

Changing requirements and mental workload factors in mobile multi-locational work

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Working in multiple locations creates continuously changing physical, virtual and social settings for mobile employees. This paper shows, by exploring locally and globally moving employees, that changing environments arouse varying perceptions of both well-being and stress. The identification of mental workload factors is necessary both for working in and managing mobile, multi-locational work.

Introduction

Although there seems to be a growing consensus that telework is remote work away from a centralised workplace involving the use of information and communication technologies (ICT) (Sullivan, 2003), a question has arisen concerning the neglect of, especially, mobile employees in the empirically based telework literature. According to Hislop and Axtell (2007: 35, see also Hislop and Axtell, 2009): 'the telework literature has placed significantly more emphasis on the movement of work into the home than work done "on the move"'. Before this, Halford (2005: 19–20) observed that many people work both from home and from an organisational workplace, using virtual technologies to connect the two spaces. To her mind, studying these 'hybrid work-spaces' is largely neglected, although this combination of organisational and domestic spaces, mediated by cyberspace, affects practices of work, organisation and management. It seems that along with the development of technologies, the variety of working contexts is also growing. In this article, we study what it means to work 'on the move' in and from multiple places, and we define this kind of work as mobile, multi-locational work.

Mobile technologies in particular make it possible to work in and from multiple places and when moving between them. The available research on mobile, multi-locational work argues that there are new and previously undefined complexity and workload factors related to these new ways of working (Andriessen and Vartiainen, 2006; Hislop and Axtell, 2007; 2009). To make the work possible and foster employees'

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well-being, it is essential for managers and leaders, as well as employees themselves, to understand these requirements better. However, there seem to be only a few studies on these developing types of work which connect employees' experiences of strain and well-being to the characteristics of their work (Richter *et al.*, 2006). This article attempts to fill this gap to some degree and to increase the knowledge of the requirements and challenges and their mental workload factors.

In this paper, we first present the main concepts of new ways of working as the development of traditional telework into mobile, multi-locational work. The evolution of these concepts is related to developments in ICT that make possible more and more flexible working and collaboration from multiple locations. In this context, we also show the growing prevalence of new ways of working. The next section introduces the theoretical frames which we use to analyse mobile, multi-locational work in six case studies. The frames are based on the concept of 'ba' (Nonaka *et al.*, 2000), which considers each workplace as an embedded combination of physical, virtual and social/mental spaces. We shall concentrate on physical and virtual settings as the factors causing mental workload factors. Next, the methods and research settings of the six case studies are presented. The cases are examples of highly mobile employees using multiple locations globally and locally in their work. Thereafter, the article describes our empirical findings, illustrating how physical and virtual spaces were used in these cases and what kinds of mental workload factors these environments included. It is shown that locally and globally mobile employees share some factors in some locations, such as in a 'secondary workplace', arousing perceptions of well-being and stress, whereas in some other places, such as at 'home' and in 'moving places', the factors are dissimilar. Finally, the results are discussed by presenting their implications from managerial and employees' perspectives.

From telework to mobile, multi-locational work

Next, the history and development of the concepts of telework and mobile, multi-locational work are briefly summarised. It is shown that with the development of enabling technologies the variety of ways of working and working locations has also increased (Figure 1).

At the beginning there were the terms 'telework' and 'remote work'. The concepts were used in a generic manner to refer to all kinds of work and work arrangements carried out outside a main office but related to it (e.g. Olson and Primps, 1984; Van der Wielen and Taillieu, 1993; Korte and Wynne, 1996; Bailey and Kurland, 2002; Sullivan, 2003). The use of ICT as communication links between the teleworker and the employer was brought as a feature to the telework concept quite early, which often meant home-based telework (Korte and Wynne, 1996). Additionally, making full nomadicity possible by developing portable computers and communication devices was required (e.g. Kleinrock, 1996).

In continental Europe, the term 'eWork' was later used to refer to all those work practices that make use of ICT to increase efficiency, flexibility (in terms of time and place) and the sustainability of resource use. eWork was defined as including the following specific types of work (ECATT, 2000: 8–11; see also Korte and Wynne, 1996: 3).

1. *Home-based telework or homeworking* (Sullivan, 2003; Halford, 2005) is the most widely recognised type of eWork. Individuals who work at home were further divided according to the amount of working time spent at home. 'Permanent teleworkers' are those who spend more than 90 per cent of their working time at home and 'Supplementary teleworkers' are those who spend less than one full day per week working from home. They are also called 'Occasional teleworkers', to distinguish them from regular teleworkers.
2. Concepts of *Self-employed teleworkers in Small Office Home Offices* (SOHOs) were used for private entrepreneurs, such as consultants or plumbers, working and communicating with their contractors, partners, and clients by means of the new technologies.

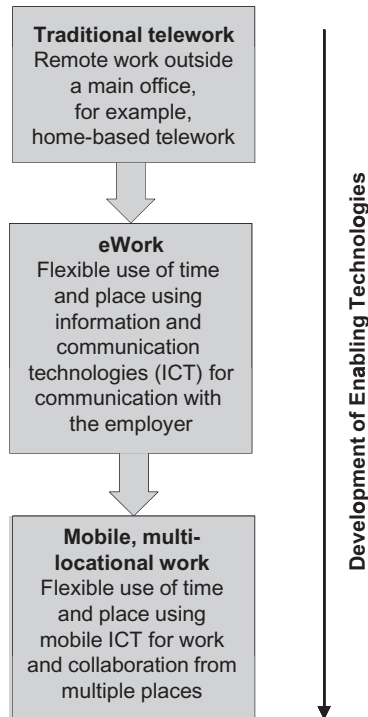


Figure 1: The path from traditional telework to the concept of mobile, multi-locational work

3. *Mobile workers* were defined as those employees who 'spend some *paid* working time away from their home and away from their main place of work, e.g. on business trips, in the field, travelling, or on a customer's premises'.

