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THE EFFECTS OF TELEWORK ON ORGANISATION AND BUSINESS TRAVEL

An exploratory study on a university context

H.N. Lim
A.I.J.M. van der Hoorn
V.A.W.J Marchau

*Delft University of Technology
Faculty of Technology, Policy & Management
Jaffalaan 5, 2628BX Delft, the Netherlands
Phone: +31 15 278 1144, Fax: +31 15 278 2719
Email: h.n.lim@tbm.tudelft.nl*

Abstract: In recent years, many companies have implemented telework to improve work efficiency and quality of life for employees. Transport planners attempt to assist companies in reducing business travel time losses related to traffic congestion by stimulating telework. However, current knowledge concerning the effects of teleworking on business travel is limited. Furthermore, despite constant promotion, telework penetration in The Netherlands remains low because companies are uncertain about the benefits of teleworking and its effects on their organisation and employees. In this paper, insights from literature review and pilot survey results are used to contribute to the development of a preliminary exploratory model.

1. INTRODUCTION

The advent of computers and the internet has rapidly opened up new possibilities for telework. Telework allows employees to work fully or partially from alternative teleworkplaces such as homes, telecentres, hotels and airports or even during travel journeys. Employees are able to interact with colleagues and customers using non face-to-face contact (e.g. using web-conferencing, audio-conferencing, instant messaging, emails etc) that may result in less business and commuting travel. In addition, work can be accomplished before or after regular office hours, for example, during evenings or weekends. (Mirti 1998). In the Netherlands, approximately 10% of the Dutch salaried workforce are teleworkers (MuConsult *et al.* 2003).

Our main question here concerns about the effects of telework on business travel. Can telework reduce the number of business travel trips to avoid travel time losses related to traffic delays? Or can business travel be reorganised so that employees have less possibility of encountering traffic delays by means of telework? Up till now, very limited knowledge is available in this specific topic. Current studies look at travel effects in general. Experts believe that while direct effects of telework may reduce travel, the wider effects of telework and ICT use will generate sufficient number of new trips to eliminate the benefit or may even increase road traffic levels. (Salomon 1986, Niles 1994, Mokhtarian 1997)

The first sub-question relates to the discrepancy of telework definition in literature. Because telework is

used in many different contexts (i.e. in labour force, economic and transport studies), it leads to different teleworking definitions and methods of measurement. In this study, we will review and adopt the most useful definition for our study.

The second sub-question relates to the effects of telework on organisational efficiency. Has the organisational efficiency improved since they adopted telework? Most companies have shown an interest in participating in teleworking programs but are not willing to commit themselves until they are convinced about the benefits of telework for their company and employees. After all, conventional work cultures use face-to-face contact as the primary means of interaction between colleagues. A change to existing working practice presents challenging tasks to both management and employees. Some employees may find teleworking notion attractive and beneficial to their quality of life, while others find it unnatural and disconcerting.

The third question relates to the effects of telework on the locations of work. Traditionally, the work locations of employees are mainly situated at employer premises. They are for the greater part located near city centres in order to be close to customers and to tap human labour. But now, telework enables employee workplaces to be potentially dispersed to the outskirts of the city or sub urban areas. A basic question in this context involves how we can measure these changes in 'workplace geography'?

2. TELEWORK DEFINITION

Telework has been around for many years. In some literature, telework and telecommuting are often used interchangeably. There are contradicting definitions emerging from literature, which clearly show the incoherent views among researchers on what telework is and its purpose. Therefore, any reports on the number of teleworkers should be carefully analysed before making comparisons. In general, the motives of telecommuters are mainly aimed at achieving travel-time savings while teleworkers (which may include telecommuters) attempt to work at alternative workplaces for a variety of reasons (e.g. cost savings, balancing work and family life, unsafe working environment, etc). In most transport related literature, the term 'telecommuting' is often considered as an alternative mode of transport (e.g. Mokhtarian 1997, Salomon 1998). Others (ETO 2000) use the term 'telework' to cover the full array of work activities involving the use of ICT. According to Limburg (2002), the definition of telework should reflect the practice of telework in organisations, not simply something employees want to do, but what the organisation does. Furthermore, it should also reflect the conceptual model that helps define what telework is.

