of the organisation with less frequent contacts with the minister found it disturbing not to have her present when discussing their matters, but to be forced to meet via tele-link. In this case, adaptations had to be made by the rest of the organisation to accommodate this way of working. The advantages were mainly for the minister, with side effects for the rest of the organisation.

The impact of the ministers telecommuting on the organisation and the way work was performed had been viewed differently from different

parts of the organisation. The Ministers personal assistant preferred this way of working, since it created a more structured situation for him personally, with a more fixed schedule for the minister. The fixed structure with preparatory meetings every Monday seemed to work with the use of a fixed media. A disadvantage was the background material, which had to be sent in advance to Karlstad, causing a more elaborate procedure and less available time than before. The preparatory meetings were mainly a forum for checking off various issues on the agenda, and not a forum for discussions. One minor change triggered by telecommuting was that the preparatory meetings, which earlier had been held with two ministers present, now had been split into two sessions to become more efficient. The presence of two ministers was perceived to be a waste of their time.

The surrounding organisation had to adapt their activities to the ministers needs, this had always been the way things worked. This fact was more articulated when the minister was telecommuting part of the time.

*I see no advantages for the rest of the organisation with me working from Karlstad. Maybe there are indirect positive effects, but none that I can think of. (The Minister)*

### Communication

The type of communication was different when tele-link was used. The meetings had a more formal character, with less deviations from the subject and less small talk. The task-oriented efficiency of the communication was perceived as higher, while the social part of the communication was not as good as in a face to face meeting. The meetings were more concentrated to the subject, and less personal.

*The teleconference meetings are colder as a communication media, no real eye contact, no social talk, and this leads to tighter meetings. For a deeper discussion or a brainstorming, TV is too impersonal, there are no real discussions.*

*Most subordinates prefer a personal meeting, but most of them have come to terms with using the teleconferencing facilities. (The Minister)*

In the first period when the teleconference equipment was introduced it was decided that the first time someone met the minister it should be in person, not via the tele-link. It was seen as important that one had met in person before using the teleconferencing facilities. The reason for this was that it was seen as too impersonal to have the first meeting via tele-link.

For some subordinates the preparatory meetings were the only contact they had with the minister, and for them, the personal contact would be missed. Others who had more contact with the minister, had less problems with accepting the teleconferencing.

### Work practices

Telecommuting was seen as an advantage for the Ministers own personal work situation. The telecommuting was seen by the minister as a tool to be able to achieve more, not an end in itself. On the other hand, she mentioned a reduced stress level due to the telecommuting practice, and that she felt more efficient without overworking.

*At home I work better myself, I can meet more people this way, and Karlstad gets more attention. I manage to have a public life in other parts of the country than Stockholm. (The Minister)*

This was also commented on by her staff, who saw personal advantages for her in this arrangement. The staff thought that the minister had the possibility of a more normal family situation than otherwise and possibly more time for solitary work.

An advantage mentioned above with the use of teleconferencing was that the meetings were more focused, according to both the Minister and the head of staff. The issue was focused, there was less small talk, and the conclusions were reached faster. On the other hand, the meetings were less personal. Parts of the organisation with less frequent contacts with the minister found it disturbing not to have her present when discussing matters, but to be forced to meet via tele-link. In this case, adaptations had to be made by the rest of the organisation to accommodate this way of working.

*The minister is fairly personal in her style, she likes to meet people in person. This has become more difficult since the TV conferencing was introduced.*

### **Experts in the organisation**

An observation in this case is that the level of telecommuting of the staff in the secretariat of law was low, close to none. A few people may have spent a day at home on certain occasions, but there was no regular use of the possibility to work from home. Telecommuting was permitted, but not common. On the contrary, employees seemed to be spending more time at the office than required, in spite of the fact that the tasks and the environment seemed suitable for telework. The ministers opinion was that telecommuting should be supported, and seen as an alternative for those who had the possibility to combine their tasks with working from home part of the time. The lack of telecommuting by the other members of the organisation, although this is possible and practised by management, was the other interesting aspect of this case.

The work of the studied group had both solitary and co-operative parts. Approximately 1/3 to 1/2 of the time at the secretariat of law was spent on co-operation, meetings and communication, while the rest was spent at the computer, creating texts. It was seen as possible to spend one entire day at home now and then without disturbing the work process. An approximation by one employee was that roughly 2 days a week were spent on short-term tasks, questions that needed an answer within a few hours. The rest of the time was spent on long-term tasks such as law proposals and investigations.

The short-term tasks could not easily be done from home. There were good opportunities to plan several weeks ahead in regard to the long-term tasks. In spite of this, the level of telecommuting was low. On any given day, maybe one or two, or none, of the 150 employees were working from home. To be working from home more than once a month was not common. On the other hand, many of the employees worked overtime at home, at weekends and in the evenings. There were laptop computers available to take home, and these were frequently used. If someone was working from home, they often came in to the office at some time during the day, to check on things.



A reason mentioned for not telecommuting was that the secretariat of law had quite a conservative attitude to work. It was seen as important to do your share of the work, to be there and to show commitment.

*It is not accepted to stay at home today. In principle, anyone at the secretariat of law may stay at home if they want to. It would be possible for anyone to stay at home half time, but no one does. You are expected to be at the office.*

This can be linked to by findings in an investigation performed at the ministry of foreign affairs (Utrikesdepartementet, 1996). The employees were found to see presence at the office at the right time as important for their future career. If time were spent at home, opportunities might be missed and informal information might be missed. The actual result was only part of doing a good job, being available and being in touch with what was going on might be at least as important.

The short term tasks that now and then appeared, as a request from a superior to respond to a question within a few hours, was another reason mentioned that may require presence at the office, if one wanted to be assigned these tasks.

Other reasons for not working from home mentioned were difficulties to concentrate when being at home, the need to have access to colleagues for consultation and the need to have access to the library and all the documentation linked to the case. These are seen as secondary reasons to the fact that it was not socially accepted to be at home during working hours.



## 6 Telecommuting's Impact on Structure

This chapter summarises the findings in the three cases presented in chapter 5. The findings in the three cases are synthesised to a more general picture of telecommuting introduction. This is mainly based on the major case, Telia Research, but complemented with findings from the other two cases.

The impact of telecommuting in the three cases can be summarised as follows. The impact on management & co-ordination on a more aggregated level seemed to be small (or telecommuting was not allowed to have any major impact) in all of the three organisations. The expected changes in structure and management practice (more planning, more structured, more management by objectives) had not been fulfilled to any higher degree in any of the cases, and most things remained as before.

The use of communication media was not affected to any higher degree by telecommuting. Substitution between communication media was found to be low. Spontaneous contacts decreased, and face to face communication was slightly reduced. Meetings were prioritised, and telecommuting was adapted to enable meetings at the office.

The changes in work patterns were more significant than the changes in the other two areas. The division between tasks performed at home and at the office had turned out to be as expected. Productivity was perceived to be higher due to fewer disturbances at home, and possibly by an increase in the total number of productive working hours. The perceived increase in control over ones own work situation was mentioned as one of the most important advantages of telecommuting. Even if the possibility of flexible work time had been used to a lower degree than expected, and sometimes not at all, the knowledge that this could be done if needed was an advantage in itself. Flexibility regarding the days spent at home has turned out to be important. These three areas will be elaborated on further below.

## **Management & co-ordination**

The changes in management & co-ordination were mainly changes on a system level, focusing on a more aggregated unit of analysis. In this context, telecommuting was a limited phenomenon, since not all members of the organisation practised telecommuting as a work option in any of the cases. When summing up the changes on management & co-ordination due to telecommuting in the three cases, we see that these are not many and not very significant. There was an obvious impact geographically, but this did not seem to affect the management & co-ordination. No major impact on the overall roles and tasks of the telecommuters was observed. The general way of organising work was not affected, except in the case of the telecommuting minister, where some routines were changed for her subordinates.

In none of the three cases, was management & co-ordination much affected by the introduction of telecommuting, although this had been expected. Management style and co-ordination mechanisms were supposed to change due to the introduction of a new structural aspect, the geographical dispersion of colleagues (Huvs, 1996; Kugelmas, 1995), but this change turned out to be limited. The formal hierarchy had not changed due to telecommuting in any of the cases, organisational structure, formal roles and responsibilities had not been affected.

In the Telia case, the organisation was already accustomed to geographical distances and working in a flexible manner. Despite this, telecommuting was still expected to have impact on the way work was organised. This impact turned out to be limited. If the organisation were already prepared for telecommuting, this is likely to have facilitated its acceptance. This will be discussed further in the last section in this chapter, where telecommuting's development over time is looked at.

The minor changes observed were rescheduling of meetings due to telecommuters, but this was limited to only a few occasions. The form of the meetings were not changed, and the role of the telecommuters in the projects or the line organisation was not affected by telecommuting, at least not in the short run. In Telia, projects were not affected by having members that telecommute; they were manned

and run in the same manner as before. Telecommuters were regarded as any other project member, and no special exceptions were made to accommodate for telecommuting. This may be linked to the fact that the projects or the line organisation saw no actual gain in telecommuting on their own behalf. On the other hand, some disadvantages were mentioned, such as difficulties to co-ordinate the work, and difficulties to handle emergencies, when telecommuters were not available in person.

#### Programmatic change

The programmatic, change in management & co-ordination in connection with telecommuting was limited or none. In Telia, no changes were planned in the surrounding organisation, as was also the case for Info Company. In the Ministry, some changes were made regarding the preparatory meetings, but other deliberate organisational changes were limited to the group immediately surrounding the minister. No organisational changes were made to facilitate telecommuting in the rest of the organisation. A reason for the limited deliberate organisational changes may be that the aim of the implementation in two of the cases was not to primarily change the surrounding organisation, but to test telecommuting as an individual option, not interfering with the daily work of the surrounding organisation. Although this was the aim, some changes were predicted, but they were of the emergent type.

#### Emergent change

The emergent change was also limited, telecommuting was marginalised on an overall level, and telecommuters were expected to behave and be treated as anyone else in the organisation. At Info Company this caused the trial to be aborted, the organisation did not see telecommuting as fitting into the formal organisation, in the way "things were done around here". At the Ministry, the management & co-ordination was forced to adapt, in the case of the ministers telecommuting, while for the legal department, telecommuting never spread enough to have any impact.

## **Communication structure**

The second dimension of structure is communication structure, including communication media and communication patterns. Media choice theories predicted a rational use of media, adapted to the message and the media available (Daft & Lengel, 1986), while more institutionally oriented theories (Trevino et.al.,1987) predicted a more stable communication pattern, with the same media being used for the same type of communication, regardless of rational arguments for changing communication patterns. This will be discussed in the following section.

Communication is often dyadic, or in a smaller group, and the influence of telecommuting on these units is thus greater than on the organisation as a whole. This can be described as a subsystem unit of analysis from a structural perspective. This would lead us to believe that the impact from telecommuting would be greater on communication structures than for the larger issue of management & co-ordination. This was only found to be the case in some limited areas. The use of communication media was found to be stable, and the only major change was a rearrangement of communication over time, on a personal level, for the telecommuters. The communication pattern of the surrounding organisation defined the communication of the telecommuters to a large extent, and new media substituted traditional communication only marginally, if at all.

Observed changes in The Telia case were that the spontaneous communication decreased for the telecommuters, since the unplanned communication was low when at home, and this was not compensated for when being at the office. Other communication was marginally changed, meetings were maintained, but a slight decrease for telecommuters was detected. E-mail and telephone were little changed in absolute figures and solitary, non-communicative tasks increased for telecommuters. In the case of the Ministry, a change in communication media was the main change linked to telecommuting. This was more of a deliberate change of routines, and will be discussed further below.

### Programmatic change

The programmatic change due to telecommuting was limited in all three cases. Telia had no change in overall communication structure due to telecommuting, except a rescheduling of some meetings to allow telecommuters to attend. Rescheduled meetings may be regarded as a programmatic change of formal schedules to avoid changing other communication structures. Info Company changed nothing in the way of communication. The ministry changed programmatically in one communication genre, the preparatory meetings, but emergent change was small.

The change in the ministry was a top-down decision to change communication media for certain issues, from face to face to TV-link. This had certain effects on communication quality and efficiency that had not been foreseen, and which was perceived differently by those involved. The TV-link, as a leaner communication media than face-to-face communication, caused a more focused and efficient communication of straightforward issues, while side issues and fine cues were missed. This was partially seen as an improvement by the minister, since meetings were speeded up, while subordinates felt that they had little opportunity to get through with messages that were more delicate.

### Emergent change

The emergent changes develop over time, as adaption to other changes, such as telecommuting. The level of emergent change in communication structure due to telecommuting was limited, less than can be expected due to media choice theories, and less than expected by the organisation and in some cases actually less than perceived. As shown above, changes in media use were small and changes in overall communication were limited, with formal communication less affected than informal and social communication.