According to Lilischkis (2003), this type of working in many places could be called 'multi-locational work'. Halford (2005) used 'hybrid workspace' to describe the combination of organisational, that is, 'office', and domestic, that is, home, spaces mediated by cyberspace. Hislop and Axtell (2007) added a third dimension of 'locations beyond the home & office' to this concept of 'hybridity' and defined this type of multi-locational work as 'mobile telework' or 'multi-location work'. According to them (Hislop and Axtell, 2009), by using ICT it is increasingly possible to work not only at home and office but also in public spaces such as airports, hotel lobbies and cafes sometimes referred to as 'non-places' because of their transience, and in mobile locations such as cars and planes.

The first discussions on the concept of mobility dealt with employees moving physically and spatially or commuting from place to place. Later, the concept of 'mobility' was extended with new features. For example, Kakihara and Sørensen (2004) added two new aspects and described worker mobility as locational, interactional and operational mobility. 'Locational mobility' was characterised functionally as travelling, visiting and wandering. In addition, Kakihara and Sørensen observed that some workers have a static work style in a geographical sense, but they constantly and intensively interact with others through the Internet. This is what they called 'interactional mobility'. Andriessen and Vartiainen (2006; see also Brodt and Verburg, 2007) called this feature 'virtual mobility', referring to stationary actors moving in virtual workspaces with the help of ICT tools. 'Operational mobility', on the other hand, refers to mobility in the performance of work practices, such as independent business units and outsourced jobs.

In this article, we use the concept of a mobile, multi-locational worker to refer to those employees who move a lot spatially, utilise different locations for work and communicate with others via electronic tools, being both physically and virtually mobile. Virtual mobility makes it possible to collaborate with others from multiple locations in virtual and distributed teams (Lipnack and Stamps, 2000).

The above-described reasoning leads us to conclude that, largely on the basis of the development of enabling technologies, the concept of 'mobile, multi-locational work' is a more versatile way than the traditional concept of 'telework' to describe the content of present working in multiple locations. The concept is also wider than that of a 'hybrid workspace' (Halford, 2005) as it also covers other workplaces in addition to domestic and organisational spaces (see also Hislop and Axtell, 2009). Our research interest in this article lies in work which takes place with the help of mobile ICT in and from multiple locations and while moving between them.

Prevalence and future developments of mobile, multi-locational work

The prevalence of working from multiple locations has increased rapidly during the last 10 years and will continue to do so, as several reviews show, and although the definitions and indicators may vary (e.g. Felstead *et al.*, 2005; Halford, 2005; Hislop and Axtell, 2007). In Europe, telework, including home-based telework (at least one day/week), supplementary home-based work, mobile eWork and freelance telework in SOHOs, increased from six per cent in 1999 to 13 per cent in 2002 (Gareis *et al.*, 2006). The Fourth European Working Conditions Survey (Parent-Thirion *et al.*, 2007) shows that in 2005, only 51 per cent of the working population in the European Union worked at their place of work all the time and that a total of 21 per cent never worked at their workplace. This indirectly shows the increased portion of mobile working in multiple locations. Furthermore, nine per cent of workers always worked in locations outside the home and company premises. The WorldatWork 2006 Telework Trendlines (2007) report shows that the sum of teleworkers (both employed and self-employed) working remotely at least one day per month in the USA rose by 10 per cent, from 26.1 million in 2005 to 28.7 million in 2006. Based on the US government estimates of 149.3 million workers in the US labour force, the 2006 data mean that roughly eight per cent of US workers have an employer that allows them to telecommute one day per month and roughly 20 per cent of the workforce engages in telework. It was estimated that 100 million US workers will telework by 2010. The technological enablers are the increased use of broadband connections at home and wireless access to the Internet from anywhere. The 2006 US data also demonstrated that during the past month, 24.6 million had worked at a customer or client's place of business, 24 million in their car, 20.2 million in a café or restaurant, 17.8 million in a hotel or motel, 11.5 million in a park or other outdoor location, 10.6 million on an aeroplane, train or underground railway, and 9.1 million in an airport or railway station or on an underground railway platform.

In the future, this development of, and increase in, mobile and virtual work will be closely integrated into the development of technologies, expanding bandwidths and ever-smarter mobile devices. Through the broadband mobile Internet it is possible to access multiple communication functions, including email, the Internet, instant and text messaging, and a company network. As Castells *et al.* (2007: 258) wrote: 'The mobile network society deepens and diffuses the network society. . . First on the basis of networks of electronic exchange, next with the development of networks of computers, then with the internet, powered and extended by the World Wide Web. Wireless communication technologies diffuse the networking logic of social organisation and social practice everywhere, to all contexts—on the condition of being on the mobile Net'.

The analysis of working in multiple locations

As shown previously, physically mobile work is in some sense fictitious, as only in a few professions is travelling the main mode of working, such as in the case of the crew

of an aeroplane. Working while moving is only one option in multi-locational work, as it invariably takes place in some place, whether it is a car or a customer site. In our case study, we explore multiple and changing workplaces by using the concept of 'ba' proposed by Nonaka *et al.* (2000) as the methodological guide for the data collection and analysis. 'Ba' roughly means 'place', referring to a shared context in which knowledge is created, shared and utilised by those who interact and communicate there. 'Ba' unifies the 'physical space', such as an office space, the 'virtual space', such as email, and the 'mental' or 'social space', such as common experiences, ideas, values and ideals shared by people with common goals as a working context. The key point is that these spaces are embedded. In this meaning, the concept is rather close to Halford's (2005) concept of a 'hybrid workspace' as a combination of organisational and domestic spaces mediated in cyberspace. The concept 'ba' has deeper roots, as Lewin (1972) described individuals as existing in a psychological field of forces that determines and limits their behaviour as early as in the 1940s. Lewin called this psychological field the 'life space'. It was described as a highly subjective 'space' that deals with the world as the individual sees it. The 'life space' was, however, considered to be embedded in the objective elements of physical and social fields. From the 'life space' concept, only virtual space is missing when compared with the concept of 'ba'. In this study, the multiple workplaces of mobile employees are analysed by using these embedded space categories in the following manner (Nenonen, 2005; Vartiainen, 2006; Vartiainen *et al.*, 2006; Vartiainen and Andriessen, 2008).

