Telework – Work Environment and Well Being. A Longitudinal Study

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Abstract

The aim of this study is to analyse the effects that part-time tele-commuting from home will have on office workers' physical and psycho-social work environment, at home and at the ordinary workplace, as well as on their general well being. Twenty-eight employees from two organizations were followed for a 2-year period. Diaries, interviews, and expert evaluation were used to collect data. Participants experienced part-time (1-2 days per week) telework from home as being helpful in obtaining a balance between work and leisure time, and in being more

effective in their work. The participants worked more hours at home, worked long hours without breaks, and worked late at night and on the weekends at home. The workstation was seldom as good ergonomically at home as at the office. All the respondents experienced problems with the computer equipment and computer system.

Conclusions: Introducing telework can enhance work effectiveness; however, it can also result in both an increase in workload and various work-related health risks.

1 BACKGROUND

1.1 Technology

During the 1980s and 1990s, a rapid development of information and communication technology suitable for use in private homes has transpired. Technical and commercial development, leading to better and cheaper equipment, has facilitated the private use of computers. The Internet has made global computer communication from home more expeditious. Ericsson and Nokia, two world leaders in telecommunication, have contributed to give Sweden and Finland, respectively, a strong position in the field of electronic communication. Changes in tax legislation and worker unions engaging in offering their members computers at discount prices have also helped Sweden to reach a leading position concerning computerization in the home and teleworking (Rognes, 1999).

In a study during September 2001 Statistics Sweden found that 32 % of the Swedish population between 16 and 64 years of age used computers at home every day, and 61 % every week (SCB, 2002). In the future, we will see continued integration between computer and telecommunication technology. The development of "intelligent homes" and "intelligent buildings," using computers to manage different kinds of equipment and systems, such as heating and lightning, will continue. Thus, computer-based communication in private homes will continue to develop at a rapid rate.

1.2 Labour market

The economic problems, including growing unemployment, during the early 1990s led to a restructuring of the labour market in Sweden. More people are working as short-term employees, with less security and greater flexibility (Statistiska Centralbyrån [Statistics Sweden] [SCB], 1998). All kinds of flexibleness (in space, time, salary, legislation, etc.) have been "trendy" concepts in modern working life.

1.3 Telework

In the development toward increasing flexibility in working life the concept of telework, in different forms, has been presented as a solution, both to employers and employees' difficulties. There is no generally accepted definition of the term telework; because of that, there are no exact figures on the number of people engaged in telework.

Since 1986, there have been a number of Swedish studies on the topic of telework, but unfortunately with different definitions of the concept (Statens Offentliga Utredningar, [The Swedish Government] [SOU] 1998a). Still, we can safely conclude from these studies that the number of people working "at a distance" (i.e., from somewhere else than the employers' premises) at least one whole day per week has been around 250,000 from the middle of the 1980s until the end of the millennium.

Most of these individuals are working from their home and approximately half of them use information and communication technology. Only a small number, 30,000-50,000 people, are connected to the computer system of their organization/employer while on-line (SOU 1998a). For over 20 years, there has been an expectation that the number of teleworkers will increase and, despite the fact that this has not come true, the anticipation is still strong.

1.4 Work Environment

Today, 66% of the Swedish work force use computers in their work, 35 % of the women and 30% of the men use computers at least half of the working day (Arbetsmiljöverket [The Swedish Work Environment Authority] [AV] 2001). Several studies have shown that the use of computers and visual display units (VDUs) at work produces increased mental and physical workload and a higher risk of somatic and mental health symptoms, especially eye strain, neck/shoulder problems, and psychosomatic symptoms (Aronsson, Dallner, Åborg 1994, Aronsson, Åborg, Örelius 1988, Bergqvist 1993, Punnett & Bergqvist 1997). Computer systems that are to be used by skilled professionals are often poorly designed and lack usability (Nielsen 1993).