There seemed to be little substitution between face-to-face meetings and other communication media in telecommuting. However, communication through face-to-face mediated meetings moved from “home days” to “office days”, the result of which being that problem-solving tasks were re-shuffled so that some tasks were performed only during days when the meeting communication genre was available. That is why more formal meetings than average were

planned for “office days” for the study group. Instead of changing communication patterns, *work patterns* were changed. This may lead us to a conclusion that communication genres are more stable than work patterns. This is partly in conflict with expectations, and also with Moberg's findings (1993), that the lack of spontaneous contacts at home are compensated for when working at the office, and that communication at home is shifted to an increase in telephone and mail use. The predicted substitution of communication media and compensation for face-to-face communication was not taking place.

The slight increase in the use of telephone when at home might substitute for some of the face-to-face communication. A possibility was that the issues relating to uncertainty or some degree of equivocality were handled on the phone, while matters involving equivocality were saved for the meetings. This might explain the slight decrease in total planned meetings for the study group, and this would be an argument that partial substitution between meetings and the use of telephone might have been taking place.

For the group studied in the Telia case, the change in use of e-mail mediated memos was small. This could be due to the fact that e-mail mediated memo writing was an asynchronous communication mode and thus not likely to be affected by distance. On the other hand, we might have expected an increase in the use of e-mail mediated memos when other communication modes were restricted. This was, however, not the situation.

A possible conclusion is that the e-mail communication had developed into a genre of its own. Certain issues are discussed over mail, such as project specific technicalities and details. This is also verified by the way the respondents claim to use e-mail. The substitution was low, at least for this group and this limited period. On the other hand, the overall use of e-mail was changing, and growing, according to the respondents, which made a longitudinal study problematic in this respect. The increase in e-mail use may be correlated to the overall increase in solitary work, or the increased productivity. If this is corrected for, the e-mail part of solitary work is not increasing for telecommuters.



It is worth noticing that the overall work profile for telecommuters was quite similar to the profile of the control group, who worked at the office all their time. This indicates that the overall work picture had not changed significantly. The telecommuters had more solitary activities and fewer meetings than their colleagues did. The time at home, with no spontaneous contact with colleagues, was not compensated for when at the office. Days at the office could be very meeting intensive for some telecommuters, with up to over 80% planned meetings (see figure 10).

### **Work patterns**

The third studied aspect of structure was the personal work pattern of the telecommuters. Here we have found a clear split in activities between working at home and at the office, most clearly observed in the Telia case. A radical rescheduling of activities was done by the telecommuters. Home was used for solitary tasks while the office was used for communication and group activities.

Other expected changes due to telecommuting were an increase in the level of personal planning, longer overall working hours, an increase in personal productivity, a reduced stress level and increased personal flexibility. In addition to this, a deterioration of social contacts was feared. All these expectations were more or less fulfilled.

Programmatic change takes another form when the change is on the individual level, and may be better described as deliberate change of work routines. As we have seen in the case descriptions, the deliberate change of work routines was central to the Telia telecommuters, while the Info Company telecommuters to a large degree choose to keep the same work routines at home as at the office.

The deliberate change of work routines was combined with a gradual change over time of work patterns for the telecommuters. Some of the deliberate changes, such as fixed work schedules, were weakened or disappeared, in combination with a gradual adaption, or reversal, to the old way of working, in the Telia case. The influence from habit and surrounding organisation caused the deliberate changes in work patterns to decrease over time. In the ministry case study, no change

took place regarding work patterns for the department of law, due to a low utilisation of the opportunity to telecommute.

The productivity increase expected in combination with telecommuting has, according to the telecommuters themselves, been achieved. There is a perceived increase in productivity on the personal level, due to better opportunities to concentrate and less disturbances. This, in combination with longer working hours, has lead to a perceived increase in output.

### ***Telecommuting development over time***

As we have seen in the three cases, the development of telecommuting over time has shown no spontaneous increase. On the contrary, in two of the cases we see a decrease of telecommuting despite the seemingly positive circumstances in which it is implemented.

In the case of Telia, the level of telecommuting among the trial group decreased gradually, to be slightly less than one day a week on average after two years. Telecommuting was not taking off in this case, although management had supported the issue and there was a pilot project in the company. In the case of the Info Company, telecommuting was tested during a 9-month period, and then abandoned as an option in the company. At the end of the trial period the project was phased out, no formal report was made on the trial and the decision was to close the project and abort the telecommuting. In the third case, the Ministry of Social affairs, the option held by parts of the staff to telecommute was not utilised to any larger extent; the only regular telecommuter was the Minister. Possible explanations for this development, as well as for the structural impacts of telecommuting described above, will be discussed in the following section

Due to the longitudinal set-up of the Telia case, it was possible to follow the development of telecommuting over a period of 2 years. In the case of the Info Company, we followed the entire introduction and abortion of telecommuting as an option, and in the case of the Ministry of Social affairs, we reconstructed the adaption of telecommuting in the organisation. These three cases show three

different patterns of telecommuting development, with one thing in common; the level of telecommuting was not increasing.

In the case of Telia, the initial aim for the telecommuters was to telecommute two fixed days a week. This initial aim was never reached. Telecommuting started off with slightly less than two days a week for the studied group. The level of telecommuting gradually decreased, to be slightly less than one day a week on average after two years. In the same period it was decided that telecommuting would be a general option for all employees at Telia Research. This did not render any increase in telecommuting among the colleagues of the telecommuting trial group, as noticed by several of the interviewed persons.

*"Among colleagues there are none who spend time at home regularly, as far as I knows."*

Telecommuting did not take off in this case, although management had supported the issue and there was a pilot project in the company. On the other hand, there was a large group of people that had a home office, and who had the possibility to work from home outside regular working hours. This is not considered telecommuting in this study, as defined in chapter 1. This option to work overtime at home was claimed to be used by a large group of the white-collar employees, and was called telecommuting by Telia. From this aspect, telecommuting had increased dramatically over the studied two years, but again, not according to our definition. Working from home during regular working hours did not increase among colleagues, and decreased in the telecommuting group, as shown in figure 13.

In the case of the Info Company, telecommuting was abandoned as an option in the company at the end of the trial period. The decision to stop telecommuting and not have it as an option for employees was officially based on the technical problems during the test period. If telecommuting should be implemented in the organisation, the technical equipment at home would have to be at the same level as that at the office. This was considered too expensive. In addition to this, the gain from telecommuting was seen as limited. Another important factor that surfaced in the Info Company interviews was the fit between telecommuting and the company culture. As both the

personnel manger and the telecommuting project manager stated: "telecommuting does not fit into the way we work in this organisation". This may very well be the case, since the organisation consisted of experienced employees with a long time in the field. They were accustomed to a certain way of doing things, and changes in work routines had been few during the last years. Technical problems had reduced the personal gains for the telecommuters, and the organisational resistance may have been higher than in the case of Telia Research.

There were not much absence from the office due to travelling, normal presence was close to one hundred percent, and the dependence on infrastructure was harder to get around than expected. On the other hand, the tasks and the work situation were seen as suitable for telecommuting at the start, with low interdependency among colleagues, defined and mainly solitary tasks, experienced personnel and a high degree of personal self management. The development of telecommuting in the Info Company case is shown below in figure 13.

In the third case, the Ministry of Social affairs, the option to telecommute was quite old, since the legal staff had had a free working situation for many years, with an option to do their work at any site and time. In spite of this, telecommuting had not developed to anything that was utilised to any larger extent. Even though the top manager of the department telecommuted, and the option was there for part of the organisation, it was not utilised to any great degree. The level of telecommuting for the minister was stable, but the level of telecommuting for the legal section was low and not increasing. This is shown in figure 13.

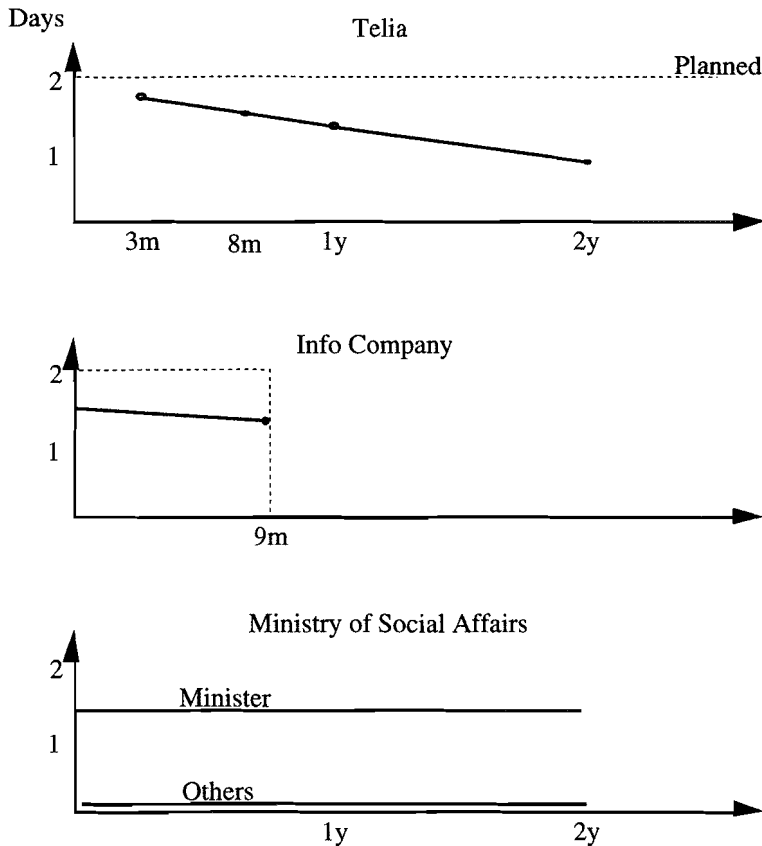


Figure 13: Telecommuting development in the three cases over two years,  
Telia Research, Info Company and Ministry of social affairs  
Scale: telecommuting days per week as an average among telecommuters.

In the last set of interviews, the telecommuters in Telia research were asked what they thought was an appropriate amount of time to spend at home, for a telecommuter in their situation, and why? The general answer to the question was that approximately one to two days a week would make it possible to function as anyone else in the organisation. More than two days a week would probably lead to difficulties. Half days at home, to work undisturbed, and the other half at the office, to keep in touch, were advocated, and used, by several of the telecommuters.

One reason for the decrease in telecommuting at Telia was the technical equipment, both changes in the equipment and lack of upgrading of the home equipment. Some of the telecommuters changed from Macintosh to PC during the reorganisation, and this caused some problems in the technical solutions and set-up at home. The overall computer environment and support was seen as less functional now than before, with more problems and less service. This was pronounced when working at home, where service was mostly unavailable. Seven of the ten telecommuters mentioned technical problems as a negative influence on their telecommuting.

*"The equipment requires support and maintenance. In the last period the technical solutions has deteriorated. It is even difficult to reach the mail system at home sometimes."*

*"The problem with the technical solutions has been the major problem in the last period. The support has decreased and the technical solutions in the new organisation are much inferior to the previous. There is no understanding in the organisation that this (telecommuting equipment and communication links) is important."*

In the case of Info Company, one of the reasons to call off the trial was the immature technical solution. The editors did not have a good enough technical solution at home to be productive, and a full upgrade of computers and communication links was seen as too expensive.

The development of telecommuting has been predicted to increase three times (1973, 1985 and 1996). In the two earlier periods it has failed to do so, and this looks to be the case this time as well. There has been a period of public interest, and then a lower rate of further development than expected. Underlying mechanisms for this lack of adoption will be discussed further in chapter 8.

## **7 Complementing perspectives on telecommuting**

When the cases had been summarised and partly analysed it was apparent that the initial framework was not sufficient to explain some of the findings, or to elaborate on the underlying mechanisms. The structural focus, used to study the organisations, in combination with the theories on communication did not provide a good enough theoretical base to elaborate on the found changes and lack of expected changes. This called for an expanded use of theory, as discussed in chapter 4, including alternative perspectives to shed light on the findings.

This section will introduce additional theoretical perspectives used to analyse the impact of telecommuting in the studied cases. The theoretical perspectives are selected from a broader range of possible additional perspectives. The choice is made based on the additional explanatory value of the perspectives, given the initial framework and the empirical findings. Several other perspectives may be relevant, but the perspectives presented here are seen as sufficient for this study to shed more light on the empirical findings.