- A 'physical space' refers to those physical workplaces that mobile employees use for working. They are divided in this article into five categories: (1) home; (2) the main workplace ('main office'); (3) means of transport, such as cars, trains, planes and ships ('moving places'); (4) a customer's and partner's premises or one's own company's other premises, and satellite and telework offices ('secondary workplaces'); and (5) hotels and cafés, etc. ('third workplaces'). In this study, we use physical locations that employees use as the starting point of the analysis.
- A 'virtual space' refers to an electronic working environment or virtual workspace consisting of various tools and media for individual employees, groups and whole organisations that are used in physical workplaces. The Internet and Intranet provide a platform to communicate, collaborate and find knowledge, both with different tools, such as email, audioconferencing, videoconferencing, chat, group calendars, document management, and presence awareness and findability tools, and with integrated collaborative working environments, such as various groupware systems and combinations of social media such as blogs, wikis, instant messaging, chat and other communications systems that host many-to-many interactions and support group and community interactions. The use of virtual workspaces can be analysed and described by focusing on connections, devices and services, and on their purposes, functionality and usability. In this study, we analyse and describe the tools used in each physical location.
- A 'social space' refers to the social context and the whole social network where working takes place in each physical location; that is, for example, other team members, managers, customers and family members. Network and sociometric analyses are often used to explore the ties and relationships of individual members, such as 'advising' and 'not advising' or 'helping' and 'not helping'. This category is not explicitly used in the analysis of this study.
- A 'mental space' refers to individual or shared cognitive constructs, thoughts, beliefs, ideas and mental states; for example, the state of stress characterised by physical, psychological, or social complaints or dysfunctions, which influence and reflect an employee's interpretations of the other three spaces. A mental space can be shared with others. Creating and forming joint mental spaces requires communication and collaboration, such as exchanging ideas in face-to-face or virtual dialogues. Social and mental spaces are usually studied by collecting individual perceptions, attitudes and conceptions, and then by analysing their contents. In

this study, we use mental workload factors related to physical and virtual spaces as indicators of mental space.

In conclusion, the workplaces of mobile, multi-locational workers are combinations of physical, virtual, social and mental spaces. The requirements and use of various spaces vary, depending on the contents and interdependence of the tasks to be done alone or jointly with others. Therefore, individual telework at home in solitude without virtual connections to others is an extreme and rather rare case. Usually, home-based teleworkers communicate sporadically with superiors and colleagues face-to-face by commuting to the main office and by using ICT for virtual collaboration. When employees are working in multiple locations, the combination and emphases of their spaces are different and variable from co-located employees, just because of the greater number of physical places they rotate through and use (see also Hislop and Axtell, 2007). Still, they need not inevitably communicate virtually. The significance of virtual spaces grows when mobile employees are members of a distributed team and have to communicate and collaborate virtually with each other from different locations. They are not only distributed in physical places but simultaneously use virtual spaces (videoconferencing and documents shared on the Intranet), and are also related to other team members who must share common goals (social space) to be able to reach the aim, and possibly also share common ideas, beliefs and values (mental space).

Research method and data collection

Research questions

The purpose of our study was to explore the requirements of mobile, multi-locational work by investigating how physical and virtual spaces are used in practice in six groups whose members work locally and globally in a mobile, multi-locational manner, and what kinds of mental workload factors these spaces contain that arouse positive or negative mental states among employees. The questions to be studied are these.

1. What are the purposes of using different locations for work (use of 'physical space')?
2. What kinds of virtual tools and devices (use of 'virtual space') are used in each location?
3. What kinds of well-being- and stress-related mental workload factors ('mental space') do physical and virtual spaces include?

Six mobile cases

The study was carried out as a qualitative multi-case study (Yin, 2003), in which six groups of mobile, multi-locational employees were explored. The members of three of the groups moved globally either worldwide or in Europe, and the members of the other three groups moved locally in one country.

- Case 1 ($n = 8$) is a group of employees working in a small enterprise manufacturing production lines for textile materials and installing them all over the world, for example in Europe, Russia, Asia and South America. The firm's customers are from 37 countries. After a sales contract is concluded, the machinery is assembled, tested and dismantled in Finland, and then it is transported and reassembled in the target country by a mechanic.
- Case 2 ($n = 8$) is a global sales force marketing tailored product and system packages and new wireless solutions, especially in Asia, South America and Africa.
- Case 3 ($n = 5$) is a dispersed support group of a Finnish member of the European Parliament (MEP) working every month in Brussels and Strasbourg and weekly in Finland.
- Case 4 ($n = 7$) is a group of maintenance employees under one supervisor, responsible for the maintenance and service of properties, such as repairing lifts and escalators. The size of the maintenance area is some 20–30 sq km.

- Case 5 ($n = 7$) is a group of security guards watching premises. A security guard moves around in a car at night in a small district, using well-defined routes. Every night, around 200 km are driven and specific spots are checked.
- Case 6 ($n = 6$) is a group of community nurses. They visit their mainly elderly clients in their homes mainly by car or bicycle or on foot. A total of 6–10 clients are visited daily. The size of the district is some dozens of square kilometres.

Collection and analysis of data

The data were collected in three phases by means of interviews. First, a context study was conducted by interviewing a company representative to get an overview of the purposes and aims of the target group. Second, each employee was interviewed individually. The themes of the semi-structured interviews dealt with the purpose of work in different locations, the work community, the division of work and collaboration. Third, the tools in use for communication and collaboration were studied, as were the perceptions of well-being and stress factors when working at different locations.