1.5 Musculoskeletal Disorders

The health problem that has most often been related to VDU work is probably musculoskeletal symptoms. The most frequent symptoms are located in the arm, hand, and wrist but also in the neck and shoulder areas (Fernström & Åborg, 1999). At Swedish work places, there is an ongoing

process to successively introduce such office appliances as easily adjustable tables, flexible chairs, forearm support systems, modern keyboards and other input devices, and larger and better quality computer screens. Despite these improvements, various health problems often emerge.

Although the general ergonomic standard is relatively high, the individual workstation can be problematic. This knowledge implies that each employee needs to have his or her workstation individually designed.

1.6 Work-related Stress

According to figures from the Swedish National Board of Occupational Safety and Health (AV) and from Statistics Sweden (SCB), negative stress at work is increasing; for example, two of three persons in the Swedish work force express that the work pace has increased since 1995 (AV 2000). The AV and SCB studies as well as studies from the National committee on public health (SOU 1998b) suggest that work-related stress has increased over the past years and is a growing health problem.

Work organisation and work content are important factors concerning stress-related problems (Aronsson et al. 1994). The same authors claim that also information technology (IT) plays an important role: mental workload tends to increase when new IT systems are introduced.

There are important stressors directly related to the technology (hardware and software) itself. Temporary stoppages, system disruptions, and unexpected long response times are common and highly stressful to most computer users (Aronsson et al. 1994). Psychophysiological studies have shown quick stress-responses to system disruptions, including increases in blood pressure and different stress-hormones (Johansson & Aronsson, 1984). One important factor related to these reactions is the feeling of uncertainty and helplessness the situation creates: what happened? Did I make an error? How long will it take? What shall I do now? These feelings are more stressful when working by yourself at home than when working at an ordinary workplace.

You can find causes and explanations to technical disruptions in both the hardware and the software that make up a computer system. Badly designed computer systems lead to inefficient use and may cause a variety of cognitive problems, such as confusion, lack of overview, and memory overload (Nielsen, 1993). In the next step this can lead to high mental workload, frustration and stress (Aronsson et al. 1994).

1.7 Work Environment Outside the Ordinary Workplace

Some recent Swedish studies on teleworking from home have been reported (Hultén 1998, Rognes 1999, Sturesson 2000, Wikström et al. 1997) though these studies have not focused on the work environment. So far, we cannot learn very much about physical and psychosocial work environments for teleworkers from the scientific literature.

When persons are not at their ordinary workplace, normal routines and requirements are not in effect. If you are temporally working in some other employer's premises, that employer has a certain responsibility, but if you are working in a hotel, on a ship or in an airport, your ordinary employer has the responsibility for your work environment. According to Swedish law, a person's employer has the exact same responsibility when the person is working from home as when he or she is at the office/the regular workplace. Despite this fact, the physical workplace at home is often not acceptable from an ergonomic argument.

There are few studies on professional, white-collar workers' work content and working patterns.

There are strong expectations that the information technology will change our way of working. Nevertheless, we still have little knowledge about what people actually do at a workplace and when and where they do it (Rognes, 1999).

2 DEFINITIONS

For this study, we define telework as "the use of IT to perform office work at home rather than from the ordinary workplace."

3 AIM

The aim was to analyse the effects that part-time telecommuting from home will have on office workers' physical and psychosocial work environment, at home and at the ordinary workplace, as well as on their general well being.

4 MATERIAL AND METHODS

4.1 Design

A longitudinal design was used. Data collection occurred on three occasions: a few months after teleworking was first initiated and then one and two years after its introduction.

Parallel to the longitudinal studies, cross-sectional studies were also carried out.

4.2 Study Groups

This paper is based on the results from three groups, one from a state-owned company (n=5) and two groups from a local authority in Stockholm, (n=11 and n=12).

Of these 28 participants, 17 (n=12 + n=5) were followed longitudinally and the remaining 11 were studied only once, after the introduction of telework, see Table 1 below.