Based on the above-mentioned considerations, three most relevant definitions are shown on Table 1. It is

important to note that most definitions in literature focus on the workplace location being moved or the substitution of physical travel. Nilles (1994) and Mokhtarian (1991) concentrate on reflecting the process of travel substitution while ETO (2000) focuses on locational changes caused by telework. The former is aimed specifically at commuters who travel to and from work. The latter provides better insights into employee the workplace location and allows coverage of various travel purposes. (E.g. business travel, recreation travel etc) The concept of telework might be best understood through the model of time-space geography (Hagerstrand, 1970). In this way, temporal and spatial effects due to telework can be reflected in the time-space geography "aquarium" (See Fig. 1)

The Hagerstrand time-space model illustrates how a person navigates his way through the spatial-temporal environment known as the space-time path. The physical area given to an individual is represented by a two-dimensional plane and time is represented by the vertical axis, creating a three dimensional "aquarium". However, since the inception of information and communication technologies (ICT), the space-time paths have been altered greatly that may affect the levels of human interaction, land-use decisions and travel behaviour. It is important to take note that time is a zero sum property. Time spent performing telework at a location takes time away from other work activities.

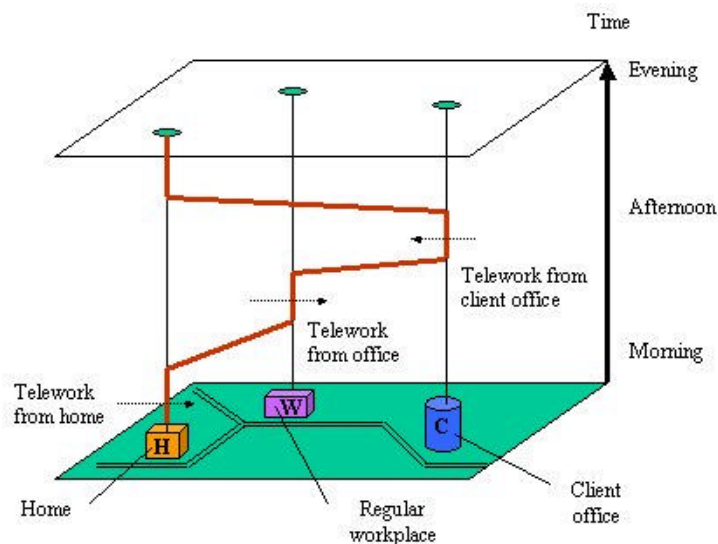


Fig 1: Adapted from Hagerstrand's time geography 'aquarium'

Source	Definition
ETO 2000	Telework occurs when ICTs are applied to enable work to be done at a distance from the place where the work results are needed or where the work would conventionally have been done.
Nilles, 1994	Telecommuting is the partial or total substitution of telecommunications technologies, possibly with the aid of computers, for the commute to work.
Mokhtarian 1991	Telecommuting is 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.

Table 1: Overview of definitions of telework

ICT provides the opportunity to create more new relationships and contacts (Gaspar & Glaeser 1996). These new contacts may have started initially through email and eventually lead to face-to-face contacts (i.e. trip generation). On the other hand, when face-to-face interaction is being used in the initial stages, relationship can be followed-up later by emails or telephones. (I.e. trip substitution). For instance, work activities (e.g. project planning activities) previously requiring business travel to customers can now be undertaken at the office through online collaboration software and the use of electronic communication tools (e.g. videoconferencing, instant messaging, emails etc) to support interaction. However, the underlying question here is whether the quality of electronic communication is good enough to substitute face-to-face interaction. Some have argued that face-to-face interaction is irreplaceable (Nohria & Eccles 1992, Handy 1995). Nevertheless, ongoing technological developments have improved "virtual interaction" tools greatly where people can look and talk to each other in real-time using ICT. In theory, if technology is able to substitute face-to-face contact, then face-to-face contact should decline as technology improves (Mills, 1992). But most of the time, it is often not a question of choosing between electronic communication or face-to-face contact, usually, a decision is made based on the number of people involved, how urgent are the meetings and the amount of work that needs to be done (Bennison, 1988).