As discussed by Barley and Kunda (1992), the study of organisations may be divided into two major paradigms: the rational/economical view and the institutional/sociological view. The framework presented in chapter 3 is mainly derived from the rational view. The notion of communication genres, as discussed by Orlikowski (1992), and the notion of telework as a breaking of unspoken relations to the manager and to the work place (Perin, 1991), introduce parts of a more sociological and institutional view. In the following section, I have included additional perspectives from a more sociological and institutional view on organisations. The rational view is strong in general debate, and is thus flavouring the debate as well as the empirical findings, while the institutional and sociological views may have better explanatory value for many of my findings. This chapter presents some additional perspectives that, based on the findings presented in the previous chapter, add value to the further analysis.

Further arguments for the selection of these theoretical perspectives are presented below.

### **Institutionalism**

Institutional theory within organisational studies tries to replace rational contingency theories or strategic choice with alternative models that are more consistent with the organisational reality that researchers have observed (Powell & DiMaggio 1991). An unifying characteristic among institutional theorists is the scepticism toward atomistic accounts of social processes. Environment, cultural and historical factors, are seen as important, and institutions are embedded in this framework. One branch of institutional theory, incorporating most institutional economists and public choice theorists, define institutions as something deliberately constructed by actors to serve their interests (Jepperson, 1991). The sociologically oriented branch of institutional theory, on the other hand, stress the social constructedness of institutions, where individual actors have little influence over the rules and norms in a given situation. Institutions are viewed more as taken-for-granted expectations, where actors associate certain actions with certain situations by rules of appropriateness.

Institutional inertia is often maintained because individuals cannot conceive of appropriate alternatives. Institutions do not just constrain the options; they establish criteria from which to judge options. Functional explanations are overruled by the way institutions complicate and constitute the reality in which action is taken or not taken. The new institutionalism is mainly oriented towards the sociological view of institutions, focusing on irrationalities in the organisational structure itself. Institutionalisation is fundamentally seen as a cognitive process, where normative obligations enter into social life, primarily as facts that actors must take into account, taken for granted scripts and rules (Meyer et al, 1989). One example of an institution could be the concept of work and employment, related to being at the work-site during a certain time, when work is to be performed.

Scott (1995) identifies three varying emphases of institutional theory. A regulative branch is identified; focusing on legally sanctioned institutions. A normative branch focusing on social obligations and



explicit institutions, and finally a cognitive branch of institutional theory focusing on taken for granted, culturally supported, underlying values, based on orthodoxy and isomorphism.

In the case of telecommuting, the cultural and institutional aspects are central to understanding the effect of telecommuting on the organisation. It can be argued that all three carriers of the institutions relating to work and work place are counteracting the implementation of telecommuting, regulative normative and cognitive resistance may exist. The legal, insurance and union-related resistance (not discussed in this thesis) is a third impediment to telecommuting being accepted as an alternative way of working.

For the present study, the cognitive branch seems to be the most interesting perspective to use to investigate the development of telecommuting and its impact on the studied organisations. The concept of institutions and institutionalisation as elaborated by Jepperson (1991), embodies programmed action or common responses to situations. Through their effect on expectations, institutions become taken for granted, socially constructed, routine-reproduced rule systems. Institutions are often associated with culture. In this aspect, culture may be more or less institutionalised, while institutions on the other hand, may be carried by culture, as well as by formal organisation and by regimes (or central authority systems) (Jepperson, 1991). The cultural aspect of work and leisure being separated and dichotomous, as discussed in Perin (1991), may have impact on telecommutings acceptance.

Structure may or may not be related to patterns of activity. In many cases the structural form is only loosely coupled to activity, but may have an important role in mobilising and controlling participants (Meyer, 1992). The overwhelmingly dominant form of formalised organisations in modern societies is, however, rationalised and is built upon and legitimated by rationalisation. This means that structure and formal organisation provides a rational map to how “things are done”.

Institutional theory is related to technical contingency theory. As Scott (1995) noted, the technical contingency conceptual hegemony was challenged in 1977 by Meyer and Rowans introduction of the up till

then neglected facet of environment of institutions, beliefs, rules and roles, symbolic elements. Notable is that the focus is still the same, environmental impact on structure, but another dimension, in addition to rational forces, the dimension of institutions and cultural and seemingly irrational explanations are added. Contingency theory may in this perspective be seen as not overruled, but possible to expand to include institutional contingencies.

A specific topic related to institutional theory is communication, which is discussed in chapter four. The area of genres of communications is based in institutional theory. This perspective on communication stresses the socio-historical determinants of communicative behaviour, but suggests that the change in situational factors ultimately would change behaviour. This change in behaviour would take place through a process of social modification of the communication genre, of which communication media is a part.

### **Symbols and symbolic interaction**

Taking a view based on symbolic aspects, or symbolism, is an alternative when analysing the impact of telecommuting. Parts of the empirical findings indicate that there are symbolic aspects regarding presence and commitment. Before this is elaborated on further, the concept of symbolism needs to be clarified. There are several uses of the term "symbolism" (Turner, 1996). One use is linked to culture and organisations, with a link to anthropological approaches. The concept of symbols is seen as a metaphor for organisations rather than as an aspect of organisations and organisational behaviour. The important thing is not what happened, but what it means. In the present study, the use of "symbolism" as aspects of organisational behaviour is more appropriate, since these aspects are studied, and the data collected may support this discussion. In this view telecommuting or the voluntary distancing from the regular workplace, may take a symbolic meaning, or rather make several symbolic interpretations possible.

Another view of symbolic action is the semi-rationalistic view of symbolic action as a tool to manipulate the organisation (Turner, 1996). In this view, the action is meant to signal certain symbolic undertones or contain a covert message. The intent is stressed and

symbolic action is seen as a possible component to be taken into consideration.

The school of symbolic interactionism is linked to the concept of symbols in a more general way. What distinguishes humans from other animals is the elaborate symbol-producing capacity enabling them to produce a history, a culture and very intricate webs of communication. A core concept here is meaning, what meaning we attribute to action and interaction, and how do we share these meanings (Turner, 1996). The core area of interest in symbolic interactionism is “how people do things together”. Negotiated meanings, “sense-making”, and mechanisms behind social behaviour in groups are studied. Blumer (1969) states three premises on which symbolic interactionism rests; (a) human beings act towards things based on the meaning things have for them, (b) these meanings are derived through social interactions, and (c) this is handled in, and modified through, an interpretative process by the person. This is similar to the thoughts of Berger and Luckmann, presented under the name of Social Constructionism (Berger and Luckmann, 1966).

The perspective using symbols as metaphors or as a frame for sense-making, to better understand organisational phenomena, is linked to studies of organisational tales, myths, rituals and cultural perspectives of organisational life (Schein, 1992, Alvesson, 1992). Organisations are full of unanswerable questions, problems, and events. These will be made meaningful by the humans in the organisation by linking them to symbols and stories. This may also be used by leaders, stories of the organisation are told, a picture is painted, where events are given a symbolic meaning. Symbols are here something created to explain or make sense of a chaotic environment. To study symbols as metaphors and stories in depth, a rich and varied empirical data is needed, often linked to an ethno-methodological approach, with participatory observation. The data collected in this study do not make a comprehensive study of organisational symbolism and culture related to telecommuting possible. However there are still indications that organisational symbolism and culture may be a fruitful perspective for shedding light on some aspects of telecommuting.

On a more specific level, Trevino et al (1987) discusses the symbolic aspects of media choice. The use of face-to-face as a communication

media signals attention and stresses the importance of the issue being discussed. By being personally present, the message that the subject is important is stressed. In the interaction with clients and external parties face-to-face interaction is in many cases the only accepted form of interaction (Trevino et al, 1987). Lindström (1996) found that face-to-face communication is used in many cases where the content of the communication in itself does not call for such a rich media. Social and symbolic aspects are stressed, by gathering several people for the occasion a sense of commitment and importance is signalled.

One aspect of underlying norms in everyday life is that these norms are not seen until they are disturbed, they are taken for granted (Goffman 1959). Goffman (1959), makes an analogy between a theatre stage and everyday life. People are seen to take different roles, dependent on the context and the situation, and each person has several roles in their repertoire. A mix-up of these roles, or taking an unexpected role creates confusion and misunderstanding. The change between roles is not necessarily conscious.

To analyse telecommuting and organisational change, as well as the development of telecommuting over time, a simple classification of symbolic action is proposed here. The first categorisation is between intended and unintended symbolic action. Intended symbolic action is meant to manipulate the environment, to send signals. Unintended symbolic action is not primarily meant to be perceived as a symbolic act, but is interpreted to have a underlying symbolic meaning. This may be linked to the concept of an honest respectively a cynical actor (Goffman, in Månsson, 1991, p.163). The level of intention of the act is in this respect linked to the degree of awareness of the act. In an intended symbolic action the actor must be aware of the symbolic aspects of the act.

The intended symbolic action may be categorised as explicit or non-explicit. An explicit symbolic action is meant to be seen as a symbolic act by the environment, primarily with a symbolic value. For instance the findings in the Ministry case may be linked to the explicit type of symbolic behaviour. A non-explicit symbolic act is intended to be interpreted symbolically, but not to be seen as an intended symbolic act. The symbolic aspects given to the action will differ between individuals. It may be argued that all acts have symbolic meanings in

some respect. In this case the interesting aspects are if there is a symbolic meaning that is linked to telecommuting.

There might be unintended, breaking of unspoken norms that is not explicitly reflected upon by either the actor or the environment. The behaviour may in this case be seen as inappropriate. The action is not given a symbolic meaning, but is perceived as unacceptable for reasons not reflected on. The action is not an intended symbolic action, and is not decoded as a symbolic action, but has an underlying symbolic value. This may be the case in some of the telecommuting organisations, as we shall see in the next chapter.

### **Networks and telecommuting**

The term "networks" may be used in several ways in organisation studies. One perspective is to see networks as a new ideal type of organisation, different from both the Weberian bureaucracy and the market based relationship. Another perspective of networks is the electronic network, connecting people all over the world in a complex fluid, flexible and dense pattern of interconnections that cut across various intra and inter-organisational boundaries (Norcia & Eccles, 1992). This perspective envisions a telecom-based organisation, linked together by communication technology and electronic networks. These two perspectives are not the same thing. Electronically based networks and organisational networks must be distinguished from each other. Network organisations cannot be entirely based on electronic networks. Effective network organisations require face to face communication, to build robust, rich and multidimensional relationships, since the social dimension is especially crucial in a network-based organisation. Electronically mediated communication cannot fully replace face-to-face communication, but may complement it, according to Norcia and Eccles (1992). Network organisations are not the same as electronic networks, and nor can they be built entirely on electronic networks.

Network theories are related to transaction cost analysis. Transaction cost theory may be an alternative perspective to study the development of organisations when telecommuting is introduced. The basic idea of transaction cost theory is that there is a trade-off between a market relationship, choosing the best option every time, and the costs of investigating the market and establishing new relationships

(Williamson, 1975). This trade-off would favour longer relationships and alliances, since the costs of finding and establishing new contacts would be greater than the gains of using the most appropriate source at all times.

The reasoning behind the transaction cost model is rational; a choice is made to maintain established contacts, based on an overall cost estimate. This links well with media choice theories, taking a rational approach to the influence of telecommuting on the organisation. As we have seen in chapter 6, a rational explanation does not seem to be sufficient. The transaction cost approach would be more appropriate in a situation where links are less determined by an existing organisation. In this case, the establishment of new relationships is not primarily linked to telecommuting. Transaction cost aspects of the organisational changes in these cases may be closely linked to network theory.

In the sociological use of the term, the network is seen as an internal organisational form. This organisational form involves lasting relationships, lateral links and consensus rather than orders in decision making. These factors are of interest when telecommuting is discussed. Physical distance is likely to influence the strength of a network relation, and this relation is likely to influence the development of geographically dispersed organisations (Noriah and Eccles, 1992). Face-to-face encounters play an essential role in establishing lasting relationships and trust in a group. This suggests a minimum amount of co-presence, depending on the task and the uncertainty and ambiguity of the task. Noriah and Eccles hypothesise that building a network organisation requires more, not less, face to face communication.

Labels such as "post-industrial, heterarchical, self-designing, post-bureaucratic and cluster" are used in relation to network organisations. As a new organisational form based on networks and communication, the term "virtual organisation" has been coined. Virtual Corporations or Imaginary Organisations describe the alleged new form of enterprise in the 1990s. Writers such as Davidov and Malone (1992), Hedberg et al (1994) and Handy (1995) paint a picture where the stable organisational form of the early 20th century is replaced by a contemporary organisational form. In these new

organisations, links are formed when needed, units are rearranged constantly and each micro-company does what it can do best.

One way to describe the virtual corporation is to talk about organisational outsourcing "to the limit". All that is not vital to the strategic core business is outsourced, production and distribution can be done by subcontractors, as well as all support functions such as order handling, billing and personnel recruitment. Only a small core of employees and immaterial resources remains, such as the brand names and necessary knowledge of the production chain and distribution network. The main assets in this type of organisation are claimed to be knowledge and contacts.