All respondents had qualified administrative work and had been working for several years in their present line of work.

Organisation	***Subjects, N=***	***Study groups***	***Design***
A	***12***	***1***	***longitudinal***
A	***11***	***2***	***cross-sect***
B	***5***	***3***	***longitudinal***

Table 1. Study Groups

After the study period, four colleagues who were not involved in teleworking and four supervisors to the teleworkers from organization A were interviewed concerning their experiences and personal opinions.

4.3 Methods

Methods used were interviews, expert evaluation and diaries.

In the longitudinal study interviews were conducted on two separate occasions: a few months and 2 years after the introduction of telework. The interviews were semi-structured and concerned work content, workload, personal control, peer and supervisory relations, social support, balance between work and leisure time, and concerns about the future. Each interview session lasted for about 90 minutes. An expert that specialized in occupational health psychology and that was experienced with this type of investigation conducted the interviews.

An expert in ergonomics evaluated the participants' physical activity and the physical ergonomics at the office and at the workplaces in the participants' homes on two occasions (i.e., a few months and two years after the introduction of telework). In the evaluation procedure, the ergonomist used checklists, interviews and photo documentation to document work places, tasks, activities and equipment (Fernström, 1997).

One year after the introduction of telework, diaries were kept by six respondents in group 1 (Dallner et al., 1993). The diaries were used to collect data on how long and at what time of the day the subjects worked on various tasks. They also were asked to report any breaks they took (e.g., for lunch and coffee breaks) and all travelling that were made during the day. The subjects filled in the diary during two "office day" and two "home days. The diary contained columns in which pre-determined tasks and other activities (e.g., breaks and journeys) were listed. The diary also included rows in which the times of day from 07.00 to 24.00 were given.

In the cross-sectional studies interviews and ergonomic expert evaluation were conducted 6 months after the introduction of telework to that group in organisation A, and supervisors and colleagues to the teleworkers in this organisation were interviewed 2 years after.

5 RESULTS

5.1 Work Patterns

The participants were allowed to work one or two days per week from home and were free to schedule these days from week to week. The mean time spent working from home slightly decreased for the longitudinal

study groups (groups 1 and 3), from 1.1 days per week a few months after the introduction of telework to 0.9 days per week two years after.

This decrement could be accredited to the participants' own choice and not to any managerial decision. The mean home working time for group 2, the cross-sectional study group, was 1.5 days per week 6 months after the introduction of telework.

From the interview data, it was found that 25 of the 28 respondents worked longer computer hours at home than at the office. Moreover, all participants reported that they worked longer periods at home without taking a break at the VDU. Seventeen participants stated that they used the computer equipment at home to work on the weekends and in the late evenings. At the first interview the mean daily number of working hours was 1 hour longer at home than at the office (9 hours vs. 8 hours). The total computer time was more than 5 hours at home and 3 hours at the office; the time spent on a computer without taking a break was longer at home than at work.

Only 6 of 17 respondents reported taking walks when working at home.

The second interview (i.e., 2 years after teleworking was introduced) showed that, according to the respondents, the time spent on a computer and the length of the computer periods at home had not changed, but they said a little more of the working hours were spent in late evenings and during weekends. The mean computer time at the office had slightly increased (from 3 hours to 3.5 hours per day). Time spent for lunch and the frequency of walks during lunch breaks had decreased on home working days, whereas these activities on office days went unchanged.

The diaries showed that the total time spent at a VDU was longer at home than at the office. In addition, the VDU periods without breaks were longer and the time used for breaks was shorter at home.

The data from the diaries also showed that the work content differed a lot between the "home days" and the "office days." The most common work tasks at home were computer tasks, writing text on a computer (mean time 215 minutes per day), and reading text on a computer screen (mean time 28 minutes per day). This means that the participants worked at home a little over 4 hours per day on the computer. Thus the respondents reported more computer time per day in the interviews compared to the diary data. This is not an unusual phenomenon, as reported in earlier studies (Fernström & Åborg, 1999). When working at the office, the mean time on the computer was 2 hours per day. The dominating activity at the office was attending internal and external meetings, which occupied a mean of 3.5 hours per day.