The interview data were coded and classified according to the 'ba' model of embedded spaces (physical, virtual, social/mental) with the help of the Atlas.ti program. First, as the starting point, the use and purposes of using different working locations ('home', 'main workplace', 'moving places', 'secondary workplaces' and 'third places') were analysed. Second, the variety and usage of virtual tools and devices in each location were explored. Finally, the mental workload factors analysed as perceptions of factors influencing well-being and stress in each location were studied. The analysis was based on the workload-strain model (Richter *et al.*, 2006: 235), which draws a distinction between the effects of external sources impinging upon a human being (mental workload). These factors have an immediate effect on mental strain, which includes an individual's habitual and current preconditions. The consequences of mental strain can be divided into both positive (e.g. flow, engagement, motivation, further development of the worker's knowledge and skills) and negative consequences (e.g. monotony, mental fatigue, psychosomatic disturbances and illnesses). Positive ('well-being') and negative ('stress') workload factors were considered to show the mental outcomes of working in the specific combination of physical and virtual spaces in each location. A parallel coder was used to confirm the reliability of the coding. After parallel coding, the parameters of the classification were redefined. Following space-coding, each space was examined separately. Within each workplace, the descriptions and main statements with which the interviewees described the tools they used and their perceptions of well-being (as either positive or negative) were selected for analysis.

Findings—Working in multiple locations

Purposes of using multiple locations

Both the global and local group members worked in multiple places, as shown in Table 1. Locally mobile employees worked in a local area, which varied in size from tens to hundreds of square kilometres. As expected, the geographical dispersion of workplaces was greatest with those moving globally. The representatives of the small and large companies operating globally worked on different continents, and the third group travelled within Europe. Two of the global groups used all of the five types of physical places intensively for working.

Home

The global groups used the home as a workplace according to the demands of their global duties, for example, when they had to collaborate with colleagues or customers over time zones outside their ordinary working hours. Another important situation for working from home was the need to concentrate and accomplish a task. For this kind of work, the home represented a more undisturbed place than the primary workplace.

Table 1: The purposes of using different physical places for work, the tools used in them and perceived mental workload factors related to perceptions of well-being and stress in physical and virtual spaces

Physical, virtual, social/mental spaces	Global movers			Local movers		
	Case 1 (<i>n</i> = 8) Small enterprise	Case 2 (<i>n</i> = 8) Large enterprise	Case 3 (<i>n</i> = 4) European group	Case 4 (<i>n</i> = 7) Maintenance employees	Case 5 (<i>n</i> = 6) Security guards	Case 6 (<i>n</i> = 7) Community nurses
<i>Home</i> Purpose	Reading professional journals sometimes	Call meetings Doing tasks requiring concentration Collaboration over time zones with colleagues and customers	Same tasks at desk as in main office Doing tasks requiring concentration	Writing hour reports Being on duty advice to colleagues Receiving work orders and designing work	No working at home Giving occasional advice to colleagues	Doing student evaluations Additional projects Doing tasks requiring concentration
Tools in use	Mobile phones and a few laptops for communication with clients and team members	Smart phones, laptops and one-way information-gathering devices for collaboration with team members and partners; for tracing continuously changing information	Smart phones, laptops and one-way information-gathering devices for collaboration with team members and partners; for tracing continuously changing information	Mobile phones and desktops for planning tasks for the next day	Seldom work at home	Seldom work at home
Well-being						
Stress	No home-based stress factors but working elsewhere produces problems with family members	Concentration, job control, mastery of time Breakdown of work-life balance Need to work over time zones and at weekends	Concentration, job control, mastery of time Breakdown of work-life Long working days	Job control Advising others Sometimes too many calls from customers and peers	Family as a balance to work Breakdown of work-life balance because of night work	Concentration No stress
<i>Main workplace</i> Purpose	Assembling production lines at factory Selling products Informing and negotiating	Meetings and project work in open office Exchanging information Seeking information Managing projects Contacts with customers	Meetings at workplace: negotiations and decision-making	Fetching materials and tools from store Used as dressing room Meeting supervisor and colleagues	Guiding and counselling clients and other guards Using distance-monitoring camera Looking for information, reporting	Reporting and paperwork Being on call Meetings Fetching nursing material
Tools in use	Phones, mobile phones, desktops and fax for communication with clients around the world and for collaboration with team members	Smart phones, laptops, two-way information channels: video- and net-conferencing for communication and collaboration with team members, partners and clients around the world	Smart phones, laptops and desktops for communication and collaboration with partners and team members around Europe	Few visits to main workplace for face-to-face meetings	Phones, desktops, control room with computers connected to monitoring cameras, GPS monitoring system for monitoring places of clients around the country and advising partners on move	Phones, mobile phones and desktops for communication and collaboration with doctors and pharmacy personnel as well as with social workers, for planning tasks for the next day
Well-being	Team support	Team support, High-quality meeting rooms Good virtual connections	Team support, interesting work community Informal network	Opportunity to meet manager and get support	Place to rest and meet one's duty partner	Team support, user-oriented virtual connections