The concept of virtual organisations has been taken up by the general debate, and the label has been used for several less distributed organisational forms. One extreme on the "virtual" side is the single entrepreneur with a network of colleagues, which he can call on when needed. On the other hand Toyota could be described as virtual, with subcontractors and suppliers outside the company, but still closely linked. Toyota use outsourcing, with a very well developed network of suppliers and subcontractors, and extensive contacts around the world. A core of long term employees is supplemented by a peripheral flexible work force and subcontractors. If the definition of virtual organisations is stretched even further, every corporation with some form of contact with the environment could be considered as virtual, since they utilise resources that they do not fully control themselves.

Virtual organisations are described by Brigham and Corbett (1996) as the archetype of the post-modern organisation:

*which is thought to generate a culture of expression and involvement, facilitate personal development of individuals... and celebrates the dissolution of and demise of normative regimes and disciplinary practices associated with rational bureaucracy (Clegg 1990).*

These organisations comprise, according to its protagonists, all claimed advantages of most of the modern (or maybe post-modern) management techniques. This includes ad-hoc mini organisations,

just-in-time practices, teamwork, flexibility, empowerment, total quality and performance related pay (Davidow and Malone, 1992; Hedberg, 1994). Other aspects are the realisation of a core and a peripheral work force, contract workers, subcontracting of systems and constant re-engineering. How this is possible at the same time is not fully clarified.

Several other theoretical perspectives may have been used, and some have also been tried, such as lead user theory, but I have chosen not to discuss these here. These additional perspectives, in combination with the initial theoretical framework, will be the basis for the investigation of the underlying mechanisms of change, or resistance to change, linked to telecommuting.



## 8 Underlying Mechanisms

This chapter focuses on the mechanisms behind the impact telecommuting has had on organisational structure, and on the development of telecommuting over time. Theories used in this analysis come from previous studies presented in chapter two and general theories on organisations and organisational change, presented in chapters five and seven. Theory is used to understand outcomes, for generalisation, and to put the empirical results in perspective. First let us review the purpose of the study.

The purpose has been stated in chapter 1 as:

To contribute with a deeper understanding on what impact telecommuting may have on an organisation, and more specifically how telecommuting influences management & co-ordination, communication structure and personal work routines. This is done by describing the most important perceived changes in structure and ways of working in combination with the implementation of telecommuting in a few chosen organisations. A second objective is to propose mechanisms underlying the found changes, or lack of change, linked to the development of telecommuting over time.

The findings presented in chapters 5 and 6 are analysed in this chapter using an expanded theoretical framework, to suggest and elaborate on underlying mechanisms. To sum up the findings in one sentence, management & co-ordination was found to be stable when telecommuting was introduced, communication structure was also fairly stable, while personal work patterns changed. The impact of telecommuting in the organisation is summarised in figure 14. The development of telecommuting over time in the studied cases (and in several other cases; Huvs, 1996) was not as positive as anticipated. The mechanisms behind this are sought. These mechanisms are also linked to the low impact on the more aggregated structural levels. Why the impact is low for management and coordination, as well as for communication structure, but high for personal work patterns, and how this may be linked to the slow adaption of (or resistance to) telecommuting, will be discussed in this chapter.

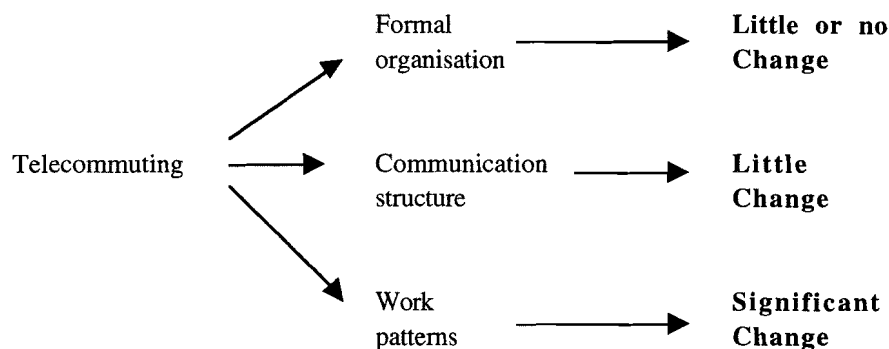


Figure 14, telecommuting's impact on structure

### ***Analysing underlying mechanisms***

The impact of telecommuting on the organisation, and the development over time, is analysed using a set of different approaches. First, a number of rational and structural explanations are discussed. This is followed by a discussion on institutional influence, and a symbolic approach to the mechanisms underlying the impact of telecommuting on organisational structures. Analysis is based on a re-interpretation and re-reading of the data, using Nud.Ist, as well as going back to the interview protocols and notes. The analysis is a prolonged process, including discussions with colleagues and relating to theories in several iterations. Parts of the analysis have also been presented as conference papers during the process, in order to gain comments and further ideas.

### **Rational and structural mechanisms**

As discussed, management & co-ordination structure in the studied organisations was found to be stable. The perceived changes due to telecommuting in management & co-ordination were small or none. One possible explanation for this lack of impact is the limited level in which telecommuting is introduced, where only a part of the organisation were telecommuters. This low level of implementation is probably the most viable form of telecommuting in this type of

organisation, knowledge producing, loosely structured and with highly skilled employees (Moktharian, 1997). The work situation differs significantly over time for many employees, and the work differs between employees, regarding project situation, work content, communication needs etc.

The differences in tasks and variations over time makes an introduction of telecommuting in the entire organisation, and for all employees, difficult. An individually based, flexible program is more likely to be compatible with the organisation's multifaceted task and activity structure. Moktharian (1997) found that 80% of potential telecommuters had individual reasons not to utilise the option to telecommute. Given a different organisation than the ones studied, with other tasks and other personnel characteristics, a different approach for telecommuting implementation may be feasible. This is discussed further in the next chapter, contributions and implications.

In the Telia case, the organisation is already distributed, with offices in six locations in Sweden, and has employees with experience of working with colleagues in other locations. Telecommuting may in this case be seen as an increased degree of distribution in the organisation. This would imply that some of the changes might already have been made to accommodate for co-operation over distance, which would facilitate the introduction of telecommuting, and also limit the impact of telecommuting. On the other hand, communication is still largely relying on the use of traditional media. Although Telia have advanced video conferencing equipment and computer networks, travelling is still frequent and personal meetings are preferred. Changes and adaption in management & co-ordination was expected in Telia, and predicted by previous studies (Huvs, 1990, Kugelmas, 1995), but did not happen.

A change in management style towards more result orientation and management by objectives was predicted in previous studies (Handy, 1995, Nilles, 1994), but these expected changes did not occur in the first two cases. The change in management style is thought to be necessary to compensate for the lack of possibility to co-ordinate the work on a continuous basis. The expected increase in standardisation due to difficulties in mutual adjustment (Mintzberg, 1979) has not been observed. The lack of change may be linked to both the limited

scope of telecommuting, as discussed above, and to the organisational characteristics, the fact that management style in the cases studied was already well suited for telecommuting.

Info Company did not support changes in the formal organisation, all roles and routines were formally left unchanged, the only change was the home-based working days for the editors and the managers. In the case of the Ministry of Social Affairs, the preparatory meetings may be regarded as more result oriented than before. This is not due to a change in management style, but rather a side effect of using another communication media.

Structural changes appear to be pushed down to the individual level, with most change in personal work patterns. No perceived advantages on an organisational level have been raised in the three cases. An important aspect of the adaption of telecommuting is where gains are found and where the possible drawbacks occur. In the case of telecommuting the gains are mainly on the individual level, while the short term gains on the group level is small. The drawback is there are costs, such as lesser communication and greater needs to co-ordinate and plan work when telecommuters are involved.

The fact that the advantages of telecommuting on the group level are scarce, or even negative, may lead to a perceived rationality in the formal organisation being reluctant to change in favour of the telecommuters. Since the advantages are mainly on the individual level, this may explain why changes and accommodation for telecommuting are also made primarily on the individual level. The focus on personal gains still does not explain the deterioration in telecommuting, since there is a positive impact on overall result (productivity or output), and this would from a rational point of view favour telecommuting. Using the terminology of Mintzberg (1979), the co-ordination principle, mutual adjustment, is the closest of his basic co-ordination principles, but this seems to more a case of one-sided adjustment, where the telecommuter is the one that has to adapt.

In these three cases, we can see that the individual level is the one that changes most easily. The adaptations to telecommuting are made on a personal level, influencing personal planning, work practice and private life. On the personal level, changes were planned and

implemented, the whole telecommuting scheme was primarily a planned change. Both Telia and Info Company followed the guidelines given by popular literature on how telecommuting should be introduced in a successful way. This includes management support, careful selection of telecommuters on a voluntary basis and with tasks that may be performed at home and with appropriate technical support.

The reason to telecommute given by the telecommuters was basically a rational argument based on personal gains, both in productivity and personally. This was found in the expectations interviews and in the first set of interviews. The motivation for the organisation to permit, or support, telecommuting was built on rational arguments regarding the work situation of the individual, expected productivity gains and employee commitment. This logic is based on management literature presented in chapter 2. The expected change was to be legitimised by a better personal work situation, with more self control, reduced travelling time and a choice of work environment to match various tasks.

It can be argued that changes occur on the lowest level in the structure due to the set-up of the telecommuting programs. The aim at Telia was to test telecommuting in an existing organisation. A natural development in this case is that the telecommuters are the ones who have to encounter the problems and buffer for changes in the surrounding organisation. Since the gains are on the personal level, the adaptations are made at the personal level. On the other hand telecommuting is praised by management in two of the cases, and positive effects are brought forward.

Higher productivity is one of the basic rational arguments for telecommuting (Forester, 1987; Bailyn, 1988; Huys 1996). These findings have also been confirmed by this study. Productivity is perceived to be higher by the telecommuters in the main case. In Info Company, the personal positive effects are not as obvious as in Telia. In the Ministry of Social Affairs, the positive effects for the minister are clear, but in the case of the non-telecommuting staff, these effects are again not strong enough to make telecommuting a frequent phenomenon. In all three cases the personal situation of the telecommuter is experienced as improved.

These personal gains and short-term individual productivity gains are the major positive outcomes of telecommuting, but this has apparently not been enough to sustain telecommuting in any of the organisations. Personal gains (efficiency and stress reduction) were not enough to support telecommuting.

### Telecommuting and organisational change

A determining factor in the case of telecommuting may be organisational coherence, as discussed in chapter 7. In an unstable system, organisational stability may be seen as a goal in itself (Tyrstrup, 1993). Stability and coherence is seen as a requisite to hold the organisation together in order to achieve long term results (Barnard 1956). This view on organisations may explain why telecommuting in some cases is seen as negative, although the output from the group might be improved. Telecommuting weakens the possibility for the manager to handle incidents, due to fewer available communication options and weaker social ties within the group. Telecommuting may in this case lead to a deterioration of the group, and be harmful to the group's long term survival.

When coherence is a determining factor for success, and long term group output is favoured, as opposed to short term individual performance, telecommuting may be seen as counterproductive, even if productivity is high. The behaviour seen in the three cases, where telecommuting is not overly successful, may be explained using this perspective. Coherence and belonging may be more important due to the complexity of the task, which requires co-operation and teamwork. This argument is not necessarily articulated, but may manifest itself in more unspoken beliefs of "how things should be", which will be further discussed below in combination with an institutional approach.

An aspect of telecommuting is the difference of how much telecommuting was practiced in various phases of projects in the Telia case. Project phases and telecommuting are interrelated in that during more hectic project periods people spend more at the office and less at home. This is related to the uncertain phases of projects, where ambiguity and equivocality is high. Rich communication is preferred in this situation, which calls for presence. In addition to the start up

phase, there also is a lower level of telecommuting at the last phase of projects, when time limits are short, but the task is well defined. This covers another form of need for presence, information needs to be exchanged at short notice and solutions and presentation material needs to be reviewed and discussed.

The same need for presence is experienced during the reorganisation in one of the cases. Telia was experiencing a turbulent period, with deregulation of the telecommunication market, changes in technology and new services competing with their products. This has caused several reorganisations over the last years. In a turbulent environment, there are many such phases where presence is preferred. In an environment with many short-term projects, the situation with start up or finishing phases, is more or less permanent. If it is true that we are moving towards shorter time limits, increasing speed in product development and shorter project phases it is even less likely to be viable to telecommute. A dynamic organisation requires a high degree of co-presence, and relies to a large extent on face to face communication and ad-hoc problem solving.