The time spent on the telephone per day was twice as long at home (mean 38 minutes) than at the office (mean 19 minutes).

The distribution of working hours over the day did not differ substantially between home and office days, except that working late in the evening was somewhat more frequent when working at home.

5.2 Physical Ergonomics

5.2.1 Study Groups 1 and 3 (the Longitudinal Study)

Data collection 1 (n=17)

The physical ergonomics at the workplace and at home had, at the time for data collection 1 gained little or no interest from employees and management alike. The furniture was found not suitable for the type of work carried out and the lighting conditions were rarely given a high rating. The need for ergonomic guidance was great and such help was clearly expressed by the respondents.

Technical equipment was seen as unsatisfactory (e.g., the fax and printer caused problems and stress). Technical support was also unacceptable and routines and systems for support were not yet established.

At the office, the workplace ergonomy and technology were rated as satisfactory.

Physical exercise performed at home during working days was limited. During ordinary office days, the mean walking time to and from transportation was 20 minutes per day. However, after the start of telework, only 6 of 17 persons took a break for walks during "home-days."

Data collection 2 (n=12)

Five of the respondents in the original group had left either the organisation or the telework project.

Using the same methods that were described with respect to the first evaluation (data collection 1), a new evaluation of the physical ergonomics at the participants' home and office was conducted 2 years after the introduction of telework. The second evaluation indicated that the physical ergonomy was improved: 6 of 12 participants had new and better tables. 3 participants had obtained especially designed "home-work-cabinets", but this did not quite work as intended; Two of these cabinets were too big for the intended place in the home and at the same

time the cabinets were too small to give the users enough working space. Lighting was found to improve at the home and office workplaces.

At the office, the physical ergonomy for most of the participants was unchanged, though a few participants did receive new chairs or tables.

The technical equipment was also improved, but 8 of 12 participants still had frequent problems with system disruptions (e.g., temporary stoppages, unexpected long response times) and with insufficient technical support.

Breaks, including lunch and physical exercise (e.g., walks) during working days at home had decreased from an already low level; these same activities had not changed during work days at the office.

5.2.2 Study Group 2 (Cross-Sectional, n=11)

This group was observed on only one occasion, 6 months after the introduction of telework. The persons in this group belong to the same organisation as the participants in group1 (Organisation A in Table 1). The observations were made during the same period as in group 1, i.e. during the second data collection period (see Table 2). This means that the project management could use almost 2 years of experiences from group 1 when implementing telework for group 2. As a result of these experiences, the organisation was willing to spend more money on technical and other equipment for those working at home in this second group.

Despite these better opportunities, the physical ergonomy at the home workplaces varied considerably from very good to very poor quality.

The technical equipment at home was better for group 2 than for group 1; still the respondents experienced technical problems and insufficient technical support, and had not acquired all the software they needed.

5.3 Psychosocial Factor

5.3.1 Study Group 1 (the Longitudinal Study).

Data collection 1 (n=6).

A few months after the introduction of telework a psychologist conducted semi-structured interviews with 6 randomly selected teleworkers.. The interview data are summarised under the following headlines: work

content/workload, contact/cooperation, information, technology, working at home and expectations for the future.

Work content/workload. The workload varied substantially, but was most of the time perceived as too high. Workload, time limits, etc., were hard for the individual to gain control over and most of the participants had such specific tasks that it was difficult to obtain help from others. A good part of the day was spent in meetings, often with the result that evenings had to be used for writing. Working overtime was common, but because most of the tasks were seen as stimulating, working beyond the regular number of working hours was accepted.