Stress	Timing manufacturing process Tasks piling up Inter-group relationships	Managing changing networks, inefficient days Restless open-plan office	Long working days Conservative ICT policy Building work-related networks Continuously changing clients Compatibility and functionality of software	Conflicts between teams	The monitoring partner of the working pair; responsibility of the safety of the pair in the field, responsibility for making accurate observations with monitoring tools	Tasks piling up Changing personnel Social relations
<i>Moving places</i> Purpose	Trips to customers by airplane, no working Calls from car Local use of car and train: reading, brainstorming	Reading and preparing presentations in airplane and at airport Car and train: calls, reporting	Reading, writing, checking calendar Discussing in aeroplane Car: moving from place to place	Calls from superior for changes Guidance by calling 'backman' Car: moving from place to place, preparing	Travelling to work sites Exchanging information about problems Breathing time	Travelling to work site by car or bicycle, on foot Advising patients or a colleague
Tools in use	Mobile phones for occasional communication with team members and clients	Smart phones and laptops for planning upcoming meetings and presentations, for checking and answering emails	Smart phones and laptops for planning upcoming meetings and presentations, for checking and answering emails	Palm computers with mobile phones for receiving urgent tasks, for communication with team members	Mobile phones and GPS devices for checking risks, for ensuring own safety	Mobile phones for occasional urgent duties with team members, doctors, social workers and first aid
Well-being	Knowledge of well-functioning work at the main workplace	Rest	Sometimes productive place to work Team support	—	Opportunity to get momentary rest between demanding tasks	Opportunity to get momentary rest between demanding tasks
Stress	Cramped work premises, long immobility, different tightness, different traffic cultures Crossing time zones	Cramped work premises; long immobility conditions, number of travel days, short nights Crossing time zones Insecurity in public transportation Customs security checks Tasks piling up while travelling Non-working networks and devices	Cramped work premises, long hours during night Continuous travelling Continuous changes in timetables and routes Travelling with a small child Documents in wrong places	Cramped work premises; traffic jams, bad roads, bad weather sometimes PDA difficult to use as phone, too small keys, usability, not reliable	Bad road conditions, driving in darkness, haste	Bad road conditions, bad weather sometimes Heavy bag
<i>Secondary workplaces</i> Purpose	Assembling machinery at a customer's site Customer training Calls and meetings	Marketing, training, negotiating and informing customers and interest groups at their offices in different countries	Meetings and interviews at Strasbourg, parliament and party district offices in Finland, lecture rooms	Maintenance work at customers' site Guidance by calls Calls from superior for changes	Checking security at customers' sites	Nursing at patients' homes Calls from colleagues and home services (7) Meeting relatives of a patient
Tools in use	Mobile phones, laptops and fax for asking for advice from team members, for reporting the completed tasks	Smart phones, laptops and video- and net-conferencing tools for giving presentations, for asking for advice from team members and partners, for checking and answering emails	Smart phones and laptops for asking for advice from team members and partners, for checking and answering emails	Palm computers with mobile phones for receiving and reporting tasks, for asking for advice from team members and experts in the field	Mobile phones and monitoring cameras for checking risks, for ensuring own safety	Mobile phones for occasional urgent duties with team members, doctors, social workers and first aid

Table 1: Continued

	Global movers			Local movers		
	Case 1 (<i>n</i> = 8) Small enterprise	Case 2 (<i>n</i> = 8) Large enterprise	Case 3 (<i>n</i> = 4) European group	Case 4 (<i>n</i> = 7) Maintenance employees	Case 5 (<i>n</i> = 6) Security guards	Case 6 (<i>n</i> = 7) Community nurses
Physical, virtual, social/mental spaces						
Well-being	Productive work and successful communication with clients	Productive work with partners and clients Interesting job content	Productive and rewarding negotiations with partners and other delegates	Productive work, communication with clients Feedback from work	Experience of the significance of fieldwork	Experience of the significance of fieldwork Feedback from patient
Stress	Too warm or cold, heavy loads, missing tools Functionality of communication tools Long days, many meetings, need to concentrate, inability to reach one's colleagues and managers from distance, cross-cultural communication	Long working days, demanding negotiations and extensive responsibility Cultural differences Efforts required to prepare presentations	Long working days, demanding negotiations and extensive responsibility Tight premises Continuously changing topics Building network	Busy days with many urgent interruptions Dissatisfied clients Isolated lift chasms Tight workplaces Simultaneous assignments	Critical, unexpected situations, aggressive people Changing working conditions: warmth and lighting Quick changes from monotony to quick reactions	Working in places which are not meant for nursing Disturbing privacy of a patient Difficulties in communication with patients Responsibility for decisions
<i>Third workplaces</i>						
Purpose	No working in hotels Fairs: looking for novelties	Preparing and checking presentations at hotels Updating knowledge by calls Being on duty	Visiting universities, companies and public meetings, doing party road shows Hotels and restaurants working with own teams and interest groups	Chatting at a café	Informal meetings at service stations	No working
Tools in use	Mobile phones and occasionally laptops for communication with family members and friends If connections to home are available, discussions with family members	Smart phones and laptops for checking and answering emails, for planning upcoming meetings, for getting help from team members Meeting peers, enriching discussions	Mobile phones and laptops for checking and answering emails, for planning upcoming meetings, for getting help from team members Meeting colleagues, enriching discussions	Mobile phones and laptops	Mobile phones for receiving urgent duties	No working
Well-being				Meeting colleagues, enriching discussions, opportunity to get help and guidance from colleagues	Meeting other guards	—
Stress	Isolation, loneliness	Poorly working virtual connections Similar hotel rooms: 'hotel death', sleep	Long working days Promoting activities	—	—	—

ICT, information and communication technologies; GPS global positioning system; PDA, personal digital assistant

All the groups used their homes for working to some degree, though of the locally mobile groups only the maintenance employees worked from home on a regular basis. The locally mobile groups mainly used their homes as a workplace when there was a need to plan and organise the work of the next day. The security personnel and community nurses rarely worked at home and they did not use virtual connections at all for working from home.

Main workplace

The meaning of the main workplace for work differed slightly between the globally and locally mobile employees.

The globally mobile employees used their primary workplace when there was a need for face-to-face or proper working virtual meetings and demanding negotiations. So for them, the main reason to visit the main office was interaction with their peers and superiors. Globally mobile individuals worked in their primary workplace for a few consecutive days and then spent several days or even weeks in secondary workplaces.

For the locally mobile employees, the main working area was 'the field', that is, customers' houses and their surroundings. Compared with this, the primary place was used only for preparing themselves for their fieldwork or for accomplishing their fieldwork. The main workplace was also used for official meetings. The security personnel and community nurses visited their primary workplace daily but the maintenance men only once per two weeks. The maintenance men's use of palm computers for receiving and reporting jobs had diminished the necessity of visiting their primary workplace.

Moving places

Means of transport, that is, aeroplanes, cars and trains, were used as a workplace if an employee was forced to spend some time in them. For the globally mobile employees, the spaces of the means of transport regulated the work that it was feasible to perform. The tasks were mainly preparatory, updating and reporting in nature. Sometimes, the spaces of the means of transport were also used for remote communication, as well as face-to-face discussions with colleagues and to plan forthcoming duties.

The locally mobile employees mainly used a car or a van for transition from one place to another. While moving, they checked their forthcoming duties and reported on their finished tasks. For the community nurses and security personnel, a car represented a place for a break between demanding duties.