#### Telecommuting and communication

In a complex and ambiguous situation, telecommunication and other forms of lean communication media are second best to presence, according to media richness theories (Daft, 1987). These forms of media are in this situation primarily useful when presence is not possible, or when the task is not important enough to justify the possible cost of co-location. The distancing from colleagues and the use of other communication media rather than face-to-face communication will influence the result in a negative way. Work will become more focused on short-term results, and less adaptive and reactive to cues and small changes. Task efficiency increases, but adaptiveness and ability to co-operate decreases. This is supported by the high degree of connectedness found in innovative systems by Allen (1994), and the intensive internal communication found in innovative projects by Tushman (1988).

It is suggested that there is a minimum amount of face to face interaction required for any type of social organisation to work effectively (Noriah & Eccles, 1992). It is vital to maintain this critical ratio of face-to-face communication to electronically mediated

interaction. This is a strong argument against telecommuting in an ambiguous environment. This is also in line with the findings on project phases and difficulties to telecommute when the projects are defined and problem setting is on the agenda. It may be possible, but not yet shown, that absence of face-to-face communication may be compensated for in innovative ways.

The influence from telecommuting can be linked to the different forms of change discussed in chapter 5: programmatic change, made deliberately to enable telecommuting, or emergent change, gradual adaptations over time. Change can also be categorised as local individual, as opposed to general change in the group or organisation. Most attempts to introduce telecommuting have been on a pilot scale or on an individual basis. This has been either programmatic, in the case of the pilots, or emergent, in the case of the individual initiatives.

The lack of change in communication patterns may be seen as a process of changing communication behaviour. From this perspective, the present study may be too short to capture these changes. In the long run, there will probably be a shift towards a rational use of communication media (Daft, 1987). The advantage of using the most effective media for each form of communication will probably cause a change in the longer term perspective. The suggestion is that in the short run the social and institutional factors in determining use of media are dominant (Orlikowski, 1992). There is no possibility to choose media for each instance, or to rapidly change the organisation's use of media for different situations.

A change in communication patterns and media use takes place over time, giving each organisation an individual pattern of communication genres (Yates & Orlikowski, 1992). In this respect, the dynamic dimension of communication media use and communication genres is useful to understand the lack of major changes found in communication structure in this study. In the type of organisations studied, major changes in communication patterns or communication media use are not likely to occur as a result of part time, individually planned telecommuting, at least not in a short-term perspective. Communication patterns are found to be more stable than personal work patterns, and it is also found that immediate media substitution is low. There appears to be dynamic influence in this case, changing



communication patterns or genres of communication takes time. One may expect to see a transformation over time that will eventually lead to various forms of communication genre (Orlikowski, 1992). In this perspective, communication patterns are seen as local institutions, not easily changed, and sometimes not even reflected on. This line of thought will be taken further in the section discussing institutional influence on telecommuting.

### Technology

Technology in itself, and more specifically the communication links and technological solutions used to replicate an office environment at home, have in all three cases in some way had negative influence on telecommuting development. Technology and ICT solutions are seen as a necessary but not a promoting factor. Having a computer at home is seen as necessary to be able to telecommute in these organisations, but is apparently not enough to make it happen. The fact that the technical solutions are seen as less than perfect has caused irritation among the telecommuters. The dynamic development in this area has also caused the home equipment to rapidly become less updated than the office equipment, leading, in some cases, to a reluctance to work from home. This has influenced the level of telecommuting. Technology may in this case be seen as a hygiene factor, but not a motivator.

Based on the findings presented in chapter 6, it can be argued that there might be a hierarchy of positive and negative effects acceptable to an organisation. Positive effects on a lower level of aggregation (as in Telia) might not be accepted as beneficial to the organisation, even if the overall outcome might be positive. In contrast, positive effects on a higher level of organisational hierarchy might create problems on lower levels, but are still pursued (as in the ministry). Rational positive effects on an individual level are not seen as an advantage to the group, since the group as such is weakened, even if the result and the output is improved. These ideas are not firmly grounded in the findings, and must be examined further, in future studies of telecommuting.

### **Institutional influence**

The use of telecommuting as an option can be examined taking a perspective based on institutional theories. It can be argued that the

way work is organised is influenced by institutions, as discussed in chapter 7, general or company specific, which by definition are not easily changed. The approach to telecommuting in this study was to look at structural changes in combination with the introduction of telecommuting. This approach is not set up primarily to study institutions, connected to telecommuting. On the other hand, the findings on structure and structural changes, or rather lack of change, in many areas in the three studied cases, can be examined using institutional theory.

The degree of institutionalisation may be seen as the relative vulnerability to social intervention (Jepperson, 1991). Institutions with high resistance to any form of change may be regarded as strong. Institutions can be carried by organisations, by regimes or by culture. If the concept of working time and working place is looked at in this light, it must be regarded as a strong institution. It is a world-wide concept, embraced by all legislation and incorporated in most cultures in the western world. This view of work falls into the second criteria for stability, mentioned by Jepperson, when an institution is imbedded in a framework of institutions. From this perspective it seems like a formidable task to change the institution of work being something one performs at the working place and during working hours. The concept of work is part of a group of institutions that are taken for granted, or even seen as moral obligations to be followed by all (Perin, 1991). This may be stated as a "Calvinistic imperative of work": being at the work site during regular working hours, doing "work". In recent years the rigid working hours and division between leisure and work has partly been relaxed, the concept of flexible working hours has spread, more so in the Nordic countries than in the US (Bailyn, 1988). Still this is a limited change, stretching the old paradigm, but not really challenging it.

Institutions may be seen as taken for granted scripts, rules and classifications (Powell & DiMaggio, 1991). The necessity for presence when working may in this context be seen as a society-wide institution. As noted by Bailyn (1988) and Perin (1991), the image of work is something performed at the workplace, and something separate from activities performed at home.

Institutions are fundamentally cognitive structures, normative obligations. Another characteristic of institutions, according to neo-institutionalists is the inherent resistance to change, and the built-in irrationality in the structure itself (Powell & DiMaggio, 1991). This links very well with the resistance to telework, although the rational arguments in favour of this new work arrangement are numerous. The concepts of work and work place can be linked to several underlying norms or institutions that counteract the strive to implement telecommuting. These mechanisms may be illustrated by a few quotes from the interviews:

*"There is a certain irritation when you are not at the office, but working from home" (Telia)*

*"It is not really accepted to work from home, you are supposed to be at the office" (Ministry)*

*"The way of working here is so well established that the introduction of telecommuting is problematic" (Info company)*

The observation that changes in relation to telecommuting are largely on a personal level fits well with the believed importance of institutions in this case. The changes that take place are "hidden" from the rest of the organisation, as they are on an individual level. Here, norms can be set aside, at least temporarily, without conflicting with the rest of the organisation. Adaptions are made in the area where the least resistance is encountered. The area of personal work pattern and personal routines is the area where the least number of people are involved.

A plausible explanation for the lack of substitution of face-to-face with e-mail mediated communication is that stable communication genres are shaped in socio-historical contexts (Orlikowski, 1992). These stable communication genres are transformed through social interaction between communication partners. A change in a situational factor, distance in this case, did not lead to a difference in communication patterns, at not least initially. When confronted with a situational change, the group studied did not alter their behaviour according to media richness theory, that is, they did not try to substitute face-to-face with e-mail mediated communication. Instead,

they used communication genres according to routine, and re-scheduled work to suit the availability of certain genres. The idea of communication genres brought forward by Yates and Orlikowski (1992) is supported by the findings of this study.

Social and institutional factors constrain communication substitution, and communication will be either rescheduled or reduced, rather than substituted by communication using other media. Eventually, there might be a shift in use of media and media content. This implies that there are significant difficulties involved with deliberately implementing new modes of communication in an already existing organisation.

Judging from the Telia case, planned meetings appear to be an important communication genre. The fact that the level of formal meetings is almost as high for the telecommuting group as for the control group indicates the relative importance of formal meetings. Since the level of equivocality is high in this type of organisation, the rich communication used in meetings plays an important role. Social context explanations suggest that changing the situational factors does not mean communicative behaviour would change. People would behave according to what the social context prescribes, and this context will not be instantaneously altered. Thus, communication behaviour will initially stay the same. This is explained by institutional factors. The group preserves the socially constructed symbolic cues of a specific communicative behaviour, here labelled communication genre.

This study seeks to identify impact from telecommuting and discuss underlying mechanisms. To do this, institutional aspects of the organisation have been discussed. It is not in the scope of this study to investigate how these institutions are contained in the system, or by which mechanisms they influence the outcome. This study will rest with the observation that institutional factors appear to play an important role in the introduction of telecommuting, and the impact telecommuting is found to have on the studied organisations. The mechanisms by which these institutions influence the organisation will be left to future studies to investigate.

## Symbolic aspects of telecommuting

The symbolic aspect of telecommuting is another possible way of explaining the impact and development of telecommuting. The importance of presence, and thereby showing commitment to the group and the common task is made visible when telecommuting is introduced. Telecommuting can be seen as a non-deliberate breaking of institutional norms, which is interpreted symbolically by colleagues (Turner, 1996). This breaking of norms is not acceptable behaviour, and even when officially sanctioned, unwritten behavioural codes will counteract the acceptance of telecommuting. Presence at the work site signals a belonging to the group and the organisation.

*"It is important to be at the office, to be visible"*  
(Utrikesdepartementet (Ministry of Foreign Affairs), 1996)

To go further along this line of argument, a conclusion would be that telecommuting is not compatible with explicit or implicit group norms regarding commitment and presence. Commitment may in many cases be constituted by presence, and voluntary geographical distancing from other group members is not accepted. The dispersion of the group is seen as weakening the ties, and leads to a weaker organisation. As discussed by Noriah & Eccles (1992), face to face encounters play an essential role in establishing and maintaining lasting relationships. The dispersed version of the group may in this perspective be seen as second best, not to be chosen if group coherence and common activities are important.

When a member of a group voluntarily decreases the presence and availability for colleagues, this sends signals to the environment (Trevino, 1987). The telecommuting member of the group is not as interested in the common activities as the rest of the group, who choose to spend their time at the office. The absence may have a positive impact on result, but this is outweighed by the symbolic action of distancing oneself from the group. Differences in productivity are accepted as a normal variation between people, but presence may be controlled, and is often seen as a more important measurement of performance, or willingness to perform. Choosing to stay away may be seen as a symbolic way of opting out, showing that there are other things more important than the common task. This is not directly expressed in the interviews, probably because it is not

reflected upon by the respondents, but there are several indications that telecommuting has symbolic aspects. One indication is an irritation from colleagues, as illustrated by the following quotes.

*"There is a degree of jealousy among my colleagues" (Info Company)*

*"Nice weather to stay at home today, telecommuting-weather" (Telia)*

The symbolic aspects may be linked to the low development of telecommuting in the three cases. The negative reaction to telecommuting and the lack of adaption on an organisational level may be seen as a reaction to the symbolic or perceived symbolic character of telecommuting. Telecommuting could be perceived as a withdrawal from the group when a person chooses to work away from colleagues for part of the time, when the option to be present is there.

This might be different if the absence is caused by external factors; the person is forced to be absent, for instance by meetings at other locations. In this case, the absence is a sacrifice for the sake of the group, and the person is not primarily distancing himself due to personal advantage, whether professional or private. In this perspective, the performance or the actual result is of less importance than the fact that one is loyal to the group. It might even be better to be counter productive and loyal than productive and break the norms for loyalty. The underlying norm could be stated as being present when possible during working hours.

There may be a self-eliminating mechanism for telework for skilled professionals and managers. The trust to be a teleworker may be given to those whom it is believed will use the opportunity to a limited degree, or mainly during overtime. You may work from home if it is not likely you will use the option regularly. This is linked to commitment, as discussed above, and career possibilities, discussed by Bailyn (1988). Telework may in this perspective be seen as a possibility for extra work, overtime at home for the devoted worker, but not to be absent during working hours when it is possible to be at the normal work site. During working hours, you are supposed to be at the work site.

This study focuses on white-collar, skilled employees, with an articulated need for interaction with colleagues. The situation regarding telecommuting and symbolic aspects is most likely different for other groups, with lower interaction needs and a higher focus on individual, short term results. Typical groups with these more individually oriented characteristics are the sales force and technical support personnel. These groups have shown a different development regarding telecommuting (Tomascovic, Dewey & Riesman, 1993). The rational factors, primarily personal results, appear to be stronger for these groups, while the institutional and symbolic factors are of less importance than in the cases studied here. This will be discussed further in chapter 9.

One aspect of telecommuting and group norms is that the underlying norms are not seen until they are disturbed (Goffman, 1959). This may help to explain the large number of failed telecommuting pilots. The underlying cultural resistance is not seen until it is challenged. It would also explain the lack of enthusiasm in the Ministry of Social Affairs. Here the possibility to telecommute has been present for some time, which may have lead to some reflection on the underlying symbolic meaning of working from home. This reflection on what telecommuting may lead to could have made this less attractive to the employees. The time when telecommuting is accepted is when there is an external force to telecommute, not when it is a choice to distance oneself from the group, but a necessity.