Contact/cooperation. Each one of the participants did most of the work exclusively, with little contact with supervisors or colleagues. When cooperation did occur, it was more common to find it with partners outside the organization than with colleagues within the organization. Five of the respondents were quite satisfied with this situation, but 3 of them wanted more internal cooperation. Social support could be found when needed and the general atmosphere was good.

Information. Work-related information was given "top-down," on paper and in meetings. Three of the participants expressed feelings of "information overload." Electronic information was seldom used.

Technology. The IT caused various problems and stress. The technology was not adequate at the office and even inferior in quality at home. Management failed to show enough interest in issues related to IT.

Working at home. When the first data collection was done, the respondents had only a few months experience of teleworking from home. They all were quite positive, both professionally and privately. The work at home was perceived as effective, with fewer disruptions than at the office. The participants also noted that they could concentrate better at home. Four participants felt it was a relief not having to travel to and from work, and that it was easier to adjust the work to the needs of the family. Two mentioned the risk of working long hours and spending too much time in the evenings and weekends working.

Future expectations. All the 6 participants had a strong desire to continue the telework and expected to increase the number of days at home (e.g., from 1-2 days to 2-3 days per week). However, all agreed that the technology and technical support had to be improved.

Data collection 2 (n=5).

Two years after the introduction of telework, the same interviews were conducted with the same participants. At the time of the second interview, one participant had left the organization and hence was not interviewed.

Work content/workload. The workload was still too high and even a little higher in comparison with the first interview period. All of the respondents expressed the problem of working long hours and working many evenings and weekends at home. At the same time, they all perceived telework as a positive opportunity to cope with the high work demands effectively. They had been working a little more than normal because of the opportunity to work at home, but also believed they had worked more effectively, which was reinforcing.

Contact/cooperation. The telework program had not influenced these factors. Probable explanations for this lack of influence, according to the participants, are that they worked only a few days per week at home and the individual character of their work tasks. The participants availability to others was even better at home than at the office, apparently because they were on the phone most of the time and not attending meetings. Despite these facts, all the participants had some worries for the future, and the fear to loose contact and information was a major factor underlying their decision not to work more than about one day per week at home.

Information. Electronic information was used to a greater extent than earlier, but was still not used very often or effectively. Work-related information was not affected by telework, but there was concern that informal, social information was negatively affected.

Technology. Throughout the teleworking period, technical disruptions had been a serious problem and a major stress factor. All the respondents expressed the need for more advanced equipment and improved technical support.

Working at home. Working at home had largely been experienced as positive. One important reason for this positive attitude was the feeling of higher personal efficiency during the home working days. Not having to travel every day to and from work and a better balance between work and leisure time were other important factors. The families had generally been positive, except they did express a few negative reactions concerning late working hours. Two of the participants still needed help in adjusting the workstation at home, which management had promised to arrange.

Future expectations. All participants reported that they wished to continue the telework program and were convinced that the project would expand and eventually become permanent. They thought that the work days per week at home should be limited to 1-2 in order to avoid negative effects concerning contact and cooperation. They asked for better technical equipment and support.

5.3.2 Study Group 2 (Cross-Sectional n=5).

This group was interviewed 3 months after the introduction of telework.

Work content/workload. Three of the 5 participants reported problems with a workload that was overwhelming and that continuously increased despite long work days. The participants hoped that telework would be a better way to cope with the situation. As one of them noted: "it's better to work at home than to go to the office on the weekends."

Contact/cooperation. According to the participants, the individual work pattern and the high workload resulted in diminished contact and cooperation. The respondents welcomed both more social and work-related contact with colleagues and supervisors. Two participants expressed concern that such forms of contact could be hindered by telework.

Information. Electronic information was used frequently and was thought to work well. The biggest problem was "information overload," i.e., excessive information and difficulties to organize the information.

Technology. All of the participants had experienced a large array of technical problems and insufficient technical support. Moreover, they felt they did not get access to all the software that was needed.