Secondary workplaces

The main work outcomes of the observed mobile employee groups were performed in secondary workplaces at customers' sites. The job contents of the groups varied according to their assignments. In addition, the secondary workplaces were important places to meet, discuss and negotiate face to face with customers and interest groups. Additionally, colleagues in the main workplace were often contacted from a secondary workplace.

The globally mobile employees visited several locations in the target country or a continent and, thus, there were numerous client and interest group meetings during one trip. Only the group of assembly personnel stayed in one location for the whole duration of the job, advising and training customers. In secondary workplaces, working hours were always long.

The secondary workplace of the locally mobile employees was the whole area where they moved and visited their customers: during one work shift the nurses had 6–10 places (i.e. patients' homes), the maintenance men around 10–20 (i.e. buildings) and the security personnel a few contracted places, along with several emergency calls.

Third workplaces

The third places represented a forum for informal meetings, as well as a place for updating knowledge, reporting on tasks and for finalising, for example, the presenta-

tions for the next day. For the global groups, hotels were often places for preparation for the next day, discussions and contacting their home country. The local groups often used third places, for example, cafés, for informal meetings with their colleagues.

Virtual tools and devices in use

The tools and devices of the globally mobile employees were more versatile than those of the local employees. They had smart phones with different functions for their use, providing the minimum means to call and to read and send emails and text messages and to update calendars and confer with colleagues from anywhere and at any time. They used different tools actively at home to communicate with colleagues and clients, as well as for tracing information. The use of tools in the main workplace had the same purposes. In moving places, the global employees used mobile phones for communication with team members and clients and laptops for planning upcoming meetings and checking emails. In the secondary workplaces in target countries, mobile phones were often used for communication and collaboration, because other connections often failed. Personal computers (PCs) and laptops were used for Internet connections, such as having a meeting, as well as to access the Intranet of the company. Only a few extra tools and devices were available in the third workplaces. Therefore, the globally mobile employees used the tools and devices that they were carrying with them when working in third places.

The locally mobile employees had less equipment, and they worked and communicated less or not at all from home. The main workplace was mainly for face-to-face meetings with superiors, colleagues and experts, except the security guards, who used centralised monitoring systems for monitoring the premises of their clients and advising partners on the move. When moving, the locally mobile employees used mobile phones and mobile devices, that is, personal digital assistants (PDAs), tailored to their specific purposes, such as receiving urgent tasks and checking risks. In the secondary workplaces, they used the same devices for reporting on tasks and asking for advice and help. The third places were either not used at all for working or mobile devices were ready for urgent duties.

Mental workload factors in physical and virtual spaces

Home

The main sources of well-being at home, both for the globally and locally mobile employees, were the opportunities to concentrate and to exert control over their jobs and over time. The family was considered as a counterbalance to work. Chances to advise others from home were considered a positive factor among the maintenance employees.

On the other hand, virtual meetings from home at night and during weekends and long working days and times elsewhere among global movers led to breakdowns in the work-life balance at home and problems with family members as stress factors. The maintenance employees considered too many calls to their homes from customers and peers to be nuisances.

Main workplace

The main source of well-being in the main workplace was both formal and informal social interaction with colleagues and management. The main workplace was also a place to rest after a long working period in the field. High-quality meeting rooms and well-functioning virtual connections were perceived as positive mental workload factors.

At the same time, many features of the main workplace were perceived as negative mental workload factors. These included disturbances in social relationships and conflicts between teams and their members. Tasks also often piled up as the main workplace was visited only seldom and therefore working days were also getting long there.

Managing and building work-related and frequently changing networks were mentioned as stress factors among globally mobile employees. Busy open-plan offices and company ICT policies and compatibility issues related to tools were criticised as well. Security guards considered the responsibility of monitoring and securing the safety of field workers as a stress-arousing mental workload factor.

Moving places

Very often moving places such as aeroplanes and cars were seen as places to try to rest, and they were occasionally used for work. Some globally mobile employees considered moving places as productive places to work, especially when travelling with colleagues.

Both the globally and locally mobile employees complained very consistently that moving places were 'cramped', being tight and causing immobility. The global movers complained about the outcomes of crossing time zones, short nights and inconvenient customs checks. When moving with a car in other countries, a different traffic culture from that of the home country caused stress. Failing infrastructure was a widespread problem while moving abroad; missing contacts, disturbances in information transfer and audibility. The locally mobile employees also mentioned bad road conditions and weather.

Secondary workplaces

Productive work and successful communication with clients and partners were quite consistently reported as the main sources of well-being at work in the secondary workplace among both the globally and locally mobile employees. Fulfilling their tasks in the field was considered significant and satisfying.

However, there were several stress-arousing factors in the secondary workplace as well. The global movers complained about long working days and many meetings with demanding negotiations and extensive responsibilities related to them. The cultural diversity of the people met by the globally mobile groups was a workload factor both in the physical and virtual workspaces. The mobile employees also encountered a multitude of different individuals in their work. The main workload factor in the virtual spaces refers to the communication connections: demanding duties and social relationships associated with poorly or roughly working virtual connections with colleagues.

The locally mobile employees perceived working in secondary workplaces as busy, and full of unexpected situations and interruptions requiring quick responses with sometimes dissatisfied, aggressive or non-communicative clients. Changing physical conditions in the secondary workplace could make it a tight and isolated place or one not originally meant for performing their duties. Because the ICT devices constructing the virtual working environment were kept in a pocket or in a backpack while moving, they were expected to be light and tiny. On the other hand, problems of visibility in the use of their interfaces emerged when the devices were small. For example, the maintenance employees moved in dark wells and engine rooms and had visual difficulties with the palm computer they used. This is a dilemmatic question of the trade-off between size and visual requirements, as well as portability requirements in mobile devices.

Third workplaces

Hotels, restaurants, cafés and service stations were places to meet colleagues and to have enriching discussions with them in which they exchanged all kinds of experiences. These mainly informal meetings were seen as positive social workload factors.

The locally mobile employees did not mention any negative workload factors in third workplaces, whereas the global movers complained of feelings of isolation, loneliness and 'hotel death'.