In general, telework may be broken down into their specific types. The three most common telework types are *home-based telework*, *centre-based telework* and *mobile-based telework*. The time spent by salaried employees at teleworkplaces varies from 1 day per week to full-time basis. Home-based telework occurs when an employee works at home instead of travelling to the employer premises, therefore avoiding commuting travel. Centre-based telework occurs when employees work at third party telecentres for the purpose of avoiding travel or to be closer to customers. Mobile-based telework

occurs when employee (often equipped with notebook) spend more time in the field with various customers and delivering services on the spot that previously would have needed office-based staff and visits by customers to the company office. In our study, our focus will be placed on business travellers who may spend substantial amount of their working time performing front-office activities, e.g. consultants, sales executives, field technicians, advisors and so on. After all, these are the people who are most likely to contribute road traffic on the one hand and willing to adopt telework on the other hand (BEA-KPMG 1997). It may also be useful at this point to draw a distinction between commuting and business travel. Business travel is defined as 'travelling to and from a destination primarily for business purposes'. This definition also includes business journeys starting from teleworking workplaces such as from home, telecentres etc. Travel to and back from main employer premises for meetings does not count as a business trip (i.e. commuting).

3. BUILDING THE CONCEPTUAL MODEL

Theory development is a process, which begins with a set of observations and later moves on to develop concepts based on these observations. However, because the theory specific to effects of telework on business travel is not well developed, it is often difficult to know which particular observations could be a factor or an indicator. Our approach, based on Vaus (1996) is to locate the commonality between factors in literature with similar outcomes. There is little point of re-inventing the wheel if existing concepts and theories could be used. In our case, we will use existing theories, amended and enriched by new relationships found from our data to build our conceptual model.

From our literature review, we believe that there are three dominant factors influencing the decision makers to adopt telework in an organisation: *management goals*, *individual needs* and *quality of ICT and facilities* (See Fig. 2). Companies use telework as a tool to re-evaluate their means of achieving their management goals (Brown 1999, Ecatt 2000) (e.g. improving customer service, reduce costs, labour productivity etc). Employers may attempt to accommodate the individual needs of employees by using telework as a benefit to retain established employees who may otherwise resign for personal reasons such as moving house, childcare issues, work-family life etc. (EPA 2001, IST 2002). In addition, we believe that the quality of ICT and teleworkplace facilities plays an important role whether telework would be adopted in the company. The availability of broadband infrastructure (Pratt 2003), the usability of virtual communication tools and the risk of data security problems may influence management decision to adopt telework. With regards to facilities, employers may require appropriate workspace to be allocated at home or other teleworkplaces. The facilities may need to conform to the required standard as laid down by the employer. (E.g. appropriate furniture, separate rooms etc.)