Working at home. The participants' short experience of working at home was similar to that expressed by group 1. Two of the participants spontaneously mentioned the risk of developing musculoskeletal disorders.

Future expectations. All participants were convinced that the project would be expanded and become a permanent feature of their working schedule. They were positive with the notion of continuing the telework program if it was restricted to 1-2 days per week. Some participants described the general interest of employees and employers within the organization as not being very high and underlined that telework could never be an appropriate model for all members of the organization.

5.4 Interviews with Supervisors

The teleworkers from Organization A worked in four different groups, with each group having a different supervisor. Two years after the introduction of telework, the same psychologist that interviewed the teleworkers interviewed these supervisors. A summary of the answers is described in the following section.

5.4.1 Tasks and Persons Suitable for Telework

Three of the four supervisors believed that all of their employees have tasks suitable for telework; one supervisor maintained that there are employees working with tasks that make telework impossible. All supervisors believed that, for personal reasons, not all of their employees could work at home. Difficulties in planning the work, social problems, and not enough computer skills were mentioned as reasons.

5.4.2 Effectiveness

The supervisors suggested that 1-2 working days/week at home could increase the effectiveness of most employees.

5.4.3 Supervising Methods

According to the supervisors, no change in the methods used by the supervisors is needed.

5.4.4 Information/Communication

The planning of meetings is more difficult, which is why no one should work at home more than 2 days per week. Much information today is spread electronically and can be reached at home as well as at the office. Still, planned personal meetings are needed and can be even more important when some employees work at home, since spontaneous meetings are then less likely.

5.4.5 Social Support

Social contact is likely to decrease already when people work one or two days per week at home. If supervisors work from home, it would have a negative effect on social contact and support.

5.4.6 Availability

The accessibility of the employees can be good with the use of telephone and e-mail; such availability to others is probably even better when working at home than at the office.

5.4.7 Effect on the Rest of the Employees

If telework is restricted to 1-2 days per week, there will be very small effects; however, if supervisors work from home, there will be negative effects. According to one supervisor, “there is a need for supervisors to be physically present all the time.”

5.4.8 Technology

Telework puts exceedingly high demands on technology and technical support. It did not work well in the beginning of the project, but was found to improve with time. The software has to improve and enhance in user-friendliness. Presently, some tasks cannot be performed at home because of inferior software products.

5.4.9 Physical Ergonomics

Expert advice and support for the individual teleworker and the supervisor are needed to plan, organize, and carry out the establishment of workplaces in the teleworkers' homes.

5.4.10 Future

It is expected that more people will start teleworking, which should be conceived of as a positive development. However, it is important to remember that not everybody wants to, or should be allowed to, telework.

5.4.11 Important Advantages and Disadvantages

Increased effectiveness is the most important positive effect of teleworking, according to the interviewed supervisors, and difficulties in planning social contact and cooperation among co-workers is the most negative effect encountered.

5.5 Interviews with Colleagues

Two years after the introduction of telework, the same psychologist that did all the interviews in this study interviewed 4 randomly selected, not teleworking, colleagues of the teleworkers in Organization A. The results of these interviews are summarized below.

5.5.1 Effect on the Rest of the Employees

Because the employees have individual tasks they work on, they cannot merely take on the duties and responsibilities of their colleagues. On several occasions, teleworkers asked people at the office to fax or mail documents to their home. It also happened that colleagues had to take care of visitors at the office when teleworkers were working at home. Better planning and information about the teleworkers working days at home could help avoid this problem.

5.5.2 Effectiveness

The respondents had detected no clear effects for the teleworkers or for the rest of the organization on the effectiveness of working at home. If the number of people teleworking increased, a reduction in effectiveness might occur because of the risk of reduced employee contact and communication.

5.5.3 Information/Communication

Electronic information is spread progressively, which makes telework easier. On the other hand, planning meetings becomes problematic in that the teleworkers are free to choose different days to be at home.