Discussion: Benefits and drawbacks of working in multiple locations

Many requirements of working in multiple locations

This study shows that especially the globally mobile employees used all the five types of locations for working, the locally mobile employees less so. Homes are places to perform tasks requiring concentration, to prepare, and, to some degree, to communicate with and counsel colleagues. Homes are also places to rest and to increase well-being. Main workplaces are for social support and getting and giving advice by meeting colleagues, exchanging information, having negotiations, doing decisions and reporting. Moving places have different purposes for global and local movers. Globally mobile employees may travel for a long time in aeroplanes and use the time to read materials and to prepare presentations, whereas locally mobile employees use their often short-term trips to call colleagues and superiors for advice and feedback. Secondary workplaces are places for accomplishing work with customers and partners, both among global and local movers. They are important places to finalise jobs and result in job satisfaction. Third workplaces also have a different function for global and local movers. Globally mobile employees use hotels—in addition to resting—to prepare and to meet colleagues either face-to-face or virtually. They also visit other 'third' local places in target countries, such as fairs, conferences and universities to look for innovations and to create networks. Locally mobile employees use cafés for short-term informal discussions with peers.

The globally mobile employees used mainly common electronic tools and devices, such as smart phones, PCs and laptops, whereas two of the local groups had special tools tailored for specific purposes in the places they worked in; for example, the maintenance employees had a multi-purpose PDA designed for maintenance work, and the security guards used a mobile phone with a global positioning system to guarantee their security and safety. Integrated groupware systems were unexpectedly little used. The most popular usage of virtual tools was sending and receiving emails.

Different locations contained factors arousing both well-being and stress. The factors influencing well-being differed, however, in their types. At home, individual opportunities to concentrate on and exert control over the job and time were sources of well-being, whereas in the main workplace social support from colleagues and management had the same positive meaning. Moving places were for physical rest, although often being uncomfortable reduced the quality of the rest. Secondary workplaces satisfied the achievement motivation as tasks were accomplished there. Third workplaces again were places for social interaction—both formal and informal—as was the main workplace.

The same places could arouse stress as well. At home, work seemed to interfere with family life and to create feelings of a work-life imbalance. In the main workplace, tasks often piled up, lengthening the working day after travelling, and bad social relationships in the workplace also created stress. In the moving places, the physical conditions were often poor as they were too tight and inconvenient. In the secondary workplaces, there were many different factors arousing stress, as the places varied considerably among the groups that were studied. The global movers complained about demanding tasks and extensive responsibilities, cultural differences and the functionality of communication tools. The main complaints among the local movers were quickly changing working conditions and dissatisfied or aggressive people.

In this study, especially with the employees working globally in virtual spaces, synchronous working over time zones had the effect of changing the hours and rhythm of their work. This 'timeless' continuous working and collaboration is potentially a very strong negative mental workload factor as it breaks down the traditional eight-hour working periods. It had to be taken into account that their colleagues or customers were spread out around the world. The employees did not have uninterrupted working days starting at a particular time and ending at another, but instead altered the rhythms of their days, as well as their weeks, according to the demands of their tasks. Working

periods could take place early in the morning, in the afternoon and in the evening. Work might be done to some extent every day of the week. This all caused an inclination towards unconventional working hours, with evening and weekend work. The need to be constantly available also affected the experiences of strain.

As the degree of mobility and the geographical dispersion of the workplaces increased, so did the demands for mediated interaction, that is, the use of virtual workspaces. The mental workload experiences of the interviewees were also associated with the interpretation of messages sent with means of communication and collaboration: mediated interaction carried many opportunities for misunderstandings, which could even be fatal; for example, in the work of security personnel the supervisor in the control centre directs the movement of a guard in the field during dangerous situations. The explicit and shared understanding of messages between them was essential. On account of this, the workload factors related to mediated interaction were mainly mental and social in nature. The central issue can be consolidated into a question of cognitive abilities, that is, how successfully one can build up mental and social constructions in virtual working environments.

Benefits and drawbacks of mobile, multi-locational work to employers and employees

Working in multiple places and travelling to them has its benefits and drawbacks, both for an employee and an employer (see, e.g. Becker and Tennesen, 1995; Kurland and Bailey, 1999; Bailey and Kurland, 2002; Mann and Holdsworth, 2003). The working days of many mobile, multi-locational employees are blurred, as there is no specific time or place at which it is possible for work to start or end (see also Hislop and Axtell, 2007). The distinction between work and private life easily fades away. People work all the time both in solitude, virtually asynchronously, and synchronously online and in face-to-face collaboration with others when visiting their offices. It is often rather difficult to separate working in solitude from collaborative work, even when working at home. Working in solitude often takes place in 'pseudo-privacy' (Becker and Sims, 2000: 15), that is, it is interrupted by numerous emails, text messages, calls and online virtual meetings, as in the cases of the global groups in this study. Increasing findability (Morville, 2005) and awareness of others' locations and the resulting continuous availability reduce the feeling of autonomy and increase that of external controllability. Findability implies that you can be contacted by anybody through various communication technologies at any time, for example with Twitter. Thus, the nature of work seems to have become all the more blurred on several levels.

Next, the benefits and drawbacks of mobile multi-locational work are discussed from the viewpoints of five types of physical places and from the perspectives of employers and employees (see also Vartiainen *et al.*, 2007).

Home

From a company's point of view, *working at home* reduces the need for office premises and transportation and the costs associated with them, as well as self-perceived effectiveness (see, e.g. Toffler, 1980; Baruch, 2000). Reduced transportation needs result in a reduction of traffic congestion and air pollution. The ability to work at home may also attract and retain certain highly valued employees, thus broadening the workforce pool. On the other hand, companies' responsibilities based on legislation, for example insurance liabilities, increase. Management control over work performance is lost as the visibility of employees is lower. Employees may commit only weakly to the organisation, and there are also challenges to renew bases of compensation. Building up a home office, for example, furniture, equipment, rent and additional media lines, also requires funding.