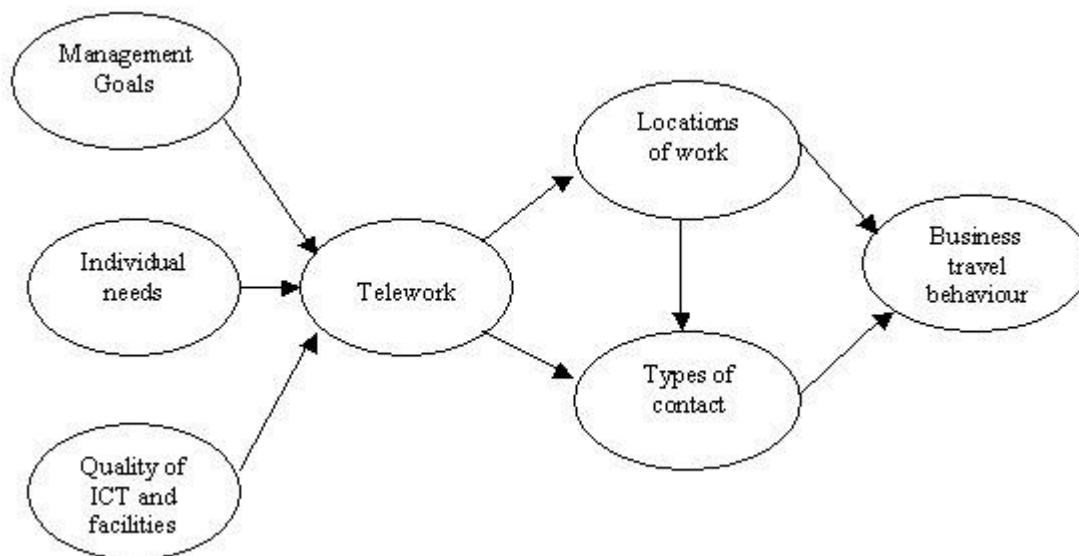


Fig 2: Conceptual framework of teleworking causes and effects

4. ORGANISATIONAL EFFECTS

In order to remain competitive, companies attempt to restructure their business models. ICT provides opportunities for cost cutting measures and enable companies to offer service differentiation. Many now offer online services to customers in addition to telephone and face-to-face support (Fuller 1996). Indeed, online services are fast becoming a norm in the computer services industry. For instance, computer technicians are able to interact with customers online and trouble-shoot their software problems without physically travelling to the customer office (Sustel *et al.* 2002). By using electronic communication, employees could save business travel trips and also minimise the disruptions to customer operations. On the other hand, when employees use teleworkplaces (e.g. homes, telecentres or client offices), companies realise cost savings in terms of office space, parking fees and other travel related costs (Skyrme 1993, Bresnahan 1998). Many companies recorded productivity gains when employee works approximately 1 day per week at home because of fewer disturbances and less travel etc. The tasks mostly affected by disturbances at the office are transferred to homes so that they could concentrate on their work (E.g. writing reports, project planning etc.) However, productivity starts to decline when the number of days spent at home increases (Gareis 1998). This is probably due to the fact that everyday tasks that could be done easily at the office have to be done from home, which may result in more time spent on particular tasks. The reduced opportunities of face-to-face interaction with colleagues and

customers may also seclude teleworkers from office politics that may be vital for their careers.

Employees want to telework because they want to fulfil their individual needs. Most issues are related to individual preferences and family commitments (Pratt 1999, Catpie 2001, IST 2002). Being stuck in traffic congestion is considered stressful and undesirable to some employees. Some people change jobs to search for careers that require less commuting and business travel. The increasing workload of the employees may disrupt family life because more time is spent working at employer premises and visiting clients. In this case, telework provides an excellent opportunity to reverse this trend by working partly from homes or other teleworkplaces convenient to the employee. (E.g. spending more time with family, fetch children from school, go shopping etc).

The quality of ICT and facilities at the employer premises and teleworkplace plays an important role for telework program to succeed in an organisation. The organisation should have the capability to deploy, manage and upgrade necessary hardware, software, network connection and support services for teleworkers. Nowadays, many companies recognise that quality of telework facilities include the design of the accommodation and also the layout of the workplace furniture (Hartjes 2002). These trends suggest that ICT services are increasing integrated with the facility management to facilitate telework. Telework poses many challenges to management on how to facilities at teleworkplaces

be made comparable to those at employer premises. To set standards, companies initiate telework agreements with employee unions on the required facilities in order for employees to telework at homes or other teleworkplaces. For example, KPN

(Koninklijke PTT Nederland; the privatised national Dutch telecom provider) and the trade unions have collective labour agreements regarding teleworking in homes. (See table 2)