5.5.4 Social Contact

Social, not work-related, contacts with teleworkers are fewer during their home-working days. If many people are teleworking the same day, it has a negative effect on the social life at the office.

5.5.5 Availability

Availability to colleagues through the use of the telephone is as good or better when people work at home, though personal meetings with teleworkers are fewer.

5.5.6 Future of Teleworking

All of the respondents believed that teleworking will increase in the near future and that it will have mostly positive effects if restricted to one (!) day per week. A more flexible organization, with the possibility to telework part of days would be better. Only two of them were willing to participate in a teleworking program. The other respondents were negative about teleworking because of the difficulty involved in finding space at home and the need to separate work from leisure and family life.

5.5.7 Most Important Advantages and Disadvantages

The interviewed colleagues found the most positive aspect of teleworking to be that the teleworkers were happy with this opportunity and that the result of their work is focused on rather than where and when it is done.

The most negative feature was less contact with the teleworking colleagues and that the employer was using telework to be able to reduce office space and have people work in shared rooms.

6 DISCUSSION

Most of the teleworkers had experienced an increased workload during the study period. They felt satisfied with the belief that they were working more effective since the introduction of telework. They believed their own personal efficiency to be higher at home than at the office. The study showed that the teleworkers worked totally more hours than before the introduction of telework, put in more hours during the home working days than during the office days, and sometimes worked late at night and on the weekends at home. A primary reason why people want to work from home is that they wish to avoid all the disturbances characteristic of the regular workplace. One implication of this is the risk of working long periods without breaks.

Working long hours as well as late nights and on the weekends is a growing problem in the life of many office workers. Such working conditions may lead to various health problems, such as "burnout – syndrome." (Maslach 1982). The present study suggests that telework is likely to increase this risk in organizations with high workload.

The physical ergonomics at the workstation was seldom of the same calibre at home as it was at the office. Furthermore, another source of difficulty was the appreciable lack of ergonomic support.

All the teleworking respondents had frequently experienced severe problems with the computer equipment and information/communication system. All had experienced feelings of technostress as result of these technical problems. The risk of experiencing technical disruptions increased during the home working days. These disruptions had more severe consequences at home because there the participants worked almost exclusively with computers. Insufficient computer capacity, inadequate software and inadequate technical support are common factors behind technical problems. The software problems are of special interest, whether from a human factors or an economical perspective. Numerous studies, mostly from the USA, have shown that staff costs, including education, training, and support, are a predominate portion of the total costs when introducing new computer systems. These studies have also indicated that poorly designed software products may result in big economic losses, lack of efficiency, and ineffectiveness (Nielsen 1993).

Working long hours at a computer with poor ergonomics, badly designed computer systems, high work demands, and restricted opportunities to obtain help or support, could result in lower productivity and effectiveness and increased risk of health problems.

Somewhat surprising to the participants and management, as well as the present researchers, was the finding that the time spent working from home decreased during the study period. At the second interview (two years after the introduction of telework), most of the subjects worked only one day per week from home, which is in contrast to the two or three days they expected at the first interview. This finding can be accounted for by the concern that the participants had with regard to a possible decrease in the social contact and collaboration with their co-workers. This was not an important issue in this study, because the participants worked only one or two days per week from home, but it could be, if there is an increase in the number of days working at home.

7 CONCLUSIONS

When introducing a system such as telework into the organization, special attention needs to be paid to the following factors:

The working hours

Working long hours at a computer is a well-known health risk, a risk that was found to increase with telework.

The work environment at home

The computer workstation at home is very important in that the teleworker tends to work long durations at the computer without taking breaks.

The technical computer and telecommunication system

Hardware, software, and support system has to function well.

The social contacts

Contact, communication, and collaboration with co-workers could suffer.

The influence on the rest of the organization

The introduction of telework obviously affects the entire organization, including management, supervisors, and other colleagues. Thus, all members of the organization have to be prepared and involved in the process.

8 ACKNOWLEDGEMENTS

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