This "irrational attitude" towards telecommuting would then need to be changed, if we listen to the proponents of new organisations, such as virtual networks. Changing basic underlying assumptions of work and commitment is probably a formidable task, if it can be considered a task, or possible at all. Telecommuting has been shown to create problems with the symbolic aspects of work and commitment, both on an articulated level, as in the Ministry of Foreign Affairs, and on a non-articulated level, as in Telia. Symbolic factors such as showing commitment, in combination with rational arguments of organisational coherence may be of greater importance than the actual performance.

### ***Summing up perspectives***

The result of the case studies shows that structural changes due to telecommuting are concentrated at the individual level, on work patterns. Changes in management and communication were limited. This, in combination with the negative development of telecommuting in the studied cases has been discussed in this chapter, taking several theoretical perspectives. The proposed underlying mechanisms discussed in this chapter relate to some of the difficulties found when examining telecommuting implementation and telecommuting acceptance in an organisation. The following underlying mechanisms are suggested.

The low level of implementation is one possible explanation of the low impact from telecommuting on more aggregated levels. The relatively low number of telecommuters in these cases leads to a limited impact from telecommuting on the surrounding organisation.

The lack of perceived advantages on a more aggregated level may be linked to the low impact from telecommuting on management and coordination. There is a need for adaption at some level, and this may explain that most changes and adaptations are made at the individual level. The individual level is also where most advantages are found.

The need for rich communication in ambiguous situations, such as certain project phases or during reorganisation, calls for presence, which makes telecommuting more difficult.

It is difficult to achieve simultaneous change at all three studied structural levels. Changes at the individual level are easier, and thus faster, while the institutional factors influence management, coordination and communication structure more. This creates an unbalance, which is buffered by the individual.

The coherence of the group may be seen as more important than personal output. This favours presence, which has positive impact on team aspects. This may lead to a resistance to telecommute.

Telecommuting may have important symbolic meanings for the group and for organisational coherence. The symbolic aspects of telecommuting interferes with the acceptance of telecommuting as an



organisational form. These symbolic aspects are not necessarily explicitly stated, or even conscious.

Institutional theories stress the importance of organisational inertia, and the difficulties of changing established patterns and ways of acting. Society-wide institutions, like the way work and leisure is conceptualised, are likely to influence the acceptance of telecommuting.

### ***Generalisation and quality aspects***

The analysis and interpretation of the findings are influenced both by the chosen theoretical frameworks and by the researcher. Since the interpretation is done by establishing patterns and finding links between the patterns and theory, the interpretation will be influenced by the researcher, and his pre-cognition. This can not be avoided when qualitative methods are used, involving interpretation (Alvesson & Sköldbberg, 1994). This fact calls for a discussion on the found results in terms of generalisability and plausibility, which was begun in chapter 4 and is continued here.

The results presented in chapter 6 describe the most important changes in the chosen organisations. This part of the study, with an exploratory and descriptive focus, is mainly built on empirical observations. These observations are made by the researcher, using a set framework to capture perceived changes linked to telecommuting. Theory is used to sort and conceptualise these findings. The discussion held in this chapter links the findings to a wider theoretical framework, and makes it possible to suggest more general conclusions based on the local findings from the cases. The underlying mechanisms discussed in this chapter are attempts to find more general mechanisms underlying the results, based on theories and on the outcome of the study.

One limitation to the generalisability is the cultural setting of the studied companies. Since institutions are used as a possible influencing factor, the society and the environment at large play an important role, and therefore limits the generalisability in certain aspects. The type of organisation and the type of people involved in telecommuting also limit the generalisability, as discussed above, in

chapter 2. On the other hand, informal discussions during seminars, with people from other organisations, showed a similar picture as the one painted in this chapter. This might indicate that the discussed mechanisms could be valid in more types of organisations. This needs to be studied further.

The discussions and generalisations made in this chapter are based on several theoretical frameworks, in order to suggest possible underlying mechanisms for the results found in these cases. This use of more than one theoretical framework leads to the question of how deep the analysis is taken in each theoretical area. The path taken in this study is to suggest more than one alternative perspective. One alternative would have been to fully develop a theory based on one of the perspectives, but this is not done. The purpose was to propose alternative underlying mechanisms, based on theoretical areas that added to the overall understanding of telecommuting.

These underlying mechanisms and the impact telecommuting had on the studied organisation may be linked to the circumstances under which telecommuting was implemented. In chapter 2 a matrix was presented to limit the issue (Figure 5). Based on this, the possibility to generalise from the above discussions on underlying mechanisms is looked into.

With a more individually oriented and less co-operative work situation, the findings would probably have been different. Both communication and symbolic issues would be less problematic and play a smaller role if the task was more individually focused and less communication intensive, regarding rich communication. The use of ICT has in these cases had a dual effect. On one hand, it makes telecommuting possible; on the other hand, it has turned out to be a problem. A reason for this is that the ICT situation is not stable, and a perceived deterioration in the technical solution took place in two of the cases.

The type of work performed and the interaction needs are both central issues for the findings in this study. The choice to allow fully flexible working hours, does not appear to have been an issue of conflict, or utilised to any higher degree in any of the three cases. On the other hand, the amount of time spent at home, away from the office, is seen

as central. More time at home is creating more difficulties. The time block synchrony or the contract form is not questioned, and thus irrelevant to discuss based on the present empirical data. The spatial categorisation is central, with a fixed home based telework solution creating symbolic differences from a mobile or external office solution.

The following chapter first sums up the contributions from this study and then leads on to discuss possible implications for practice from the findings. The second part of the chapter, implications, is of a more speculative nature, generalising from the discussion in this chapter and giving normative advice on how to handle telecommuting. This is not always firmly grounded in the findings, and should be seen as reflections made by the researcher rather than as scientific results from the study.



## 9 Contributions & Implications

### ***Contributions***

The purpose of this study is to contribute with a deeper understanding to what impact telecommuting may have on an organisation, and more specifically how telecommuting influences management & co-ordination, communication structure and personal work routines. This is done by describing the impact from telecommuting in a few chosen organisations, and by proposing underlying mechanisms for the impact. The impact from telecommuting is largely presented in chapters five and six, and the possible underlying mechanisms are elaborated on and discussed in chapter 8.

The first contribution of this study is to describe the impact from telecommuting on three structural levels in the studied organisations. The impact of telecommuting on structure is shown to be low in the case of management & co-ordination, limited for communication structure and high for personal work patterns. This balance between impact on the three studied levels of organisational structure was not predicted in previous studies (Bailyn, 1989; Reinsch, 1995; Huvs, 1996). No previous studies on telecommuting have covered all the three structural areas of this study, and thus the approach of the present study is a contribution to the understanding of telecommuting.

The low impact on management and co-ordination is of interest, since this was seen as an area where changes were expected (Kugelmas, 1995; Reinsch, 1995; Nilles, 1994; Gray, 1993). Since little change was found regarding management and co-ordination, the expectations from previous studies and the popular press are not supported in the three studied cases.

A limited impact on communication structure and media use was found. This limited impact contributes to the discussion on media choice and media genres (Yates, 1992; Moberg, 1997; Webster, 1995).

The limited substitution of face-to-face communication to other forms of communication that is found in the three cases is a contribution to the discussion on the possibilities of new communication patterns due to ICT and new communication media. Alternative mechanisms for media use patterns are discussed. An argument for telecommuting is the technical possibilities to substitute presence with ICT-supported communication (Huvs, 1996), and this study contributes to the understanding of ICT use in telecommuting.

The work pattern study is in itself a contribution, as a descriptive and exploratory study of work patterns for R&D personnel, since few other studies of work patterns have been made of this type of work (Barley and Kunda, 1998).

The major adaptations of work patterns, made when telecommuting was introduced, linked to the weak adaptations in management and co-ordination as well as communication structure, shows the role of individual adaption in a telecommuting situation. Changes in work patterns are mentioned by previous studies, but are not linked to the other two structural levels which are included in this study.

The development over time has been sparsely studied (Huvs, 1996). The shown decrease in telecommuting over time, in combination with an organisational environment that is in favour of telecommuting, and the following discussion of underlying mechanisms, contributes to the understanding of telecommuting.

Mechanisms behind the changes, or lack of changes, in management & co-ordination, communication structure and personal work patterns, as well as the development of telecommuting over time, are proposed. Symbolic and institutional perspectives are discussed, and related to telecommuting. The proposed mechanisms are a possible starting point for further research.

### ***Implications***

This chapter takes the analysis and results a little further, drawing on possible implications from the findings. The generalisation of the findings is taken one step further than in the previous chapters, and some of the proposed implications are based on possible underlying factors that are shown to be plausible but not fully grounded in the

present study. The proposed implications are thus more speculative than the previous chapter, in the sense that they are not well grounded, but are more a plausible guide for organisations considering telecommuting as an option, given that the findings and proposed mechanisms discussed in chapter 8 are general. The implications are largely based on a combination of findings, previous theories and proposed underlying mechanisms. Parts of this need to be studied further. A proposal for further studies will be given at the end of this chapter.

### **Group and team implications**

Teamwork is largely dependent on face-to-face communication, as discussed in chapter 8. Teamwork is a way to integrate competences from more than one individual, a process highly dependent on face-to-face communication. Since telecommuting makes face-to-face communication impossible for certain periods (when being at home), it may influence the perceived commitment and coherence, which may not be suitable for some tasks requiring team efforts. The choice to include telecommuting as an option may make the organisation become more individually oriented, since rich communication decreases.

Rich communication is shown to be vital for creating a sense of belonging, a common culture and a common understanding (Norcia & Eccles, 1992). The conclusion is that telecommuting, due to the decrease in rich communication, influences teamwork in a negative way. This has direct implications for when telecommuting may be suitable. When teamwork is seen as an important tool to achieve a result, telecommuting may not always be a good choice .

As soon as there are dependence or group activities, telecommuting is more problematic than when solitary tasks and individual results are concerned. This is true at least when there is the option to arrange for presence. Absence may be tolerated, but will probably not be liked by colleagues, and will most likely be avoided when no external factors forces members of the group to be absent.

Note that the observations on telecommuting and teamwork are based on professional groups, with the main case being R&D activities. The basic group dynamic differ in other groups, and in a more

individualistic environment (result oriented on a personal basis), the conclusions may differ. There will most likely be a difference for more individual and manageable activities (predictable and controllable), but this is not studied here.

### **Telecommuting for other professional categories**

The form of telecommuting practiced in the present study, full days spent at home on a regular basis, will probably stay limited in most professional groups. It may, however, develop in groups where short-term, individually based results are the most important. On the other hand, these types of tasks are often connected to a less influential position in the organisation, which makes arguing for an option to work from home more difficult. A possible driving force here is company gains, productivity and cost savings. These are the common arguments in many telecommuting studies, of which some are discussed in chapter two.

The situation is different for the sales force, a group of individually evaluated employees, working largely on a result basis. Home-based sales force or hot-desking for these will probably be advantageous for the company, since group activities and actual group commitment is not central, the individual result is focused on. Task and telecommuting appropriateness have been discussed in several previous studies (Huvs 1990; Larsen 1996; Nilles 1994; Gray 1994; Bailyn 1989). The contribution from this study in the area of task and telecommuting appropriateness is to further stress the importance of presence in team activities, "virtual teams" seems to be second best, when presence is possible. These thoughts link back to contingency theories, and the discussions on organisational fit where the success of telecommuting may be seen as contingent on task, environment and several other factors.

### **Telecommuting introduction**

The observation that many pilot introductions of telecommuting fail (both in this study and other cases), in combination with the fact that most adaptations take place on the individual level (even in these pilots) can be taken as an argument for individually based introduction of telecommuting. Since most employees, according to previous studies, have no possibility or urge to telecommute, a large scale introduction of telecommuting in an organisation is not likely to be successful,



particularly if the organisation involves co-operation and knowledge work. The present most viable way to handle telecommuting seems to be on an individual and local basis. If a person wants to telecommute for a period, this may be allowed since the impact on the surrounding organisation is shown to be low and adaptations are made by the telecommuter to handle inconveniences. The individual introduction of telecommuting does not handle the cultural resistance to telecommuting, as discussed in chapter 8. Arguments need to be found on an individual level to justify the fact that this person is allowed to telecommute. This form of telecommuting involves more flexibility from the employee, combined with trust from the employer. Individual and local solutions seems to be a possible alternative to large scale introduction.

### **Telecommuting as an organisational tool**

Telecommuting may in some cases be used to increase the short-term result orientation of an organisation. A shift towards more result oriented and individually focused activities may be achieved by allowing people to work undisturbed from home. If the organisation is more focused on consensus, meetings and group activities, rather than actual output, less opportunities to meet and discuss may in some cases shift the organisation to a more result oriented and individual focus.