Workplace	The employee has at home the disposal of a workplace, which conforms to the requirements of the Working Conditions Act. If this is not the case, the employee can make use of the fiscal possibilities to buy furniture from gross wage.
Hardware and Software	The employee has the disposal of a personal computer and other necessary devices and equipment. If this is not the case the employee can make use of the fiscal possibilities to buy a personal computer from gross wage. The employer takes care of the necessary software in order to make access possible to the teleworkplace.
Telecommunication	The employer compensates the initial expenses and installation of necessary telecommunication devices and equipment (such as ISDN and Quattrovox). The employer compensates the expenditure costs of the use of the business telephone line(s).

Table 2: Collective Agreement on Home-Teleworking (KPN, 2000)

4.1 Pilot survey at TU-Delft

Delft University of Technology (TU-Delft) has some 2,100 employees mostly consisting of researchers, lecturers, professors and administrative workers. It does not have an official telework scheme for its employees. Instead, informal telework arrangements are agreed between the immediate supervisor and the employee. On average, 18% of the total employees in TU-Delft are home teleworkers who use their home partly or fully for teleworking. 6% are mobile teleworkers who use multiple teleworkable facilities (e.g. client office, internet cafes, airports, etc) while travelling in the field. A majority of home-teleworkers have been teleworking for 5 years or more.

In order for us to check the current status of evidence in literature and the integrity of the questionnaire, a pilot survey was conducted between June and August in 2003 among decision makers at the facility and personnel departments at TU-Delft. This pilot survey is a preliminary step towards a full-scale survey to be done on decision makers in the commercial sector at a later stage of our study. Closed questions were asked on what motivates the organisation to adopt telework and the effects of telework in their respective departments. A number of open questions were also asked to uncover any new factors or relationships. The questionnaire was confidential, and was hosted on a secure third-party server. A request to complete the questionnaire was sent by post to all managers (24) of facility and personnel departments of TU-Delft. At the end of the closing date, a total of 11 valid responses had been received, providing a response rate of 46%. The following sections are the summary results from the pilot survey.

With regards to the individual needs of the employees, 8 out of 11 managers agreed that telework provides their employees an opportunity to balance the work and family life. The same number of managers also agreed that telework allows flexible working time arrangements, which enables them to participate on childcare arrangements. Almost three quarter of the managers are convinced

that telework can be used as a tool to retain and recruit skilled employees in the local labour market while less than half (4) agreed that telework would enable employees to reduce stress associated with traffic congestions.

Interestingly, although cost-savings is mentioned as one of the main reasons why organisations decide to adopt telework, not a single manager reported a decrease in operational costs, compared to 6 who reported either no change or have seen an increase in operational costs. A majority (7 out of 11) reported gains in employee productivity since their employees became teleworkers. Surprisingly, although telework is generally accepted at the university, the survey had found instances of resistance from management. As one personnel manager explains:

"Traditionally, scientists work a lot from home, especially during non-regular working hours. From the average working time, a substantial part of working time is spent at home. The management does not encourage this, but is generally accepted as a norm because concentration and production are higher when working from home."

Indeed, although employees are allowed to partially telework from home, management may not want to see employees spending excessive periods of working time away from the office. One probable reason could be that lecturers and support staffs have to be present at the office so that students can easily reach them for consultation and advice.

5. BUSINESS TRAVEL EFFECTS

It has to be noted that our study at this stage does not contain empirical data on business travel effects. The following mentioned results are based on limited literature extracted from ICT, transportation and labour force studies.

Arnfolk (2000) investigated employees who are using videoconferencing tools as substitutes to face-

to-face meetings. In total, nine surveys were conducted on six companies and associations in Sweden from 1996 to 1999. On average, 64% of the respondents said they had reduced their business trips, 2% had an impression that trips had increased. More than a quarter of the respondents use videoconferencing tools to complement meetings conducted during business trips (average 27%). The travel distance saved per person ranged from 1300 km to 5000 km per year. However, because of the small amount of employees using this technology, the overall reduction of business trips is minimal.