From an employee's viewpoint, working at home can result in increased feelings of autonomy and self-control over time and reduced work-related stress, although family-related stress may increase (e.g. Baruch, 2000). Homes are places where the interruptions that take place at the office can be avoided and where one can do work that needs

concentration (Halford, 2005; Hislop and Axtell, 2009). The time used is increased because of there being no commuting. There is freedom to choose when to work and when to have personal time. This may lead to a higher quality of personal life and more effective work. On the other hand, 'workaholism', that is, an addiction to working excessively and persistently with harmful consequences (Schaufeli *et al.*, 2008), may be exacerbated. Feelings of isolation from the main office have been reported (e.g. Konradt *et al.*, 2000). The main challenges are work spilling over into family life and leisure time and the imbalance between them. This may reduce the opportunity for recovery from work (Zijlstra and Sonnentag, 2006), especially among women (Hartig *et al.*, 2007). Additionally, there are also interruptions at home if the children are small. The workspace can be inadequate and separate workplaces are costly. Because of reduced staff interaction, there is a lack of social contacts and isolation from the flow of information, support, and help from management and colleagues. The deterioration of the relationship with supervisors may harm promotion prospects.

Main workplace

The dilemma of 'main offices' is whether they should be a social setting or a place to concentrate full time on task performance, as was also shown in this research. Many studies (e.g. Gonz ales and Mark, 2004) show that work in offices is frequently interrupted, which may seriously reduce work productivity. Difficulties in concentrating increase because of uncontrolled noise and interruptions, such as uninvited chatting, being asked questions about work and disturbances created by meetings within the space. The feeling of privacy is lost.

Nevertheless, offices are places for meetings and dialogues, which are necessary for creating something new and for decision making. Halford (2005) also observed that organisational space was associated with more concentrated and challenging forms of work and with interactions between teams and between managers and staff. Hislop and Axtell (2009) in their study observed that consultants' days in office included both formal project meetings and informal social interactions. It may be that increasing multi-locality strengthens the social meaning and attraction of the main workplace.

Moving places

Little is known about working in *moving workplaces*. The main conclusion of our study is that moving places are still designed for transporting employees, not for their work. As working environments, moving places are the most constraining locations though there are differences in usefulness depending on the means of transportation and the length of time spent in them. This is not, however, to take the attitude that moving places should be workplaces, as they often have other functions such as rest and leisure (Letherby and Reynolds, 2003). In any case, those travelling a lot often attempt to do some work while travelling. What is done depends on the means of transportation, for example, driving a car safely precludes people from undertaking any other work-related task apart from communicating with others (Hislop and Axtell, 2009). Once again, a company can save on the costs of premises when means of transportation are used for work, and it is better able to respond to customers' needs. On the other hand, providing communication tools for moving employees increases costs. There is no direct control over employees, as tracking them may be unethical.

From the employees' point of view, there is an opportunity to interact with interesting strangers and go to exotic places to work. Travelling also provides chances to be alone and to think and reflect. The opportunities to concentrate on reading, writing, using a mobile device and consulting documents also increase. On the other hand, the main challenge is the necessity to adapt to changing environments again and again. What is possible in one place is not possible in another. There also seem to be some differences between working in public places, such as trains, and working in a private car. As Felstead *et al.* (2005) note, public transport throws large numbers of strangers together in enclosed spaces under each other's observation and leads to unwanted interaction with strangers. The car allows drivers more choice as to their types of social

encounters. In order to work, it is necessary to take along numerous devices to communicate and collaborate, though the lack of power sockets is still a common nuisance.

Secondary workplaces

From a company's viewpoint, 'secondary workplaces', such as customers' sites and satellite and telework offices, also usually reduce costs per square metre in the main office. Working in them may also promote environmental protection by reducing traffic congestion, energy consumption, air pollution, and the number of commutes. They may also increase the availability of skilled personnel. On the other hand, there are extra costs related to communication and collaboration technologies. Remote management is a challenge, as indicators to measure performance may be missing, as too many guidelines on how to act. In some cases, protecting company secrets represents a challenge.

From an employee's viewpoint, our study showed that the secondary workplace was a significant place for the accomplishment of tasks, which aroused feelings of well-being and satisfaction. The accomplishment means close working with clients and communicating with colleagues from afar as was also shown in Hislop and Axtell's (2009) study on consultants. Working near home in a satellite office may bring about a better quality of life, though working far from the main office may disconnect an employee from his or her work community. Working near the home helps in avoiding the harmful mixing of work and family life, compared with teleworking at home. In addition to saving time, the reduced commuting time to and from the main office reduces employee stress related to commuting. On the other hand, social contacts with peers and preserving one's professional identity are challenges.

Third workplaces

Hotels, cafés and conference venues, as well as the public areas and lounges of airports, are quickly available and easy to access. Their benefits from a company's point of view once more relate to cutting the costs of main office premises. Working in these places also means more working hours. On the other hand, if they are in permanent use, the public image of the company may suffer. Investing in the technologies that are needed is not without its costs either. Additionally, protecting confidential information is a challenge.

From an employee viewpoint, feelings of freedom and control over time and schedule may increase. Easy access, on the other hand, may reduce the ability to separate work from one's personal life. Privacy and personal space are lacking, and there may be interruptions. Reduced social interaction with co-workers results in the loss of opportunities to learn from others. The technological infrastructure and devices that are needed in order to really be able to work are often lacking.

All in all, there seems to be a dilemma of control versus trust and empowerment from the viewpoint of management, and a dilemma of full findability versus autonomy and work-life balance from the viewpoint of employees. It is a long jump to change from the 'one-place office', be it home or any other permanent place, to the 'multiple-place workplace', which could be called a mobile virtual office for multi-locational work. It may increase employees' self-regulation and control, productivity, happiness and time spent with clients as a result of reduced commuting time, and, especially, reduce space and occupancy costs. At the same time, it may reduce professional and social interaction between employees and between employees and management, reducing employees' rights and connections to the organisation, and upsetting the balance between work and life. It is evident that working in multiple locations increases the variety of work requirements and mental workload factors.

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