Presence gives the possibility for direct action, and face to face contact facilitates the handling of minor problems or questions that arise. The physical distance of telecommuting removes this possibility for part of the time. Removal of face to face contact may also have a constraining effect on the social and collaborative activities at the office, thus creating a more individualistic climate. This may be a dangerous path, if not carefully navigated, but telecommuting may be a tool in focusing on individual result. Telecommuting may also have the side effect of causing the organisation to become more rigid and less adaptive to rapid changes, due to fewer possibilities for discussing problems in informal forums, in a face to face situation.

A positive management attitude is not enough to make telecommuting successful. There are other factors that are shown to be strong in the three cases studied here, such as team aspects and institutional factors. These have influenced telecommuting negatively. With

management support, it may be the case that articulated top level management support does not include middle management support of the initiative.

Telecommuting has not been openly contested in any of the studied cases (except for the second part of the Info Company case, where it was stopped after a time), but a lack of support and an unspoken negative attitude may be just as powerful as open resistance. In the Telia case, technical support deteriorated in the new organisation, without management acting to support the telecommuters. Still, the company's official policy was to support telecommuting.

When discussing telecommuting, it seems to be appropriate to ask if the individual and short-term result is the most important factor, or if commitment and co-operation is more central to the organisation. Telecommuting may lead to an increased focus on the local or individual level, and make it more difficult to see the whole picture.

### **Technical and IT system implications**

The notion that telecommuting is primarily a technical problem is clearly simplistic. There are technical aspects of telecommuting, but the technical side does not seem to be the primary obstacle where telecommuting is concerned. The technical solution for telecommuting may be seen as a hygiene factor or a qualifying criterion. It is seen as very disturbing when the technical system is not working, but the main areas of concern when introducing telecommuting are not technical but social and organisational. This has implications on where a telecommuting initiative is placed in the organisation. If a telecommuting project is planned, this is clearly not to be placed in the IT or technical department. These are departments supporting an infrastructure needed to enable telecommuting, but the organisational change involved can not be handled by them. The idea that IT-based communication will be an substitute for face-to-face communication is unlikely. The substitution is shown to be low, and ITC is complementing rather than substituting face-to-face communication. This calls for a different strategy which does not concentrate on ITC applications to replicate face to face communication. A finding in the major case is that the technical system is a moving target. The home-system needs continous support, and upgrading in the same way as at the central office. This is easily neglected and focus is put on the

central system, as in the major case. The costs of maintaining a duplicate system in another location may be underestimated.

### **Future development of telecommuting**

In many cases, as in the three studied cases, the introduction of telecommuting is done on a pilot or individual basis. The findings show that this limited level of implementation has little impact on structural and communicational areas in the organisation. It is argued that the level of impact will be different if the whole organisation is telecommuting. However, studies imply that telecommuting is not a general solution (Moktharian, 1997). Several criteria need to be fulfilled, such as task nature, individual characteristics of the telecommuter and trust. This makes a large-scale introduction of telecommuting unlikely.

The most likely outcome is an organisation with only a limited number of telecommuters and a majority that does not telecommute. The question is then how to handle this mix rather than how to handle the full-scale telecommuting organisation. The organisation with a few telecommuters will face the problems raised in this study, while organisations with all personnel telecommuting will have different problems.

One of the conclusions of this study is that in the most likely case of telecommuting adaption, the consequences and adaptations in the organisation are less dramatic than anticipated. On the other hand, there are mechanisms that make the acceptance and implementation of telecommuting difficult, and these mechanisms are often underestimated.

Managers are often entrusted to telecommute, but they may have difficulties to practice telecommuting for symbolic reasons. Lower level employees are not always entrusted, but it may be argued that they should have better preconditions for telecommuting from a symbolic view. On the other hand, the symbolic reasons may operate at any level, concerning group commitment and symbolic interpretation of absence. With this line of reasoning it is not a matter of trust but a matter of symbolic commitment. If commitment to the group is important, pronounced or not, the acceptance of telecommuting will be more difficult.

### ***Proposed future research***

The role of communication media, and the potential role of IT, in creating new organisations and new organisational forms is partly challenged by the results of this study. The likelihood of substitution of face-to-face communication with other forms of communication, needs to be examined further. This is most relevant in the light of the public IT-optimism, which in some cases has over-estimated the power of IT and communication as tools. Communication and distance needs to be examined more critically, focusing more on communication characteristics rather than technical solutions.

An area that needs to be examined further in relation to telecommuting is the symbolic aspect of presence and commitment. This appears to be one of the major obstacles to telecommuting. It may not simply be a matter of changing the attitudes to telecommuting, as there is a deeper lying value base regarding group membership to consider. The commitment to a common task in combination with geographical aspects and absence from the group needs to be studied further, both from an organisational perspective and from a psychosocial perspective.

The issue of telecommuting's appropriateness in various tasks and organisational environment needs to be examined further. This study focuses on skilled knowledge workers, with a high degree of co-operation in their work. The situation is most likely different for other tasks and groups, and this needs to be studied further.

The development of telecommuting and geographically dispersed organisations needs to be followed longitudinally, focusing on failures as well as successes. There have been several case studies and pilots initiated in the last years, but the follow up on failures is scarce. To find reasons for why so many telecommuting implementations fail is important to avoid future mistakes.

Finally, after all the difficulties discussed, it should be remembered that there are certain advantages with telecommuting, not least on the individual level. This study has brought up many negative factors and mechanisms working against the successful implementation of telecommuting. However, even if these factors are strong, the positive aspects of telecommuting must not be forgotten.

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## **Appendixes**

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- 5** Work diary form
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## **Appendix 1 Data Sources**

### **1A Data sources Telia reserach**

Several modes of information gathering has been used in the project. Below are the major sources of input in the analysis in this report. // Rognes means that data collection is performed by Rognes, and similar for // Telia. The interview set-ups and contents are always discussed and agreed by both parties. If nothing else is stated, interviews are between one and two hours. Data is presented in chronological order.

#### Official documents

Annual reports for Telia and Telia Research

Agreements on telecommuting

Organisational charts, memos and policy documents, telephone books, etc.

#### Expectation interviews, all involved (Dec 1994 - Jan 1995)

Interviews with future telecommuters (10 interviews), control group (11 interviews) taped and transcribed, word by word, 4-8 pages per person. Interviews with administrative personnel, (7 interviews) summary, managers (2 interviews), spouses (10 interviews) summary. All interviews are structured with a pre-set questionnaire. // Telia

#### Discussions and meetings during star up and project (Feb 1995 - Feb 1996)

Meeting protocols, notes from discussions and other project documentation. (approx. 100 pages) // Rognes

Logging of mail (newsgroup for telecommuters)

Logging of mail within telecommuter newsgroup (only parts of total mail, no access to detailed files) // Telia

#### Work diaries (detailed logging of activities)

Minute-level logging, by telecommutes and colleagues, at home and at work. Approximately 150 one-day diaries, with comments. Work diaries were regularly followed up by short interviews (5-10 minutes). Diaries from April, June, August, October and December. // Rognes and Telia

#### Questionnaires regarding equipment and technical solutions, (June 1995)

Questionnaire regarding technical. Questions about tasks, social relations and work situation in general. Open question for personal comments. Approx. 7 pages per person. (11 questionnaires) // Rognes and Telia

#### Interviews with telecommuters autumn -95 (Oct - Nov 1995)

Interviews covering a brief follow up on events and general comments. Main focus on personal situation, work content, social issues and general personal reflections. (11 interviews), 1-2 hour interviews, taped and summarised in text, approx. 2-3 pages per interview. // Telia (Rognes)

#### Interviews with managers autumn -95 (Sep - Nov 1995)



Open interviews on attitudes, effects and actions on telecommuting. Structure, work situation, management. (3 interviews) 1-2 hour interviews summaries in text, approx. 3 pages. // Rognes

Interviews with colleagues autumn -95 (Nov-Dec 1995)

Covering communication, work situation, structure and social issues, partly structured interviews, some open questions. (9 interviews), 2 hour interviews, taped, summary in text, 2-3 pages. // Rognes

Interviews with project personnel. Interviews with persons involved in two major projects, related to telecommuting. General mapping of work routines, and telecommuting impact on projects. (7 interviews, project diaries). Report, 30 pages, (no access to detailed source.) // Telia

Interviews with telecommuters spring -96 ( Jan-Feb 1996). Follow up on all areas, lengthy interviews, two interviewers. (10 persons), 2 hour interviews, taped and summarised in text, approx. 4-7 pages. // Rognes

Questionnaire to spouses (Jan-Feb 1996) Follow up on personal issues, structured telephone questionnaire, (9 questionnaires) // Telia

Interviews with related other personnel and administration (Jan -96). Follow up on general areas, open interviews (6 interviews) 30-60 min , text summaries 3-6 pages // Rognes

Interviews with telecommuters winter 1997. Follow up on all areas, 2 hour interviews, two interviewers. (10 persons), taped and summarised in text by both interviewers, approx. 4-7 pages. // Rognes

Quantification of impact from telecommuting. Self assessment using a form with a -2 to 2 scale for assessing telecommuting's impact on various areas, see appendix 4. Used in last set of interviews, filled in by interviewer in co-operation with teleworker.

### **Company Internal Reports, Telia**

Evaluation criteria for internal telecommuting project (Swedish title: Utvärderingskriterier för det interna projektet med telependling på Division Tjänsteutveckling). 1994-04-12

The telecommuting project at Telia Research: background and description. 1995-06-21

Employee Expectations on Telecommuting, Division of Service Development. 1995-06-29

Work roles and the individual practice of telecommuting. 1996-04-09

Introducing telecommuting at TrAB, Division of Telecom Service. 1995-08-23

Telecommuting and Project work at Telia Research, Rogberg, 1996-02-29

Telependling och Projekt - Arbete på Telia Research. 1996-06-06

Arbeta Hemifrån, five reports on telecommuting, Leif Rune Hedman, TF-rapport  
1995-11-23

## **1B Data sources Info company**

Project documentation on telecommuting project, minutes from meetings and action plans, 9 documents spanning over 10 months, approximately 40 pages.

Summary of questionnaire on telecommuting impact, 18 respondents, colleagues, no access to primary data, summary 3 pages.

Interviews managers winter -97 (Jan-March). Open interviews on attitudes, effects and actions on telecommuting. Structure, work situation, management. (2 interviews) summaries in text, approx. 3 pages. // Rognes

Interviews with telecommuters winter -97 (Jan-March). Open interviews on attitudes, effects and actions on telecommuting. Structure, work situation, management. (2 interviews) summaries in text, approx. 3 pages., including a self assessment on telecommuting impact, see Telia // Rognes

## **1C Data sources Department of social affairs**

Interviews with minister, regarding personal work situation and consequences of telecommuting. Approximately 30 minutes, taped // Rognes.

Interview with head of department, ministers personal assistant, focusing on ministers telecommuting and on telecommuting in the surrounding organisation. 2 interviews approx. 2 hours, taped, // Rognes

Interviews with personnel at the secretariat of law. 3 interviews, approx. 1 hours each. // Rognes

Internal Report on telework in the Ministry of Foreign Affairs (Utrikesdepartementet, 1996).

## Appendix 2 Time Schedule for projects

### the Telia project

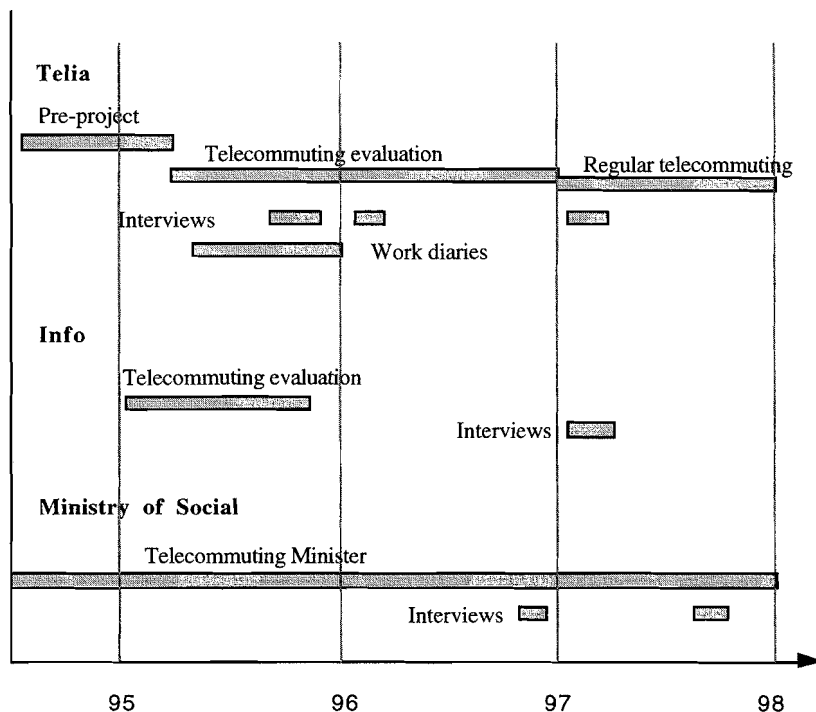
Aug -94	Project start
October -94	Applications to become telecommuter
Nov -94	Choice of telecommuters
Jan -95	Expectation interviews
Feb -95	Legal agreements set, practicalities set
Jan / April -95	Telecommuters started
April - Dec -95	Work diaries
June -95	Questionnaire on start-up and equipment
Sept - Nov -95	Interviews 1
Dec - 95	Reorganisation at Telia Research
Jan-Feb -96	Interviews 2
Jan-Feb -97	Interviews 3

### Info Company

Jan-Nov 95	Project period, internal follow up
Jan-March -97	Interviews

### Department of social affairs

1994-1998	Telecommuting for minister
Nov 96-Sep 97	Interviews



### Appendix 3 Interview guides

These guides are used as checklists during an unstructured interview, and not as questions to be answered. For some interviews all areas are covered, but for others only relevant areas or areas that has not been covered by other means is brought up in the interview. Since interviews were performed in Swedish, the guides were originally in Swedish. This appendix is a translation from Swedish.