In another study, the European Commission initiated the Sustel telework research project in 2002. The aim of this study is to enhance the understanding of economic, environmental and social impacts of teleworking. This ongoing research consists of 30 teleworking cases studies conducted in 5 countries. In the case study framework itself, only one research question has been dedicated to the effects of telework on business travel. As such, very limited data was yielded from these cases with regards to the effects of telework on business travel. Most respondents were not able to differentiate between commuting and business travel or did not find travel reduction significant enough to report. Only 2 cases are worth mentioning (Sustel *et al.* 2002). The first case involves a large telecommunications company in Denmark. Some relocation of business activities was detected. Field technicians who previously needed to travel to customer's premises to repair or set up new connections can now perform their tasks remotely from their premises, thus eliminating business travel to customer premises. The second case involves a marketing firm located in Milan (Italy), which has some employees who relocated permanently at satellite offices in Rome and Genoa. But because most of their customers are located in Milan, they often have to travel to their customers for meetings, resulting in longer travel time and distance.

6. DISCUSSION

Our pilot survey at the university has showed that introducing telework did not lead to reduction of operating costs as mentioned in literature and by commentators (Skyrme 1993, Bresnahan 1998, Nilles 2003). The increased costs maybe due to extra investments spent on teleworking facilities and support services. However, we must also take into account that civil servants working at universities may not be as sensitive to costs as their counterparts in the commercial sector. Nevertheless, most respondents (7 out of 11) reported improvement in employee productivity. This result is generally in line with existing literature (Nilles 1998, Roitz 2002) where the improvement in productivity could be due to better motivation and extension of working time beyond office hours. The findings suggested that highly skilled employees could be retained or recruited from distance, therefore opening up more labour options for the university. It also highlighted the contribution of telework in balancing the work and family life of the TU-Delft

employees. However, in our opinion, although it looks like a perfect solution for families, working with the presence of family members may contribute to distraction and thus lower productivity.

With respect to business travel effects, current literature points to significant reduction of the number of business trip per teleworker (Arnfall 2000, Sustel *et al.* 2002). This is probably due to relocation of front-office activities (such as face-to-face meetings) back to the employer premises. In addition, there are indications that the distance of business trips may have increased due to the relocation of employee workplace to other parts of the country. This means that not only do we see trends of the workplace being moved away from the employer, but also away from where customers are located. We recognized that empirical evidence is insufficient at this point of time to draw any general conclusions with regards to the effects of telework on workplace location and business travel behaviour, but we intend to conduct activity-based diaries and personal interviews at a later stage to elicit the required data in order to answer our research questions.

It has to be noted that the work culture in the academic sector may not be similar to those companies in commercial sector. Employees in commercial companies are arguably more competitive than their counterparts in the academic sector. Therefore, the effects of telework on their organisations may be different, particularly with regards to the location(s) of workplaces, the amount of time spent at teleworkplaces and the amount of face-to-face contact with colleagues and customers. For our full-scale survey, we will focus on companies in the business services sector. The reasons are that previous studies had reported substantial higher number of teleworkers in this sector (Ecatt 2002) and in addition, the employees generate more business travel than other sector of businesses (BEA-KPMG 1997). Therefore, it would be most appropriate to use the companies this sector to gather the required evidence with regards to the effects of telework on commercial organisations and business travel.

7. CONCLUSION

This paper presents a first step in building an exploratory model with regards to the effects of telework on organization and business travel. Reviewing various telework definitions and using Hagerstrand time-space "aquarium" have help us to better understand and visualize the effects of telework on space and time. The interpretation, which derives from literature and pilot results, are of course subjected to limitations of generalisation. Nevertheless, this paper provides insights on conceptual development and lays a path for further empirical research on this specific terrain of telework and time-space research.

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