#### *General interview guide for Telia and further cases*

(not to be fully completed, interviews are concentrated on selected sections)  
In Swedish

#### Interview guide, telecommuting

Area	Issue	Key-words
Company / Group / person general	Open first question	Experiences from telecommuting +/-
	Person, main tasks	Position Links to other persons, functions
	Company , (division) main area of business	Sector Size Product/service International contacts Links to other companies
	Personal profile	Private life, family, education
	Profile of own work group	Education , attitudes, work habits, age structure
	Work site as a large	Subjective statements , such as bureaucratic, messy, flexible, young, stiff, etc
Tele- commuting general	Company's official position	No position Positive, negative, neutral
	Who telecommuters	You, others, since how long
	How much of the time	Part of total time distribution

Work in general	Why did it start	Personal, work related, others
	Technical issues, technical dependence	Computer connections, modems, Mail, Telephone, videoconference, fax, others
	Work content, your own	Tasks, formal, informal, self afflicted, use of time
	Dependence of others	Describe tasks where dependent
	Degree of solitary tasks	Examples How large part of total work
	Work situation change due to telecommuting	Group situation Co-operation Work division, tasks responsibilities
	Work content change due to telecommuting	Other tasks Amount of work, distribution Generalist specialist
	Work routines, own planning, doing work	Split between home / work Planning and structures
Management	Results, impact form telecommuting	Quality Efficiency Time use
	Co-ordination in the group	Meetings Formal rules PM / reports Informal mechanisms
	Follow up and result measurements	Soft variables Hard variables Unclear, implicit
	Has this changed due to telecommuting	?
	Has your relation to your manager changed due to telecommuting	Type of management Level of details, own initiatives, change in communication, degree of freedom
	If you are a manager, has your relation with subordinates changed	As above

Communi- cation	Meetings Routines Planned / unplanned	Form, content frequency, degree of formality, time, structure, roles at meetings
	Has the frequency of meetings changed	As above
	Has any other forms of meetings been introduced	Telephone meetings Video conferences others
	Professional contacts, have they changed	More result oriented Reachability Help with problems
Others	Social contacts with others in the work group, changes?	Coffee chats Talk in the corridors
	Problems?	Isolation?
	Have you seen any impact on the organisation as a whole due to your telecommuting	Structure roles
	Project set-up Roles and tasks Any difference?	Talk about project phases and career development in general
Free reflection	Career, any impact?	visibility
	General comments What has been affected most by telecommuting	Own role? Work situation? Surrounding organisation
	How do you find others view on your telecommuting	Managers Group members Other colleagues Support personnel External persons
	Have you encountered any problems?	Open question
	Have you encountered any advantages?	Open question
	What advice would you give to someone that are thinking of telecommuting?	

## ***Interview guide for interviews 2, Telia***

(Translated from Swedish, original guide only used in Swedish.)

### **General**

Start and end with an open question

Invite respondent to make own reflections on the importance of telecommuting for work and private life.

### **Work patterns at home/ at the office**

Do you take breaks, how are they over time (looks like few breaks in work diary)

How much extra time do you work (unpaid)

With work (free labour)

With own development (internet etc)

### **Work role**

Has your role changed due to telecommuting in any of the following areas

Specialist (stronger division of labour)

Generalist (more independent, larger area for one self)

Independent tasks (less dependence of manager, own decisions)

Has the amount of own decision increased?

Has your own delegation changed (if you are a project manager))

### **Efficiency / productivity**

Do you see yourself as more efficient when you telecommute? What influences this?

Do more different tasks (scope of work)

Do one thing better (concentration)

Work more time (free overtime)

Use the time better (more structured, less disturbed)

### **Relations and contacts**

When at the office, how often do you have spontaneous encounters with colleagues (compare to work diary)

Has your relations to colleagues changed due to telecommuting

Does old relationships become better/worse

How does it work with new relationships, newly employed

### **Reorganisation**

Have you been more at the office due to the reorganisation

Did you know what was going on, or were you badly informed (due to telecommuting)

Has your new boss questioned your telecommuting

Has your choice of new position been influenced by your telecommuting

### **Structure and meetings**

Have you seen any formal adaption from the surrounding organisation to your telecommuting



How have things worked with secretaries and support personnel

Reachability (both ways)

Support when you telecommute

Do you see any difference in meetings when you are at the office

More planned meetings

More short / spontaneous meetings

### **Projects**

In the projects you have participated in

In which of the se have telecommuting worked well / not so well

Type of project

Your role

why

Has telecommuting worked better / less good during any particular phase in projects

Phases, intensity in project

why

Has the fact that members in the project were telecommuters been taken into consideration.

### **Spontaneous and social contacts**

Do you see any difference in the way you spend the time at the office now compared to when you did not telecommute

Are your coffee breaks of the same length and frequency

(how much is that)

What do you discuss during coffee breaks

work

others

### **Finally**

State the three first things that come to mind linked to telecommuting, positive or negative

#### Appendix 4 Basis for quantification of telecommuting impact

(Translated from Swedish, original guide only used in Swedish.)

Filled out by interviewer and telecommuter jointly

	-2	-1	0	1	2	?	irr
Social contact with colleagues							
Feel like a "Telia-person"							
Satisfaction in work							
Contact with my boss							
Development in tasks							
Level of difficulty in tasks							
Career development							
Like it at the office							
Stress level							
Amount of overtime							
Clear tasks							
Control over own work situation							
Own planning							
Number of short assignments							
Reachability for others							
Effective work time							
Time in meetings							
Quality of work							
Distance to "where things happen"							
Communication with colleagues							
Get things done							
One in the team							
Contacts outside the group							

( ? = don't know; irr = irrelevant question)

**ARBETSDAGBOK**

Namn:

Datum:

Ange i minuter den tid du varje timme lägger på olika arbetsuppgifter.  
För telefonsamtal och besök/möten ange både antal och total tid ( $\Sigma$  min.), samt  
om du uppfattade eventuella avbrott som negativa (-), neutrala (0) eller positiva (+).

Tim	Datorarbete					Telefonsamtal				Besök/Möten				Avbrott	Annat	
	mail	rapport skrivn.	rapport tläsnin g	data- bas	annat	inkomman- de		utgående		spontant		planerat		bedöm- ning		
	min.	min.	min.	min.	min.	ant.	$\Sigma$ min.	ant.	$\Sigma$ min.	ant.	$\Sigma$ min.	ant.	$\Sigma$ min.	- , 0 , +	min.	beskrivning /kommentar
6-7																
7-8																
8-9																
9-10																
10-11																
11-12																
12-13																
13-14																
14-15																
15-16																
16-17																
17-18																
18-19																
19-20																
20-21																
21-22																
Summa																

## Appendix 6 Development of telecommuting over time at Telia

The development of telecommuting for the test persons over time

Perceived optimum level of telecommuting after two years

TCdays/ week after 3 months	8 months	1 year	2 years
2	1,5	1,5	0
1,5	1,8	1,7	1,2
1,5	1,5	0,8	0,8
2	1,5	1	1,5
2	2	2	0
2	1,8	2	1
2	2	2	3
2	1,5	1,5	1,2
1,5	0,2	0	0
2	1,5	1,5	0,2
1	1	1	0

TC: days a week preferred
0
1,5
1
2
1,5
2
2
1,5
0
1

## Appendix 7 Work diary results

Percentage of time spent in activities, not aggregated to constructs

	<u>Telecom. at Home</u>	<u>Telecom. at Office</u>	<u>Telecom in average</u>	<u>Colleagues contr group</u>
<b>Mail</b>	10,9	8,04	9,44	8,44
<b>Write</b>	42	13,8	27,5	20,5
<b>Read</b>	20	6,74	13,2	15,8
<b>Comp</b>	13	9,34	11,1	7,39
<b>Tele</b>	10,5	6,95	8,68	6,65
<b>Spont meetings</b>	0,02	9,68	4,99	8,42
<b>Planned meetings</b>	3,45	44,6	24,6	32,3
<b>Others</b>	0,12	0,88	0,51	0,51
<b>Pause</b>	14,8	11,7	13,2	11,8

## Appendix 8 NUD.IST Codes used for thematic analysis

(1) /Type  
(1 1) /Doc.  
(1 1 2) /Doc./Questionnaire  
(1 1 3) /Doc./Obs&Notes  
(1 1 4) /Doc./Proj doc  
(1 1 5) /Doc./Int.Notes  
(1 1 6) /Doc./Int.Summary  
(1 1 7) /Doc./Int transc.  
(1 1 8) /Doc./Ohters

(1 2) /Company  
(1 2 1) /Company/Telia R  
(1 2 2) /Company/Posten  
(1 2 3) /Company/Byggj

(1 3) /who?  
(1 3 1) /who?/TP  
(1 3 2) /who?/Colleague  
(1 3 3) /who?/Manager  
(1 3 4) /who?/Support  
(1 3 5) /who?/Tech support  
(1 3 6) /who?/Spouse  
(1 3 7) /who?/Proj group

(1 4) /Period  
(1 4 1) /Period/Pre-project  
(1 4 2) /Period/Start-Up  
(1 4 3) /Period/Spring-95  
(1 4 4) /Period/Summer -95  
(1 4 5) /Period/Autumn -95  
(1 4 6) /Period/winter 95-96  
(1 4 7) /Period/spr 97

(1 6) /Prep by  
(1 6 1) /Prep by/Jon R  
(1 6 2) /Prep by/Proj grp  
(1 6 3) /Prep by/Comp repr  
(1 6 4) /Prep by/Other

## Appendix 8 (2)

- (2 1 1) /Comm./ Media
- (2 1 2) /Comm./ Meetings
- (2 1 3) /Comm./ Formal
- (2 1 4) /Comm./ Informal & Spont
- (2 1 5) /Comm./ Social & relations
- (2 1 6) /Comm./ reachability
  
- (2 2 1) /Mgmt & str./ Leader Style
- (2 2 2) /Mgmt & str./ Plan, routine & follow up
- (2 2 3) /Mgmt & str./ Coord. mechanism & cooperation
- (2 2 4) /Mgmt & str./ Formal Structure
- (2 2 5) /Mgmt & str./ Adm & Support & tech support org.
- (2 2 6) /Mgmt & str./ Culture & Group awareness
- (2 2 7) /Mgmt & str./ Meeting structure
  
- (2 3 1) /Work routines/ Time, when TP and amount of work
- (2 3 2) /Work routines/ task , split h/w and planning
- (2 3 3) /Work routines/ productivity& quality
- (2 3 4) /Work routines/ content & career
- (2 3 5) /Work routines/ leisure & flex
- (2 3 6) /Work routines/ daily shedule
- (2 3 7) /Work routines/ access to infrastrucutre
- (2 3 8) /Work routines/ disturbance
  
- (2 5 1) /Tech&envir/ Equipm & tech support
- (2 5 2) /Tech&envir/ Office & real estae
- (2 5 3) /Tech&envir/ Ergonomic
  
- (2 6) /Others
- (2 6 1) /Others/ Travel
- (2 6 2) /Others/ TC general
- (2 6 3) /Others/ Org change
- (2 6 4) /Others/ Private
- (2 6 5) /Others/ Project
- (2 6 6) /Others/ Others
  
- (3) /Person char
- (3 1) /Person char/Education
- (3 2) /Person char/Family
- (3 3) /Person char/Home&travel
- (3 4) /Person char/Tasks

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